Åã÷åéñßäéï ôïõ FreeBSD

ÏìÜäá Ôåêìçñßùóçò ôïõ FreeBSD

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áðü ÏìÜäá Ôåêìçñßùóçò ôïõ FreeBSD
ÄçìïóéåõìÝíï ÖåâñïõÜñéïò 1999
Ðíåõìáôéêü Äéêáéþìáôá © 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 ÏìÜäá Ôåêìçñßùóçò ôïõ FreeBSD

Êáëþò Þñèáôå óôï FreeBSD! Áõôü ôï åã÷åéñßäéï êáëýðôåé ôçí åãêáôÜóôáóç êáé ôçí êáèçìåñéíÞ ÷ñÞóç ôïõ *FreeBSD 8.3-RELEASE* êáé ôïõ *FreeBSD 9.1-RELEASE*. Ôï âéâëßï áõôü åßíáé *ìüíéìá õðü âåëôßùóç êáé áíÜðôõîç* êáé áðïôåëåß ôï áðïôÝëåóìá ôçò äïõëåéÜò ðïëëþí áôüìùí, ïðüôå êÜðïéá ôìÞìáôá ìðïñåß íá ðåñéÝ÷ïõí ó÷åôéêÜ îåðåñáóìÝíåò ðëçñïöïñßåò êáé íá ÷ñåéÜæïíôáé áíáíÝùóç. Áí åíäéáöÝñåóôå íá ìáò âïçèÞóåôå óå áõôü ôï Ýñãï, åðéêïéíùíÞóôå ìáæß ìáò óôçí çëåêôñïíéêÞ ëßóôá ïìÜäáò ôåêìçñßùóçò ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-doc). Ç ôåëåõôáßá Ýêäïóç áõôïý ôïõ êåéìÝíïõ åßíáé ðÜíôá äéáèÝóéìç áðü ôçí éóôïóåëßäá ôïõ FreeBSD (http://www.FreeBSD.org/) (ðáëéüôåñåò åêäüóåéò ìðïñåßôå íá âñåßôå óôç äéåýèõíóç http://docs.FreeBSD.org/doc/). Ìðïñåßôå åðßóçò íá ìåôáöïñôþóåôå óôïí õðïëïãéóôÞ óáò ôï ßäéï âéâëßï óå Üëëåò ìïñöÝò áñ÷åßïõ êáé ìå äéÜöïñåò ìïñöÝò óõìðßåóçò áðü ôïí åîõðçñåôçôÞ FTP ôïõ FreeBSD (ftp://ftp.FreeBSD.org/pub/FreeBSD/doc/) Þ Ýíá áðü ôá ðïëëÜ mirror sites. Áí ðñïôéìÜôå Ýíá ôõðùìÝíï áíôßôõðï, ìðïñåßôå íá áãïñÜóåôå Ýíá áíôßãñáöï ôïõ Åã÷åéñéäßïõ, áðü ôï FreeBSD Mall (http://www.freebsdmall.com/). Ìðïñåßôå åðßóçò íá øÜîåôå óå üëï ôï âéâëßï (http://www.FreeBSD.org/search/index.html).

Ç äéáíïìÞ êáé ÷ñÞóç óå ìïñöÞ ðçãáßïõ êþäéêá (SGML DocBook) Þ óå ’ìåôáãëùôôéóìÝíç’ ìïñöÞ (SGML, HTML, PDF, PostScript, RTF êïê) ìå Þ ÷ùñßò áëëáãÝò, åðéôñÝðåôáé åöüóïí ïé ðáñáêÜôù ðñïûðïèÝóåéò ôçñïýíôáé:

1. Ç äéáíïìÞ óå ìïñöÞ ðçãáßïõ êþäéêá (SGML DocBook) ðñÝðåé íá äéáôçñåß ôçí ðáñáðÜíù äÞëùóç ðíåõìáôéêþí äéêáéùìÜôùí, áõôÞ ôç ëßóôá ìå ðñïûðïèÝóåéò êáé ôçí åðüìåíç ðáñÜãñáöï óôéò ðñþôåò ãñáììÝò ôïõ áñ÷åßïõ, áìåôÜâëçôåò.
2. Ç äéáíïìÞ óå ìåôáãëùôôéóìÝíåò ìïñöÝò (ìåôÜöñáóç óå Üëëá DTD, ìåôáôñïðÞ óå PDF, PostScript, RTF Þ Üëëåò ìïñöÝò) ðñÝðåé íá áíáðáñÜãåé ôçí ðáñáðÜíù äÞëùóç ðíåõìáôéêþí äéêáéùìÜôùí, áõôÞ ôç ëßóôá ìå ðñïûðïèÝóåéò, êáé ôçí ðáñáêÜôù ðáñÜãñáöï ôüóï óôçí ôåêìçñßùóç üóï êáé óå Üëëï õëéêü ðïõ ðáñÝ÷åôáé ìáæß ìå ôçí äéáíïìÞ.

Óçìáíôéêü: ÁÕÔÇ Ç ÔÅÊÌÇÑÉÙÓÇ ÄÉÍÅÔÁÉ ÁÐÏ ÔÇÍ ÏÌÁÄÁ ÔÅÊÌÇÑÉÙÓÇÓ ÔÏÕ FREEBSD "ÙÓ Å×ÅÉ" ÊÁÉ ÄÅÍ ÐÁÑÅ×ÅÔÁÉ ÊÁÌÉÁ ÁÌÅÓÇ Ç ÅÌÌÅÓÇ ÅÃÃÕÇÓÇ, ÓÕÌÐÅÑÉËÁÌÂÁÍÏÌÅÍÙÍ, ÁËËÁ ×ÙÑÉÓ ÍÁ ÐÅÑÉÏÑÉÆÅÔÁÉ ÌÏÍÏ ÓÅ ÁÕÔÅÓ, ÊÁÉ ÔÙÍ ÅÌÌÅÓÙÍ ÅÃÃÕÇÓÅÙÍ ÃÉÁ ÅÌÐÏÑÅÕÓÉÌÏÔÇÔÁ Ç ÊÁÔÁËËÇËÏÔÇÔÁ ÃÉÁ ÏÐÏÉÏÍÄÇÐÏÔÅ ÓÕÃÊÅÊÑÉÌÅÍÏ ÓÊÏÐÏ. ÓÅ ÊÁÌÉÁ ÐÅÑÉÐÔÙÓÇ ÄÅÍ ÅÕÈÕÍÅÔÁÉ Ç ÏÌÁÄÁ ÔÅÊÌÇÑÉÙÓÇÓ ÔÏÕ FREEBSD ÃÉÁ ÏÐÏÉÅÓÄÇÐÏÔÅ ÁÌÅÓÅÓ, ÅÌÌÅÓÅÓ, ÔÕ×ÁÉÅÓ, ÅÉÄÉÊÅÓ, ÓÇÌÁÍÔÉÊÅÓ, Ç ÊÁÔÁ ÐÅÑÉÐÔÙÓÇ ÂËÁÂÅÓ (ÓÕÌÐÅÑÉËÁÌÂÁÍÏÌÅÍÙÍ, ÁËËÁ ×ÙÑÉÓ ÍÁ ÐÅÑÉÏÑÉÆÅÔÁÉ ÌÏÍÏ ÓÅ ÁÕÔÅÓ, ÊÁÉ ÔÇÍ ÁÄÕÍÁÌÉÁ ÐÑÏÓÂÁÓÇÓ ÓÅ ÅÍÁËËÁÊÔÉÊÅÓ ÐÇÃÅÓ Ç ÕÐÇÑÅÓÉÅÓ, ÔÇÍ ÁÄÕÍÁÌÉÁ ×ÑÇÓÇÓ, ÔÇÍ ÁÐÙËÅÉÁ ÄÅÄÏÌÅÍÙÍ Ç ÊÅÑÄÏÕÓ, ÊÁÉ ÔÇÍ ÄÉÁÊÏÐÇ ÅÐÉ×ÅÉÑÇÌÁÔÉÊÙÍ ËÅÉÔÏÕÑÃÉÙÍ), ÐÏÕ ÐÑÏÊÁËÏÕÍÔÁÉ ÌÅ ÏÐÏÉÏÄÇÐÏÔÅ ÔÑÏÐÏ ÁÐÏ ÔÇ ×ÑÇÓÇ ÁÕÔÇÓ ÔÇÓ ÔÅÊÌÇÑÉÙÓÇÓ.

Ôï FreeBSD åßíáé Ýíá êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôïõ FreeBSD Foundation.

Ïé ëÝîåéò 3Com êáé HomeConnect åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò 3Com Corporation.

Ïé ëÝîåéò 3ware êáé Escalade åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò 3ware Inc.

Ç ëÝîç ARM åßíáé êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôçò ARM Limited.

Ç ëÝîç Adaptec åßíáé êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôçò Adaptec, Inc.

Ïé ëÝîåéò Þ öñÜóåéò Adobe, Acrobat, Acrobat Reader, êáé PostScript åßíáé åßôå êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá Þ åìðïñéêÜ óýìâïëá ôçò Adobe Systems Incorporated óôéò ÇíùìÝíåò Ðïëéôåßåò Þ/êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Þ öñÜóåéò Apple, AirPort, FireWire, Mac, Macintosh, Mac OS, Quicktime, êáé TrueType åßíáé åìðïñéêÜ óýìâïëá ôçò Apple Computer, Inc., êáôï÷õñùìÝíá óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Corel êáé WordPerfect åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Corel Corporation Þ/êáé ôùí èõãáôñéêþí ôçò óôïí ÊáíáäÜ, ôéò ÇíùìÝíåò Ðïëéôåßåò Þ/êáé óå Üëëåò ÷þñåò.

Ç öñÜóç Sound Blaster åßíáé åìðïñéêü óýìâïëï ôçò Creative Technology Ltd. óôéò ÇíùìÝíåò Ðïëéôåßåò Þ/êáé óå Üëëåò ÷þñåò.

Ç ëÝîç CVSup åßíáé êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôïõ John D. Polstra.

Ïé ëÝîåéò Þ öñÜóåéò Heidelberg, Helvetica, Palatino, êáé Times Roman åßíáé åßôå êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá Þ åìðïñéêÜ óýìâïëá ôçò Heidelberger Druckmaschinen AG óôéò ÇÐÁ êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Þ öñÜóåéò IBM, AIX, EtherJet, Netfinity, OS/2, PowerPC, PS/2, S/390, êáé ThinkPad åßíáé åìðïñéêÜ óýìâïëá ôçò International Business Machines Corporation óôéò ÇíùìÝíåò Ðïëéôåßåò, Üëëåò ÷þñåò, Þ êáé óôá äýï ôáõôü÷ñïíá.

Ïé ëÝîåéò IEEE, POSIX, êáé 802 åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôïõ Institute of Electrical and Electronics Engineers, Inc. óôéò ÇíùìÝíåò Ðïëéôåßåò.

Ïé ëÝîåéò Intel, Celeron, EtherExpress, i386, i486, Itanium, Pentium, êáé Xeon åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Intel Corporation êáé ôùí èõãáôñéêþí ôçò óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Intuit êáé Quicken åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá óýìâïëá õðçñåóéþí ôçò Intuit Inc., Þ êÜðïéáò áðü ôéò èõãáôñéêÝò ôçò, óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ôï Linux åßíáé Ýíá êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôïõ Linus Torvalds óôéò ÇíùìÝíåò Ðïëéôåßåò.

Ïé ëÝîåéò LSI Logic, AcceleRAID, eXtremeRAID, MegaRAID êáé Mylex åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò LSI Logic Corp.

Ïé ëÝîåéò M-Systems êáé DiskOnChip åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò M-Systems Flash Disk Pioneers, Ltd.

Ïé ëÝîåéò Macromedia, Flash, êáé Shockwave åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Macromedia, Inc. óôéò ÇíùìÝíåò Ðïëéôåßåò êáé/Þ óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Microsoft, IntelliMouse, MS-DOS, Outlook, Windows, Windows Media, êáé Windows NT åßíáé åßôå êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá Þ åìðïñéêÜ óýìâïëá ôçò Microsoft Corporation óôéò ÇíùìÝíåò Ðïëéôåßåò êáé/Þ óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Netscape êáé Netscape Navigator åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Netscape Communications Corporation óôéò Ç.Ð.Á êáé Üëëåò ÷þñåò.

Ïé ëÝîåéò GateD êáé NextHop åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá êáé åìðïñéêÜ óýìâïëá ôçò NextHop óôéò Ç.Ð.Á. êáé Üëëåò ÷þñåò.

Ïé ëÝîåéò Motif, OSF/1, êáé UNIX åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá êáé ïé ëÝîåéò Þ öñÜóåéò IT DialTone êáé The Open Group åßíáé åìðïñéêÜ óýìâïëá ôïõ The Open Group óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ç ëÝîç Oracle åßíáé êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôçò Oracle Corporation.

Ïé ëÝîåéò PowerQuest êáé PartitionMagic åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò PowerQuest Corporation óôéò ÇíùìÝíåò Ðïëéôåßåò êáé/Þ óå Üëëåò ÷þñåò.

Ïé ëÝîåéò RealNetworks, RealPlayer êáé RealAudio åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò RealNetworks, Inc.

Ïé ëÝîåéò Þ öñÜóåéò Red Hat, êáé RPM åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Red Hat, Inc. óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò SAP, R/3, êáé mySAP åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò SAP AG óôç Ãåñìáíßá êáé óå ðïëëÝò Üëëåò ÷þñåò ôïõ êüóìïõ.

Ïé ëÝîåéò Þ öñÜóåéò Sun, Sun Microsystems, Java, Java Virtual Machine, JavaServer Pages, JDK, JRE, JSP, JVM, Netra, OpenJDK, Solaris, StarOffice, Sun Blade, Sun Enterprise, Sun Fire, SunOS, Ultra êáé VirtualBox åßíáé åìðïñéêÜ óýìâïëá Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Sun Microsystems, Inc. óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ïé ëÝîåéò Symantec êáé Ghost åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Symantec Corporation óôéò ÇíùìÝíåò Ðïëéôåßåò êáé óå Üëëåò ÷þñåò.

Ç ëÝîç MATLAB åßíáé Ýíá êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôçò The MathWorks, Inc.

Ç ëÝîç SpeedTouch åßíáé Ýíá åìðïñéêü óýìâïëï ôçò Thomson

Ïé ëÝîåéò Þ öñÜóåéò U.S. Robotics êáé Sportster åßíáé êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò U.S. Robotics Corporation.

Ç ëÝîç VMware åßíáé åìðïñéêü óýìâïëï ôçò VMware, Inc.

Ïé ëÝîåéò Þ öñÜóåéò Waterloo Maple êáé Maple åßíáé åìðïñéêÜ Þ êáôï÷õñùìÝíá åìðïñéêÜ óýìâïëá ôçò Waterloo Maple Inc.

Ç ëÝîç Mathematica åßíáé êáôï÷õñùìÝíï åìðïñéêü óýìâïëï ôçò Wolfram Research, Inc.

Ç ëÝîç XFree86 åßíáé Ýíá åìðïñéêü óýìâïëï ôïõ The XFree86 Project, Inc.

Ïé ëÝîåéò Þ öñÜóåéò Ogg Vorbis êáé Xiph.Org åßíáé åìðïñéêÜ óýìâïëá ôïõXiph.Org.

ÐïëëÝò áðü ôéò ëÝîåéò Þ öñÜóåéò ïé ïðïßåò ÷ñçóéìïðïéïýíôáé áðü ôïõò êáôáóêåõáóôÝò Þ ôïõò ðùëçôÝò ôïõò ãéá íá äéáêñßíïõí ôá ðñïúüíôá ôïõò èåùñïýíôáé åìðïñéêÜ óýìâïëá. ¼ðïõ áõôÝò åìöáíßæïíôáé óå áõôü ôï êåßìåíï êáé ãéá üóåò áðü áõôÝò ãíùñßæåé ç ÏìÜäá ÁíÜðôõîçò ôïõ FreeBSD üôé åßíáé ðéèáíüí íá åßíáé åìðïñéêÜ óýìâïëá, èá äåßôå Ýíá áðü ôá óýìâïëá: “™” Þ “®”.

Ðßíáêáò Ðåñéå÷ïìÝíùí

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Ðñüëïãïò

Óå Ðïéïõò Áðåõèýíåôáé Áõôü ôï Âéâëßï

Ôï ðñþôï ôìÞìá áõôïý ôïõ âéâëßïõ, ïäçãåß ôïí íÝï ÷ñÞóôç óôç äéáäéêáóßá åãêáôÜóôáóçò ôïõ FreeBSD êáé ôïí åéóÜãåé ïìáëÜ óôç öéëïóïößá êáé ôïí ó÷åäéáóìü ôïõ UNIX®. Áõôü ôï ôìÞìá äåí Ý÷åé éäéáßôåñåò áðáéôÞóåéò. Áñêåß ìüíï ç äéÜèåóç ãéá åîåñåýíçóç åíüò íÝïõ óõóôÞìáôïò êáé ç äõíáôüôçôá áöïìïßùóçò ôùí ãíþóåùí ãéá ôï FreeBSD êáèþò áõôÝò åéóÜãïíôáé óôáäéáêÜ.

Áöïý äéáâÜóåôå ôï ðñþôï ôìÞìá, ôï äåýôåñï, êáôÜ ðïëý ìåãáëýôåñï ôìÞìá, ðåñéëáìâÜíåé ìéá åêôåíÞ áíáöïñÜ óå äéÜöïñá èÝìáôá ðïõ åíäéáöÝñïõí ôïõò äéá÷åéñéóôÝò óõóôçìÜôùí FreeBSD. ÌåñéêÜ áðü áõôÜ ôá êåöÜëáéá åßíáé åõêïëüôåñï íá ôá êáôáíïÞóåôå áí Ý÷åôå Þäç ìåëåôÞóåé óõãêåêñéìÝíá ôìÞìáôá ôïõ âéâëßïõ. ¼ðïõ ÷ñåéÜæåôáé êÜôé ôÝôïéï, èá áíáöÝñåôáé óôç óýíïøç ôïõ êåöáëáßïõ ðïõ ìüëéò îåêéíÞóáôå íá äéáâÜæåôå.

Ãéá ðåñéóóüôåñåò ðçãÝò ðëçñïöïñéþí, äåßôå ôï ÐáñÜñôçìá B.

ÁëëáãÝò áðü ôçí Ôñßôç ¸êäïóç

Ç ôñÝ÷ïõóá Ýêäïóç ôïõ Åã÷åéñéäßïõ óôï äéáäßêôõï, åßíáé ôï áðïôÝëåóìá ôçò ðñïóðÜèåéáò ðïëëþí åêáôïíôÜäùí åèåëïíôþí óôï äéÜóôçìá ôùí ôåëåõôáßùí 10 ÷ñüíùí. Ïé ðéï óçìáíôéêÝò áëëáãÝò óå ó÷Ýóç ìå ôçí ôñßôç Ýíôõðç Ýêäïóç ôïõ Åã÷åéñéäßïõ (2004) öáßíïíôáé ðáñáêÜôù:

- ÊåöÜëáéï 26, ôï DTrace, åßíáé Ýíá íÝï êåöÜëáéï ìå ðëçñïöïñßåò ó÷åôéêÜ ìå áõôü ôï ðáíßó÷õñï åñãáëåßï áíÜëõóçò áðüäïóçò.
- ÊåöÜëáéï 21, ç ÕðïóôÞñéîç ÓõóôçìÜôùí Áñ÷åßùí, åßíáé Ýíá íÝï êåöÜëáéï ìå ðëçñïöïñßåò ãéá óõóôÞìáôá áñ÷åßùí ôá ïðïßá õðïóôçñßæïíôáé áðü ôï FreeBSD áëëÜ áíáðôýóóïíôáé áðü Üëëåò ïìÜäåò, üðùò ôï ZFS áðü ôçí Sun™.
- ÊåöÜëáéï 18,ï ¸ëåã÷ïò ÓõìâÜíôùí Áóöáëåßáò, åßíáé Ýíá íÝï êåöÜëáéï ìå ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò íÝåò äõíáôüôçôåò êáé ôçí ÷ñÞóç ôïõ auditing óôï FreeBSD.
- ÊåöÜëáéï 23, ç Åéêïíéêïðïßçóç, åßíáé Ýíá íÝï êåöÜëáéï ìå ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç ôïõ FreeBSD óå ëïãéóìéêü åêôÝëåóçò åéêïíéêþí (virtual) ìç÷áíçìÜôùí.
- ÊåöÜëáéï 3, ç ÅãêáôÜóôáóç ôïõ FreeBSD 9.*x* êáé ÌåôáãåíÝóôåñùí Åêäüóåùí, åßíáé Ýíá íÝï êåöÜëáéï ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç ôïõ FreeBSD ìå ôç âïÞèåéá ôïõ íÝïõ ðñïãñÜììáôïò **bsdinstall**.

ÁëëáãÝò áðü ôç Äåýôåñç ¸êäïóç (2004)

Ç ôñßôç Ýêäïóç áõôïý ôïõ âéâëßïõ Þôáí ôï áðïôÝëåóìá ôçò ðñïóðÜèåéáò ðåñéóóüôåñùí áðü äýï ÷ñüíùí áðü ôá ìÝëç ôçò ÏìÜäáò Ôåêìçñßùóçò ôïõ FreeBSD. Ç Ýíôõðç Ýêäïóç åß÷å ôüóï ìåãÜëï ìÝãåèïò, ðïõ êñßèçêå áíáãêáßï íá ôõðùèåß óå äýï ÷ùñéóôïýò ôüìïõò. ÐáñáêÜôù öáßíïíôáé ïé óçìáíôéêüôåñåò áëëáãÝò óå áõôÞ ôç íÝá Ýêäïóç:

- ÊåöÜëáéï 12, Ôï êåöÜëáéï Ñýèìéóçò êáé Âåëôéóôïðïßçóçò ôïõ FreeBSD, åðåêôÜèçêå ìå íÝåò ðëçñïöïñßåò ãéá ôç äéá÷åßñéóç åíÝñãåéáò êáé ðüñùí ôïõ óõóôÞìáôïò ìÝóù ACPI, ìå ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï óýóôçìá `cron` êáé ìå ðåñéóóüôåñåò åðéëïãÝò ðáñáìåôñïðïßçóçò ôïõ ðõñÞíá ôïõ FreeBSD.
- ÊåöÜëáéï 15, Ôï êåöÜëáéï ÁóöÜëåéáò, åðåêôÜèçêå ìå íÝåò ðëçñïöïñßåò ãéá Äßêôõá VPN, ãéá ëßóôåò åëÝã÷ïõ ðñüóâáóçò áñ÷åßùí (ACLs) êáé ðåñéóóüôåñåò óõìâïõëÝò ó÷åôéêÜ ìå ôçí áóöÜëåéá ôïõ FreeBSD.

- ÊåöÜëáéï 17, Ï Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò (MAC), åßíáé Ýíá íÝï êåöÜëáéï óå áõôÞ ôçí Ýêäïóç. Åîçãåß ôé åßíáé ï ìç÷áíéóìüò MAC êáé ðþò ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá åíéó÷õèåß ç áóöÜëåéá åíüò óõóôÞìáôïò FreeBSD.
- ÊåöÜëáéï 19, Ôï êåöÜëáéï ãéá ôá ÁðïèçêåõôéêÜ ÌÝóá, åðåêôÜèçêå, ìå íÝåò ðëçñïöïñßåò ãéá óõóêåõÝò áðïèÞêåõóçò USB, óôéãìéüôõðá óõóôÞìáôïò áñ÷åßùí (snapshots), ðåñéïñéóìïýò óôç ÷ñÞóç ôùí óõóôçìÜôùí áñ÷åßùí (quotas), óõóôÞìáôá áñ÷åßùí ðïõ âáóßæïíôáé óå õðÜñ÷ïíôá áñ÷åßá Þ óôï äßêôõï, êáèþò êáé êñõðôïãñáöçìÝíåò êáôáôìÞóåéò äßóêùí.
- ÊåöÜëáéï 22, Ï Äéá÷åéñéóôÞò Ôüìùí Vinum, åßíáé Ýíá íÝï êåöÜëáéï óå áõôÞ ôçí Ýêäïóç. ÐåñéãñÜöåé ôïí ôñüðï ÷ñÞóçò ôïõ Vinum, åíüò óõóôÞìáôïò äéá÷åßñéóçò áðïèçêåõôéêþí ìÝóùí ðïõ õëïðïéåß ôçí ïñãÜíùóç öõóéêþí äßóêùí ôïõ óõóôÞìáôïò óå äéÜôáîç RAID-0, RAID-1 êáé RAID-5.
- Óôï ÊåöÜëáéï 28, ðñïóôÝèçêå Ýíá ôìÞìá ó÷åôéêü ìå ôçí åðßëõóç ðñïâëçìÜôùí óôéò óõíäÝóåéò PPP êáé SLIP.
- ÊåöÜëáéï 29, Ôï êåöÜëáéï ãéá ôï Çëåêôñïíéêü Ôá÷õäñïìåßï, åðåêôÜèçêå ìå íÝåò ðëçñïöïñßåò ãéá ôçí ÷ñÞóç åíáëëáêôéêþí MTA, ðéóôïðïßçóç ôáõôüôçôáò óôï SMTP, ôï ðñùôüêïëëï UUCP, ôá åñãáëåßá **fetchmail** êáé **procmail** êáé ìå Üëëá èÝìáôá ãéá ðñï÷ùñçìÝíïõò.
- ÊåöÜëáéï 30, Ôï êåöÜëáéï Åîõðçñåôçôþí Äéêôýùí, ðåñéëáìâÜíåôáé ãéá ðñþôç öïñÜ óå áõôÞ ôçí Ýêäïóç. Áõôü ôï êåöÜëáéï ðåñéãñÜöåé ðùò íá åãêáôáóôÞóåôå ôïí **ÄéáêïìéóôÞ HTTP Apache**, ôïí åîõðçñåôçôÞ **ftpd** ôïõ FreeBSD êáé ôïí äéáêïìéóôÞ **Samba** ãéá åðéêïéíùíßá ìå ðåëÜôåò Microsoft® Windows®. Óôï êåöÜëáéï áõôü, Ý÷ïõí ìåôáöåñèåß êÜðïéåò åíüôçôåò áðü ôï ÊåöÜëáéï 32 (Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùóçò), ðñïêåéìÝíïõ íá âåëôéùèåß ç ðáñïõóßáóç ôïõò.
- ÊåöÜëáéï 32, Ôï êåöÜëáéï ãéá Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùóçò, åðåêôÜèçêå ìå íÝåò ðëçñïöïñßåò ãéá ôç ÷ñÞóç óõóêåõþí Bluetooth® óôï FreeBSD, ôçí åãêáôÜóôáóç áóýñìáôùí äéêôýùí, êáé ôçí ÌÝèïäï Äéêôýùóçò Áóýã÷ñïíçò ÌåôáöïñÜò (ATM).
- ÐñïóôÝèçêå Ýíá Ëåîéëüãéï, ãéá íá óõãêåíôñþóåé üëïõò ôïõò ôå÷íéêïýò üñïõò êáé ôïõò äéÜöïñïõò ïñéóìïýò ðïõ ðåñéÝ÷ïíôáé óå ïëüêëçñï ôï âéâëßï.
- ¸ãéíáí áéóèçôéêÝò âåëôéþóåéò óôïõò ðßíáêåò êáé óôá ãñáöÞìáôá óå ïëüêëçñï ôï âéâëßï.

ÁëëáãÝò áðü ôçí Ðñþôç ¸êäïóç (2001)

Ç äåýôåñç Ýêäïóç Þôáí ôï áðïôÝëåóìá ôïõëÜ÷éóôïí äýï ÷ñüíùí åñãáóßáò áðü ôá ìÝëç ôçò ÏìÜäáò Ôåêìçñßùóçò ôïõ FreeBSD. Ïé ðéï óçìáíôéêÝò áëëáãÝò óå áõôÞ ôçí Ýêäïóç Þôáí ïé ðáñáêÜôù:

- ÐñïóôÝèçêå Ýíá ïëïêëçñùìÝíï ÅõñåôÞñéï.
- ¼ëá ôá ãñáöÞìáôá óå ASCII áíôéêáôáóôÜèçêáí áðü ãñáöéêÜ äéáãñÜììáôá.
- ÐñïóôÝèçêå ìéá ôõðïðïéçìÝíç óýíïøç óå êÜèå êåöÜëáéï, ç ïðïßá ðåñéÝ÷åé ìéá óýíôïìç áíáêåöáëáßùóç ôùí ðëçñïöïñéþí ðïõ ðåñéÝ÷åé ôï êåöÜëáéï êáé ôé áíáìÝíåôáé íá ãíùñßæåé áðü ðñéí ï áíáãíþóôçò.
- Ôï ðåñéå÷üìåíï áíáäéïñãáíþèçêå óå ôñßá ëïãéêÜ ìÝñç: “Îåêéíþíôáò ìå ôï FreeBSD”, “Äéá÷åßñéóç ÓõóôÞìáôïò” êáé “ÐáñáñôÞìáôá”.
- Ôï ÊåöÜëáéï 2 (“Åãêáèéóôþíôáò ôï FreeBSD”) îáíáãñÜöôçêå áðü ôçí áñ÷Þ ìå ðïëëÝò åéêüíåò, þóôå íá äéåõêïëýíåé ôïõò ÷ñÞóôåò íá êáôáíïÞóïõí ôï êåßìåíï.
- Ôï ÊåöÜëáéï 4 (“ÂáóéêÝò ¸ííïéåò óôï UNIX”) åðåêôÜèçêå þóôå íá óõìðåñéëáìâÜíåé ðñüóèåôåò ðëçñïöïñßåò ãéá ôéò äéåñãáóßåò (processes), ôïõò äáßìïíåò (daemons), êáé ôá óÞìáôá (signals).

- Ôï ÊåöÜëáéï 5 (“ÅãêáôÜóôáóç Åöáñìïãþí: ÐáêÝôá êáé Ports”) åðåêôÜèçêå þóôå íá óõìðåñéëáìâÜíåé ðñüóèåôåò ðëçñïöïñßåò ãéá ôçí äéá÷åßñéóç ðñïìåôáãëùôôéóìÝíùí ðáêÝôùí (packages).
- Ôï ÊåöÜëáéï 6 (“Ôï Óýóôçìá X Window”) îáíáãñÜöôçêå áðü ôçí áñ÷Þ ìå Ýìöáóç óôçí ÷ñÞóç ìïíôÝñíùí ôå÷íïëïãéþí, üðùò ôá ðåñéâÜëëïíôá åñãáóßáò **KDE** êáé **GNOME** óå XFree86™ 4.X.
- Ôï ÊåöÜëáéï 13 (“Ç Äéáäéêáóßá Åêêßíçóçò ôïõ FreeBSD”) åðåêôÜèçêå ìå ðåñéóóüôåñåò ðëçñïöïñßåò.
- Ôï ÊåöÜëáéï 19 (“Áðïèçêåõôéêü ÌÝóá”) îáíáãñÜöôçêå ìå âÜóç ôá ðáëáéüôåñá äýï êåöÜëáéá “Äßóêïé” êáé “Áíôßãñáöá Áóöáëåßáò”. Ðéóôåýïõìå üôé ôá èÝìáôá áõôÜ åßíáé ðéï åõêïëüíïçôá üôáí ðáñïõóéÜæïíôáé ìáæß óáí Ýíá êåöÜëáéï. ÐñïóôÝèçêå åðßóçò ìéá åíüôçôá ãéá RAID (õëïðïßçóçò ìÝóù õëéêïý Þ ëïãéóìéêïý).
- Ôï ÊåöÜëáéï 27 (“ÓåéñéáêÝò Åðéêïéíùíßåò”) áíáäéïñãáíþèçêå áðü ôçí áñ÷Þ êáé åíçìåñþèçêå ãéá ôéò åêäüóåéò FreeBSD 4.X/5.X.
- Ôï ÊåöÜëáéï 28 (“PPP êáé SLIP”) åíçìåñþèçêå óå óçìáíôéêü âáèìü.
- Ðïëëïß íÝïé ôïìåßò ðñïóôÝèçêáí óôï ÊåöÜëáéï 32 (“Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùóçò”).
- Ôï ÊåöÜëáéï 29 (“Çëåêôñïíéêü Ôá÷õäñïìåßï”) åðåêôÜèçêå ãéá íá óõìðåñéëáìâÜíåé ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôéò ñõèìßóåéò ôïõ **Sendmail**.
- Ôï ÊåöÜëáéï 11 (“Óõìâáôüôçôá ìå ÅêôåëÝóéìá ôïõ Linux®”) åðåêôÜèçêå ãéá íá óõìðåñéëáìâÜíåé ðëçñïöïñßåò ãéá ôçí åãêáôÜóôáóç ôçò âÜóçò äåäïìÝíùí **Oracle®** êáé ôïõ **Mathematica®**.
- Óôçí äåýôåñç Ýêäïóç êáëýðôïíôáé åðßóçò ôá ðáñáêÜôù íÝá èÝìáôá:
  - Ñýèìéóç êáé Âåëôéóôïðïßçóç (ÊåöÜëáéï 12)
  - ÐïëõìÝóá (ÊåöÜëáéï 8)

ÏñãÜíùóç Áõôïý ôïõ Âéâëßïõ

Áõôü ôï âéâëßï ÷ùñßæåôáé óå ðÝíôå äéáêñéôÜ ëïãéêÜ ôìÞìáôá. Ôï ðñþôï ôìÞìá, *Îåêéíþíôáò ìå ôï FreeBSD*, ðåñéãñÜöåé ôçí åãêáôÜóôáóç êáé ôçí âáóéêÞ ÷ñÞóç ôïõ FreeBSD. Ï ðñïôåéíüìåíïò ôñüðïò áíÜãíùóçò áõôïý ôïõ ôìÞìáôïò åßíáé Ýíá-Ýíá êåöÜëáéï, ìå ôç óåéñÜ, ðñïóðåñíþíôáò êåöÜëáéá ìå ãíùóôÜ èÝìáôá. Ôï äåýôåñï ôìÞìá, *ÂáóéêÝò Åñãáóßåò*, ðåñéãñÜöåé ìåñéêÜ ÷áñáêôçñéóôéêÜ ôïõ FreeBSD ôá ïðïßá ÷ñçóéìïðïéïýíôáé óõ÷íÜ. Ìðïñåßôå íá äéáâÜóåôå ôá êåöÜëáéá óå áõôü ôï ôìÞìá (êáèþò êáé óå üëá ôá ôìÞìáôá ðïõ áêïëïõèïýí) ìå ïðïéá óåéñÜ èÝëåôå. ÊÜèå êåöÜëáéï îåêéíÜ ìå ìéá óáöÞ êáé óýíôïìç óýíïøç, ç ïðïßá ðåñéãñÜöåé ôá ðåñéå÷üìåíá ôïõ êåöáëáßïõ êáèþò êáé ôé ÷ñåéÜæåôáé íá ãíùñßæåé Þäç ï áíáãíþóôçò. Áõôü åðéôñÝðåé óôïí ðåñéóôáóéáêü áíáãíþóôç íá ðñïóðåñíÜ ãñÞãïñá åíüôçôåò, ãéá íá âñåé êåöÜëáéá ôá ïðïßá ôïí åíäéáöÝñïõí ðåñéóóüôåñï. Ôï ôñßôï ôìÞìá, *Äéá÷åßñéóç ÓõóôÞìáôïò*, ðåñéÝ÷åé èÝìáôá ó÷åôéêÜ ìå ôç äéá÷åßñéóç õðïëïãéóôþí FreeBSD. Ôï ôÝôáñôï ôìÞìá, *ÄéêôõáêÝò Åðéêïéíùíßåò*, êáëýðôåé èÝìáôá äéêôýùóçò êáé äéáêïìéóôþí. Ôï ðÝìðôï ôìÞìá ðåñéÝ÷åé ðáñáñôÞìáôá ìå äéÜöïñåò ðëçñïöïñßåò.

ÊåöÜëáéï 1, ÅéóáãùãÞ

ÐáñïõóéÜæåé ôï FreeBSD óôïí íÝï ÷ñÞóôç. ÐåñéãñÜöåé ôçí éóôïñßá ôïõ FreeBSD Project, ôïõò óôü÷ïõò ôïõ êáé ôï ìïíôÝëï áíÜðôõîçò ôïõ.

ÊåöÜëáéï 2, ÅãêáôÜóôáóç ôïõ FreeBSD 8.x êáé ÐñïãåíÝóôåñùí Åêäüóåùí

Ïäçãåß ôïí ÷ñÞóôç óôçí äéáäéêáóßá åãêáôÜóôáóçò ôïõ FreeBSD 8.*x* êáé ðñïãåíÝóôåñùí åêäüóåùí ìå ôç ÷ñÞóç ôïõ **sysinstall**. ÓõìðåñéëáìâÜíïíôáé åðßóçò ìåñéêÜ èÝìáôá åãêáôÜóôáóçò ãéá ðñï÷ùñçìÝíïõò, üðùò ç åãêáôÜóôáóç ìÝóù óåéñéáêÞò êïíóüëáò.

ÊåöÜëáéï 3, ÅãêáôÜóôáóç ôïõ FreeBSD 9.x êáé ÌåôáãåíÝóôåñùí Åêäüóåùí

Ïäçãåß ôïí ÷ñÞóôç óôçí äéáäéêáóßá åãêáôÜóôáóçò ôïõ FreeBSD 9.*x* êáé ìåôáãåíÝóôåñùí åêäüóåùí ìå ôç ÷ñÞóç ôïõ **bsdinstall**.

ÊåöÜëáéï 4, ÂáóéêÝò ¸ííïéåò óôï UNIX

ÐåñéÝ÷åé ôéò âáóéêÝò åíôïëÝò êáé ëåéôïõñãßåò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò FreeBSD. ÅÜí åßóôå åîïéêåéùìÝíïò ìå ôï Linux Þ ìå Üëëï ëåéôïõñãéêü ôýðïõ UNIX ìðïñåßôå ðéèáíþò íá ðñïóðåñÜóåôå áõôü ôï êåöÜëáéï.

ÊåöÜëáéï 5, ÅãêáôÜóôáóç Åöáñìïãþí: ÐáêÝôá êáé Ports

ÐåñéãñÜöåé ôïí ôñüðï åãêáôÜóôáóçò ëïãéóìéêïý ôñßôùí êáôáóêåõáóôþí ìå ôçí êáéíïôüìï "ÓõëëïãÞ ôùí Ports (Ports Collection)" ôïõ FreeBSD êáé ìå ôá óõíÞèç ðñïìåôáãëùôôéóìÝíá ðáêÝôá (packages).

ÊåöÜëáéï 6, Ôï Óýóôçìá X Window

ÐåñéãñÜöåé ãåíéêÜ ôï óýóôçìá X Window êáé åéäéêüôåñá ôï X11 ôïõ FreeBSD. Åðßóçò ðåñéãñÜöåé ïëïêëçñùìÝíá ðåñéâÜëëïíôá åñãáóßáò üðùò ôï **KDE** êáé ôï **GNOME**.

ÊåöÜëáéï 7, Desktop ÅöáñìïãÝò

ÁíáöÝñåé êáé åîçãåß ìåñéêÝò áðü ôéò ðéï óõíÞèåéò åöáñìïãÝò ãéá õðïëïãéóôÝò ãñáöåßïõ, üðùò ðñïãñÜììáôá ðëïÞãçóçò éóôïóåëßäùí êáé åöáñìïãÝò ãñáöåßïõ êáé ðåñéãñÜöåé ðùò íá ôéò åãêáôáóôÞóåôå óôï FreeBSD.

ÊåöÜëáéï 8, ÐïëõìÝóá

Õðïäåéêíýåé ðùò íá åãêáôáóôÞóåôå äõíáôüôçôåò áíáðáñáãùãÞò Þ÷ïõ êáé âßíôåï óôï óýóôçìá óáò. Åðßóçò ðåñéëáìâÜíåé äåéãìáôïëçðôéêÜ êÜðïéåò åöáñìïãÝò Þ÷ïõ êáé âßíôåï.

ÊåöÜëáéï 9, Ñõèìßæïíôáò ôïí ÐõñÞíá ôïõ FreeBSD

Åîçãåß ôïõò ëüãïõò ãéá ôïõò ïðïßïõò èá ðñÝðåé íá äçìéïõñãÞóåôå Ýíá íÝï ðõñÞíá. ÐáñÝ÷åé, åðßóçò, ëåðôïìåñåßò ïäçãßåò ãéá ôçí ñýèìéóç, ìåôáãëþôôéóç êáé åãêáôÜóôáóç ôïõ íÝïõ óáò ðñïóáñìïóìÝíïõ ðõñÞíá.

ÊåöÜëáéï 10, Åêôõðþóåéò

ÐåñéãñÜöåé ðùò íá äéá÷åéñßæåóôå åêôõðùôÝò óôï FreeBSD. ÓõìðåñéëáìâÜíåé ðëçñïöïñßåò ãéá óåëßäåò ëïãïôýðùí, ëïãáñéáóìïýò åêôõðùôþí êáé áñ÷éêÝò ñõèìßóåéò.

ÊåöÜëáéï 11, Óõìâáôüôçôá ìå ÅêôåëÝóéìá ôïõ Linux

ÐåñéãñÜöåé ôéò äõíáôüôçôåò óõìâáôüôçôáò ôïõ FreeBSD ìå åöáñìïãÝò Linux. Åðßóçò ðáñÝ÷åé ëåðôïìåñåßò ïäçãßåò åãêáôÜóôáóçò ãéá ðïëëÝò ãíùóôÝò åöáñìïãÝò ôïõ Linux üðùò **Oracle**, **SAP® R/3®**, êáé **Mathematica**.

ÊåöÜëáéï 12, Ñýèìéóç êáé Âåëôéóôïðïßçóç

ÐåñéãñÜöåé ôéò ðáñáìÝôñïõò ðïõ Ý÷ïõí óôç äéÜèåóç ôïõò ïé äéá÷åéñéóôÝò ôïõ óõóôÞìáôïò, þóôå íá ñõèìßóïõí Ýíá óýóôçìá FreeBSD ãéá âÝëôéóôç áðüäïóç. Åðßóçò ðåñéãñÜöåé ôá äéÜöïñá áñ÷åßá ñõèìßóåùí ðïõ ÷ñçóéìïðïéïýíôáé óôï FreeBSD êáé ðïõ íá ôá âñåßôå.

ÊåöÜëáéï 13, Ç Äéáäéêáóßá Åêêßíçóçò ôïõ FreeBSD

ÐåñéãñÜöåé ôçí äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD êáé åîçãåß ðùò ìðïñïýìå íá ôçí åëÝã÷ïõìå ìå ôç âïÞèåéá åðéëïãþí êáé ñõèìßóåùí.

ÊåöÜëáéï 14, ×ñÞóôåò êáé ÂáóéêÞ Äéá÷åßñéóç Ëïãáñéáóìþí

ÐåñéãñÜöåé ôçí äçìéïõñãßá êáé ôçí äéá÷åßñéóç ôùí ëïãáñéáóìþí ÷ñçóôþí. Åðßóçò ðåñéãñÜöåé ôñüðïõò ìå ôïõò ïðïßïõò ìðïñïýí íá ôåèïýí ðåñéïñéóìïß óôïõò ÷ñÞóôåò üóï áöïñÜ ôç ÷ñÞóç ðüñùí ôïõ óõóôÞìáôïò, êáèþò êáé Üëëåò ëåéôïõñãßåò äéá÷åßñéóçò ëïãáñéáóìþí.

ÊåöÜëáéï 15, ÁóöÜëåéá

ÐåñéãñÜöåé äéÜöïñá äéáèÝóéìá åñãáëåßá ðïõ èá óáò âïçèÞóïõí íá êñáôÞóåôå ôï FreeBSD óýóôçìá óáò áóöáëÝò. ÓõìðåñéëáìâÜíïíôáé ïé õëïðïéÞóåéò Kerberos, IPsec êáé OpenSSH.

ÊåöÜëáéï 16, Jails

ÐåñéãñÜöåé ôï ðëáßóéï ëåéôïõñãéþí ôùí jails êáé ôéò âåëôéþóåéò ðïõ ðáñÝ÷ïõí óå ó÷Ýóç ìå ôçí ðáñáäïóéáêÞ chroot õðïóôÞñéîç ôïõ FreeBSD.

ÊåöÜëáéï 17, Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò

Åîçãåß ôé åßíáé ï Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò (MAC) êáé ðùò ï ìç÷áíéóìüò áõôüò ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí áóöÜëéóç åíüò FreeBSD óõóôÞìáôïò.

ÊåöÜëáéï 18, ¸ëåã÷ïò ÓõìâÜíôùí Áóöáëåßáò

ÐåñéãñÜöåé ôé åßíáé ï ¸ëåã÷ïò ÓõìâÜíôùí, ðùò ìðïñåß íá åãêáôáóôáèåß, íá ñõèìéóôåß êáé ðùò ìðïñïýí íá äéåñåõíþíôáé êáé íá ðáñáêïëïõèïýíôáé ôá ß÷ç ôïõ åëÝã÷ïõ (audit trails).

ÊåöÜëáéï 19, ÁðïèçêåõôéêÜ ÌÝóá

ÐåñéãñÜöåé ðùò íá äéá÷åéñßæåóôå ìÝóá áðïèÞêåõóçò êáé óõóôÞìáôá áñ÷åßùí ìå ôï FreeBSD. ÓõìðåñéëáìâÜíïíôáé öõóéêïß äßóêïé, óõóôïé÷ßåò RAID, ïðôéêÜ êáé ìáãíçôéêÜ ìÝóá, åéêïíéêïß äßóêïé ìíÞìçò êáé äéêôõáêÜ óõóôÞìáôá áñ÷åßùí.

ÊåöÜëáéï 20, GEOM: Äéá÷åßñéóç Óõóôïé÷éþí Äßóêùí

ÐåñéãñÜöåé ôé åßíáé ôï ðëáßóéï ëåéôïõñãéþí GEOM óôï FreeBSD êáé ðùò íá ñõèìßóåôå äéÜöïñá åðßðåäá RAID ðïõ õðïóôçñßæïíôáé óôï FreeBSD.

ÊåöÜëáéï 21, ÕðïóôÞñéîç ÓõóôçìÜôùí Áñ÷åßùí

ÅîåôÜæåé ôçí õðïóôÞñéîç ìç-åããåíþí óõóôçìÜôùí áñ÷åßùí óôï FreeBSD, üðùò ôï Z File System ôçò Sun.

ÊåöÜëáéï 22, Vinum

ÐåñéãñÜöåé ðùò íá ÷ñçóéìïðïéÞóåôå ôï Vinum, Ýíá äéá÷åéñéóôÞ ëïãéêþí ôüìùí ðïõ ðáñÝ÷åé ëïãéêïýò äßóêïõò áíåîÜñôçôá áðü ôç óõóêåõÞ óôçí ïðïßá åßíáé áðïèçêåõìÝíïé, êáèþò êáé äõíáôüôçôåò RAID-0, RAID-1 êáé RAID-5 ìÝóù ëïãéóìéêïý.

ÊåöÜëáéï 23, Åéêïíéêïðïßçóç

ÐåñéãñÜöåé ôé ðñïóöÝñïõí ôá óõóôÞìáôá åéêïíéêïðïßçóçò êáé ðùò ìðïñïýí íá ÷ñçóéìïðïéçèïýí ìå ôï FreeBSD.

ÊåöÜëáéï 24, ÔïðéêÝò Ñõèìßóåéò - ×ñÞóç êáé Ñýèìéóç I18N/L10N

ÐåñéãñÜöåé ðùò íá ÷ñçóéìïðïéÞóåôå ôï FreeBSD óå ãëþóóåò åêôüò ôçò ÁããëéêÞò. Êáëýðôåé ôçí äõíáôüôçôá ôïðéêþí ñõèìßóåùí ôüóï óå åðßðåäï óõóôÞìáôïò, üóï êáé óå åðßðåäï åöáñìïãþí.

ÊåöÜëáéï 25, ÅíçìÝñùóç êáé ÁíáâÜèìéóç ôïõ FreeBSD

Åîçãåß ôéò äéáöïñÝò ìåôáîý ôùí åêäüóåùí FreeBSD-STABLE, FreeBSD-CURRENT êáé ôùí åðßóçìùí (RELEASE) åêäüóåùí ôïõ FreeBSD. ÐåñéãñÜöåé ðïéïé ÷ñÞóôåò ùöåëïýíôáé üôáí áêïëïõèïýí Ýíá óýóôçìá áíÜðôõîçò êáèþò êáé ôá áðáéôïýìåíá ãéá áõôü ôï óêïðü âÞìáôá. Êáëýðôåé ôéò ìåèüäïõò ðïõ ìðïñïýí íá ÷ñçóéìïðïéÞóïõí ïé ÷ñÞóôåò ãéá íá åíçìåñþóïõí ôï óýóôçìá ôïõò ìå ôéò ôåëåõôáßåò äéïñèþóåéò áóöáëåßáò.

ÊåöÜëáéï 26, DTrace

ÐåñéãñÜöåé ôçí ñýèìéóç êáé ÷ñÞóç ôïõ åñãáëåßïõ DTrace ôçò Sun óôï FreeBSD. Ôï äõíáìéêü tracing ìðïñåß íá âïçèÞóåé óôïí åíôïðéóìü ðñïâëçìÜôùí áðüäïóçò, ðáñÝ÷ïíôáò áíÜëõóç ôïõ óõóôÞìáôïò óå ðñáãìáôéêü ÷ñüíï.

ÊåöÜëáéï 27, ÓåéñéáêÝò Åðéêïéíùíßåò

Åîçãåß ðùò íá óõíäÝóåôå ôåñìáôéêÜ êáé ìüíôåì óôï FreeBSD óýóôçìá óáò, ãéá ÷ñÞóç ôüóï óå åéóåñ÷üìåíåò üóï êáé óå åîåñ÷üìåíåò óõíäÝóåéò.

ÊåöÜëáéï 28, PPP êáé SLIP

ÐåñéãñÜöåé ðùò íá ÷ñçóéìïðïéÞóåôå ôéò ôå÷íïëïãßåò PPP, SLIP, Þ PPP ìÝóù Ethernet ãéá íá óõíäåèåßôå óå áðïìáêñõóìÝíá óõóôÞìáôá ìå ôï FreeBSD.

ÊåöÜëáéï 29, Çëåêôñïíéêü Ôá÷õäñïìåßï

Åîçãåß ôá äéáöïñåôéêÜ óôïé÷åßá åíüò äéáêïìéóôÞ çëåêôñïíéêÞò áëëçëïãñáößáò êáé åìâáèýíåé óå èÝìáôá áðëþí ñõèìßóåùí ãéá ôï ðëÝïí äçìïöéëÝò ëïãéóìéêü äéáêïìéóôÞ çëåêôñïíéêÞò áëëçëïãñáößáò: ôï **sendmail**.

ÊåöÜëáéï 30, ÅîõðçñåôçôÝò Äéêôýïõ

ÐáñÝ÷åé ëåðôïìåñåßò ïäçãßåò êáé ðáñáäåßãìáôá áñ÷åßùí ñýèìéóçò ãéá íá ñõèìßóåôå ôï FreeBSD íá åíåñãåß ùò äéêôõáêüò åîõðçñåôçôÞò áñ÷åßùí, åîõðçñåôçôÞò ïíïìÜôùí ôïìÝá (DNS), åîõðçñåôçôÞò äéêôõáêþí ðëçñïöïñéþí (NIS), ç åîõðçñåôçôÞò óõã÷ñïíéóìïý þñáò (NTP).

ÊåöÜëáéï 31, Firewalls

Åîçãåß ôçí öéëïóïößá ðïõ êñýâåôáé ðßóù áðü ôá firewalls (ôåß÷ç ðñïóôáóßáò) ðïõ âáóßæïíôáé óå ëïãéóìéêü êáé ðáñÝ÷åé ëåðôïìåñåßò ðëçñïöïñßåò ãéá ôéò ñõèìßóåéò ôùí äéáöüñùí firewalls ðïõ äéáôßèåíôáé ãéá ôï FreeBSD.

ÊåöÜëáéï 32, Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùóçò

ÐåñéãñÜöåé ðïëëÜ ðñï÷ùñçìÝíá èÝìáôá äéêôýùóçò, óõìðåñéëáìâáíïìÝíïõ ôïõ äéáìïéñáóìïý ìéáò óýíäåóçò Internet ìå Üëëïõò õðïëïãéóôÝò óôï ôïðéêü óáò äßêôõï (LAN), èÝìáôá äñïìïëüãçóçò ãéá ðñï÷ùñçìÝíïõò, áóýñìáôç äéêôýùóç, Bluetooth, ATM, IPv6 êáé ðïëëÜ áêüìç.

ÐáñÜñôçìá A, Ðïõ èá Âñåßôå ôï FreeBSD

ÐåñéÝ÷åé ëßóôá ìå äéÜöïñåò ðçãÝò ãéá íá áðïêôÞóåôå ôï FreeBSD óå CD-ROM Þ DVD, üðùò åðßóçò êáé äéÜöïñåò ôïðïèåóßåò óôï Internet áðü üðïõ ìðïñåßôå íá êáôåâÜóåôå êáé íá åãêáôáóôÞóåôå ôï FreeBSD.

ÐáñÜñôçìá B, Âéâëéïãñáößá

Áõôü ôï âéâëßï áããßæåé ðïëëÜ äéáöïñåôéêÜ èÝìáôá ðïõ ìðïñåß íá óáò êåíôñßóïõí ôï åíäéáöÝñïí ãéá ìéá ðéï ëåðôïìåñÞ åîåñåýíçóç. Ç âéâëéïãñáößá ôáîéíïìåß óå êáôçãïñßåò ðïëëÜ åîáéñåôéêÜ âéâëßá ôá ïðïßá áíáöÝñïíôáé óôï êåßìåíï.

ÐáñÜñôçìá C, ÐçãÝò Ðëçñïöüñçóçò óôï Äéáäßêôõï

ÐåñéãñÜöåé ðïëëÜ öüñïõì ðïõ äéáôßèåíôáé óôïõò ÷ñÞóôåò ôïõ FreeBSD, þóôå íá èÝôïõí åñùôÞìáôá êáé íá óõììåôÝ÷ïõí óå ôå÷íéêÝò óõæçôÞóåéò ãéá ôï FreeBSD.

ÐáñÜñôçìá D, ÊëåéäéÜ PGP

ÊáôáãñÜöåé ôá äáêôõëéêÜ áðïôõðþìáôá ôùí êëåéäéþí PGP áñêåôþí ìåëþí ôçò ÏìÜäáò ÁíÜðôõîçò ôïõ FreeBSD.

ÓõìâÜóåéò ðïõ ÷ñçóéìïðïéïýíôáé óå áõôü ôï âéâëßï

Óå ïëüêëçñï ôï âéâëßï, ÷ñçóéìïðïéïýíôáé êÜðïéåò ôõðïãñáöéêÝò óõìâÜóåéò þóôå ç ìïñöïðïßçóç ôïõ íá åßíáé óõíåðÞò êáé íá åßíáé ðéï åõáíÜãíùóôï:

ÔõðïãñáöéêÝò ÓõìâÜóåéò

ÐëÜãéá ãñáöÞ

Ç *ðëÜãéá* ãñáììáôïóåéñÜ ÷ñçóéìïðïéåßôáé ãéá ïíüìáôá áñ÷åßùí, URLs, êåßìåíï ìå Ýìöáóç êáé ãéá ÷ñÞóç ðñùôïåìöáíéæüìåíùí ôå÷íéêþí üñùí.

`ÃñáöÞ óôáèåñïý ðëÜôïõò`

Ç `óôáèåñïý ðëÜôïõò` ãñáììáôïóåéñÜ ÷ñçóéìïðïéåßôáé ãéá ìçíýìáôá ëÜèïõò, åíôïëÝò, ìåôáâëçôÝò ðåñéâÜëëïíôïò, ïíïìáóßåò ôùí ports, ïíüìáôá êåíôñéêþí õðïëïãéóôþí, ïíüìáôá ÷ñçóôþí, ïíüìáôá ïìÜäùí, ïíüìáôá óõóêåõþí, ìåôáâëçôÝò êáé áðïóðÜóìáôá êþäéêá.

¸íôïíç ãñáöÞ

Ç **Ýíôïíç** ãñáììáôïóåéñÜ ÷ñçóéìïðïéåßôáé ãéá åöáñìïãÝò, åíôïëÝò êáé ðëÞêôñá.

Åßóïäïò ÄåäïìÝíùí áðü ôï ×ñÞóôç

Ç ðëçêôñïëüãçóç óçìåéþíåôáé ìå **Ýíôïíç** ãñáöÞ þóôå íá îå÷ùñßæåé áðü ôï õðüëïéðï êåßìåíï. Óõíäõáóìïß ðëÞêôñùí ðïõ ðñÝðåé íá ðéåóôïýí ôáõôü÷ñïíá óçìåéþíïíôáé ìå ‘+’ ìåôáîý ôùí ðëÞêôñùí, üðùò:

Ctrl+Alt+Del

Ôï ïðïßï óçìáßíåé ðùò ï ÷ñÞóôçò èá ðñÝðåé íá ðéÝóåé ôá ðëÞêôñá **Ctrl**, **Alt** êáé ôï ðëÞêôñï **Del** ôáõôü÷ñïíá.

Óå ðåñßðôùóç ðïõ êÜðïéá ðëÞêôñá ðñÝðåé íá ðéåóôïýí ìå óõãêåêñéìÝíç óåéñÜ, èá åìöáíßæïíôáé ÷ùñéóìÝíá ìå êüììáôá:

Ctrl+X, **Ctrl+S**

Ôï ïðïßï óçìáßíåé ðùò ï ÷ñÞóôçò áíáìÝíåôáé íá ðéÝóåé ôá ðëÞêôñá **Ctrl** êáé **X** ôáõôü÷ñïíá êáé Ýðåéôá íá ðéÝóåé ôá ðëÞêôñá **Ctrl** êáé **S** ôáõôü÷ñïíá.

Ðáñáäåßãìáôá

Ôá ðáñáäåßãìáôá ðïõ îåêéíïýí ìå `E:\>` õðïäçëþíïõí ìéá åíôïëÞ MS-DOS®. ÁõôÝò ïé åíôïëÝò ìðïñïýí íá åêôåëïýíôáé áðü ôï ðáñÜèõñï “ÃñáììÞò Åíôïëþí” óå óýã÷ñïíï ðåñéâÜëëïí Microsoft Windows, åêôüò áí áíáöÝñåôáé êÜôé äéáöïñåôéêü.

```
E:\> tools\fdimage floppies\kern.flp A:
```

Ôá ðáñáäåßãìáôá ðïõ îåêéíïýí ìå # õðïäçëþíïõí ìéá åíôïëÞ ðïõ èá ðñÝðåé íá åêôåëåóôåß áðü ôïí õðåñ÷ñÞóôç (superuser) åíüò óõóôÞìáôïò FreeBSD. Ìðïñåßôå íá óõíäåèåßôå óáí ÷ñÞóôçò `root` ãéá íá ðëçêôñïëïãÞóåôå ôçí åíôïëÞ, Þ íá óõíäåèåßôå óáí êáíïíéêüò ÷ñÞóôçò êáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ su(1) þóôå íá áðïêôÞóåôå ðñïíüìéá õðåñ÷ñÞóôç.

```
# dd if=kern.flp of=/dev/fd0
```

Ôá ðáñáäåßãìáôá ðïõ îåêéíïýí ìå % õðïäçëþíïõí ìéá åíôïëÞ ðïõ ðñÝðåé íá åêôåëåóôåß áðü Ýíá êáíïíéêü ÷ñÞóôç. ×ñçóéìïðïéåßôáé ç óýíôáîç C-shell ãéá íá èÝóïõìå ìåôáâëçôÝò ðåñéâÜëëïíôïò êáé Üëëåò åíôïëÝò êåëýöïõò, åêôüò áí áíáöÝñåôáé êÜôé äéáöïñåôéêü.

```
% top
```

Åõ÷áñéóôßåò

Ôï âéâëßï ðïõ êñáôÜôå, ðáñïõóéÜæåé ôéò ðñïóðÜèåéåò ðïëëþí åêáôïíôÜäùí áíèñþðùí áðü üëï ôïí êüóìï. Åßôå ìáò åíçìÝñùóáí ãéá ôõðïãñáöéêÜ ëÜèç, åßôå ìáò Ýóôåéëáí ïëüêëçñá êåöÜëáéá, ç óõìâïëÞ üëùí Þôáí ÷ñÞóéìç.

ÌåñéêÝò åôáéñåßåò õðïóôÞñéîáí ôçí áíÜðôõîç áõôïý ôïõ åããñÜöïõ ìéóèþíïíôáò óõíôÜêôåò íá åñãÜæïíôáé óå ðëÞñç áðáó÷üëçóç, ðëçñþíïíôáò ãéá ôçí Ýêäïóç, êôë. Åéäéêüôåñá, ç BSDi (ç ïðïßá áñãüôåñá áðïêôÞèçêå áðü ôçí Wind River Systems (http://www.windriver.com)) ìßóèùóå ìÝëç ôïõ FreeBSD Documentation Project íá åñãÜæïíôáé óå ðëÞñç áðáó÷üëçóç ãéá ôçí âåëôßùóç ôïõ âéâëßïõ, ïäçãþíôáò óôçí ðñþôç Ýíôõðç Ýêäïóç óôá áããëéêÜ ôïí ÌÜñôéï ôïõ 2000 (ISBN 1-57176-241-8). Ç åôáéñßá Wind River Systems ìßóèùóå ôüôå ìåñéêïýò åðéðñüóèåôïõò óõíôÜêôåò þóôå íá êÜíåé âåëôéþóåéò óôçí äïìÞ ôçò Ýíôõðçò Ýêäïóçò êáé íá ðñïóèÝóåé êÜðïéá íÝá êåöÜëáéá. Ç áðïêïñýöùóç áõôÞò ôçò åñãáóßáò Þôáí ç ðáñïõóßáóç ôçò äåýôåñçò Ýíôõðçò Ýêäïóçò, ôïí ÍïÝìâñéï ôïõ 2001 (ISBN 1-57176-303-1). 1-57176-303-1). Ôï 2003-2004, ç FreeBSD Mall, Inc (http://www.freebsdmall.com), ìßóèùóå áñêåôïýò óõíåñãÜôåò íá âåëôéþóïõí ôï Åã÷åéñßäéï ×ñÞóçò ðñïò åôïéìáóßá ôçò ôñßôçò Ýíôõðçò Ýêäïóçò.

I. Îåêéíþíôáò ìå ôï FreeBSD

Áõôü ôï ìÝñïò ôïõ Åã÷åéñéäßïõ ôïõ FreeBSD åßíáé ãéá ôïõò ÷ñÞóôåò êáé ôïõò äéá÷åéñéóôÝò óõóôçìÜôùí ðïõ äåí Ý÷ïõí Þäç ìåãÜëç åìðåéñßá ìå ôï FreeBSD. Ôá êåöÜëáéá ðïõ áêïëïõèïýí:

- Åßíáé åéóáãùãéêÜ ãéá ôï FreeBSD
- Óáò êáèïäçãïýí êáôÜ ôç äéÜñêåéá ôçò äéáäéêáóßáò åãêáôÜóôáóçò
- Óáò åéóÜãïõí óôéò âáóéêÝò Ýííïéåò ôïõ UNIX
- ÐåñéãñÜöïõí ôç äéáäéêáóßá åãêáôÜóôáóçò ôçò ðëçèþñáò åöáñìïãþí ðïõ åßíáé äéáèÝóéìåò óôï FreeBSD
- Óáò åéóÜãïõí óôï ãñáöéêü ðåñéâÜëëïí ôïõ UNIX, ôï óýóôçìá ×, êáé óáò êáèïäçãïýí ó÷åôéêÜ ìå ôéò áñ÷éêÝò ñõèìßóåéò åíüò ãñáöéêïý ðåñéâÜëëïíôïò åñãáóßáò, ìå ôï ïðïßï ìðïñåßôå íá åßóôå áêüìá ðéï ðáñáãùãéêïß

Óå áõôü ôï ôìÞìá ôïõ âéâëßïõ, Ý÷ïõìå ðñïóðáèÞóåé íá ìåéþóïõìå óôï åëÜ÷éóôï ôéò áíáöïñÝò óå ôìÞìáôá Þ êåöÜëáéá ôïõ Åã÷åéñéäßïõ ôá ïðïßá äåí Ý÷åôå Þäç äéáâÜóåé. Áõôü áðïóêïðåß óôï íá ãßíåé ðéï åýêïëç ç áíÜãíùóç ôïõ ôìÞìáôïò áõôïý ôïõ Åã÷åéñéäßïõ áðü ôçí áñ÷Þ ìÝ÷ñé êáé ôï ôÝëïò, ÷ùñßò íá áðáéôåßôáé íá øÜ÷íåôå óõíå÷þò ôá åðüìåíá Þ ðñïçãïýìåíá ôìÞìáôá.

ÊåöÜëáéï 1 ÅéóáãùãÞ

Áíáó÷çìáôéóìÝíï, áíáäéïñãáíùìÝíï, êáé ìåñéêþò îáíáãñáììÝíï áðü ôïí Jim Mock.

1.1 Óýíïøç

Åõ÷áñéóôïýìå ãéá ôï åíäéáöÝñïí óáò ãéá ôï FreeBSD! Ôï áêüëïõèï êåöÜëáéï êáëýðôåé äéÜöïñåò ðôõ÷Ýò ôïõ FreeBSD Project, üðùò ôçí éóôïñßá ôïõ, ôïõò óôü÷ïõò ôïõ, ôï ìïíôÝëï áíÜðôõîçò, ê.ô.ë.

ÌåôÜ ôçí áíÜãíùóç áõôïý ôïõ êåöáëáßïõ, èá ãíùñßæåôå:

- Ðùò ó÷åôßæåôáé ôï FreeBSD ìå Üëëá ëåéôïõñãéêÜ óõóôÞìáôá Ç/Õ.
- Ôçí éóôïñßá ôïõ FreeBSD Project.
- Ôïõò óôü÷ïõò ôïõ FreeBSD Project.
- Ôéò âáóéêÝò áñ÷Ýò ôïõ open-source ìïíôÝëïõ áíÜðôõîçò ôïõ FreeBSD.
- Êáé öõóéêÜ: áðü ðïõ ðñïÝñ÷åôáé ôï üíïìá “FreeBSD”.

1.2 Êáëþò Þëèáôå óôï FreeBSD!

Ôï FreeBSD åßíáé Ýíá ëåéôïõñãéêü óýóôçìá âáóéóìÝíï óôï 4.4BSD-Lite, ôï ïðïßï ìðïñåß íá ÷ñçóéìïðïéçèåß óå Ç/Õ Intel (x86 êáé Itanium®), AMD64 êáé Sun UltraSPARC®. Óå åîÝëéîç âñßóêïíôáé åðßóçò ç äéáäéêáóßá ìåôáöïñÜò ôïõ FreeBSD óå Üëëåò áñ÷éôåêôïíéêÝò. Ìðïñåßôå åðßóçò íá äéáâÜóåôå ãéá ôçí éóôïñßá ôïõ FreeBSD, Þ ãéá ôçí ðéï ðñüóöáôç Ýêäïóç ôïõ. ÅÜí åíäéáöÝñåóôå íá óõìâÜëëåôå ìå êÜðïéï ôñüðï óôï Project (êþäéêáò, hardware, ìç-ðñïóçìåéùìÝíá ÷áñôïíïìßóìáôá), äéáâÜóôå ôï Üñèñï ÓõíåéóöÝñïíôáò óôçí ÁíÜðôõîç ôïõ FreeBSD (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/contributing/index.html).

1.2.1 Ôé ìðïñåß íá êÜíåé ôï FreeBSD;

Ôï FreeBSD Ý÷åé ðïëëÜ áîéüëïãá ÷áñáêôçñéóôéêÜ. ÌåñéêÜ áðü áõôÜ åßíáé:

- *Preemptive ðïëõåðåîåñãáóßá* (preemptive multitasking) ìå äõíáìéêü Ýëåã÷ï ðñïôåñáéüôçôáò ãéá íá åîáóöáëßóåé ïìáëüò êáé äßêáéïò äéáìïéñáóìüò ôùí ðüñùí ôïõ Ç/Õ ìåôáîý åöáñìïãþí êáé ÷ñçóôþí, áêüìç êáé óôéò ðéï áíôßîïåò óõíèÞêåò.
- *Ðïëõ÷ñçóôéêÝò äõíáôüôçôåò* (multi-user facilities) ïé ïðïßåò åðéôñÝðïõí óå ðïëëÜ Üôïìá ôáõôü÷ñïíá íá ÷ñçóéìïðïéÞóïõí Ýíá óýóôçìá FreeBSD ãéá äéáöïñåôéêÜ ðñÜãìáôá. Áõôü óçìáßíåé, ãéá ðáñÜäåéãìá, üôé ôá ðåñéöåñåéáêÜ ôïõ óõóôÞìáôïò, üðùò åêôõðùôÝò êáé ïäçãïß ôáéíéþí åßíáé óùóôÜ ìïéñáóìÝíá ìåôáîý üëùí ôùí ÷ñçóôþí ôïõ óõóôÞìáôïò Þ ôïõ äéêôýïõ êáé ðùò ìðïñïýí íá ôåèïýí óõãêåêñéìÝíá üñéá óå ÷ñÞóôåò Þ ïìÜäåò ÷ñçóôþí, ðñïóôáôåýïíôáò êñßóéìïõò ðüñïõò ôïõ óõóôÞìáôïò áðü õðåñâïëéêÞ ÷ñÞóç.
- Éó÷õñÝò äõíáôüôçôåò *äéêôýùóçò TCP/IP* (TCP/IP networking) ìå õðïóôÞñéîç ãéá âéïìç÷áíéêÜ ðñüôõðá üðùò ôá SCTP, DHCP, NFS, NIS, PPP, SLIP, IPsec êáé IPv6. Áõôü óçìáßíåé ðùò Ýíá ìç÷Üíçìá FreeBSD ìðïñåß íá áëëçëåðéäñÜ åýêïëá ìå Üëëá óõóôÞìáôá êáé íá åñãÜæåôáé óáí åîõðçñåôçôÞò, õðïóôçñßæïíôáò ëåéôïõñãßåò æùôéêÞò óçìáóßáò, üðùò NFS (áðïìáêñõóìÝíç ðñüóâáóç óå áñ÷åßá) êáé õðçñåóßåò çëåêôñïíéêïý

ôá÷õäñïìåßïõ (e-mail), Þ ôçí ðáñïõóßá ôïõ ïñãáíéóìïý óáò óôï äéáäßêôõï ìÝóù ôùí õðçñåóéþí WWW, FTP, routing êáé firewall (áóöÜëåéáò).

- Ç *ðñïóôáóßá ôçò ìíÞìçò* (memory protection) åîáóöáëßæåé üôé ïé äéÜöïñåò åöáñìïãÝò (Þ ïé ÷ñÞóôåò) äåí áëëçëåðéäñïýí ìåôáîý ôïõò. Ìéá åöáñìïãÞ ðïõ ðáñïõóéÜæåé êÜðïéï ðñüâëçìá äå ìðïñåß íá åðçñåÜóåé Üëëåò ìå êáíÝíáí ôñüðï.
- Ôï FreeBSD åßíáé Ýíá ëåéôïõñãéêü óýóôçìá *32-bit* (*64-bit* óå AMD64, êáé UltraSPARC) êáé ó÷åäéÜóôçêå ìå áõôü ôïí ôñüðï åî’ áñ÷Þò.
- Ôï âéïìç÷áíéêü ðñüôõðï *X Window System* (X11R6) ðñïóöÝñåé ãñáöéêü ðåñéâÜëëïí åñãáóßáò (GUI) óôï êüóôïò ìéáò êïéíÞò êÜñôáò VGA êáé ìéáò ïèüíçò êáé äéáôßèåôáé ìå ôïí ðëÞñç ðçãáßï êþäéêá.
- *Óõìâáôüôçôá åêôåëÝóéìùí* ìå ðïëëÜ ðñïãñÜììáôá ðïõ Ý÷ïõí ìåôáãëùôôéóôåß ãéá Linux, SCO, SVR4, BSDI êáé NetBSD.
- ×éëéÜäåò *Ýôïéìåò-ðñïò-åêôÝëåóç* åöáñìïãÝò åßíáé äéáèÝóéìåò áðü ôçí óõëëïãÞ *ports* êáé *packages* ãéá ôï FreeBSD. Ãéáôß íá øÜ÷íåôå óôï äéáäßêôõï üôáí ìðïñåßôå íá ôá âñåßôå üëá åäþ;
- Óôï äéáäßêôõï åßíáé åðßóçò äéáèÝóéìåò ÷éëéÜäåò ðñüóèåôåò êáé *åýêïëåò óôçí ðñïóáñìïãÞ* åöáñìïãÝò. Ôï FreeBSD Ý÷åé óõìâáôüôçôá ðçãáßïõ êþäéêá ìå ôá ðéï äçìïöéëÞ åìðïñéêÜ óõóôÞìáôá UNIX, åðïìÝíùò ïé ðåñéóóüôåñåò åöáñìïãÝò ÷ñåéÜæïíôáé ëßãåò Ýùò êáèüëïõ ìåôáôñïðÝò ãéá íá ìåôáãëùôôéóôïýí (compile).
- Ç ÄõíáìéêÞ óåëéäïðïßçóç *åéêïíéêÞò ìíÞìçò* êáé ôï “ïëïêëçñùìÝíï VM/buffer cache” ðáñÝ÷ïõí õøçëÞ áðüäïóç óå åöáñìïãÝò ìå áõîçìÝíåò áíÜãêåò óå ìíÞìç, åíþ äéáôçñïýí ôçí éêáíïðïéçôéêÞ áðüêñéóç ôïõ óõóôÞìáôïò óôïõò Üëëïõò ÷ñÞóôåò.
- ÕðïóôÞñéîç *SMP* ãéá ìç÷áíÞìáôá ìå ðïëëáðëÝò CPU.
- ÐëÞñçò óåéñÜ åñãáëåßùí áíÜðôõîçò ãéá *C*, *C++*, êáé *Fortran*. Óôç ÓõëëïãÞ ôùí Ports êáé ôùí Ýôïéìùí ðáêÝôùí, èá âñåßôå ðïëëÝò áêüìá ãëþóóåò ðñïãñáììáôéóìïý, êáôÜëëçëåò ôüóï ãéá Ýñåõíá üóï êáé ãéá áíÜðôõîç ëïãéóìéêïý.
- *Ç äéáèåóéìüôçôá ôïõ ðçãáßïõ êþäéêá* ïëüêëçñïõ ôïõ óõóôÞìáôïò óçìáßíåé üôé Ý÷åôå ôïí õøçëüôåñï âáèìü åëÝã÷ïõ óôï ðåñéâÜëëïí óáò. Ãéáôß íá åßóôå êëåéäùìÝíïé óå Ýíá êëåéóôü óýóôçìá êáé íá åßóôå åîáñôçìÝíïé áðü ôïí ðñïìçèåõôÞ óáò, üôáí ìðïñåßôå íá Ý÷åôå Ýíá ðñáãìáôéêÜ áíïé÷ôü óýóôçìá;
- ÅêôåôáìÝíç *online ôåêìçñßùóç*.
- *Êáé ðïëëÜ Üëëá!*

Ôï FreeBSD âáóßæåôáé óôçí Ýêäïóç 4.4BSD-Lite ôïõ Computer Systems Research Group (CSRG) ôïõ Ðáíåðéóôçìßïõ ôçò Êáëéöüñíéáò óôï Berkeley, êáé óõíå÷ßæåé ôçí äéáêåêñéìÝíç ðáñÜäïóç ôïõ óôçí áíÜðôõîç óõóôçìÜôùí BSD. Åðéðñüóèåôá óôï åîáßñåôï Ýñãï ðïõ ðáñåß÷å ôï CSRG, ôï FreeBSD Project îüäåøå ðïëëÝò ÷éëéÜäåò þñåò óôç âåëôéóôïðïßçóç ôïõ óõóôÞìáôïò ãéá ìÝãéóôåò åðéäüóåéò êáé áîéïðéóôßá óå êáèçìåñéíÝò êáôáóôÜóåéò ðñáãìáôéêïý öüñôïõ åñãáóßáò. Áí êáé ðïëëïß åìðïñéêïß êïëïóóïß äõóêïëåýïíôáé íá ðñïóöÝñïõí ëåéôïõñãéêÜ óõóôÞìáôá ìå ôÝôïéá ÷áñáêôçñéóôéêÜ, åðéäüóåéò êáé áîéïðéóôßá, ôï FreeBSD ìðïñåß íá ôá ðñïóöÝñåé *ôþñá*!

Ïé åöáñìïãÝò óôéò ïðïßåò ìðïñåß íá ÷ñçóéìïðïéçèåß ôï FreeBSD, ðñáãìáôéêÜ ðåñéïñßæïíôáé ìüíï áðü ôçí öáíôáóßá óáò. Áðü áíÜðôõîç ëïãéóìéêïý ìÝ÷ñé áõôïìáôéóìïýò åñãïóôáóßùí, áðü áðïãñáöÞ åéäþí ìÝ÷ñé ôçí äéüñèùóç ôïõ áæéìïýèéïõ áðïìáêñõóìÝíùí äïñõöïñéêþí êåñáéþí, åÜí ìðïñåß íá ãßíåé ìå Ýíá åìðïñéêü ðñïúüí UNIX, åßíáé ðáñáðÜíù áðü ðéèáíü üôé ìðïñåß íá ãßíåé êáé ìå ôï FreeBSD! Ôï FreeBSD åðßóçò ùöåëåßôáé óçìáíôéêÜ áðü êõñéïëåêôéêÜ ÷éëéÜäåò åöáñìïãÝò õøçëÞò ðïéüôçôáò ðïõ áíáðôýóóïíôáé áðü êÝíôñá åñåõíþí êáé ðáíåðéóôÞìéá óå üëï ôïí êüóìï, êáé óõ÷íÜ äéáôßèåíôáé óå ÷áìçëü êüóôïò Þ äùñåÜí. Ôï ðëÞèïò ôùí åìðïñéêþí åöáñìïãþí ðïõ äéáôßèåíôáé ãéá ôï FreeBSD, áõîÜíåôáé åðßóçò êáèçìåñéíÜ.

Ï ðçãáßïò êþäéêáò ôïõ ßäéïõ ôïõ FreeBSD åßíáé ðëÞñùò äéáèÝóéìïò, êáé Ýôóé ôï óýóôçìá ìðïñåß íá ðñïóáñìïóôåß óå áöÜíôáóôá õøçëü åðßðåäï ãéá åéäéêÝò åöáñìïãÝò Þ projects, êáé ìå ôñüðïõò ãåíéêÜ ìç ðñáãìáôïðïéÞóéìïõò óå Üëëá ëåéôïõñãéêÜ åìðïñéêþí ðñïìçèåõôþí. ÐáñáêÜôù èá âñåßôå ìåñéêÜ ìüíï ðáñáäåßãìáôá áðü åöáñìïãÝò óôéò ïðïßåò ìðïñåß íá ÷ñçóéìïðïéçèåß áõôÞ ôç óôéãìÞ ôï FreeBSD:

- *Õðçñåóßåò ºíôåñíåô:* Ôï éó÷õñü óýóôçìá äéêôýùóçò TCP/IP ôïõ FreeBSD, ôï áíáäåéêíýåé óå éäåþäç ðëáôöüñìá ãéá ìéá ìåãÜëç ãêÜìá õðçñåóéþí ºíôåñíåô üðùò:
  - ÅîõðçñåôçôÝò FTP
  - ÅîõðçñåôçôÝò éóôïóåëßäùí World Wide Web (êïéíïýò Þ ìå áóöáëÞ óýíäåóç [SSL])
  - Äñïìïëüãçóç ðñùôïêüëëùí IPv4 êáé IPv6
  - Firewalls êáé ðýëåò NAT (“IP masquerading”)
  - ÅîõðçñåôçôÝò çëåêôñïíéêïý ôá÷õäñïìåßïõ
  - USENET News Þ Bulletin Board Systems
  - Êáé Üëëá...

  Ìå ôï FreeBSD, ìðïñåßôå åýêïëá íá îåêéíÞóåôå áðü ÷áìçëÜ ìå Ýíá öôçíü PC ôçò ïéêïãÝíåéáò 386, êáé êáèþò ç åðé÷åßñçóç óáò ìåãáëþíåé, íá áíáâáèìßóåôå óå Ýíá ôåôñáðýñçíï åðåîåñãáóôÞ Xeon ìå äßóêïõò RAID.
- *Åêðáßäåõóç:* Åßóôå öïéôçôÞò ðëçñïöïñéêÞò Þ êÜðïéïõ ó÷åôéêïý ôïìÝá; Äåí õðÜñ÷åé êáëýôåñïò ôñüðïò íá ìÜèåôå ãéá ëåéôïõñãéêÜ óõóôÞìáôá, áñ÷éôåêôïíéêÝò Ç/Õ, êáé óõóôÞìáôá äéêôýùí áðü ôçí ðñáêôéêÞ åìðåéñßá êáé ôçí óå âÜèïò ãíþóç ðïõ ìðïñåß íá óáò ðáñÝ÷åé ôï FreeBSD. Ôï ìåãÜëï ðëÞèïò ôùí äùñåÜí äéáèÝóéìùí ðáêÝôùí åöáñìïãþí CAD, ãñáöéêÞò ó÷åäßáóçò, êáé ìáèçìáôéêþí, êÜíïõí ôï FreeBSD åîáéñåôéêÜ ÷ñÞóéìï óå üóïõò ôï êýñéï åíäéáöÝñïí ôïõò óôïõò õðïëïãéóôÝò åßíáé íá *êÜíïõí ôç äïõëåéÜ ôïõò*!
- *¸ñåõíá:* Ìå äéáèÝóéìï ôïí ðçãáßï êþäéêá ïëüêëçñïõ ôïõ óõóôÞìáôïò, ôï FreeBSD åßíáé ìéá åîáßñåôç ðëáôöüñìá ãéá ôçí Ýñåõíá óôá ëåéôïõñãéêÜ óõóôÞìáôá üðùò åðßóçò ãéá Üëëïõò êëÜäïõò ôçò ðëçñïöïñéêÞò. Ç öýóç ôçò åëåýèåñçò äéÜèåóçò ôïõ FreeBSD åðéôñÝðåé åðßóçò óå áðïìáêñõóìÝíåò ïìÜäåò íá óõíåñãÜæïíôáé óå éäÝåò Þ íá ìïéñÜæïíôáé ôçí áíÜðôõîç åöáñìïãþí, ÷ùñßò íá áíçóõ÷ïýí ãéá Üäåéåò ÷ñÞóçò êáé ÷ùñßò íá ðåñéïñßæåôáé ç äõíáôüôçôá ôïõò ãéá åëåýèåñç óõæÞôçóç ïðïéïõäÞðïôå èÝìáôïò óå áíïé÷ôÝò ïìÜäåò óõæÞôçóçò (forums).
- *Äéêôýùóç:* ×ñåéÜæåóôå Ýíá êáéíïýñãéï router (äñïìïëïãçôÞ); ¸íá åîõðçñåôçôÞ DNS; ¸íá firewall ãéá íá êñáôÜôå ôïí êüóìï Ýîù áðü ôï åóùôåñéêü óáò äßêôõï; Ôï FreeBSD ìðïñåß åýêïëá íá ìåôáôñÝøåé åêåßíï ôï Ü÷ñçóôï 386 Þ 486 PC ðïõ êÜèåôáé óôçí ãùíßá, óå Ýíá ðñïçãìÝíï äñïìïëïãçôÞ ìå åîåæçôçìÝíåò äõíáôüôçôåò öéëôñáñßóìáôïò ðáêÝôùí.
- *Óôáèìüò åñãáóßáò ìå X Window:* Ôï FreeBSD åßíáé ìéá åîáßñåôç åðéëïãÞ ãéá Ýíá ïéêïíïìéêü åîõðçñåôçôÞ × ôåñìáôéêþí, ÷ñçóéìïðïéþíôáò ôïí åëåýèåñá äéáèÝóéìï åîõðçñåôçôÞ X11. Óå áíôßèåóç ìå ôá áðëÜ ôåñìáôéêÜ X, ìå ôï FreeBSD ìðïñåßôå, åöüóïí ôï åðéèõìåßôå, íá åêôåëåßôå ðïëëÝò åöáñìïãÝò ôïðéêÜ, áðáëëÜóóïíôáò Ýôóé ôïí êåíôñéêü åîõðçñåôçôÞ áðü ðåñéôôü öïñôßï. To FreeBSD ìðïñåß íá îåêéíÞóåé áêüìá êáé “diskless” (÷ùñßò óêëçñü äßóêï), êÜíïíôáò Ýôóé ôïõò ðñïóùðéêïýò óôáèìïýò åñãáóßáò áêüìç ðéï öôçíïýò êáé åõêïëüôåñïõò óôç äéá÷åßñéóç.
- *ÁíÜðôõîç Ëïãéóìéêïý:* Ôï âáóéêü óýóôçìá ôïõ FreeBSD äéáôßèåôáé ïëïêëçñùìÝíï, ìå ðëÞñç óåéñÜ åñãáëåßùí áíÜðôõîçò, ðïõ ðåñéëáìâÜíïõí ôïí áíáãíùñéóìÝíï GNU C/C++ compiler êáé debugger.

Ôï FreeBSD åßíáé äéáèÝóéìï óå ìïñöÞ ðçãáßïõ êþäéêá áëëÜ êáé Ýôïéìïõ, ìåôáãëùôôéóìÝíïõ åêôåëÝóéìïõ óå CD-ROM, DVD, êáé ìÝóù áíþíõìïõ FTP. Äåßôå ôï ÐáñÜñôçìá A ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï ðùò íá áðïêôÞóåôå ôï FreeBSD.

1.2.2 Ðïéïò ÷ñçóéìïðïéåß FreeBSD;

Ôï FreeBSD ÷ñçóéìïðïéåßôáé ùò âÜóç ãéá ôçí áíÜðôõîç óõóêåõþí êáé ðñïúüíôùí óå ìåñéêÝò áðü ôéò ìåãáëýôåñåò åôáéñßåò ðëçñïöïñéêÞò, ðåñéëáìâáíïìÝíùí ôùí:

- Apple (http://www.apple.com/)
- Cisco (http://www.cisco.com/)
- Juniper (http://www.juniper.net/)
- NetApp (http://www.netapp.com/)

Ôï FreeBSD ÷ñçóéìïðïéåßôáé ãéá íá õðïóôçñßæåé ìåñéêÝò áðü ôéò ìåãáëýôåñåò ôïðïèåóßåò óôï ºíôåñíåô, ðåñéëáìâáíïìÝíùí ôùí:

- Yahoo! (http://www.yahoo.com/)
- Yandex (http://www.yandex.ru/)
- Apache (http://www.apache.org/)
- Rambler (http://www.rambler.ru/)
- Sina (http://www.sina.com/)
- Pair Networks (http://www.pair.com/)
- Sony Japan (http://www.sony.co.jp/)
- Netcraft (http://www.netcraft.com/)
- NetEase (http://www.163.com/)
- Weathernews (http://www.wni.com/)
- TELEHOUSE America (http://www.telehouse.com/)
- Experts Exchange (http://www.experts-exchange.com/)

êáé ðïëëþí áêüìç.

1.3 Ðëçñïöïñßåò ãéá ôï FreeBSD Project

Ôï áêüëïõèï ôìÞìá ðáñÝ÷åé ìåñéêÝò ðëçñïöïñßåò ó÷åôéêÝò ìå ôï project, êáé ðåñéëáìâÜíåé ìéá óýíôïìç éóôïñßá ôïõ FreeBSD, ôïõò óôü÷ïõò, êáé ôï ìïíôÝëï áíÜðôõîçò ôïõ.

1.3.1 Ìéá óýíôïìç éóôïñßá ôïõ FreeBSD

ÓõíåéóöïñÜ ôïõ Jordan Hubbard.

To FreeBSD Project ãåííÞèçêå óôéò áñ÷Ýò ôïõ 1993, ìåñéêþò óáí åîÝëéîç ôïõ “Unofficial 386BSD Patchkit” áðü ôïõò 3 ôåëåõôáßïõò óõíôïíéóôÝò ôïõ patchkit: ôïí Nate Williams, ôïí Rod Grimes êáé åìÝíá.

Ï ðñùôáñ÷éêüò óôü÷ïò ìáò Þôáí íá ðáñÜãïõìå Ýíá åíäéÜìåóï óôéãìéüôõðï (snapshot) ôïõ 386BSD þóôå íá äéïñèþóïõìå ìåñéêÜ ðñïâëÞìáôá ðïõ ï ìç÷áíéóìüò ôïõ patchkit äåí Þôáí éêáíüò íá ëýóåé. Ìåñéêïß áðü óáò, ßóùò íá èõìïýíôáé ðùò ï áñ÷éêüò ôßôëïò åñãáóßáò ãéá ôï project Þôáí “386BSD 0.5” Þ “386BSD Interim” êáé áíáöÝñïíôáí óå áõôü áêñéâþò ôï ãåãïíüò.

Ôï 386BSD Þôáí ôï ëåéôïõñãéêü óýóôçìá ôïõ Bill Jolitz, ôï ïðïßï ìÝ÷ñé åêåßíï ôï óçìåßï, õðÝöåñå âáñéÜ Ý÷ïíôáò áìåëçèåß ãéá ó÷åäüí Ýíá Ýôïò. Êáèþò ôï patchkit öïýóêùíå ïëïÝíá êáé ðåñéóóüôåñï ìå ôï ðÝñáóìá ôùí çìåñþí, åß÷áìå áðïöáóßóåé ïìüöùíá ðùò Ýðñåðå íá ãßíåé êÜôé, êáé áðïöáóßóáìå íá óõìðáñáóôáèïýìå óôïí Bill ðáñÝ÷ïíôáò ôïõ áõôü ôï åíäéÜìåóï “cleanup” snapshot. Ôá ó÷Ýäéá áõôÜ äéáêüðçêáí áðüôïìá, üôáí îáöíéêÜ ï Bill Jolitz áðïöÜóéóå íá áðïóýñåé ôçí Ýãêñéóç ôïõ óôï project äß÷ùò ìéá îåêÜèáñç Ýíäåéîç ôïõ ôé èá Ýðñåðå íá ãßíåé.

Äåí ìáò ðÞñå ðïëý íá áðïöáóßóïõìå ðùò ï óôü÷ïò ðáñÝìåíå áîéüëïãïò, áêüìç êáé ÷ùñßò ôçí âïÞèåéá ôïõ Bill, êáé Ýôóé õéïèåôÞóáìå ôï üíïìá “FreeBSD”, ðïõ åðéíüçóå ï David Greenman. Ïé áñ÷éêïß óôü÷ïé ìáò ôÝèçêáí áöïý óõìâïõëåõèÞêáìå ôïõò ôüôå ÷ñÞóôåò ôïõ óõóôÞìáôïò, êáé üôáí Ýãéíå ðëÝïí îåêÜèáñï ðùò ôï project åß÷å ðÜñåé óùóôÞ ðïñåßá êáé ßóùò Ýôåéíå íá ãßíåé ðñáãìáôéêüôçôá, Þñèá óå åðáöÞ ìå ôçí Walnut Creek CDROM ðñïóâëÝðïíôáò óôçí âåëôßùóç ôùí êáíáëéþí äéáíïìÞò ôïõ FreeBSD ãéá üëïõò áõôïýò ôïõò Üôõ÷ïõò ðïõ äåí åß÷áí åýêïëç ðñüóâáóç óôï ºíôåñíåô. Ç Walnut Creek CDROM, ü÷é ìüíï õðïóôÞñéîå ôçí éäÝá äéáíïìÞò ôïõ FreeBSD óå CD, áëëÜ ðñï÷þñçóå áñêåôÜ ðåñéóóüôåñï, ðáñÝ÷ïíôáò óôï project Ýíá ìç÷Üíçìá åñãáóßáò êáé ìéá ãñÞãïñç óýíäåóç óôï ºíôåñíåô. Äß÷ùò ôçí âáèéÜ ðßóôç ôçò Walnut Creek CDROM óå áõôü ðïõ åêåßíï ôïí êáéñü Þôáí Ýíá åíôåëþò Üãíùóôï project, åßíáé ðïëý áðßèáíï ôï FreeBSD íá åß÷å öôÜóåé ôüóï ìáêñéÜ, êáé ôüóï ãñÞãïñá, üðùò óÞìåñá.

Ç ðñþôç äéáíïìÞ CD-ROM (êáé ìå ãåíéêÜ åõñåßá äéÜèåóç óôï äßêôõï) Þôáí ç FreeBSD 1.0, ðïõ êõêëïöüñçóå ôïí ÄåêÝìâñéï ôïõ 1993. Âáóßæïíôáí óå ìéá ôáéíßá ôïõ 4.3BSD-Lite (“Net/2”) ôïõ U.C. Berkeley, Ý÷ïíôáò ðÜñåé êáé ðïëëÜ óôïé÷åßá áðü ôï 386BSD êáé ôï Free Software Foundation. ¹ôáí áñêåôÜ åðéôõ÷çìÝíç ãéá ðñþôç ðñïóðÜèåéá, êáé ôçí óõíå÷ßóáìå ìå ôçí áñêåôÜ åðéôõ÷çìÝíç Ýêäïóç FreeBSD 1.1 ðïõ êõêëïöüñçóå ôïí ÌÜúï ôïõ 1994.

Ðåñßðïõ åêåßíç ôçí ðåñßïäï, ó÷çìáôßóôçêáí áðñüóìåíá óôïí ïñßæïíôá óýííåöá êáôáéãßäáò, êáèþò ç Novell êáé ôï U.C. Berkeley ôáêôïðïßçóáí ôçí ìáêñÜò äéáñêåßáò äéêáóôéêÞ äéáìÜ÷ç ó÷åôéêÜ ìå ôá äéêáéþìáôá ôçò ôáéíßáò Net/2. Ìßá óõíèÞêç áõôÞò ôçò óõìöùíßáò Þôáí ç ðáñáäï÷Þ áðü ôçí ìåñéÜ ôïõ U.C. Berkeley üôé ìåãÜëï ìÝñïò ôïõ Net/2 Þôáí “åðéâáñõìÝíïò” êþäéêáò êáé éäéïêôçóßá ôçò Novell, ç ïðïßá ìå ôçí óåéñÜ ôçò ôï åß÷å áðïêôÞóåé áðü ôçí AT&T ëßãï êáéñü ðñéí. Áõôü ðïõ ðÞñå ùò áíôÜëëáãìá ôï Berkeley Þôáí ïé “åõëïãßåò” ôçò Novell üôé ç Ýêäïóç 4.4BSD-Lite, üôáí ôåëéêÜ ïëïêëçñùíüôáí, èá äçëùíüôáí ùò ìç-åðéâáñõìÝíç, êáé üëïé ïé ìÝ÷ñé ôüôå ÷ñÞóôåò ôïõ Net/2 èá åíèáññýíïíôáí Ýíèåñìá íá ìåôáâïýí óå áõôÞ. Áõôü óõìðåñéëÜìâáíå êáé ôï FreeBSD, êáé óôï project äüèçêå ÷ñüíïò ìÝ÷ñé ôïí Éïýëéï ôïõ 1994 íá óôáìáôÞóåé ôéò ðáñáäüóåéò ôùí ðñïúüíôùí ðïõ âáóßæïíôáí óôï Net/2. Õðü ôïõò üñïõò áõôÞò ôçò óõìöùíßáò, åðéôñÜðçêå óôï project ìéá ôåëåõôáßá Ýêäïóç ðñéí ôçí ëÞîç ôçò ðñïèåóìßáò, êáé áõôÞ Þôáí ç Ýêäïóç FreeBSD 1.1.5.1.

Ôï FreeBSD âñÝèçêå ôüôå óôç äõó÷åñÞ èÝóç êõñéïëåêôéêÜ íá îáíá-áíáêáëýøåé ôïí åáõôü ôïõ áðü Ýíá óýíïëï áðü bit ôïõ 4.4BSD-Lite, åíôåëþò êáéíïýñãéï, êáé êõñßùò áôåëÝò. Ïé åêäüóåéò “Lite” Þôáí light (åëáöñéÝò) åí’ ìÝñåé åðåéäÞ ôï CSRG ôïõ Berkeley åß÷å áöáéñÝóåé ìåãÜëï üãêï êþäéêá ï ïðïßïò Þôáí áðáñáßôçôïò ãéá íá êáôáóêåõáóôåß Ýíá ðñáãìáôéêÜ åêêéíÞóéìï ëåéôïõñãéêü óýóôçìá (ëüãù äéáöüñùí íïìéêþí æçôçìÜôùí), êáé åí’ ìÝñåé åðåéäÞ ôï port ãéá Intel ôïõ 4.4 Þôáí óå õøçëü âáèìü áôåëÝò. Ç ìåôÜâáóç ïëïêëçñþèçêå ôïí ÍïÝìâñéï ôïõ 1994, êáé óå áõôü ôï óçìåßï êõêëïöüñçóå ç FreeBSD 2.0 óôï äßêôõï êáé óå CD-ROM (ôÝëç ÄåêÝìâñç). ÐáñÜ ôï ãåãïíüò üôé Þôáí áêüìç áñêåôÜ ðñü÷åéñç ìÝóåò-Üêñåò, ç Ýêäïóç Þôáí ìéá óçìáíôéêÞ åðéôõ÷ßá êáé ôçí áêïëïýèçóå ç ðéï áîéüðéóôç êáé åõêïëüôåñç ùò ðñïò ôçí åãêáôÜóôáóç Ýêäïóç FreeBSD 2.0.5 ôïí Éïýíéï ôïõ 1995.

ÊõêëïöïñÞóáìå ôçí FreeBSD 2.1.5 ôïí Áýãïõóôï ôïõ 1996, êáé öÜíçêå íá åßíáé áñêåôÜ äçìïöéëÞò óôïõò ISP êáé óôéò åìðïñéêÝò êïéíüôçôåò, ôüóï ðïõ Üîéæå Üëëï Ýíá ðáñáêëÜäé óôïí êïñìü ôçò 2.1-STABLE. ÁõôÞ Þôáí ç FreeBSD 2.1.7.1, ðïõ êõêëïöüñçóå ôïí ÖåâñïõÜñéï ôïõ 1997 êáé Þôáí ç áðïêïñýöùóç ôçò êýñéáò áíÜðôõîçò ôçò 2.1-STABLE, ç ïðïßá âñßóêåôáé ðëÝïí óå êáôÜóôáóç óõíôÞñçóçò. èá ãßíïíôáé ìüíï âåëôéþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò bugs óå áõôü ôïí êïñìü (RELENG_2_1_0).

Ç FreeBSD 2.2 äéáêëáäþèçêå áðü ôçí áíÜðôõîç ôçò êýñéáò ãñáììÞò (“-CURRENT”) ôïí ÍïÝìâñéï ôïõ 1996, ùò êëÜäïò RELENG_2_2, êáé ç ðñþôç ðëÞñçò Ýêäïóç (2.2.1) êõêëïöüñçóå ôïí Áðñßëéï ôïõ 1997. Ðñüóèåôåò åêäüóåéò áðü ôïí êëÜäï 2.2 äüèçêáí óå êõêëïöïñßá ôï êáëïêáßñé êáé ôï öèéíüðùñï ôïõ ’97, ç ôåëåõôáßá ôùí ïðïßùí (ç 2.2.8) åìöáíßóôçêå ôïí ÍïÝìâñç ôïõ 1998. Ç ðñþôç åðßóçìç Ýêäïóç 3.0 åìöáíßóôçêå ôïí Ïêôþâñéï ôïõ 1998 êáé óçìÜäåøå ôçí áñ÷Þ ôïõ ôÝëïõò ãéá ôïí êëÜäï 2.2.

Ï êïñìüò äéáêëáäþèçêå îáíÜ óôéò 20 Éáíïõáñßïõ 1999, ïäçãþíôáò óôçí 4.0-CURRENT êáé óôïí êëÜäï 3.X-STABLE. Áðü ôïí 3.X-STABLE, ç 3.1 êõêëïöüñçóå óôéò 15 Öåâñïõáñßïõ 1999, ç 3.2 óôéò 15 ÌáÀïõ 1999, ç 3.3 óôéò 16 Óåðôåìâñßïõ 1999, ç 3.4 óôéò 20 Äåêåìâñßïõ ôïõ 1999, êáé ç 3.5 óôéò 24 Éïõíßïõ 2000, ôçí ïðïßá áêïëïýèçóå ëßãåò ìÝñåò ìåôÜ ìßá ìéêñÞò ôÜîåùò áíáâÜèìéóç, ç 3.5.1, ãéá íá óõìðåñéëçöèïýí êÜðïéåò áíáâáèìßóåéò áóöáëåßáò ôçò ôåëåõôáßáò óôéãìÞò óôï Kerberos. Áõôü Þôáí êáé ç ôåëéêÞ Ýêäïóç áðü ôïí êëÜäï ôçò 3.X.

¸íá íÝï ðáñáêëÜäé äçìéïõñãÞèçêå óôéò 13 Ìáñôßïõ 2000, äçìéïõñãþíôáò Ýôóé ôïí êëÜäï áíÜðôõîçò 4.X-STABLE. ÄçìéïõñãÞèçêáí áñêåôÝò åêäüóåéò áðü áõôü ôïí êëÜäï: Ç 4.0-RELEASE êõêëïöüñçóå ôïí ÌÜñôéï ôïõ 2000, êáé ç ôåëåõôáßá 4.11-RELEASE êõêëïöüñçóå ôïí ÉáíïõÜñéï ôïõ 2005.

ÌåôÜ áðü ìåãÜëï ÷ñïíéêü äéÜóôçìá áíáìïíÞò, ç 5.0-RELEASE áíáêïéíþèçêå óôéò 19 Éáíïõáñßïõ ôïõ 2003. Ùò áðïêïñýöùìá ó÷åäüí ôñéþí ÷ñüíùí åñãáóßáò, ç Ýêäïóç áõôÞ åéóÞãáãå ôï FreeBSD óôï ìïíïðÜôé ôùí ðñïçãìÝíùí ðïëõåðåîåñãáóôþí êáé óôçí õðïóôÞñéîç åöáñìïãþí ìå threads, åíþ åéóÞãáãå êáé õðïóôÞñéîç ãéá ôéò ðëáôöüñìåò UltraSPARC êáé `ia64`. ÁõôÞí ôçí Ýêäïóç áêïëïýèçóå ç 5.1 ôïí Éïýíéï ôïõ 2003. Ç ôåëåõôáßá Ýêäïóç 5.X áðü ôïí êïñìü ôçò -CURRENT Þôáí ç 5.2.1-RELEASE, ðïõ êõêëïöüñçóå ôïí ÖåâñïõÜñéï ôïõ 2004.

Ï êïñìüò ôçò RELENG_5, äçìéïõñãÞèçêå ôïí Áýãïõóôï ôïõ 2004, êáé áêïëïýèçóå ç 5.3-RELEASE, ç ïðïßá óçìÜäåøå ôçí áñ÷Þ ôùí åêäüóåùí áðü ôïí êëÜäï 5-STABLE. Ç ðéï ðñüóöáôç 5.5-RELEASE êõêëïöüñçóå ôïí ÌÜéï ôïõ 2006. Äåí èá õðÜñîïõí ðñüóèåôåò åêäüóåéò áðü ôïí êïñìü ôçò RELENG_5.

Ï êïñìüò äéáêëáäþèçêå îáíÜ ôïí Éïýëéï ôïõ 2005, áõôÞ ôç öïñÜ ãéá ôçí äçìéïõñãßá ôïõ êëÜäïõ RELENG_6. Ç 6.0-RELEASE åßíáé ç ðñþôç Ýêäïóç ôçò óåéñÜò 6.X, êáé êõêëïöüñçóå ôïí ÍïÝìâñéï ôïõ 2005. Ç ðéï ðñüóöáôç 6.4-RELEASE êõêëïöüñçóå ôïí ÍïÝìâñéï ôïõ 2008. Äåí èá õðÜñîïõí ðñüóèåôåò åêäüóåéò áðü ôïí êïñìü ôçò RELENG_6. Áõôüò åßíáé êáé ï ôåëåõôáßïò êëÜäïò ðïõ õðïóôçñßæåé ôçí áñ÷éôåêôïíéêÞ Alpha.

Ï êëÜäïò áíÜðôõîçò RELENG_7, äçìéïõñãÞèçêå ôïí Ïêôþâñéï ôïõ 2007. Ç ðñþôç Ýêäïóç áðü áõôü ôïí êëÜäï, Þôáí ç 7.0-RELEASE ç ïðïßá êõêëïöüñçóå ôïí ÖåâñïõÜñéï ôïõ 2008. Ç ðéï ðñüóöáôç 7.4-RELEASE êõêëïöüñçóå ôïí ÖåâñïõÜñéï ôïõ 2011. Äåí èá õðÜñîïõí ðñüóèåôåò åêäüóåéò áðü ôïí êëÜäï RELENG_7.

Ï êïñìüò äéáêëáäþèçêå îáíÜ ôïí Áýãïõóôï ôïõ 2009, áõôÞ ôç öïñÜ ãéá ôçí äçìéïõñãßá ôïõ êëÜäïõ RELENG_8. Ç 8.0-RELEASE åßíáé ç ðñþôç Ýêäïóç ôçò óåéñÜò 8.× êáé êõêëïöüñçóå ôïí ÍïÝìâñéï ôïõ 2009. Ç ðéï ðñüóöáôç 8.3-RELEASE êõêëïöüñçóå ôïí ÌÜéïò 2006. Èá õðÜñîïõí ðñüóèåôåò åêäüóåéò áðü ôïí êëÜäï RELENG_8.

Ï êëÜäïò áíÜðôõîçò RELENG_9, äçìéïõñãÞèçêå ôïí ÓåðôÝìâñéï ôïõ 2011. Ç ðñþôç Ýêäïóç áðü áõôü ôïí êëÜäï, Þôáí ç 9.1-RELEASE ç ïðïßá êõêëïöüñçóå ôïí ÉáíïõÜñéïò 2007. Èá õðÜñîïõí ðñüóèåôåò åêäüóåéò áðü ôïí êëÜäï RELENG_9.

Ãéá ôçí þñá, ç ìáêñïðñüèåóìç áíÜðôõîç óõíå÷ßæåôáé óôïí êëÜäï 10.X-CURRENT. ÍÝåò åêäüóåéò SNAPshot ôïõ 10.X óå CD-ROM (êáé öõóéêÜ óôï Äéáäßêôõï), äéáôßèåíôáé áðü ôïí ôïí snapshot server (ftp://current.FreeBSD.org/pub/FreeBSD/snapshots/) êáèþò óõíå÷ßæåôáé ç áíÜðôõîç.

1.3.2 Óôü÷ïé ôïõ FreeBSD Project

ÓõíåéóöïñÜ ôïõ Jordan Hubbard.

Ïé óôü÷ïé ôïõ FreeBSD Project åßíáé íá ðáñÝ÷åé ëïãéóìéêü ðïõ èá ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ïðïéáäÞðïôå ðåñßóôáóç êáé ÷ùñßò äÝóìåõóç. Ðïëëïß áðü ìáò Ý÷ïõí êÜíåé óçìáíôéêÞ åðÝíäõóç óôïí êþäéêá (êáé ôï project) êáé óßãïõñá äå èá ìáò ðåñéáæå êÜðïéá ìéêñÞ ïéêïíïìéêÞ õðïóôÞñéîç, áëëÜ óßãïõñá äåí åßìáóôå Ýôïéìïé íá åðéìåßíïõìå óå áõôü. Ðéóôåýïõìå üôé ç ðñùôáñ÷éêÞ êáé óõíå÷Þò áðïóôïëÞ ìáò åßíáé íá ðáñÝ÷ïõìå êþäéêá óå õðÜñ÷ïíôåò êáé ìåëëïíôéêïýò ÷ñÞóôåò, êáé ãéá ïðïéïäÞðïôå óêïðü, þóôå ï êþäéêáò ìáò íá Ý÷åé ôçí åõñýôåñç ðéèáíÞ ÷ñÞóç êáé íá áðïöÝñåé ôï ìåãáëýôåñï äõíáôü üöåëïò. Áõôü åßíáé, ðéóôåýù, Ýíáò áðü ôïõò óçìáíôéêüôåñïõò óôü÷ïõò ôïõ Åëåýèåñïõ Ëïãéóìéêïý êáé Ýíáò áðü ôïõò ïðïßïõò õðïóôçñßæïõìå ìå åíèïõóéáóìü.

Ôï ôìÞìá ôïõ ðçãáßïõ ìáò êþäéêá ðïõ âñßóêåôáé õðü ôçí GNU General Public License (GPL) Þ ôçí Library General Public License (LGPL) Ý÷åé êÜðùò ðåñéóóüôåñåò äåóìåýóåéò, áí êáé óêïðüò ôïõò åßíáé ìÜëëïí íá äéáóöáëßóïõí ôçí åëåýèåñç äéÜèåóç ôïõ êþäéêá, ðáñÜ ôï áíôßèåôï. Ëüãù ôùí åðéðñüóèåôùí åðéðëïêþí ðïõ èÝôåé ç Üäåéá ÷ñÞóçò GPL óôçí åìðïñéêÞ ÷ñÞóç ôïõ ëïãéóìéêïý, ðñïôéìïýìå, üóï åßíáé åöéêôü, íá ðáñÝ÷ïõìå ôï ëïãéóìéêü ìáò õðü ôï ÷áëáñüôåñï BSD copyright.

1.3.3 Ôï ÌïíôÝëï ÁíÜðôõîçò ôïõ FreeBSD

Óõíåéóöïñ Ü ôïõ Satoshi Asami.

Ç áíÜðôõîç ôïõ FreeBSD åßíáé ìßá ðïëý áíïéêôÞ êáé åõÝëéêôç äéáäéêáóßá, áöïý êõñéïëåêôéêÜ âáóßæåôáé óôçí óõíåéóöïñÜ åêáôïíôÜäùí áíèñþðùí áðü üëï ôïí êüóìï, üðùò ìðïñåßôå íá äåßôå áðü ôçí ëßóôá ôùí óõíåñãáôþí (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/contributors/article.html) ìáò. Ç õðïäïìÞ áíÜðôõîçò ôïõ FreeBSD åðéôñÝðåé óôá åêáôïíôÜäåò ìÝëç ôçò ïìÜäáò áíÜðôõîçò íá óõíåñãÜæïíôáé ìÝóù ôïõ ºíôåñíåô. Åßìáóôå óôáèåñÜ óå áíáæÞôçóç ãéá íÝá ìÝëç óôçí ïìÜäá áíÜðôõîçò êáé ãéá éäÝåò, êáé üóïé åíäéáöÝñïíôáé íá áó÷ïëçèïýí áêüìç ðåñéóóüôåñï ìå ôï project ÷ñåéÜæåôáé áðëÜ íá åðéêïéíùíÞóïõí ìáæß ìáò óôçí çëåêôñïíéêÞ ëßóôá ôå÷íéêþí óõæçôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hackers). Åðßóçò ç çëåêôñïíéêÞ ëßóôá áíáêïéíþóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-announce) åßíáé äéáèÝóéìç óå üóïõò åðéèõìïýí íá åíçìåñþóïõí Üëëïõò ÷ñÞóôåò ôïõ FreeBSD ãéá êýñéïõò ôïìåßò åñãáóßáò ó÷åôéêÜ ìå ôï Project.

×ñÞóéìá ðñÜãìáôá ðïõ ðñÝðåé íá ãíùñßæåôå ãéá ôï FreeBSD Project êáé ôçí äéáäéêáóßá áíÜðôõîçò ôïõ, åßôå äïõëåýåôå áíåîÜñôçôá åßôå ùò óôåíïß óõíåñãÜôåò:

Ôá SVN êáé CVS repositories

Ãéá ðïëëÜ ÷ñüíéá, ï êåíôñéêüò êïñìüò êþäéêá ôïõ FreeBSD óõíôçñïýíôáí ìÝóù ôïõ CVS (http://ximbiot.com/cvs/wiki/) (Concurrent Versions System), åíüò åëåýèåñá äéáèÝóéìïõ åñãáëåßïõ åëÝã÷ïõ ðçãáßïõ êþäéêá ðïõ ðñïóöÝñåôáé åóùìáôùìÝíï óôï FreeBSD. Ôïí Éïýíéï ôïõ 2008, ôï Project áðïöÜóéóå ôç ìåôÜâáóç óôï SVN (http://subversion.tigris.org) (Subversion). Ç áëëáãÞ êñßèçêå áíáãêáßá, êáèþò ïé ôå÷íéêïß ðåñéïñéóìïß ôïõ **CVS** Þôáí ðëÝïí åìöáíåßò, åîáéôßáò ôïõ ìåãÝèïõò ôïõ áðïèçêåõìÝíïõ êþäéêá êáé ôïõ éóôïñéêïý ðïõ ôïí óõíïäåýåé. Áí êáé ôï êýñéï repository ÷ñçóéìïðïéåß ðëÝïí ôï **SVN**, ôá åñãáëåßá ÷ñÞóôç üðùò ôá **CVSup** êáé **csup** ôá ïðïßá åîáñôþíôáé áðü ôç ëåéôïõñãßá ôïõ ðáëáéüôåñïõ óõóôÞìáôïò **CVS**, óõíå÷ßæïõí íá ëåéôïõñãïýí êáíïíéêÜ. Áõôü åîáóöáëßæåôáé ìå óõã÷ñïíéóìü ôùí áëëáãþí ôïõ **SVN** óôï õðÜñ÷ïí **CVS**. Ôç äåäïìÝíç óôéãìÞ, ôï **SVN** ÷ñçóéìïðïéåßôáé ìüíï óôï êåíôñéêü repository ðçãáßïõ êþäéêá. Ôá repositories ðïõ ÷ñçóéìïðïéïýíôáé ãéá ôï documentation (ôåêìçñßùóç), ôï World Wide Web (ôï äéêôõáêü ôüðï) êáèþò êáé ôá Ports, óõíå÷ßæïõí íá ÷ñçóéìïðïéïýí ôï **CVS**. Ôï êýñéï repository (http://www.FreeBSD.org/cgi/cvsweb.cgi) âñßóêåôáé óå Ýíá ìç÷Üíçìá óôçí Santa Clara CA, USA áðü üðïõ áíôéãñÜöåôáé óå ìåãÜëï áñéèìü ìç÷áíþí mirror óå üëï ôïí êüóìï. Ï êïñìüò **SVN**, ï ïðïßïò ðåñéÝ÷åé ôïõò êëÜäïõò -CURRENT êáé -STABLE, ìðïñåß åðßóçò åýêïëá íá áíôéãñáöåß êáé óôï äéêü óáò õðïëïãéóôÞ. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá áõôü ôï èÝìá ìðïñåßôå íá âñåßôå óôçí åíüôçôá Óõã÷ñïíßæïíôáò ôïí Ðçãáßï óáò Êþäéêá.

Ç ëßóôá ôùí committers

Ïé *committers* åßíáé Üôïìá ðïõ Ý÷ïõí Üäåéá *åããñáöÞò (write)* óôïí êïñìü ôïõ CVS, êáé åßíáé åîïõóéïäïôçìÝíïé íá êÜíïõí ìåôáôñïðÝò óôïí êþäéêá ôïõ FreeBSD (ï üñïò “committer” ðñïÝñ÷åôáé áðü ôçí åíôïëÞ cvs(1) `commit`, ç ïðïßá ÷ñçóéìïðïéåßôáé ãéá íá ãßíïõí íÝåò áëëáãÝò óôï CVS repository). Ï êáëýôåñïò ôñüðïò ãéá íá ôåèïýí áëëáãÝò ðñïò áíáèåþñçóç åê ìÝñïõò ôçò ëßóôáò ôùí committers åßíáé íá ÷ñçóéìïðïéåßôáé ç åíôïëÞ send-pr(1). ÅÜí ôï ðáñáðÜíù óýóôçìá öáßíåôáé ìðëïêáñéóìÝíï, ìðïñåßôå íá ôïõò ðñïóåããßóåôå óôÝëíïíôáò email óôçí çëåêôñïíéêÞ ëßóôá ôùí committers ôïõ FreeBSD.

The FreeBSD core team

Ç *FreeBSD core team* èá Þôáí éóïäýíáìç ìå ôï äéïéêçôéêü óõìâïýëéï áí ôï FreeBSD Project Þôáí ìéá áíþíõìç åôáéñåßá. Ï ðñùôáñ÷éêüò óôü÷ïò ôçò core team åßíáé íá åîáóöáëßóåé üôé ôï project, óôï óýíïëï ôïõ, åßíáé óå êáëÞ êáôÜóôáóç êáé íá ôï ïäçãåß ðñïò ôçí óùóôÞ êáôåýèõíóç. Ìéá áðü ôéò ëåéôïõñãßåò ôçò core team åßíáé íá ðñïóêáëåß áöïóéùìÝíïõò êáé õðåýèõíïõò developers íá óõììåôÝ÷ïõí óôçí ïìÜäá áíÜðôõîçò (ôïõò committers) êáèþò êáé íá áðïìáêñýíåé ìÝëç ãéá ôçí ßäéá ôçí core team êáèþò êÜðïéïé áðï÷ùñïýí. Ç ðáñïýóá core team åêëÝ÷ôçêå áðü Ýíá óýíïëï õðïøçößùí committers ôïí Éïýëéï ôïõ 2010. ÅêëïãÝò äéåîÜãïíôáé êÜèå 2 ÷ñüíéá.

ÌåñéêÜ ìÝëç ôçò core team Ý÷ïõí åðßóçò åéäéêïýò ôïìåßò åõèýíçò, êáé áõôü óçìáßíåé ðùò äåóìåýïíôáé íá åîáóöáëßóïõí üôé Ýíá ìåãÜëï ìÝñïò ôïõ óõóôÞìáôïò ëåéôïõñãåß üðùò ðñÝðåé. Ãéá ìéá ïëïêëçñùìÝíç ëßóôá ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD êáé ôùí ôïìÝùí åõèýíçò ôïõò, ðáñáêáëïýìå äåßôå ôçí Ëßóôá ôùí Óõíåñãáôþí ìáò (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/contributors/article.html).

> **Óçìåßùóç:** Ôá ðåñéóóüôåñá ìÝëç ôïõ core team åßíáé åèåëïíôÝò üóïí áöïñÜ ôçí áíÜðôõîç ôïõ FreeBSD êáé äåí Ý÷ïõí ïéêïíïìéêÞò öýóåùò ïöÝëç áðü ôï project, åðïìÝíùò ç “äÝóìåõóç” äåí èá ðñÝðåé íá ðáñåñìçíåõèåß ùò “åããõçìÝíç õðïóôÞñéîç”. Ç ðáñáðÜíù ðáñïìïßùóç ìå ôï “äéïéêçôéêü óõìâïýëéï” äåí åßíáé ðïëý áêñéâÞò, ßóùò åßíáé êáôáëëçëüôåñï íá ðïýìå üôé ðñüêåéôáé ãéá áíèñþðïõò ðïõ èõóßáóáí ôéò æùÝò ôïõò ãéá ÷Üñç ôïõ FreeBSD åíÜíôéá óôçí êáëýôåñç ôïõò êñßóç!

Åîùôåñéêïß óõíåñãÜôåò

ÔÝëïò, áëëÜ ïðùóäÞðïôå ü÷é ìéêñüôåñçò óçìáóßáò, ç ìåãáëýôåñç ïìÜäá áíÜðôõîçò åßíáé ïé ßäéïé ïé ÷ñÞóôåò ðïõ ìáò ðáñÝ÷ïõí ó÷üëéá êáé äéïñèþóåéò ôùí bug óå ó÷åäüí óôáèåñÞ âÜóç. Ï êýñéïò ôñüðïò ãéá íá êñáôÜôå åðáöÞ ìå ôçí ìç-óõãêåíôñùôéêÞ ïìÜäá áíÜðôõîçò ôïõ FreeBSD åßíáé íá ãßíåôå óõíäñïìçôÝò óôçí çëåêôñïíéêÞ ëßóôá ôå÷íéêþí óõæçôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hackers) üðïõ ãßíïíôáé ïé áíÜëïãåò óõæçôÞóåéò. Äåßôå ôï **ÐáñÜñôçìá C** ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò äéÜöïñåò ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ ôïõ FreeBSD.

Ç Ëßóôá Óõíåñãáôþí ôïõ FreeBSD (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/contributors/article.html) åßíáé ìåãÜëç êáé óõíå÷þò áõîáíüìåíç, åðïìÝíùò ãéáôß íá ìçí ãßíåôå êáé åóåßò ìÝëïò ôçò êáé íá óõìâÜëëåôå óÞìåñá óå êÜôé óôï FreeBSD;

Ç ðáñï÷Þ êþäéêá äåí åßíáé ï ìüíïò ôñüðïò ãéá íá óõíåéóöÝñåôå óôï project. Ãéá ìéá ïëïêëçñùìÝíç ëßóôá ôùí ðñáãìÜôùí óôá ïðïßá ÷ñåéáæüìáóôå âïÞèåéá, ðáñáêáëïýìå åðéóêåöèåßôå ôçí ÄéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD Project (http://www.FreeBSD.org/index.html).

Óõíïøßæïíôáò, ôï ìïíôÝëï áíÜðôõîçò ìáò åßíáé ïñãáíùìÝíï óáí Ýíá ÷áëáñü óýíïëï ïìüêåíôñùí êýêëùí. Ôï óõãêåíôñùôéêü ìïíôÝëï åßíáé ó÷åäéáóìÝíï ãéá íá äéåõêïëýíåé ôïõò *÷ñÞóôåò* ôïõ FreeBSD, óôïõò ïðïßïõò ðáñÝ÷åôáé Ýôóé Ýíáò åýêïëïò ôñüðïò ðáñáêïëïýèçóçò ôïõ âáóéêïý êþäéêá, êáé ü÷é ãéá íá áðïêëåßïõìå ðéèáíïýò óõíåñãÜôåò! Åðéèõìßá ìáò åßíáé íá ðáñïõóéÜóïõìå Ýíá óôáèåñü ëåéôïõñãéêü óýóôçìá óå óõíÜñôçóç ìå ìéá ìåãÜëç ãêÜìá áðü ðñïãñÜììáôá åöáñìïãþí ðïõ ïé ÷ñÞóôåò íá ìðïñïýí åýêïëá íá åãêáèéóôïýí êáé íá ÷ñçóéìïðïéïýí — ãéá ôçí åêðëÞñùóç áõôþí ôùí óôü÷ùí, ôï ìïíôÝëï áõôü äïõëåýåé ðïëý êáëÜ.

Ôï ìüíï ðïõ æçôÜìå áðü üóïõò åðéèõìïýí íá åíùèïýí ìáæß ìáò óôçí ïìÜäá áíÜðôõîçò ôïõ FreeBSD, åßíáé ëßãç áðü ôçí ßäéá áöïóßùóç ôçò ôùñéíÞò ïìÜäáò, ãéá ìéá óõíå÷Þ ðïñåßá óôçí åðéôõ÷ßá ôïõ!

1.3.4 Ç ÔñÝ÷ïõóá ¸êäïóç ôïõ FreeBSD

Ôï FreeBSD åßíáé åëåýèåñá äéáèÝóéìï, âáóßæåôáé ïëüêëçñï óôïí ðçãáßï êþäéêá ôïõ 4.4BSD-Lite, êáé áíáðôýóóåôáé ãéá óõóôÞìáôá çëåêôñïíéêþí õðïëïãéóôþí âáóéóìÝíá óå åðåîåñãáóôÝò Intel i386™, i486™, Pentium®, Pentium Pro, Celeron®, Pentium II, Pentium III, Pentium 4 (Þ óõìâáôïýò), Xeon™, êáé Sun UltraSPARC. Âáóßæåôáé êõñßùò óôï software ôçò ïìÜäáò U.C. Berkeley CSRG, ìå êÜðïéåò âåëôéþóåéò ðïõ ðñïÝñ÷ïíôáé áðü ôá NetBSD, OpenBSD, 386BSD, êáé ôï Free Software Foundation.

Áðü ôçí Ýêäïóç ôïõ FreeBSD 2.0 óôá ôÝëç ôïõ 1994, ç áðüäïóç, ôï óýíïëï ôùí ÷áñáêôçñéóôéêþí, êáé ç óôáèåñüôçôá ôïõ FreeBSD Ý÷åé âåëôéùèåß óçìáíôéêÜ. Ç ìåãáëýôåñç áëëáãÞ åßíáé ç åðáíáó÷åäßáóç ôïõ óõóôÞìáôïò åéêïíéêÞò ìíÞìçò (virtual memory) ìå Ýíá ïëïêëçñùìÝíï VM/file buffer cache ôï ïðïßï ü÷é ìüíï áõîÜíåé ôçí áðüäïóç, áëëÜ åðßóçò ìåéþíåé ôéò áðáéôÞóåéò ìíÞìçò ôïõ FreeBSD, åðéôñÝðïíôáò ùò åëÜ÷éóôï áðïäåêôü üñéï ôá 5 MB. ÐåñéÝ÷ïíôáé åðßóçò êáé Üëëåò âåëôéþóåéò, üðùò ðëÞñçò õðïóôÞñéîç ðåëÜôç êáé åîõðçñåôçôÞ NIS, õðïóôÞñéîç óõíáëëáãþí TCP, dial-on-demand PPP, åíóùìáôùìÝíç õðïóôÞñéîç DHCP, Ýíá âåëôéùìÝíï õðïóýóôçìá SCSI, õðïóôÞñéîç ISDN, õðïóôÞñéîç ãéá ATM, FDDI, ðñïóáñìïãåßò äéêôýïõ Fast êáé Gigabit Ethernet (1000 Mbit), âåëôéùìÝíç õðïóôÞñéîç ãéá ôïõò ôåëåõôáßïõò åëåãêôÝò ôçò Adaptec êáé ðïëëÝò ÷éëéÜäåò äéïñèþóåéò ëáèþí (bug).

Åêôüò áðü ôç âáóéêÞ ôïõ äéáíïìÞ, ôï FreeBSD ðñïóöÝñåé ìéá óõëëïãÞ ëïãéóìéêïý ìå ÷éëéÜäåò ðñïãñÜììáôá ãéá êáèçìåñéíÞ ÷ñÞóç. Ôçí óôéãìÞ ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò, õðÜñ÷ïõí ðÜíù áðü 23,000 ports! Ç ëßóôá ôùí ports îåêéíÜåé áðü åîõðçñåôçôÝò http (WWW), ìÝ÷ñé ðáé÷íßäéá, ãëþóóåò ðñïãñáììáôéóìïý, êåéìåíïãñÜöïõò, êáé ïôéäÞðïôå Üëëï åíäéÜìåóá. Ç óõíïëéêÞ ÓõëëïãÞ ôùí Ports áðáéôåß ðñïóåããéóôéêÜ 500 MB áðïèçêåõôéêïý ÷þñïõ, áöïý üëá ôá ports åêöñÜæïíôáé ìå “deltas” (áñ÷åßá äéáöïñþí) ôùí áõèåíôéêþí ðçãþí ôïõò. Ôï ãåãïíüò áõôü ìáò åðéôñÝðåé íá áíáâáèìßæïõìå ôá ports ðïëý åõêïëüôåñá, êáé ìåéþíåé äñáóôéêÜ ôéò áðáéôÞóåéò óå óêëçñü äßóêï óå ó÷Ýóç ìå ôçí ðáëáéüôåñç ÓõëëïãÞ Ports 1.0. Ãéá íá ìåôáãëùôôßóåôå (compile) Ýíá port, ÷ñåéÜæåôáé áðëþò íá ìåôáâåßôå óôïí êáôÜëïãï ôïõ ðñïãñÜììáôïò ðïõ åðéèõìåßôå íá åãêáôáóôÞóåôå, íá ðëçêôñïëïãÞóåôå `make install`, êáé íá áöÞóåôå ôï óýóôçìá óáò íá êÜíåé ôá õðüëïéðá. Ïëüêëçñç ç áõèåíôéêÞ äéáíïìÞ ãéá êÜèå port ðïõ êÜíåôå build ðáñÝ÷åôáé äõíáìéêÜ áðü ôï CD-ROM Þ áðü ìßá ôïðéêÞ ôïðïèåóßá FTP, Ýôóé ôá ports ðïõ äåí ÷ñåéÜæåóôå äåí êáôáëáìâÜíïõí Üóêïðï ÷þñï óôï óêëçñü óáò äßóêï. Ó÷åäüí êÜèå port ðáñÝ÷åôáé åðßóçò êáé óáí ðñï-ìåôáãëùôôéóìÝíï (pre-compiled) “ðáêÝôï (package)”, ôï ïðïßï ìðïñåß íá åãêáôáóôáèåß ìå ìéá áðëÞ åíôïëÞ (`pkg_add`) ãéá åêåßíïõò ðïõ äåí åðéèõìïýí íá ìåôáãëùôôßæïõí ôá ports ôïõò áðü ôïí ðçãáßï êþäéêá. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôá packages êáé ôá ports ìðïñåßôå íá âñåßôå óôï ÊåöÜëáéï 5.

ÕðÜñ÷åé áñêåôÜ ìåãÜëç åðéðëÝïí ôåêìçñßùóç ôçí ïðïßá ìðïñåß íá âñåßôå ðïëý ÷ñÞóéìç ãéá ôçí äéáäéêáóßá åãêáôÜóôáóçò êáé ÷ñÞóçò ôïõ FreeBSD. Ìðïñåßôå íá ôçí âñåßôå åãêáôåóôçìÝíç óôïí êáôÜëïãï `/usr/share/doc` óå ïðïéïäÞðïôå óýã÷ñïíï ìç÷Üíçìá FreeBSD. Ôá ôïðéêÜ åãêáôåóôçìÝíá åã÷åéñßäéá ìðïñåßôå íá ôá äåßôå óå ìïñöÞ HTML, ÷ñçóéìïðïéþíôáò ïðïéïäÞðïôå êáôÜëëçëï browser óôéò áêüëïõèåò URL:

Ôï Åã÷åéñßäéï ×ñÞóçò ôïõ FreeBSD

`/usr/share/doc/handbook/index.html`

Óõ÷íÝò åñùôÞóåéò ôïõ FreeBSD (FAQ)

`/usr/share/doc/faq/index.html`

Ìðïñåßôå åðßóçò íá äåßôå ôá ðñùôüôõðá (êáé óõ÷íÜ áíáâáèìéæüìåíá) áíôßãñáöá óôï http://www.FreeBSD.org/.

ÊåöÜëáéï 2 ÅãêáôÜóôáóç ôïõ FreeBSD 8.*x* êáé ÐñïãåíÝóôåñùí Åêäüóåùí

Áíáó÷çìáôéóìÝíï, áíáäéïñãáíùìÝíï, êáé ìåñéêþò îáíáãñáììÝíï áðü ôïí Jim Mock. Ç âÞìá ðñïò âÞìá äéáäéêáóßá ôïõ sysinstall, ïé åéêüíåò, êáé ãåíéêÝò äéïñèþóåéò êåéìÝíïõ áðü ôïí Randy Pratt.

2.1 Óýíïøç

Ôï FreeBSD äéáíÝìåôáé ìå Ýíá åý÷ñçóôï, ìç ãñáöéêü ðñüãñáììá åãêáôÜóôáóçò. Áðü ôçí Ýêäïóç 9.0-RELEASE êáé ìåôÜ, ÷ñçóéìïðïéåßôáé ôï **bsdinstall** åíþ ïé ðáëáéüôåñåò åêäüóåéò ÷ñçóéìïðïéïýí ôï **sysinstall**. Óôï êåöÜëáéï áõôü ðåñéãñÜöåôáé ç ÷ñÞóç ôïõ **sysinstall** ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD. Ç ÷ñÞóç ôïõ **bsdinstall** ðåñéãñÜöåôáé óôï ÊåöÜëáéï 3.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá äçìéïõñãÞóåôå äéóêÝôåò åãêáôÜóôáóçò ãéá ôï FreeBSD.
- Ðùò áíáöÝñåôáé óôïõò óêëçñïýò äßóêïõò óáò ôï FreeBSD êáé ðùò ôïõò ÷ùñßæåé óå êáôáôìÞóåéò.
- Ðùò íá îåêéíÞóåôå ôï **sysinstall**.
- Ôéò åñùôÞóåéò ðïõ èá óáò êÜíåé ôï **sysinstall**, ôé óçìáßíïõí, êáé ðùò íá ôéò áðáíôÞóåôå.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá äéáâÜóåôå ôç ëßóôá ôïõ õðïóôçñéæüìåíïõ õëéêïý ðïõ Ýñ÷åôáé ìå ôçí Ýêäïóç ôïõ FreeBSD ôçí ïðïßá èá åãêáôáóôÞóåôå, êáé íá åðáëçèåýóåôå üôé ôï õëéêü ðïõ Ý÷åôå õðïóôçñßæåôáé áðü ôï FreeBSD.

> **Óçìåßùóç:** Óå ãåíéêÝò ãñáììÝò áõôÝò ïé ïäçãßåò åãêáôÜóôáóçò åßíáé ãñáììÝíåò ãéá ôïõò i386 (“PC óõìâáôïýò”) áñ÷éôåêôïíéêÞò õðïëïãéóôÝò. ¼ðïõ ÷ñåéÜæåôáé, èá åìöáíßæïíôáé óõãêåêñéìÝíåò ïäçãßåò ãéá Üëëåò ðëáôöüñìåò. Áí êáé áõôüò ï ïäçãüò äéáôçñåßôáé üóï ôï äõíáôüí ðéï åíçìåñùìÝíïò, åßíáé ðéèáíüí íá âñåßôå ìéêñÝò äéáöïñÝò ìåôáîý ôïõ ðñïãñÜììáôïò åãêáôÜóôáóçò êáé áõôïý ðïõ öáßíåôáé åäþ. Óáò ðñïôåßíïõìå íá ÷ñçóéìïðïéÞóåôå ôï êåöÜëáéï áõôü ðåñéóóüôåñï óáí ãåíéêü ïäçãü ðáñÜ óáí Ýíá êáôÜ ãñÜììá åã÷åéñßäéï åãêáôÜóôáóçò.

2.2 ÁðáéôÞóåéò Õëéêïý

2.2.1 ÅëÜ÷éóôåò ÁðáéôÞóåéò

Ïé åëÜ÷éóôåò áðáéôÞóåéò ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD ðïéêßëïõí áíÜëïãá ìå ôçí Ýêäïóç ôïõ FreeBSD êáé ôçí áñ÷éôåêôïíéêÞ ôïõ õëéêïý.

Óôéò ðáñáêÜôù åíüôçôåò èá âñåßôå ìéá ðåñßëçøç ôùí ðëçñïöïñéþí áõôþí. ÁíÜëïãá ìå ôïí ôñüðï ðïõ èá åðéëÝîåôå íá åãêáôáóôÞóåôå ôï FreeBSD, ìðïñåß íá ÷ñåéáóôåßôå ìïíÜäá äéóêÝôáò, Ýíá õðïóôçñéæüìåíï ïäçãü CD-ROM, êáé óå ïñéóìÝíåò ðåñéðôþóåéò, êÜñôá äéêôýïõ. Ôá ðáñáðÜíù êáëýðôïíôáé óôï ÔìÞìá 2.3.7.

2.2.1.1 Áñ÷éôåêôïíéêÝò FreeBSD/i386 êáé FreeBSD/pc98

Ïé åêäüóåéò FreeBSD/i386 êáé FreeBSD/pc98 áðáéôïýí 486 Þ êáëýôåñï åðåîåñãáóôÞ êáé ôïõëÜ÷éóôïí 24 MB RAM. Èá ÷ñåéáóôåßôå ôïõëÜ÷éóôïí 150 MB åëåýèåñïõ ÷þñïõ óôï óêëçñü äßóêï ãéá ôçí ðëÝïí åëÜ÷éóôç åãêáôÜóôáóç.

> **Óçìåßùóç:** Óå ðåñéðôþóåéò ðáëéþí ìç÷áíçìÜôùí, ôéò ðåñéóóüôåñåò öïñÝò, ç áýîçóç ðåñéóóüôåñçò ìíÞìçò RAM êáé åëåýèåñïõ ÷þñïõ óôïí äßóêï åßíáé ðéï óçìáíôéêÞ áðü Ýíá ôá÷ýôåñï åðåîåñãáóôÞ.

2.2.1.2 Áñ÷éôåêôïíéêÞ FreeBSD/amd64

ÕðÜñ÷ïõí äýï êëÜóåéò åðåîåñãáóôþí éêáíÝò íá åêôåëÝóïõí ôï FreeBSD/amd64. Ç ðñþôç, åßíáé ïé åðåîåñãáóôÝò AMD64, ðåñéëáìâáíïìÝíïõ ôïõ AMD Athlon™64, ôïõ AMD Athlon64-FX, ôïõ AMD Opteron™ Þ êáëýôåñùí.

Ç äåýôåñç êëÜóç åðåîåñãáóôþí ðïõ ìðïñïýí íá ÷ñçóéìïðïéÞóïõí FreeBSD/amd64, ðåñéëáìâÜíåé üóïõò ÷ñçóéìïðïéïýí ôçí áñ÷éôåêôïíéêÞ Intel® EM64T. Ðáñáäåßãìáôá ôùí åðåîåñãáóôþí áõôþí ðåñéëáìâÜíïõí ôéò ïéêïãÝíåéåò Intel Core™ 2 Duo, Quad, Extreme êáèþò êáé ôç óåéñÜ åðåîåñãáóôþí Intel Xeon 3000, 5000, êáé 7000.

Áí ôï ìç÷Üíçìá óáò åßíáé âáóéóìÝíï óå nVidia nForce3 Pro-150, èá *ðñÝðåé* íá ÷ñçóéìïðïéÞóåôå ôçí êáôÜëëçëç åðéëïãÞ óôï BIOS ãéá íá áðåíåñãïðïéÞóåôå ôï IO APIC. Áí ç åðéëïãÞ áõôÞ äåí õðÜñ÷åé, èá ðñÝðåé íá áðåíåñãïðïéÞóåôå áíôß áõôïý ôï ACPI. ÕðÜñ÷ïõí ðñïâëÞìáôá óôï Pro-150 ãéá ôá ïðïßá ìÝ÷ñé óôéãìÞò äåí Ý÷åé âñåèåß ëýóç ðïõ íá ôá ðáñáêÜìðôåé.

2.2.1.3 Áñ÷éôåêôïíéêÞ FreeBSD/sparc64

Ãéá íá åãêáôáóôÞóåôå ôï FreeBSD/sparc64, èá ÷ñåéáóôåßôå ìéá õðïóôçñéæüìåíç ðëáôöüñìá (äåßôå ÔìÞìá 2.2.2).

Èá ÷ñåéáóôåßôå Ýíá äßóêï ãéá áðïêëåéóôéêÞ ÷ñÞóç áðü ôï FreeBSD/sparc64. Ôç äåäïìÝíç óôéãìÞ, äåí åßíáé äõíáôüí íá ìïéñÜæåôáé ôïí ßäéï äßóêï ôï FreeBSD ìå Ýíá Üëëï ëåéôïõñãéêü óýóôçìá.

2.2.2 Õðïóôçñéæüìåíï Õëéêü

Ç ëßóôá ìå ôï õðïóôçñéæüìåíï õëéêü, ðáñÝ÷åôáé óôéò Óçìåéþóåéò Õëéêïý (Hardware Notes) ìå êÜèå Ýêäïóç ôïõ FreeBSD. Ôï Ýããñáöï áõôü ìðïñåß óõíÞèùò íá âñåèåß ìå üíïìá áñ÷åßïõ `HARDWARE.TXT`, óôïí ñéæéêü êáôÜëïãï ìéáò äéáíïìÞò CDROM Þ FTP, Þ êáé óôï ìåíïý documentation ôïõ **sysinstall**. Ãéá êÜèå áñ÷éôåêôïíéêÞ, èá âñåßôå ìéá ëßóôá óõóêåõþí ïé ïðïßåò åðéâåâáéùìÝíá õðïóôçñßæïíôáé áðü ôï FreeBSD. Áíôßãñáöá ôïõ êáôáëüãïõ õðïóôçñéæüìåíïõ õëéêïý ãéá äéÜöïñåò åêäüóåéò êáé áñ÷éôåêôïíéêÝò ìðïñïýí åðßóçò íá âñåèïýí óôç óåëßäá Ðëçñïöïñéþí ¸êäïóçò (http://www.FreeBSD.org/releases/index.html) óôï äéêôõáêü ôüðï ôïõ FreeBSD.

2.3 Åñãáóßåò ðñéí ôçí ÅãêáôÜóôáóç

2.3.1 ÁðïãñáöÞ Õëéêïý ôïõ Õðïëïãéóôïý óáò

Ðñéí åãêáôáóôÞóåôå ôï FreeBSD ðñÝðåé íá åðé÷åéñÞóåôå íá áðïãñÜøåôå ôá åîáñôÞìáôá ôïõ õðïëïãéóôÞ óáò. Ïé ñïõôßíåò åãêáôÜóôáóçò ôïõ FreeBSD èá óáò äåßîïõí ôá åîáñôÞìáôá (óêëçñïýò äßóêïõò, êÜñôåò äéêôýïõ, ïäçãïýò

CDROM êëð.) ìå ôá ïíüìáôá ôùí ìïíôÝëùí êáé ôùí êáôáóêåõáóôþí ôïõò. Ôï FreeBSD èá åðé÷åéñÞóåé åðßóçò íá ðñïóäéïñßóåé ôéò óùóôÝò ñõèìßóåéò ãéá ôéò óõóêåõÝò áõôÝò, óõìðåñéëáìâáíïìÝíùí êáé ôùí ðëçñïöïñéþí ãéá ôç ÷ñÞóç IRQ êáé èõñþí IO. Ëüãù ôùí éäéïìïñöéþí ôïõ õëéêïý ôùí PC, ç äéáäéêáóßá áõôÞ äåí åßíáé ðÜíôá åðéôõ÷Þò, êáé ßóùò ÷ñåéáóôåß íá äéïñèþóåôå ôéò ñõèìßóåéò ðïõ áíß÷íåõóå ôï FreeBSD.

Áí Ý÷åôå Þäç Üëëï ëåéôïõñãéêü óýóôçìá åãêáôåóôçìÝíï, üðùò Windows Þ Linux, åßíáé ãåíéêÜ êáëÞ éäÝá íá ÷ñçóéìïðïéÞóåôå ôéò äõíáôüôçôåò ðïõ óáò ðáñÝ÷åé ãéá íá äåßôå ôéò ñõèìßóåéò ôïõ õëéêïý óáò. Áí äåí åßóôå óßãïõñïé ãéá ôéò ñõèìßóåéò ìéáò êÜñôáò åðÝêôáóçò, ßóùò íá ôéò âñåßôå ôõðùìÝíåò ðÜíù óôçí ßäéá ôçí êÜñôá. ÓõíçèéóìÝíá IRQ åßíáé ôá 3, 5 êáé 7 åíþ ïé èýñåò IO óõíÞèùò ãñÜöïíôáé ùò äåêáåîáäéêïß áñéèìïß, ð.÷. 0x330.

Óáò óõíéóôïýìå íá ãñÜøåôå Þ íá åêôõðþóåôå ôéò ðëçñïöïñßåò áõôÝò ðñéí ôçí åãêáôÜóôáóç ôïõ FreeBSD. Óáí õðüäåéãìá, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå Ýíá ðßíáêá üðùò ôïí ðáñáêÜôù:

Ðßíáêáò 2-1. Õðüäåéãìá ÁðïãñáöÞò Óõóêåõþí

¼íïìá ÓõóêåõÞò	IRQ	IO èýñåò	Óçìåéþóåéò
Ðñþôïò Óêëçñüò Äßóêïò	N/A	N/A	40 GB, ôçò Seagate, master óôï ðñþôï IDE
CDROM	N/A	N/A	slave óôï ðñþôï IDE
Äåýôåñïò Óêëçñüò Äßóêïò	N/A	N/A	20 GB, ôçò IBM, master óôï äåýôåñï IDE
Ðñþôïò ÅëåãêôÞò IDE	14	0x1f0	
ÊÜñôá Äéêôýïõ	N/A	N/A	Intel 10/100
Modem	N/A	N/A	3Com® 56K faxmodem, óôçí COM1
…			

¼ôáí ôåëåéþóåôå ôçí áðïãñáöÞ åîáñôçìÜôùí ôïõ õðïëïãéóôÞ óáò, èá ðñÝðåé íá åëÝãîåôå áí ôáéñéÜæïõí ìå ôéò áðáéôÞóåéò õëéêïý ôçò Ýêäïóçò FreeBSD ðïõ óêïðåýåôå íá åãêáôáóôÞóåôå.

2.3.2 ÊñáôÞóôå Áíôßãñáöá Áóöáëåßáò ôùí ÄåäïìÝíùí óáò

Áí ï õðïëïãéóôÞò óôïí ïðïßï èá åãêáôáóôÞóåôå ôï FreeBSD ðåñéÝ÷åé ðïëýôéìá äåäïìÝíá, âåâáéùèåßôå üôé Ý÷åôå êñáôÞóåé áíôßãñáöá áóöáëåßáò ôá ïðïßá ìÜëéóôá Ý÷åôå åëÝãîåé üôé äïõëåýïõí, ðñéí åãêáôáóôÞóåôå ôï FreeBSD. Ôï ðñüãñáììá åãêáôÜóôáóçò ôïõ FreeBSD èá óáò ñùôÞóåé ðñéí ãñÜøåé ïôéäÞðïôå óôï äßóêï óáò, áëëÜ áðü ôç óôéãìÞ ðïõ ç äéáäéêáóßá áõôÞ îåêéíÞóåé, äåí õðÜñ÷åé äõíáôüôçôá åðéóôñïöÞò.

2.3.3 Áðïöáóßóôå ðïõ èá ÅãêáôáóôÞóåôå ôï FreeBSD

Áí èÝëåôå ôï FreeBSD íá ÷ñçóéìïðïéÞóåé ïëüêëçñï ôï óêëçñü óáò äßóêï, äåí õðÜñ÷åé êÜôé Üëëï ðïõ ðñÝðåé íá êÜíåôå áõôÞ ôç óôéãìÞ — ìðïñåßôå íá ðáñáëåßøåôå áõôü ôï ôìÞìá.

Áí ùóôüóï èÝëåôå ôï FreeBSD íá óõíõðÜñ÷åé ìå Üëëá ëåéôïõñãéêÜ óõóôÞìáôá, ðñÝðåé íá êáôáíïåßôå ÷ïíäñéêÜ ôïí ôñüðï äéÜôáîçò ôùí äåäïìÝíùí óôï äßóêï, êáé ôéò åðéäñÜóåéò ðïõ ìðïñåß ðñïêáëÝóåé.

2.3.3.1 ÊáôáôìÞóåéò Äßóêùí ãéá Áñ÷éôåêôïíéêÞ FreeBSD/i386

¸íáò óêëçñüò äßóêïò PC ìðïñåß íá ÷ùñéóôåß óå äéáêñéôÜ ôìÞìáôá. Ôá ôìÞìáôá áõôÜ êáëïýíôáé *êáôáôìÞóåéò (partitions)*. ÅðåéäÞ ôï FreeBSD Ý÷åé åðßóçò åóùôåñéêÝò êáôáôìÞóåéò, ç ïíïìáóßá ãñÞãïñá ìðïñåß íá ïäçãÞóåé óå óýã÷õóç, êáé ãéá ôï ëüãï áõôü ïé åîùôåñéêÝò êáôáôìÞóåéò áíáöÝñïíôáé ùò disk slices (öÝôåò) Þ áðëþò slices óôï FreeBSD. Ãéá ðáñÜäåéãìá ôï ðñüãñáììá `fdisk` ôïõ FreeBSD, ôï ïðïßï ÷åéñßæåôáé ôéò êáôáôìÞóåéò äßóêùí ôïõ PC, ôéò áíáöÝñåé ùò slices áíôß ãéá partitions. Áðü ôç ó÷åäßáóç ôïõ, ôï PC õðïóôçñßæåé ìüíï ôÝóóåñéò êáôáôìÞóåéò áíÜ äßóêï. Ïé êáôáôìÞóåéò áõôÝò ïíïìÜæïíôáé *ðñùôåýïõóåò (primary partitions)*. Ãéá íá îåðåñáóôåß áõôüò ï ðåñéïñéóìüò êáé íá äçìéïõñãÞóïõìå ðåñéóóüôåñåò êáôáôìÞóåéò, äçìéïõñãÞèçêå Ýíá íÝï åßäïò êáôÜôìçóçò, ç *åêôåôáìÝíç êáôÜôìçóç (extended partition)*. ¸íáò äßóêïò ìðïñåß íá ðåñéÝ÷åé ìüíï ìéá åêôåôáìÝíç êáôÜôìçóç. ÌÝóá óôçí åêôåôáìÝíç êáôÜôìçóç ìðïñïýí íá äçìéïõñãçèïýí åéäéêÝò *ëïãéêÝò êáôáôìÞóåéò*.

ÊÜèå êáôÜôìçóç äéáèÝôåé Ýíá *partition ID*, Ýíá áñéèìü ðïõ ÷ñçóéìïðïéåßôáé ãéá íá áíáãíùñßæåé ôïí ôýðï äåäïìÝíùí ôçò êáôÜôìçóçò. Ïé êáôáôìÞóåéò ôïõ FreeBSD Ý÷ïõí ãéá partition ID ôï `165`.

ÃåíéêÜ, êÜèå ëåéôïõñãéêü óýóôçìá ðïõ ÷ñçóéìïðïéåßôå Ý÷åé êÜðïéï ôñüðï ãéá íá áíáãíùñßæåé ôéò êáôáôìÞóåéò. Ãéá ðáñÜäåéãìá ôï MS-DOS êáé ôá ðáñÜãùãá ôïõ, üðùò ôá Windows, áíáèÝôïõí *ãñÜììáôá ïäçãþí* óå êÜèå ðñùôåýïõóá êáé ëïãéêÞ êáôÜôìçóç, îåêéíþíôáò áðü ôï ãñÜììá `C:`.

Ôï FreeBSD ðñÝðåé íá åãêáôáóôáèåß óå ðñùôåýïõóá êáôÜôìçóç. Ôï FreeBSD ìðïñåß íá êñáôÞóåé üëá ôá äåäïìÝíá ôïõ, óõìðåñéëáìâáíïìÝíùí êáé ôùí áñ÷åßùí ðïõ èá äçìéïõñãÞóåôå åóåßò, óå áõôÞ ôç ìïíáäéêÞ êáôÜôìçóç. Ðáñüëá áõôÜ, áí Ý÷åôå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò, ìðïñåßôå íá äçìéïõñãÞóåôå êáôáôìÞóåéò FreeBSD óå üëïõò Þ ìåñéêïýò áðü áõôïýò. ¼ôáí åãêáèéóôÜôå ôï FreeBSD ðñÝðåé íá Ý÷åôå ìéá êáôÜôìçóç äéáèÝóéìç. Ìðïñåß íá åßíáé ìéá êåíÞ êáôÜôìçóç ðïõ Ý÷åôå ðñïåôïéìÜóåé áðü ðñéí, Þ ìéá õðÜñ÷ïõóá ðïõ ðåñéÝ÷åé äåäïìÝíá ðïõ äåí óáò åíäéáöÝñïõí ðëÝïí.

Áí ÷ñçóéìïðïéåßôå Þäç üëåò ôéò êáôáôìÞóåéò óå üëïõò ôïõò äßóêïõò óáò, ôüôå ðñÝðåé íá åëåõèåñþóåôå ìßá ãéá ôï FreeBSD ÷ñçóéìïðïéþíôáò ôá åñãáëåßá ðïõ ðáñÝ÷ïíôáé áðü ôá Üëëá ëåéôïõñãéêÜ óõóôÞìáôá ðïõ ÷ñçóéìïðïéåßôå (ãéá ðáñÜäåéãìá, ôçí `fdisk` óôï MS-DOS Þ Windows).

Áí Ý÷åôå ìéá äéáèÝóéìç êáôÜôìçóç, ìðïñåßôå íá ôçí ÷ñçóéìïðïéÞóåôå. ºóùò üìùò ÷ñåéáóôåß íá óõññéêíþóåôå ðñþôá ìßá Þ ðåñéóóüôåñåò áðü ôéò õðÜñ÷ïõóåò êáôáôìÞóåéò óáò.

Ìéá åëÜ÷éóôç åãêáôÜóôáóç ôïõ FreeBSD ìðïñåß íá êáôáëÜâåé ìüëéò 100 MB ÷þñïõ óôï äßóêï. Ùóôüóï áõôÞ åßíáé ìéá *ðïëý* åëÜ÷éóôç åãêáôÜóôáóç ç ïðïßá äåí èá áöÞóåé êáèüëïõ ó÷åäüí ÷þñï ãéá äéêÜ óáò áñ÷åßá. ¸íá ðéï ñåáëéóôéêü åëÜ÷éóôï åßíáé ôá 250 MB ãéá ÷ñÞóç ÷ùñßò ãñáöéêü ðåñéâÜëëïí êáé 350 MB Þ ðåñéóóüôåñá áí èÝëåôå ãñáöéêü ðåñéâÜëëïí åñãáóßáò. Áí Ý÷åôå óêïðü íá åãêáôáóôÞóåôå áñêåôÜ ðñïãñÜììáôá ôñßôùí êáôáóêåõáóôþí, èá ÷ñåéáóôåßôå áêüìá ðåñéóóüôåñï ÷þñï.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå êÜðïéï åìðïñéêÜ äéáèÝóéìï åñãáëåßï üðùò ôï **PartitionMagic®**, Þ êÜðïéï åëåýèåñï åñãáëåßï üðùò ôï **GParted**, ãéá íá áëëÜîåôå ìåãÝèç óôéò êáôáôìÞóåéò óáò êáé íá äçìéïõñãÞóåôå ÷þñï ãéá ôï FreeBSD. Ôüóï ôï **PartitionMagic** üóï êáé ôï **GParted** ìðïñïýí íá ÷ñçóéìïðïéçèïýí óå êáôáôìÞóåéò NTFS. Ôï **GParted** åßíáé äéáèÝóéìï óå áñêåôÝò äéáíïìÝò Linux Live CD, üðùò ãéá ðáñÜäåéãìá ôï SystemRescueCD (http://www.sysresccd.org/).

¸÷ïõí áíáöåñèåß ðñïâëÞìáôá êáôÜ ôçí áëëáãÞ ìåãÝèïõò êáôáôìÞóåùí ôùí Microsoft Vista. Óõíßóôáôáé íá Ý÷åôå ðñü÷åéñï Ýíá CDROM åãêáôÜóôáóçò ôùí Vista ðñéí åðé÷åéñÞóåôå áõôÞ ôç äéáäéêáóßá. ¼ðùò êáé ìå üëåò ôéò áíôßóôïé÷åò äéáäéêáóßåò äßóêùí, óõíßóôáôáé åðßóçò íá Ý÷åôå Ýíá åíçìåñùìÝíï óåô áíôéãñÜöùí áóöáëåßáò.

> **Ðñïåéäïðïßçóç:** ËáíèáóìÝíç ÷ñÞóç ôùí åñãáëåßùí áõôþí ìðïñåß íá ïäçãÞóåé óå äéáãñáöÞ ôùí äåäïìÝíùí ôïõ äßóêïõ óáò. Ðñéí ôá ÷ñçóéìïðïéÞóåôå, âåâáéùèåßôå üôé Ý÷åôå ðñüóöáôá áíôßãñáöá áóöáëåßáò ôá ïðïßá äïõëåýïõí.

ÐáñÜäåéãìá 2-1. ×ñçóéìïðïéþíôáò ìéá ÕðÜñ÷ïõóá ÊáôÜôìçóç ÷ùñßò íá ôçí ÁëëÜîåôå

ÕðïèÝóôå üôé Ý÷åôå Ýíá õðïëïãéóôÞ ìå Ýíá ìüíï óêëçñü äßóêï 4 GB óôïí ïðïßï Ý÷åôå Þäç åãêáôåóôçìÝíç ìéá Ýêäïóç ôùí Windows êáé ôïí Ý÷åôå ÷ùñßóåé óå äýï ïäçãïýò ìå ãñÜììáôá `C:` êáé `D:`, êáèÝíá ìå ìÝãåèïò 2 GB. ¸÷åôå 1 GB äåäïìÝíùí óôï `C:` êáé 0.5 GB äåäïìÝíùí óôï `D:`.

Áõôü óçìáßíåé üôé ï äßóêïò óáò Ý÷åé äýï êáôáôìÞóåéò, ìßá áíÜ ãñÜììá ïäçãïý. Ìðïñåßôå íá áíôéãñÜøåôå üëá ôá õðÜñ÷ïíôá äåäïìÝíá óáò áðü ôïí `D:` óôï `C:` êáé íá åëåõèåñþóåôå Ýôóé ôçí äåýôåñç êáôÜôìçóç, þóôå íá åßíáé Ýôïéìç ãéá ôï FreeBSD.

ÐáñÜäåéãìá 2-2. Óõññéêíþíïíôáò ìéá ÕðÜñ÷ïõóá ÊáôÜôìçóç

ÕðïèÝóôå üôé Ý÷åôå Ýíá õðïëïãéóôÞ ìå Ýíá ìüíï äßóêï 4 GB óôïí ïðïßï Ý÷åôå Þäç åãêáôáóôÞóåé ìéá Ýêäïóç ôùí Windows. ¼ôáí åãêáôáóôÞóáôå ôá Windows, äçìéïõñãÞóáôå ìéá ìåãÜëç êáôÜôìçóç ìå ôï ãñÜììá `C:` êáé ìÝãåèïò 4 GB. ÁõôÞ ôç óôéãìÞ ÷ñçóéìïðïéåßôáé 1.5 GB ÷þñïõ êáé èÝëåôå íá äþóåôå óôï FreeBSD 2 GB ÷þñï.

Ãéá íá åãêáôáóôÞóåôå ôï FreeBSD èá ðñÝðåé åßôå:

1. Íá ðÜñåôå áíôßãñáöï áóöáëåßáò ôùí äåäïìÝíùí óáò ôùí Windows êáé Ýðåéôá íá ôá åãêáôáóôÞóåôå îáíÜ, äçìéïõñãþíôáò áõôÞ ôç öïñÜ ìéá êáôÜôìçóç ìåãÝèïõò 2 GB êáôÜ ôçí åãêáôÜóôáóç.
2. Íá ÷ñçóéìïðïéÞóåôå êÜðïéï áðü ôá åñãáëåßá üðùò ôï **PartitionMagic** ðïõ ðåñéãñÜøáìå ðáñáðÜíù þóôå íá óõññéêíþóåôå ôçí êáôÜôìçóç ôùí Windows.

2.3.4 ÓõëëÝîôå Ðëçñïöïñßåò ãéá ôç Ñýèìéóç ôïõ Äéêôýïõ óáò

Áí óêïðåýåôå íá óõíäåèåßôå óå Ýíá äßêôõï êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò ôïõ FreeBSD (ãéá ðáñÜäåéãìá áí ðñüêåéôáé íá êÜíåôå åãêáôÜóôáóç ìÝóù êÜðïéáò ôïðïèåóßáò FTP Þ ìÝóù äéáêïìéóôÞ NFS), ôüôå ðñÝðåé íá ãíùñßæåôå ôéò ñõèìßóåéò ôïõ äéêôýïõ óáò. ÊáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò, èá åñùôçèåßôå ãéá áõôÝò ôéò ñõèìßóåéò þóôå ôï FreeBSD íá ìðïñÝóåé íá óõíäåèåß óôï äßêôõï êáé íá ïëïêëçñþóåé ôçí åãêáôÜóôáóç.

2.3.4.1 Óýíäåóç ìå Äßêôõï Ethernet Þ Modem Cable/DSL

Áí óõíäÝóåôå óå äßêôõï Ethernet Þ áí Ý÷åôå óýíäåóç Internet ìå ÷ñÞóç åëåãêôÞ Ethernet ìÝóù êáëùäéáêÞò Þ DSL óýíäåóçò, èá ÷ñåéáóôåßôå ôéò áêüëïõèåò ðëçñïöïñßåò:

1. Äéåýèõíóç IP (IP Address)
2. Äéåýèõíóç IP ôçò ðñïåðéëåãìÝíçò ðýëçò (default gateway)
3. ¼íïìá õðïëïãéóôÞ (hostname)
4. Äéåõèýíóåéò IP ôïõ äéáêïìéóôÞ DNS (DNS server IP addresses)
5. ÌÜóêá Õðïäéêôýïõ (Subnet Mask)

Áí äåí ãíùñßæåôå áõôÝò ôéò ðëçñïöïñßåò, ñùôÞóôå ôï äéá÷åéñéóôÞ óõóôÞìáôïò Þ ôïí ðáñï÷Ýá õðçñåóéþí Internet ðïõ óáò åîõðçñåôåß. Ç áðÜíôçóç ìðïñåß íá åßíáé üôé ïé ðëçñïöïñßåò áõôÝò êá÷ùñïýíôáé áõôüìáôá ìå ÷ñÞóç *DHCP*. Óçìåéþóôå ôçí ðëçñïöïñßá áõôÞ.

2.3.4.2 Óýíäåóç ìÝóù Modem

Áí ÷ñçóéìïðïéåßôå åðéëïãéêÞ (dial up) óýíäåóç ìå êÜðïéï ðáñï÷Ýá Internet (ISP) ìå ÷ñÞóç áðëïý modem, ìðïñåßôå êáé ðÜëé íá åãêáôáóôÞóåôå ôï FreeBSD ìÝóù Internet, áëëÜ èá ÷ñåéáóôåßôå ðÜñá ðïëý ÷ñüíï.

Èá ÷ñåéáóôåß íá îÝñåôå:

1. Ôïí áñéèìü êëÞóçò ôïõ ISP óáò
2. Ôç óåéñéáêÞ èýñá (COM:) óôçí ïðïßá åßíáé óõíäåìÝíï ôï modem óáò
3. Ôï üíïìá ÷ñÞóôç (username) êáé êùäéêü (password) ãéá ôï ëïãáñéáóìü óáò óôïí ISP

2.3.5 ÅëÝãîôå ãéá ÐáñïñÜìáôá (Errata) óôï FreeBSD

Áí êáé ôï FreeBSD project ðáó÷ßæåé ãéá íá åîáóöáëßóåé üôé êÜèå Ýêäïóç ôïõ FreeBSD èá åßíáé üóï ðéï óôáèåñÞ ãßíåôáé, ïñéóìÝíåò öïñÝò óôç äéáäéêáóßá áõôÞ åéóÝñ÷ïíôáé ëÜèç. Óå ðïëý óðÜíéåò ðåñéðôþóåéò, ôá ëÜèç áõôÜ åðçñåÜæïõí ôç äéáäéêáóßá åãêáôÜóôáóçò. Êáèþò ôá ðñïâëÞìáôá áõôÜ ãßíïíôáé áíôéëçðôÜ êáé äéïñèþíïíôáé, óçìåéþíïíôáé óôá ÐáñïñÜìáôá FreeBSD (FreeBSD Errata) (http://www.FreeBSD.org/releases/9.1R/errata.html) ôá ïðïßá âñßóêïíôáé óôçí äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD. Ðñéí îåêéíÞóåôå ôçí åãêáôÜóôáóç, Èá ðñÝðåé íá åëÝãîåôå ôá ÐáñïñÜìáôá ãéá íá âåâáéùèåßôå üôé äåí õðÜñ÷ïõí ðñïâëÞìáôá ôçò ôåëåõôáßáò óôéãìÞò ôá ïðïßá èá Ýðñåðå íá ãíùñßæåôå.

Ðëçñïöïñßåò ãéá üëåò ôéò åêäüóåéò, ðåñéëáìâáíïìÝíùí êáé ôùí ðáñïñáìÜôùí ãéá êÜèå ìßá, ìðïñïýí íá âñåèïýí óôç óåëßäá ðëçñïöïñéþí Ýêäïóçò (http://www.FreeBSD.org/releases/index.html) ôçò äéêôõáêÞò ôïðïèåóßáò ôïõ FreeBSD (http://www.FreeBSD.org/index.html).

2.3.6 ÁíáêôÞóôå ôá Áñ÷åßá ÅãêáôÜóôáóçò ôïõ FreeBSD

Ç äéáäéêáóßá åãêáôÜóôáóçò ôïõ FreeBSD ìðïñåß íá åãêáôáóôÞóåé ôï ëåéôïõñãéêü óýóôçìá ÷ñçóéìïðïéþíôáò áñ÷åßá áðü ôéò ðáñáêÜôù ôïðïèåóßåò:

ÔïðéêÜ ÌÝóá

- CDROM Þ DVD
- ÌíÞìç flash ìå óýíäåóç USB
- Ìéá êáôÜôìçóç MS-DOS ðïõ âñßóêåôáé óôïí ßäéï õðïëïãéóôÞ
- Ìéá ôáéíßá SCSI Þ QIC
- ÄéóêÝôåò

Äßêôõï

- Ìéá ôïðïèåóßá FTP, ìÝóù firewall Þ ìå ÷ñÞóç äéáêïìéóôÞ ìåóïëÜâçóçò (HTTP proxy) áí åßíáé áíáãêáßï.
- ¸íá åîõðçñåôçôÞ NFS
- Ìéá áðïêëåéóôéêÞ ðáñÜëëçëç Þ óåéñéáêÞ óýíäåóç

Áí Ý÷åôå áãïñÜóåé ôï FreeBSD óå CD Þ DVD, ôüôå Ý÷åôå Þäç üôé ÷ñåéÜæåóôå êáé ìðïñåßôå íá ðÜôå óôï åðüìåíï ôìÞìá (ÔìÞìá 2.3.7).

Áí äåí Ý÷åôå áêüìá áíáêôÞóåé ôá áñ÷åßá åãêáôÜóôáóçò ôïõ FreeBSD èá ðñÝðåé íá äåßôå ôï ÔìÞìá 2.13 ôï ïðïßï åîçãåß ðùò íá ðñïåôïéìáóôåßôå ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD ìå ïðïéïäÞðïôå áðü ôïõò ðáñáðÜíù ôñüðïõò. Áöïý äéáâÜóåôå ôï ôìÞìá áõôü, èá ðñÝðåé íá ãõñßóåôå îáíÜ åäþ êáé íá äéáâÜóåôå áðü ôï ÔìÞìá 2.3.7.

2.3.7 ÅôïéìÜóôå ôá ÌÝóá Åêêßíçóçò

Ç äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD îåêéíÜåé ìå ôçí åêêßíçóç ôïõ õðïëïãéóôÞ óáò óôï ðñüãñáììá åãêáôÜóôáóçò ôïõ FreeBSD—äåí ðñüêåéôáé ãéá ðñüãñáììá ôï ïðïßï ìðïñåßôå íá åêôåëÝóåôå ìÝóá áðü êÜðïéï Üëëï ëåéôïõñãéêü óýóôçìá. Ï õðïëïãéóôÞò óáò öõóéïëïãéêÜ åêêéíåß ÷ñçóéìïðïéþíôáò ôï ëåéôïõñãéêü óýóôçìá ðïõ åßíáé åãêáôåóôçìÝíï óôïí óêëçñü äßóêï óáò, áëëÜ ìðïñåß åðßóçò íá ñõèìéóôåß íá ÷ñçóéìïðïéåß ìéá “äéóêÝôá åêêßíçóçò”. Ïé ðåñéóóüôåñïé óýã÷ñïíïé õðïëïãéóôÝò ìðïñïýí åðßóçò íá åêêéíÞóïõí áðü Ýíá CDROM óôïí áíôßóôïé÷ï ïäçãü áíÜãíùóçò, Þ áðü ìéá ìíÞìç flash ìå óýíäåóç USB.

> **Õðüäåéîç:** Áí Ý÷åôå ôï FreeBSD óå CDROM Þ DVD (åßôå ðïõ áãïñÜóáôå, åßôå ðïõ åôïéìÜóáôå ï ßäéïò), êáé ï õðïëïãéóôÞò óáò åðéôñÝðåé åêêßíçóç áðü CDROM Þ DVD (óõíÞèùò ìÝóù ôçò åðéëïãÞò “Boot Order” Þ áíôßóôïé÷çò ôïõ BIOS), ìðïñåßôå íá ðáñáëåßøåôå áõôü ôï ôìÞìá. Ôá CD Þ DVD ôïõ FreeBSD åßíáé åêêéíÞóéìá êáé ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD ÷ùñßò êáìéÜ Üëëç éäéáßôåñç ðñïåôïéìáóßá.

Ãéá íá äçìéïõñãÞóåôå ìéá åêêéíÞóéìç ìíÞìç flash USB, áêïëïõèÞóôå ôá ðáñáêÜôù âÞìáôá:

1. ÁíáêôÞóôå ôçí Åéêüíá ÅãêáôÜóôáóçò ãéá ÌíÞìç Flash USB

   Ìðïñåßôå íá êáôåâÜóåôå ôï áñ÷åßï åéêüíáò áðü ôïí êáôÜëïãï `ISO-IMAGES/` óôçí ôïðïèåóßá `ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/arch/ISO-IMAGES/version/FreeBSD-version-RELEASE-arch-` ÁíôéêáôáóôÞóôå ôï *`arch`* êáé ôï *`version`* ìå ôçí áñ÷éôåêôïíéêÞ êáé ôçí Ýêäïóç ðïõ åðéèõìåßôå íá åãêáôáóôÞóåôå. Ãéá ðáñÜäåéãìá, ôá áñ÷åßá ãéá ôï FreeBSD/i386 9.1-RELEASE åßíáé äéáèÝóéìá óôçí ôïðïèåóßá ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/i386/ISO-IMAGES/9.1/FreeBSD-9.1-RELEASE-i386-memstick.img.

   Ôï áñ÷åßï ðïõ ðñïïñßæåôáé ãéá ÷ñÞóç ìå ìíÞìç USB, Ý÷åé êáôÜëçîç `.img`. Ï êáôÜëïãïò `ISO-IMAGES/` ðåñéÝ÷åé ðëÞèïò äéáöïñåôéêþí áñ÷åßùí êáé áõôü ðïõ èá ÷ñåéáóôåßôå åîáñôÜôáé óôçí ðñáãìáôéêüôçôá áðü ôçí Ýêäïóç ôïõ FreeBSD ðïõ èá åãêáôáóôÞóåôå êáé åíäå÷ïìÝíùò êáé áðü ôï õëéêü ôïõ õðïëïãéóôÞ óáò.

   > **Óçìáíôéêü:** Ðñéí ðñï÷ùñÞóåôå, êñáôÞóôå áíôßãñáöï ôùí äåäïìÝíùí ðïõ åíäå÷ïìÝíùò õðÜñ÷ïõí óôçí USB flash ìíÞìç óáò. Ç äéáäéêáóßá ðïõ ðåñéãñÜöïõìå èá *äéáãñÜøåé* üëá ôá ðåñéå÷üìåíá ôçò.

2. ÃñÜøôå ôï Áñ÷åßï Åéêüíáò óôç ÌíÞìç Flash

   ×ñçóéìïðïéþíôáò ôï FreeBSD ãéá ôçí ÅããñáöÞ ôïõ Áñ÷åßïõ Åéêüíáò

   > **Ðñïåéäïðïßçóç:** Ôï ðáñáêÜôù ðáñÜäåéãìá ÷ñçóéìïðïéåß ùò õðüäåéãìá ôçí óõóêåõÞ `/dev/da0` ãéá ôç äçìéïõñãßá ôçò USB ìíÞìçò åêêßíçóçò. ÅðéëÝîôå ìå ðñïóï÷Þ ôï ðñáãìáôéêü üíïìá ôçò óõóêåõÞò ðïõ èá ÷ñçóéìïðïéçèåß, äéáöïñåôéêÜ ìðïñåß íá ðñïêëçèåß áðþëåéá äåäïìÝíùí.

   1. ÅããñáöÞ ôïõ Áñ÷åßïõ ìÝóù ôçò dd(1)

Ôï áñ÷åßï `.img` *äåí* åßíáé Ýíá êáíïíéêü áñ÷åßï ðïõ ìðïñåßôå áðëþò íá áíôéãñÜøåôå óôç ìíÞìç flash. Ðñüêåéôáé óôçí ðñáãìáôéêüôçôá ãéá ìéá åéêüíá ôùí ðåñéå÷ïìÝíùí ïëüêëçñïõ ôïõ äßóêïõ. Áõôü óçìáßíåé üôé *äåí* ìðïñåßôå áðëþò íá áíôéãñÜøåôå ôá äåäïìÝíá áðü ôïí Ýíá äßóêï óôïí Üëëï. Èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ dd(1) ãéá íá ãñÜøåôå ôï áñ÷åßï åéêüíáò áðåõèåßáò óôïí äßóêï:

```
# dd if=FreeBSD-9.1-RELEASE-i386-memstick.img of=/dev/da0 bs=64k
```

Áí ëÜâåôå ôï ìÞíõìá ëÜèïõò `Operation not permitted`, âåâáéùèåßôå üôé ç óõóêåõÞ ðïõ ðñïóðáèåßôå íá ÷ñçóéìïðïéÞóåôå äåí åßíáé Þäç óå ÷ñÞóç, åíäå÷ïìÝíùò ðñïóáñôçìÝíç áõôüìáôá áðü êÜðïéï âïçèçôéêü ðñüãñáììá. ¸ðåéôá ðñïóðáèÞóôå îáíÜ.

×ñçóéìïðïéþíôáò ôá Windows® ãéá ôçí ÅããñáöÞ ôïõ Áñ÷åßïõ Åéêüíáò

> **Ðñïåéäïðïßçóç:** Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôï óùóôü üíïìá ïäçãïý ãéá ôçí ìíÞìç flash, äéáöïñåôéêÜ ßóùò íá êáôáóôñÝøåôå õðÜñ÷ïíôá äåäïìÝíá.

1. ÁíÜêôçóç ôïõ ÐñïãñÜììáôïò **Image Writer ãéá Windows**

   H åöáñìïãÞ **Image Writer ãéá Windows** åßíáé åëåýèåñï ëïãéóìéêü ôï ïðïßï ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôç óùóôÞ åããñáöÞ åíüò áñ÷åßïõ åéêüíáò óå ìéá ìíÞìç USB. Ìðïñåßôå íá ôï êáôåâÜóåôå áðü ôçí ôïðïèåóßá https://launchpad.net/win32-image-writer/ êáé íá ôï áðïèçêåýóåôå óå Ýíá öÜêåëï.

2. ÅããñáöÞ ôïõ Áñ÷åßïõ ìå ôï Image Writer

   ÊÜíôå äéðëü êëéê óôï åéêïíßäéï **Win32DiskImager** ãéá íá îåêéíÞóåôå ôï ðñüãñáììá. ÊÜíôå êëéê óôï åéêïíßäéï ôïõ öáêÝëïõ êáé åðéëÝîôå ôï áñ÷åßï ðïõ èá ãñÜøåôå óôç ìíÞìç USB. ÊÜíôå êëéê óôï ðëÞêôñï Save ãéá íá áðïäå÷èåßôå ôï üíïìá áñ÷åßïõ. Åðáëçèåýóôå üôé ïé ðáñáðÜíù åðéëïãÝò åßíáé óùóôÝò êáé üôé äåí õðÜñ÷ïõí óå Üëëá ðáñÜèõñá Üíïé÷ôïé öÜêåëïé áðü ôç ìíÞìç USB. ÔÝëïò, êÜíôå êëéê óôï Write ãéá íá ãñÜøåôå ôï áñ÷åßï åéêüíáò óôïí ïäçãü.

Ãéá íá äçìéïõñãÞóåôå äéóêÝôåò åêêßíçóçò, áêïëïõèÞóôå áõôÜ ôá âÞìáôá:

1. ÁíáêôÞóôå ôá Images (Áñ÷åßá Åéêüíùí) ôùí Äéóêåôþí

   > **Óçìáíôéêü:** Óçìåéþóôå üôé óôéò åêäüóåéò 8.*x* ôïõ FreeBSD, äåí õðÜñ÷åé ðëÝïí õðïóôÞñéîç ãéá äéóêÝôåò åêêßíçóçò. Äåßôå ôéò ðáñáðÜíù ïäçãßåò ãéá íá êÜíåôå åãêáôÜóôáóç ìÝóù ìíÞìçò USB flash, Þ ÷ñçóéìïðïéÞóôå áðëþò Ýíá CDROM Þ DVD.

   Ïé äéóêÝôåò åêêßíçóçò åßíáé äéáèÝóéìåò óôï ìÝóï åãêáôÜóôáóçò ðïõ Ý÷åôå, óôïí êáôÜëïãï `floppies/` êáé ìðïñåßôå åðßóçò íá ôéò êáôåâÜóåôå áðü ôïí êáôÜëïãï `ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/arch/version-RELEASE/floppies/`. ÁíôéêáôáóôÞóôå ôá *`arch`* êáé *`version`* ìå ôçí áñ÷éôåêôïíéêÞ êáé ôïí áñéèìü ôçò Ýêäïóçò ðïõ èÝëåôå íá åãêáôáóôÞóåôå áíôßóôïé÷á. Ãéá ðáñÜäåéãìá ôá images ôùí äéóêåôþí åêêßíçóçò ãéá FreeBSD/i386 8.3-RELEASE åßíáé äéáèÝóéìá áðü ôçí ôïðïèåóßá ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/i386/8.3-RELEASE/floppies/.

   Ôá images Ý÷ïõí êáôÜëçîç `.flp`. O êáôÜëïãïò `floppies/` ðåñéÝ÷åé áñêåôÜ äéáöïñåôéêÜ images, êáé ôï ðïéá èá ÷ñåéáóôåßôå åîáñôÜôáé áðü ôçí Ýêäïóç ôïõ FreeBSD ðïõ èá åãêáôáóôÞóåôå, êáé óå ïñéóìÝíåò ðåñéðôþóåéò, êáé áðü ôï õëéêü (hardware) óôï ïðïßï êÜíåôå åãêáôÜóôáóç. Óôéò ðåñéóóüôåñåò ðåñéðôþóåéò èá ÷ñåéáóôåßôå ôÝóóåñéò äéóêÝôåò, ôéò `boot.flp`, `kern1.flp`, `kern2.flp` êáé `kern3.flp`. ÅëÝãîôå ôï áñ÷åßï `README.TXT` ðïõ âñßóêåôáé óôïí ßäéï êáôÜëïãï ãéá ôéò ôåëåõôáßåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôá áñ÷åßá áõôÜ.

> **Óçìáíôéêü:** Ôï FTP ðñüãñáììá ðïõ èá ÷ñçóéìïðïéÞóåôå ðñÝðåé íá ÷ñçóéìïðïéåß *äõáäéêü ôñüðï ìåôáöïñÜò (binary mode)* ãéá íá êáôåâÜóåôå ôá images ôùí äéóêåôþí. ÏñéóìÝíïé öõëëïìåôñçôÝò åßíáé ãíùóôü üôé ÷ñçóéìïðïéïýí *ASCII* ôñüðï (êåéìÝíïõ), ôï ïðïßï èá ôï êáôáëÜâåôå áí äåí ìðïñåßôå íá êÜíåôå åêêßíçóç áðü ôéò äéóêÝôåò.

2. ÐñïåôïéìÜóôå ôéò ÄéóêÝôåò

   Áðü êÜèå áñ÷åßï image ðïõ êáôåâÜóáôå, ðñÝðåé íá äçìéïõñãÞóåôå ìéá äéóêÝôá. Åßíáé åðéâåâëçìÝíï, ïé äéóêÝôåò áõôÝò íá ìçí Ý÷ïõí åëáôôþìáôá. Ï åõêïëüôåñïò ôñüðïò ãéá íá ôï åëÝãîåôå åßíáé íá ôéò äéáìïñöþóåôå åóåßò. Ìçí åìðéóôåýåóôå ðñï-äéáìïñöùìÝíåò äéóêÝôåò. Ôï ðñüãñáììá äéáìüñöùóçò ôùí Windows äåí èá óáò åéäïðïéÞóåé ãéá ôçí ðáñïõóßá ÷áëáóìÝíùí ôïìÝùí, áðëþò èá ôïõò ìáñêÜñåé ùò “÷áëáóìÝíïõò” êáé èá ôïõò áãíïÞóåé. Óáò óõìâïõëåýïõìå íá ÷ñçóéìïðïéÞóåôå êáéíïýñéåò äéóêÝôåò áí åðéëÝîåôå áõôÞ ôç ìÝèïäï åãêáôÜóôáóçò.

   > **Óçìáíôéêü:** Áí ðñïóðáèÞóåôå íá åãêáôáóôÞóåôå ôï FreeBSD êáé ôï ðñüãñáììá åãêáôÜóôáóçò êïëëÞóåé, ðáãþóåé Þ ìå êÜðïéï ôñüðï óõìðåñéöÝñåôáé ðåñßåñãá, ï ðñþôïò óáò ýðïðôïò ðñÝðåé íá åßíáé ïé äéóêÝôåò. ÄïêéìÜóôå íá ãñÜøåôå ôá images óå íÝåò äéóêÝôåò êáé ðñïóðáèÞóôå îáíÜ.

3. ÃñÜøôå ôá Áñ÷åßá Image óå ÄéóêÝôåò

   Ôá áñ÷åßá `.flp` *äåí* åßíáé êáíïíéêÜ áñ÷åßá ðïõ ìðïñåßôå íá áíôéãñÜøåôå óå äéóêÝôá. Åßíáé images ðïõ Ý÷ïõí üëï ôï ðåñéå÷üìåíï ôçò äéóêÝôáò óå Ýíá áñ÷åßï. Áõôü óçìáßíåé üôé *äåí ìðïñåßôå* áðëþò íá áíôéãñÜøåôå ôá áñ÷åßá áõôÜ óå äéóêÝôåò. Áíôßèåôá, ðñÝðåé íá ÷ñçóéìïðïéÞóåôå åéäéêÜ åñãáëåßá ãéá íá ãñÜøåôå ôá images áõôÜ áðåõèåßáò óôéò äéóêÝôåò.

   Áí ðñüêåéôáé íá äçìéïõñãÞóåôå ôéò äéóêÝôåò óå Ýíá õðïëïãéóôÞ ðïõ åêôåëåß MS-DOS / Windows, óáò ðáñÝ÷ïõìå Ýíá åñãáëåßï ãéá áõôÞ ôçí åñãáóßá, ôï `fdimage`.

   Áí ÷ñçóéìïðïéåßôå ôá images ôùí äéóêåôþí áðü ôï CDROM êáé ï ïäçãüò óáò CDROM åßíáé óôï ãñÜììá `E:`, èá åêôåëÝóåôå ôçí åîÞò åíôïëÞ:

   ```
   E:\> tools\fdimage floppies\boot.flp A:
   ```

   ÅðáíáëÜâåôå ôçí åíôïëÞ áõôÞ ãéá êÜèå áñ÷åßï `.flp`, áíôéêáèéóôþíôáò êÜèå öïñÜ ôç äéóêÝôá. Âåâáéùèåßôå üôé óçìåéþíåôå óôçí åôéêÝôá êÜèå äéóêÝôáò ôï üíïìá ôïõ áñ÷åßïõ ðïõ áíôéãñÜøáôå. Ñõèìßóôå êáôÜëëçëá ôçí åíôïëÞ áíÜëïãá ìå ôçí ôïðïèåóßá ôùí image áñ÷åßùí `.flp`. Áí äåí Ý÷åôå ôï CDROM, ìðïñåßôå íá êáôåâÜóåôå ôï `fdimage` áðü ôçí ôïðïèåóßá FTP `tools` directory (ftp://ftp.FreeBSD.org/pub/FreeBSD/tools/)ôïõ FreeBSD.

   Áí ãñÜöåôå ôéò äéóêÝôåò óå Ýíá óýóôçìá UNIX (üðùò êÜðïéï óýóôçìá FreeBSD) ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ dd(1) ãéá íá ãñÜøåôå ôá image áñ÷åßá áðåõèåßáò óôéò äéóêÝôåò. Óôï FreeBSD èá ãñÜöáôå:

   ```
   # dd if=boot.flp of=/dev/fd0
   ```

   Óôï FreeBSD ç óõóêåõÞ, `/dev/fd0` áíáöÝñåôáé óôçí ðñþôç ìïíÜäá äéóêÝôáò (ôïí ïäçãü `A:`). Ç óõóêåõÞ `/dev/fd1` èá Þôáí ï ïäçãüò `B:`, ê.ï.ê. ¶ëëåò ðáñáëëáãÝò ôïõ UNIX ìðïñåß íá ÷ñçóéìïðïéïýí äéáöïñåôéêÜ ïíüìáôá ãéá ôïõò ïäçãïýò äéóêÝôáò êáé èá ÷ñåéáóôåß íá åëÝãîåôå ôçí ôåêìçñßùóç ôïõ óõóôÞìáôïò óáò êáôÜ ðåñßðôùóç.

Åßóôå ôþñá Ýôïéìïé íá îåêéíÞóåôå ôçí åãêáôÜóôáóç ôïõ FreeBSD.

2.4 Îåêéíþíôáò ôçí ÅãêáôÜóôáóç

Óçìáíôéêü: Ôï ðñüãñáììá åãêáôÜóôáóçò äåí èá êÜíåé êáìéÜ áëëáãÞ óôïõò äßóêïõò óáò ìÝ÷ñé íá äåßôå ôï áêüëïõèï ìÞíõìá:

```
Last Chance: Are you SURE you want continue the installation?

If you’re running this on a disk with data you wish to save then WE
STRONGLY ENCOURAGE YOU TO MAKE PROPER BACKUPS before proceeding!

We can take no responsibility for lost disk contents!
```

Ç åãêáôÜóôáóç ìðïñåß íá áêõñùèåß ïðïéáäÞðïôå óôéãìÞ ìÝ÷ñé íá äåßôå ôçí ôåëéêÞ ðñïåéäïðïßçóç ÷ùñßò íá ãßíåé êáìéÜ áëëáãÞ óôá ðåñéå÷üìåíá ôïõ óêëçñïý äßóêïõ. Áí áíçóõ÷åßôå üôé Ý÷åôå êÜíåé êÜðïéá ëÜèïò ñýèìéóç ìðïñåßôå áðëþò íá óâÞóåôå ôïí õðïëïãéóôÞ ðñéí áðü ôï óçìåßï áõôü, êáé äåí èá äçìéïõñãçèåß êáíÝíá ðñüâëçìá.

2.4.1 Åêêßíçóç

2.4.1.1 Åêêßíçóç óôçí Áñ÷éôåêôïíéêÞ i386™

1. ÎåêéíÞóôå ìå ôïí õðïëïãéóôÞ óáò áðåíåñãïðïéçìÝíï.
2. ÅêêéíÞóôå ôïí õðïëïãéóôÞ óáò. Êáèþò îåêéíÜåé èá ðñÝðåé íá äåß÷íåé êÜðïéá åðéëïãÞ ãéá íá åéóÝëèåôå óôï ðñüãñáììá ñõèìßóåùí ôïõ BIOS (BIOS setup), óõíÞèùò ìå ôçí ðßåóç êÜðïéïõ ðëÞêôñïõ üðùò ôï **F2**, ôï **F10**, ôï **Del** Þ ôï óõíäõáóìü **Alt**+**S**. ×ñçóéìïðïéÞóôå ôï óõíäõáóìü ðïõ öáßíåôáé óôçí ïèüíç. Óå êÜðïéåò ðåñéðôþóåéò, êáôÜ ôçí åêêßíçóç ìðïñåß óôçí ïèüíç óáò íá öáßíåôáé êÜðïéï ãñáöéêü ëïãüôõðï. ÔõðéêÜ, ðéÝæïíôáò ôï **Esc** ôï ãñáöéêü áõôü åîáöáíßæåôáé êáé ìðïñåßôå ðëÝïí íá äåßôå ôá áðáñáßôçôá ìçíýìáôá.
3. Âñåßôå ôç ñýèìéóç ðïõ åëÝã÷åé áðü ðïéåò óõóêåõÝò åêêéíåß ôï óýóôçìá. ÓõíÞèùò áíáöÝñåôáé ùò “Boot Order” êáé åìöáíßæåôáé ùò ëßóôá óõóêåõþí, üðùò ãéá ðáñÜäåéãìá `Floppy`, `CDROM`, `First Hard Disk`, ê.ï.ê.

   Áí ðñüêåéôáé íá åêêéíÞóåôå áðü ôï CDROM, âåâáéùèåßôå üôé Ý÷åôå êÜíåé ôçí áíôßóôïé÷ç åðéëïãÞ. Áí ðñüêåéôáé íá åêêéíÞóåôå áðü USB ìíÞìç flash Þ áðü äéóêÝôá, âåâáéùèåßôå üôé Ý÷åôå åðßóçò êÜíåé ôç óùóôÞ åðéëïãÞ. Áí äåí åßóôå óßãïõñïé, óõìâïõëåõôåßôå ôï åã÷åéñßäéï ôïõ õðïëïãéóôÞ Þ / êáé ôçò ìçôñéêÞò ðëáêÝôáò.

   ÊÜíôå ôçí áëëáãÞ, áðïèçêåýóôå êáé âãåßôå áðü ôï ðñüãñáììá ñõèìßóåùí. Ï õðïëïãéóôÞò óáò èá åðáíåêêéíÞóåé.
4. Áí ðñïåôïéìÜóáôå ìíÞìç flash USB, üðùò ðåñéãñÜöåôáé óôï ÔìÞìá 2.3.7, ìçí ðáñáëåßøåôå íá óõíäÝóåôå ôç ìíÞìç óôçí áíôßóôïé÷ç õðïäï÷Þ, ðñéí åíåñãïðïéÞóåôå ôïí õðïëïãéóôÞ óáò.

   Áí èá åêêéíÞóåôå áðü ôï CDROM, èá ÷ñåéáóôåß íá åíåñãïðïéÞóåôå ôïí õðïëïãéóôÞ êáé íá åéóÜãåôå ôï CDROM óôïí ïäçãü ìå ôçí ðñþôç äõíáôÞ åõêáéñßá.

   > **Óçìåßùóç:** Ãéá ôï FreeBSD 7.*x* äéáôßèåíôáé äéóêÝôåò åêêßíçóçò ôéò ïðïßåò ìðïñåßôå íá äçìéïõñãÞóåôå üðùò ðåñéãñÜöåôáé óôï ÔìÞìá 2.3.7. Ìéá áðü áõôÝò èá åßíáé ç ðñþôç äéóêÝôá åêêßíçóçò: `boot.flp`. ÔïðïèåôÞóôå áõôÞ ôç äéóêÝôá óôïí ïäçãü êáé åêêéíÞóôå ôïí õðïëïãéóôÞ óáò.

   Áí ï õðïëïãéóôÞò óáò îåêéíÞóåé êáíïíéêÜ êáé öïñôþóåé ôï õðÜñ÷ïí ëåéôïõñãéêü óáò óýóôçìá, ôüôå åßôå:

1. Äåí âÜëáôå ôç äéóêÝôá Þ ôï CD áñêåôÜ íùñßò êáôÜ ôç äéáäéêáóßá åêêßíçóçò. ÁöÞóôå ôçí óôïí ïäçãü êáé äïêéìÜóôå íá åðáíåêêéíÞóåôå ôïí õðïëïãéóôÞ óáò.
2. Ïé ðñïçãïýìåíåò áëëáãÝò ðïõ êÜíáôå óôéò ñõèìßóåéò ôïõ BIOS äåí ëåéôïýñãçóáí. Èá ðñÝðåé íá åðáíáëÜâåôå ôï âÞìá áõôü ìÝ÷ñé íá ðåôý÷åôå ôç óùóôÞ åðéëïãÞ.
3. Ôï óõãêåêñéìÝíï BIOS ðïõ äéáèÝôåôå äåí õðïóôçñßæåé åêêßíçóç áðü ôï åðéëåãìÝíï ìÝóï.

5. Èá áñ÷ßóåé ç åêêßíçóç ôïõ FreeBSD. Áí îåêéíÜôå áðü ôï CDROM èá äåßôå ìéá åéêüíá üðùò ôçí åðüìåíç (Ý÷ïõí ðáñáëåéöèåß ïé ðëçñïöïñßåò Ýêäïóçò):

```
Booting from CD-Rom...
CD Loader 1.2

Building the boot loader arguments
Looking up /BOOT/LOADER... Found
Relocating the loader and the BTX
Starting the BTX loader

BTX loader 1.00 BTX version is 1.02
Consoles: internal video/keyboard
BIOS CD is cd0
BIOS drive C: is disk0
BIOS drive D: is disk1
BIOS 639kB/261056kB available memory

FreeBSD/i386 bootstrap loader, Revision 1.1

Loading /boot/defaults/loader.conf
/boot/kernel/kernel text=0x64daa0 data=0xa4e80+0xa9e40 syms=[0x4+0x6cac0+0x4+00
x88e9d]
\
```

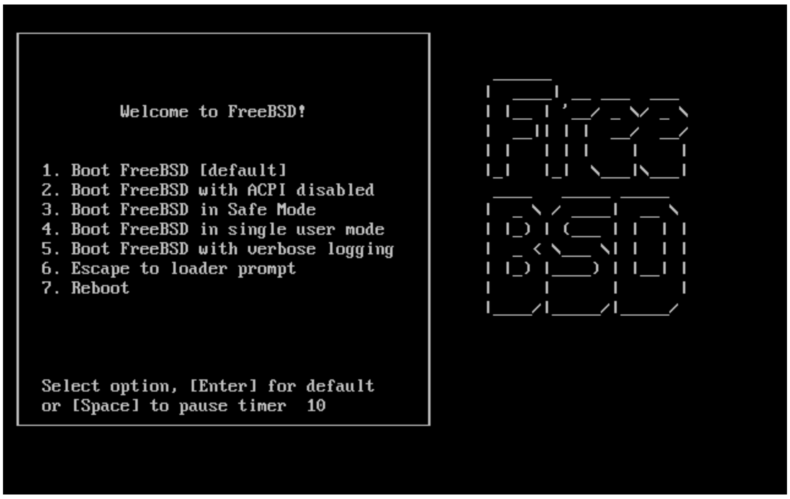
Áí êÜíåôå åêêßíçóç áðü ìïíÜäá äéóêÝôáò, èá äåßôå ìéá ïèüíç üìïéá ìå ôçí ðáñáêÜôù (Ý÷ïõí ðáñáëåéöèåß ïé ðëçñïöïñßåò Ýêäïóçò):

```
Booting from Floppy...
Uncompressing ... done

BTX loader 1.00  BTX version is 1.01
Console: internal video/keyboard
BIOS drive A: is disk0
BIOS drive C: is disk1
BIOS 639kB/261120kB available memory

FreeBSD/i386 bootstrap loader, Revision 1.1

Loading /boot/defaults/loader.conf
/kernel text=0x277391 data=0x3268c+0x332a8 |

Insert disk labelled "Kernel floppy 1" and press any key...
```

Áêïëïõèþóôå ôéò ïäçãßåò, áöáéñþíôáò ôçí äéóêÝôá `boot.flp`, åéóÜãïíôáò ôçí äéóêÝôá `kern1.flp` êáé ðéÝæïíôáò **Enter**. ÎåêéíÞóôå áðü ôçí ðñþôç äéóêÝôá, êáé üôáí óáò æçôçèåß, âÜëôå ôéò Üëëåò äéóêÝôåò üðùò áðáéôåßôáé.

6. Åßôå îåêéíÞóáôå áðü äéóêÝôá, åßôå áðü CDROM, åßôå áðü ìíÞìç flash, ç äéáäéêáóßá åêêßíçóçò èá öôÜóåé óôï ìåíïý ôïõ FreeBSD boot loader:

   Ó÷Þìá 2-1. Ìåíïý Åêêßíçóçò (FreeBSD Boot Loader)



```
Welcome to FreeBSD!

1. Boot FreeBSD [default]
2. Boot FreeBSD with ACPI disabled
3. Boot FreeBSD in Safe Mode
4. Boot FreeBSD in single user mode
5. Boot FreeBSD with verbose logging
6. Escape to loader prompt
7. Reboot

Select option, [Enter] for default
or [Space] to pause timer  10
```

   ÐåñéìÝíåôå äÝêá äåõôåñüëåðôá, Þ áðëþò ðéÝóôå **Enter**

2.4.1.2 Åêêßíçóç óôïí SPARC64®

Ôá ðåñéóóüôåñá óõóôÞìáôá SPARC64® åßíáé ñõèìéóìÝíá íá îåêéíÜíå áõôüìáôá áðü ôï óêëçñü äßóêï. Ãéá íá åãêáôáóôÞóåôå ôï FreeBSD, èá ðñÝðåé íá îåêéíÞóåôå åßôå áðü ôï äßêôõï, åßôå áðü ôï CDROM, êÜôé ôï ïðïßï áðáéôåß íá åéóÝëèåôå óôçí PROM (OpenFirmware).

Ãéá ôï óêïðü áõôü, åðáíåêêéíÞóôå ôï óýóôçìá êáé ðåñéìÝíåôå ìÝ÷ñé íá åìöáíéóôåß ôï ìÞíõìá åêêßíçóçò (boot). Áõôü åîáñôÜôáé áðü ôï ìïíôÝëï, áëëÜ ãåíéêÜ ìïéÜæåé ìå:

```
Sun Blade 100 (UltraSPARC-IIe), Keyboard Present
Copyright 1998-2001 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.2, 128 MB memory installed, Serial #51090132.
Ethernet address 0:3:ba:b:92:d4, Host ID: 830b92d4.
```

Áí ôï óýóôçìá óáò óõíå÷ßæåé ìå åêêßíçóç áðü ôï óêëçñü äßóêï, ðñÝðåé íá ðéÝóåôå: **L1**+**A** Þ **Stop**+**A** óôï ðëçêôñïëüãéï, Þ íá óôåßëåôå BREAK ìÝóù ôçò óåéñéáêÞò êïíóüëáò (÷ñçóéìïðïéþíôáò ãéá ðáñÜäåéãìá ~# óôï tip(1) Þ óôï cu(1)) ãéá íá öôÜóåôå óôçí ðñïôñïðÞ ôçò PROM. Öáßíåôáé ùðùò ðáñáêÜôù:

```
ok          ❶
ok {0}      ❷
```

❶ ÁõôÞ åßíáé ç ðñïôñïðÞ ðïõ ÷ñçóéìïðïéåßôáé óå óõóôÞìáôá ìå ìßá CPU.

❷ ÁõôÞ åßíáé ç ðñïôñïðÞ ðïõ ÷ñçóéìïðïéåßôáé óå óõóôÞìáôá SMP, ôï øçößï äåß÷íåé ôïí áñéèìü ôçò åíåñãÞò CPU.

Óôï óçìåßï áõôü, ôïðïèåôÞóôå ôï CDROM óôïí ïäçãü, êáé áðü ôçí ðñïôñïðÞ ôçò PROM, ãñÜøôå `boot cdrom`.

2.4.2 Åðéóêüðçóç ôùí ÁðïôåëåóìÜôùí Áíß÷íåõóçò Óõóêåõþí

Ïé ôåëåõôáßåò åêáôïíôÜäåò ãñáììÝò ðïõ ðÝñáóáí áðü ôçí ïèüíç óáò, áðïèçêåýïíôáé, êáé ìðïñåßôå íá ôéò îáíáäåßôå.

Ãéá íá äåßôå ôá ðåñéå÷üìåíá ôçò ðñïóùñéíÞò ìíÞìçò (buffer) ðéÝóôå ôï ðëÞêôñï **Scroll Lock**. Ìå ôïí ôñüðï áõôü åíåñãïðïéåßôáé ç êýëéóç ôçò ïèüíçò. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá ðëÞêôñá ìå ôá âåëÜêéá, Þ ôá **PageUp** êáé **PageDown** ãéá íá äåßôå ôá áðïôåëÝóìáôá. ÐéÝóôå îáíÜ ôï ðëÞêôñï **Scroll Lock** ãéá íá ôåñìáôßóåôå ôçí êýëéóç.

ÊÜíôå ôï áõôü ôþñá ãéá íá äåßôå ôï êåßìåíï ðïõ êýëçóå åêôüò ïèüíçò ôçí þñá ðïõ ï ðõñÞíáò áíß÷íåõå ôï õëéêü ôïõ õðïëïãéóôÞ óáò. Èá äåßôå Ýíá êåßìåíï áíôßóôïé÷ï ìå ôï Ó÷Þìá 2-2, áí êáé ôï áêñéâÝò êåßìåíï èá äéáöÝñåé áíÜëïãá ìå ôéò óõóêåõÝò ðïõ Ý÷åôå óôïí õðïëïãéóôÞ óáò.

Ó÷Þìá 2-2. ÔõðéêÜ ÁðïôåëÝóìáôá Áíß÷íåõóçò Óõóêåõþí

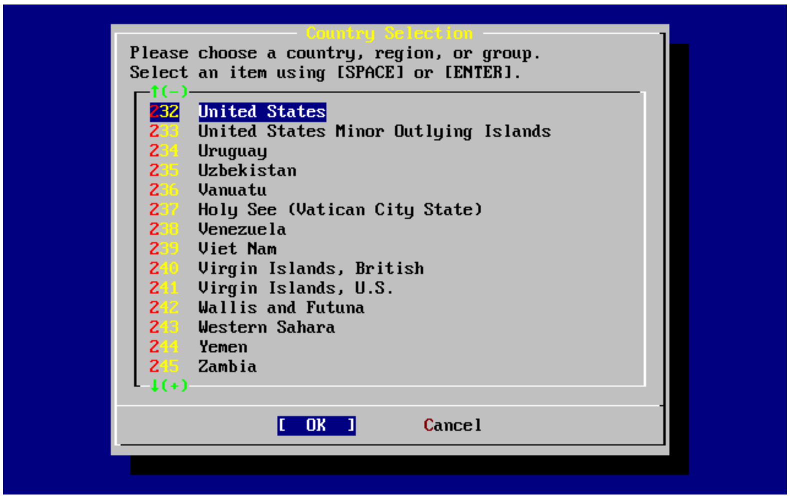
```
avail memory = 253050880 (247120K bytes)
Preloaded elf kernel "kernel" at 0xc0817000.
Preloaded mfs_root "/mfsroot" at 0xc0817084.
md0: Preloaded image </mfsroot> 4423680 bytes at 0xc03ddcd4

md1: Malloc disk
Using $PIR table, 4 entries at 0xc00fde60
npx0: <math processor> on motherboard
npx0: INT 16 interface
pcib0: <Host to PCI bridge> on motherboard
pci0: <PCI bus> on pcib0
pcib1:<VIA 82C598MVP (Apollo MVP3) PCI-PCI (AGP) bridge> at device 1.0 on pci0
pci1: <PCI bus> on pcib1
pci1: <Matrox MGA G200 AGP graphics accelerator> at 0.0 irq 11
isab0: <VIA 82C586 PCI-ISA bridge> at device 7.0 on pci0
isa0: <iSA bus> on isab0
atapci0: <VIA 82C586 ATA33 controller> port 0xe000-0xe00f at device 7.1 on pci0
ata0: at 0x1f0 irq 14 on atapci0
ata1: at 0x170 irq 15 on atapci0
uhci0 <VIA 83C572 USB controller> port 0xe400-0xe41f irq 10 at device 7.2 on pci
0
usb0: <VIA 83572 USB controller> on uhci0
usb0: USB revision 1.0
uhub0: VIA UHCI root hub, class 9/0, rev 1.00/1.00, addr1
uhub0: 2 ports with 2 removable, self powered
pci0: <unknown card> (vendor=0x1106, dev=0x3040) at 7.3
dc0: <ADMtek AN985 10/100BaseTX> port 0xe800-0xe8ff mem 0xdb000000-0xeb0003ff ir
q 11 at device 8.0 on pci0
dc0: Ethernet address: 00:04:5a:74:6b:b5
miibus0: <MII bus> on dc0
ukphy0: <Generic IEEE 802.3u media interface> on miibus0
ukphy0: 10baseT, 10baseT-FDX, 100baseTX, 100baseTX-FDX, auto
ed0: <NE2000 PCI Ethernet (RealTek 8029)> port 0xec00-0xec1f irq 9 at device 10.
0 on pci0
ed0 address 52:54:05:de:73:1b, type NE2000 (16 bit)
isa0: too many dependant configs (8)
isa0: unexpected small tag 14
orm0: <Option ROM> at iomem 0xc0000-0xc7fff on isa0
fdc0: <NEC 72065B or clone> at port 0x3f0-0x3f5,0x3f7 irq 6 drq2 on isa0
```

```
fdc0: FIFO enabled, 8 bytes threshold
fd0: <1440-KB 3.5” drive> on fdc0 drive 0
atkbdc0: <Keyboard controller (i8042)> at port 0x60,0x64 on isa0
atkbd0: <AT Keyboard> flags 0x1 irq1 on atkbdc0
kbd0 at atkbd0
psm0: <PS/2 Mouse> irq 12 on atkbdc0
psm0: model Generic PS/@ mouse, device ID 0
vga0: <Generic ISA VGA> at port 0x3c0-0x3df iomem 0xa0000-0xbffff on isa0
sc0: <System console> at flags 0x100 on isa0
sc0: VGA <16 virtual consoles, flags=0x300>
sio0 at port 0x3f8-0x3ff irq 4 flags 0x10 on isa0
sio0: type 16550A
sio1 at port 0x2f8-0x2ff irq 3 on isa0
sio1: type 16550A
ppc0: <Parallel port> at port 0x378-0x37f irq 7 on isa0
pppc0: SMC-like chipset (ECP/EPP/PS2/NIBBLE) in COMPATIBLE mode
ppc0: FIFO with 16/16/15 bytes threshold
plip0: <PLIP network interface> on ppbus0
ad0: 8063MB <IBM-DHEA-38451> [16383/16/63] at ata0-master UDMA33
acd0: CD-RW <LITE-ON LTR-1210B> at ata1-slave PIO4
Mounting root from ufs:/dev/md0c
/stand/sysinstall running as init on vty0
```

ÅëÝãîôå ðñïóåêôéêÜ ôá áðïôåëÝóìáôá ôçò áíß÷íåõóçò ãéá íá âåâáéùèåßôå üôé ôï FreeBSD áíß÷íåõóå üëåò ôéò óõóêåõÝò ðïõ áíáìÝíáôå. Áí ìéá óõóêåõÞ äåí âñÝèçêå, ôüôå äåí èá ôç äåßôå óôç ëßóôá. Ìå ôç âïÞèåéá åîåéäéêåõìÝíïõ ðõñÞíá ìðïñåßôå íá ðñïóèÝóåôå õðïóôÞñéîç ãéá óõóêåõÝò ïé ïðïßåò äåí ðåñéëáìâÜíïíôáé óôïí ðõñÞíá `GENERIC`, üðùò ôéò êÜñôåò Þ÷ïõ.

ÌåôÜ ôï ôÝëïò ôçò äéáäéêáóßáò áíß÷íåõóçò óõóêåõþí, èá äåßôå ôï Ó÷Þìá 2-3. ×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå ðåñéï÷Þ Þ ÷þñá. ¸ðåéôá ðéÝóôå **Enter**, ãéá íá ñõèìßóåôå ôç ÷þñá.

Ó÷Þìá 2-3. ÅðéëÝãïíôáò ôï Ìåíïý ×þñáò



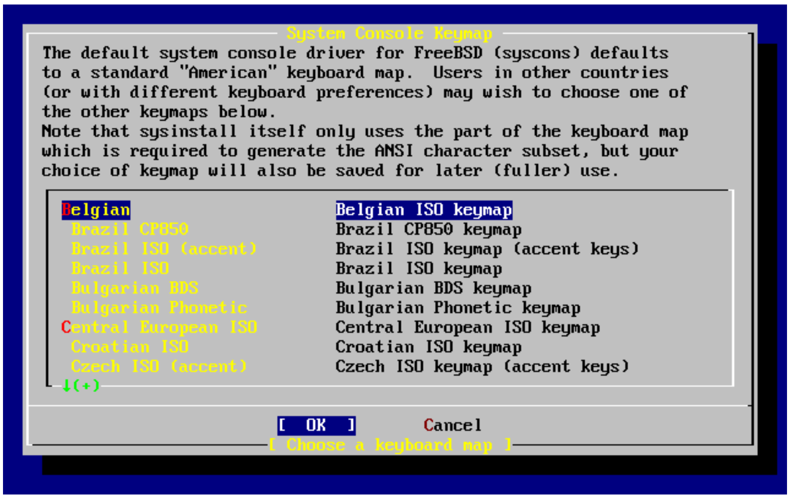
Country Selection

Please choose a country, region, or group.
Select an item using [SPACE] or [ENTER].

↑(-)
232 United States
233 United States Minor Outlying Islands
234 Uruguay
235 Uzbekistan
236 Vanuatu
237 Holy See (Vatican City State)
238 Venezuela
239 Viet Nam
240 Virgin Islands, British
241 Virgin Islands, U.S.
242 Wallis and Futuna
243 Western Sahara
244 Yemen
245 Zambia
↓(+)

Áí åðéëÝîáôå ùò ÷þñá United States, èá ÷ñçóéìïðïéçèåß ç ôõðïðïéçìÝíç ÁìåñéêáíéêÞ äéÜôáîç ðëçêôñïëïãßïõ. Áí åðéëÝîáôå äéáöïñåôéêÞ ÷þñá, èá åìöáíéóôåß ôï ðáñáêÜôù ìåíïý. ×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå ôç óùóôÞ äéÜôáîç ðëçêôñïëïãßïõ êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-4. ÅðéëïãÞ Ìåíïý Ðëçêôñïëïãßïõ


System Console Keymap

The default system console driver for FreeBSD (syscons) defaults to a standard "American" keyboard map. Users in other countries (or with different keyboard preferences) may wish to choose one of the other keymaps below.
Note that sysinstall itself only uses the part of the keyboard map which is required to generate the ANSI character subset, but your choice of keymap will also be saved for later (fuller) use.

Belgian Belgian ISO keymap
Brazil CP850 Brazil CP850 keymap
Brazil ISO (accent) Brazil ISO keymap (accent keys)
Brazil ISO Brazil ISO keymap
Bulgarian BDS Bulgarian BDS keymap
Bulgarian Phonetic Bulgarian Phonetic keymap
Central European ISO Central European ISO keymap
Croatian ISO Croatian ISO keymap
Czech ISO (accent) Czech ISO keymap (accent keys)
↓(+)
[OK]
Cancel
[Choose a keyboard map]

ÌåôÜ ôçí åðéëïãÞ ôçò ÷þñáò, èá åìöáíéóôåß ôï âáóéêü ìåíïý åðéëïãþí ôïõ **sysinstall**.

2.5 ÅéóáãùãÞ óôï Sysinstall

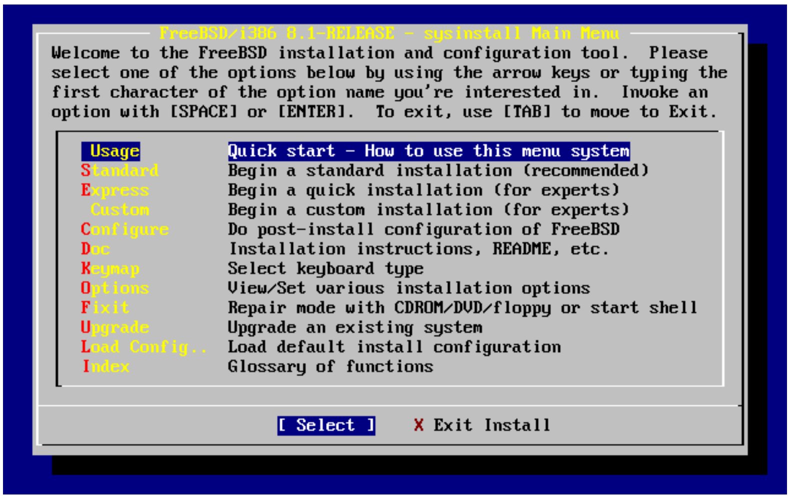
Ôï ðñüãñáììá **sysinstall** åßíáé ç åöáñìïãÞ åãêáôÜóôáóçò ðïõ ðáñÝ÷åôáé áðü ôï FreeBSD Project. Âáóßæåôáé óå ðåñéâÜëëïí êåéìÝíïõ êáé ÷ùñßæåôáé óå ìéá óåéñÜ áðü ìåíïý êáé ïèüíåò ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ãéá íá ñõèìßóåôå êáé íá åëÝãîåôå ôçí äéáäéêáóßá åãêáôÜóôáóçò.

Ôï óýóôçìá ìåíïý ôïõ **sysinstall** åëÝã÷åôáé ìå ôá âåëÜêéá, ôï **Enter**, ôï **Space** êáé Üëëá ðëÞêôñá. ËåðôïìåñÞ ðåñéãñáöÞ ôùí ðëÞêôñùí áõôþí êáé ôùí ëåéôïõñãéþí ôïõò ðåñéÝ÷åôáé óôéò ïäçãßåò ÷ñÞóçò ôïõ **sysinstall**.

Ãéá íá äåßôå ôéò ðëçñïöïñßåò áõôÝò, âåâáéùèåßôå üôé åßíáé öùôéóìÝíç ç åðéëïãÞ Usage êáé üôé åßíáé åðéëåãìÝíï ôï ðëÞêôñï [Select] üðùò öáßíåôáé óôï Ó÷Þìá 2-5, êáé ðéÝóôå **Enter**.

Èá äåßôå ôéò ïäçãßåò ÷ñÞóçò ôïõ óõóôÞìáôïò ìåíïý. Êáôüðéí ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï êýñéï ìåíïý (Main Menu).

Ó÷Þìá 2-5. ÅðéëÝãïíôáò Usage áðü ôï Main Menu ôïõ SysInstall

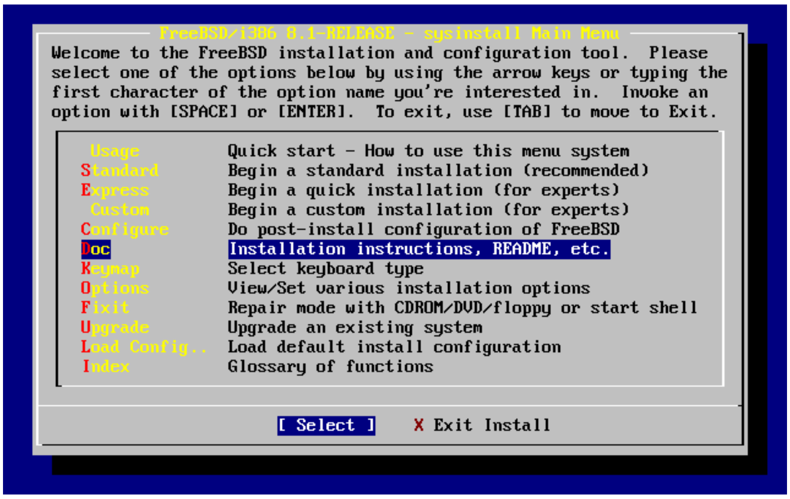


```
 FreeBSD/i386 8.1-RELEASE - sysinstall Main Menu
Welcome to the FreeBSD installation and configuration tool.  Please
select one of the options below by using the arrow keys or typing the
first character of the option name you're interested in.  Invoke an
option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

  Usage          Quick start - How to use this menu system
 Standard        Begin a standard installation (recommended)
 Express         Begin a quick installation (for experts)
  Custom         Begin a custom installation (for experts)
 Configure       Do post-install configuration of FreeBSD
 Doc             Installation instructions, README, etc.
 Keymap          Select keyboard type
 Options         View/Set various installation options
 Fixit           Repair mode with CDROM/DVD/floppy or start shell
 Upgrade         Upgrade an existing system
 Load Config..   Load default install configuration
 Index           Glossary of functions

                  [ Select ]    X Exit Install
```

2.5.1 ÅðéëÝãïíôáò ôï Ìåíïý Documentation (Ôåêìçñßùóç)

Áðü ôï Main Menu, åðéëÝîôå Doc ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

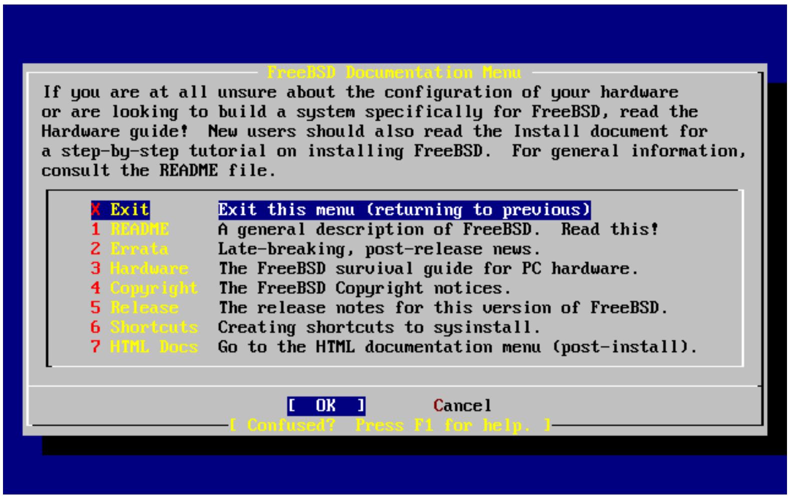
Ó÷Þìá 2-6. ÅðéëÝãïíôáò ôï Ìåíïý Documentation



```
 FreeBSD/i386 8.1-RELEASE - sysinstall Main Menu
Welcome to the FreeBSD installation and configuration tool.  Please
select one of the options below by using the arrow keys or typing the
first character of the option name you're interested in.  Invoke an
option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

  Usage          Quick start - How to use this menu system
 Standard        Begin a standard installation (recommended)
 Express         Begin a quick installation (for experts)
  Custom         Begin a custom installation (for experts)
 Configure       Do post-install configuration of FreeBSD
 Doc             Installation instructions, README, etc.
 Keymap          Select keyboard type
 Options         View/Set various installation options
 Fixit           Repair mode with CDROM/DVD/floppy or start shell
 Upgrade         Upgrade an existing system
 Load Config..   Load default install configuration
 Index           Glossary of functions

                  [ Select ]    X Exit Install
```

Áõôü èá äåßîåé ôï Ìåíïý Documentation.

Ó÷Þìá 2-7. Ôï Ìåíïý Documentation ôïõ Sysinstall



```
                     FreeBSD Documentation Menu
 If you are at all unsure about the configuration of your hardware
 or are looking to build a system specifically for FreeBSD, read the
 Hardware guide!  New users should also read the Install document for
 a step-by-step tutorial on installing FreeBSD.  For general information,
 consult the README file.

      X Exit        Exit this menu (returning to previous)
      1 README      A general description of FreeBSD.  Read this!
      2 Errata      Late-breaking, post-release news.
      3 Hardware    The FreeBSD survival guide for PC hardware.
      4 Copyright   The FreeBSD Copyright notices.
      5 Release     The release notes for this version of FreeBSD.
      6 Shortcuts   Creating shortcuts to sysinstall.
      7 HTML Docs   Go to the HTML documentation menu (post-install).

                  [  OK  ]         Cancel
                [ Confused?  Press F1 for help. ]
```

Åßíáé óçìáíôéêü íá äéáâÜóåôå ôçí ðáñå÷üìåíç ôåêìçñßùóç.

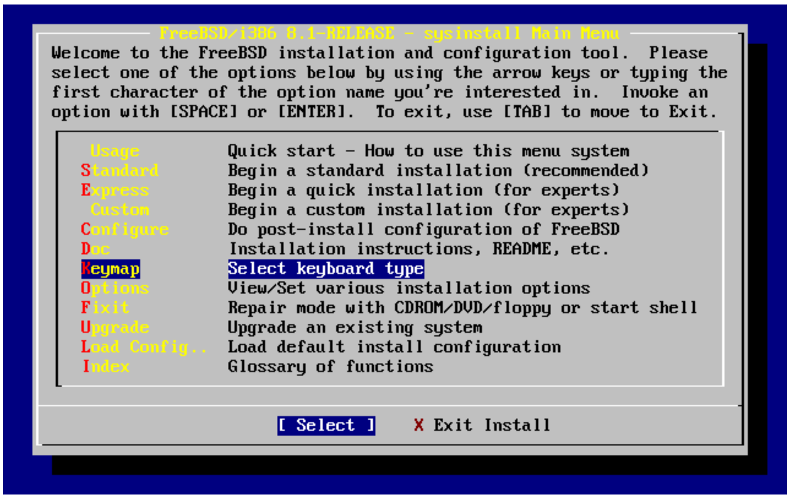
Ãéá íá äåßôå Ýíá Ýããñáöï, åðéëÝîôå ôï ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**. ¼ôáí ôåëåéþóåôå ôçí áíÜãíùóç åíüò åããñÜöïõ, ðéÝæïíôáò **Enter** èá åðéóôñÝøåôå óôï ìåíïý Documentation.

Ãéá íá åðéóôñÝøåôå óôï Êõñßùò Ìåíïý ÅãêáôÜóôáóçò, åðéëÝîôå Exit ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

2.5.2 ÅðéëÝãïíôáò ôï Ìåíïý Keymap (ÄéÜôáîç Ðëçêôñïëïãßïõ)

Ãéá íá áëëÜîåôå ôç äéÜôáîç ôïõ ðëçêôñïëïãßïõ, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Keymap áðü ôï ìåíïý êáé ðéÝóôå **Enter**. Áõôü áðáéôåßôáé ìüíï áí ÷ñçóéìïðïéåßôå äéÜôáîç ðëçêôñïëïãßïõ ðïõ äåí åßíáé óôÜíôáñ êáé åðßóçò ãéá äéáôÜîåéò åêôüò ôçò ÁããëéêÞò ÇÐÁ.

Ó÷Þìá 2-8. Êýñéï Ìåíïý ÅãêáôÜóôáóçò (Sysinstall Main Menu)

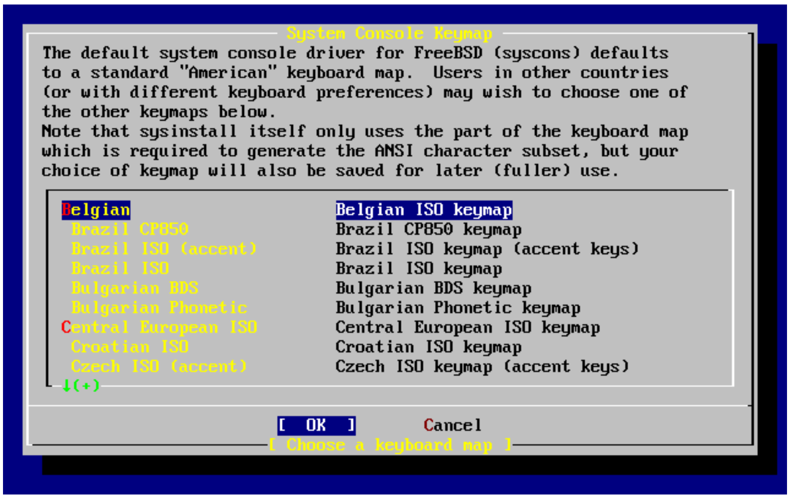


```
              FreeBSD/i386 8.1-RELEASE - sysinstall Main Menu
 Welcome to the FreeBSD installation and configuration tool.  Please
 select one of the options below by using the arrow keys or typing the
 first character of the option name you're interested in.  Invoke an
 option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

     Usage          Quick start - How to use this menu system
    Standard        Begin a standard installation (recommended)
    Express         Begin a quick installation (for experts)
     Custom         Begin a custom installation (for experts)
    Configure       Do post-install configuration of FreeBSD
    Doc             Installation instructions, README, etc.
    Keymap          Select keyboard type
    Options         View/Set various installation options
    Fixit           Repair mode with CDROM/DVD/floppy or start shell
    Upgrade         Upgrade an existing system
    Load Config..   Load default install configuration
    Index           Glossary of functions

                    [ Select ]    X Exit Install
```

Ìðïñåßôå íá åðéëÝîåôå äéáöïñåôéêÞ äéÜôáîç ðëçêôñïëïãßïõ êÜíïíôáò ôçí áíôßóôïé÷ç åðéëïãÞ áðü ôï ìåíïý ÷ñçóéìïðïéþíôáò ôá âåëÜêéá, êáé ðéÝæïíôáò **Space**. ÐéÝæïíôáò îáíÜ **Space** èá êáôáñãÞóåôå ôçí åðéëïãÞ. ¼ôáí ôåëåéþóåôå, åðéëÝîôå [OK] ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Óôçí ðáñáêÜôù áðåéêüíéóç ôçò ïèüíçò öáßíåôáé ìüíï ìÝñïò ôçò ëßóôáò. Áí åðéëÝîåôå [Cancel] ðéÝæïíôáò ôï **Tab** èá ÷ñçóéìïðïéÞóåôå ôçí ðñïåðéëåãìÝíç äéÜôáîç ðëçêôñïëïãßïõ êáé èá åðéóôñÝøåôå óôï Êýñéï Ìåíïý ÅãêáôÜóôáóçò.

Ó÷Þìá 2-9. Ôï Ìåíïý Keymap ôïõ Sysinstall

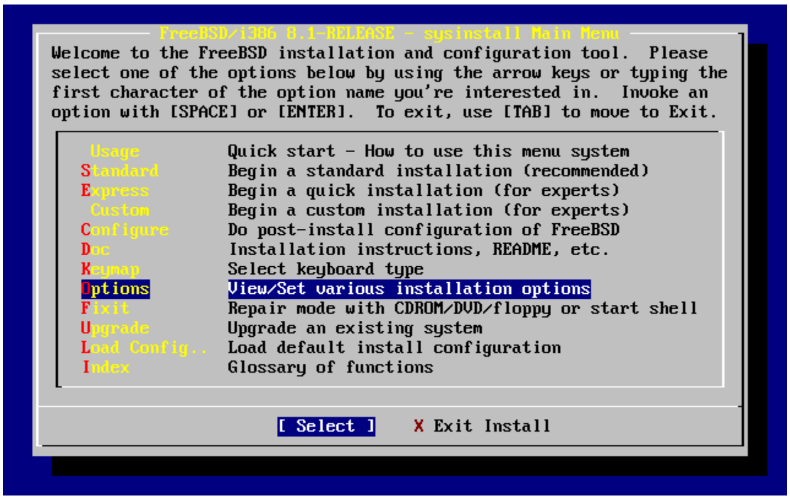


```
System Console Keymap
The default system console driver for FreeBSD (syscons) defaults
to a standard "American" keyboard map.  Users in other countries
(or with different keyboard preferences) may wish to choose one of
the other keymaps below.
Note that sysinstall itself only uses the part of the keyboard map
which is required to generate the ANSI character subset, but your
choice of keymap will also be saved for later (fuller) use.

 Belgian                    Belgian ISO keymap
  Brazil CP850              Brazil CP850 keymap
  Brazil ISO (accent)       Brazil ISO keymap (accent keys)
  Brazil ISO                Brazil ISO keymap
  Bulgarian BDS             Bulgarian BDS keymap
  Bulgarian Phonetic        Bulgarian Phonetic keymap
 Central European ISO       Central European ISO keymap
  Croatian ISO              Croatian ISO keymap
  Czech ISO (accent)        Czech ISO keymap (accent keys)
 ↓(+)

                  [  OK  ]        Cancel
                 [ Choose a keyboard map ]
```

2.5.3 Ç Ïèüíç Installation Options (Åðéëïãþí ÅãêáôÜóôáóçò)

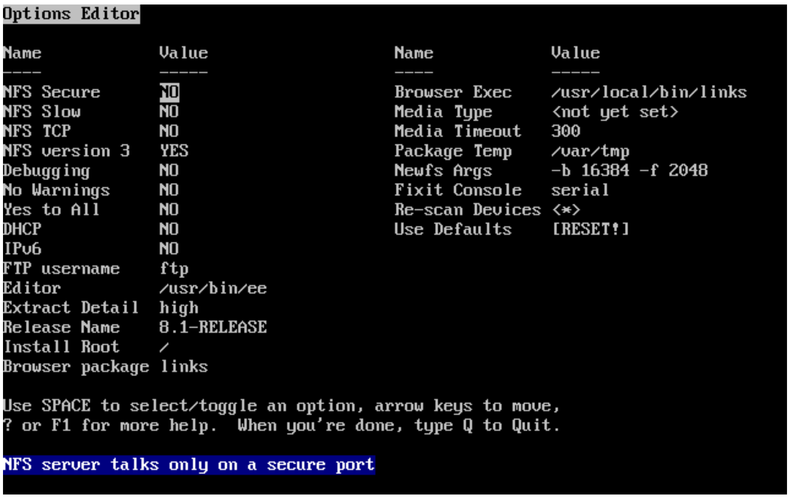
ÅðéëÝîôå Options êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-10. Ôï Êýñéï Ìåíïý ôïõ Sysinstall



```
FreeBSD/i386 8.1-RELEASE - sysinstall Main Menu
Welcome to the FreeBSD installation and configuration tool.  Please
select one of the options below by using the arrow keys or typing the
first character of the option name you're interested in.  Invoke an
option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

  Usage          Quick start - How to use this menu system
 Standard        Begin a standard installation (recommended)
 Express         Begin a quick installation (for experts)
  Custom         Begin a custom installation (for experts)
 Configure       Do post-install configuration of FreeBSD
 Doc             Installation instructions, README, etc.
 Keymap          Select keyboard type
 Options         View/Set various installation options
 Fixit           Repair mode with CDROM/DVD/floppy or start shell
 Upgrade         Upgrade an existing system
 Load Config..   Load default install configuration
 Index           Glossary of functions

                [ Select ]     X Exit Install
```

Ó÷Þìá 2-11. ÅðéëïãÝò ôïõ Sysinstall (Options)



```
Options Editor

Name             Value                    Name            Value
----             -----                    ----            -----
NFS Secure       NO                       Browser Exec    /usr/local/bin/links
NFS Slow         NO                       Media Type      <not yet set>
NFS TCP          NO                       Media Timeout   300
NFS version 3    YES                      Package Temp    /var/tmp
Debugging        NO                       Newfs Args      -b 16384 -f 2048
No Warnings      NO                       Fixit Console   serial
Yes to All       NO                       Re-scan Devices <*>
DHCP             NO                       Use Defaults    [RESET!]
IPv6             NO
FTP username     ftp
Editor           /usr/bin/ee
Extract Detail   high
Release Name     8.1-RELEASE
Install Root     /
Browser package  links

Use SPACE to select/toggle an option, arrow keys to move,
? or F1 for more help.  When you're done, type Q to Quit.

NFS server talks only on a secure port
```

Ïé ðñïåðéëåãìÝíåò ôéìÝò åßíáé óõíÞèùò óùóôÝò ãéá ôïõò ðåñéóóüôåñïõò ÷ñÞóôåò êáé äåí ÷ñåéÜæåôáé íá áëëá÷èïýí. Ôï üíïìá ôçò Ýêäïóçò (Release Name) áëëÜæåé áíÜëïãá ìå ôçí Ýêäïóç ðïõ åãêáèßóôáôáé.

Óôï êÜôù ìÝñïò ôçò ïèüíçò, åìöáíßæåôáé ìå ôïíéóìÝíï ìðëå ÷ñþìá ç ðåñéãñáöÞ ôïõ åðéëåãìÝíïõ áíôéêåéìÝíïõ. ÐáñáôçñÞóôå üôé ìéá áðü ôéò åðéëïãÝò åßíáé ç Use Defaults ç ïðïßá åðáíáöÝñåé üëåò ôéò ôéìÝò óôéò áñ÷éêÝò ðñïåðéëåãìÝíåò ôïõò ñõèìßóåéò.

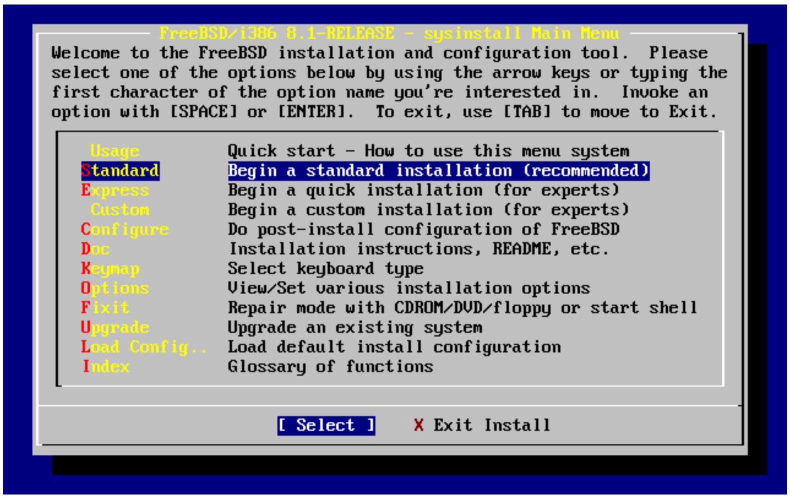
ÐéÝóôå ôï **F1** ãéá íá äéáâÜóåôå ôçí ïèüíç âïÞèåéáò ó÷åôéêÜ ìå ôéò äéÜöïñåò åðéëïãÝò.

ÐéÝæïíôáò ôï **Q** èá åðéóôñÝøåôå óôï Êýñéï Ìåíïý ÅãêáôÜóôáóçò.

2.5.4 ÎåêéíÞóôå ìéá ÔõðéêÞ ÅãêáôÜóôáóç (Standard Installation)

Ç Standard åãêáôÜóôáóç åßíáé ç åðéëïãÞ ðïõ óõíßóôáôáé ãéá ôïõò íÝïõò ÷ñÞóôåò ôïõ UNIX Þ ôïõ FreeBSD. ×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Standard áðü ôï ìåíïý, êáé ðéÝóôå **Enter** ãéá íá îåêéíÞóåôå ôçí åãêáôÜóôáóç.

Ó÷Þìá 2-12. Åêêßíçóç ôçò ÔõðéêÞò ÅãêáôÜóôáóçò (Standard Installation)



```
FreeBSD/i386 8.1-RELEASE - sysinstall Main Menu
Welcome to the FreeBSD installation and configuration tool.  Please
select one of the options below by using the arrow keys or typing the
first character of the option name you're interested in.  Invoke an
option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

  Usage            Quick start - How to use this menu system
 Standard          Begin a standard installation (recommended)
 Express           Begin a quick installation (for experts)
  Custom           Begin a custom installation (for experts)
 Configure         Do post-install configuration of FreeBSD
 Doc               Installation instructions, README, etc.
 Keymap            Select keyboard type
 Options           View/Set various installation options
 Fixit             Repair mode with CDROM/DVD/floppy or start shell
 Upgrade           Upgrade an existing system
 Load Config..     Load default install configuration
 Index             Glossary of functions

              [ Select ]     X Exit Install
```

2.6 Åê÷þñçóç ×þñïõ óôï Äßóêï

Ôï ðñþôï óáò âÞìá åßíáé íá åê÷ùñÞóåôå ÷þñï äßóêïõ ãéá ôï FreeBSD êáé íá äçìéïõñãÞóåôå ìéá åôéêÝôá (label) óôï ÷þñï áõôü þóôå íá ìðïñÝóåé íá ôïí ðñïåôïéìÜóåé ôï **sysinstall**. Ãéá ôï óêïðü áõôü ðñÝðåé íá ãíùñßæåôå ôïí ôñüðï ìå ôïí ïðïßï ðåñéìÝíåé ôï FreeBSD íá âñåé ôéò ðëçñïöïñßåò óôï äßóêï.

2.6.1 Áñßèìçóç ôùí Äßóêùí ìå âÜóç ôï BIOS

Ðñéí åãêáôáóôÞóåôå êáé ñõèìßóåôå ôï FreeBSD óôï óýóôçìá óáò, õðÜñ÷åé Ýíá óçìáíôéêü èÝìá ôï ïðïßï ðñÝðåé íá ãíùñßæåôå, åéäéêÜ áí Ý÷åôå ðïëëïýò óêëçñïýò äßóêïõò.

Óå Ýíá PC ôï ïðïßï ÷ñçóéìïðïéåß ëåéôïõñãéêü óýóôçìá ôï ïðïßï åîáñôÜôáé áðü ôï BIOS, üðùò åßíáé ôï MS-DOS Þ ôá Microsoft Windows, ôï BIOS åßíáé óå èÝóç íá óõìðåñÜíåé ôç óåéñÜ ðñïôåñáéüôçôáò ôùí äßóêùí êáé ôï ëåéôïõñãéêü óýóôçìá áðëþò óõìâáäßæåé ìå áõôÞ. Áõôü åðéôñÝðåé óôï ÷ñÞóôç íá åêêéíÞóåé áðü Ýíá äßóêï äéáöïñåôéêü áðü áõôüí ðïõ óõ÷íÜ êáëïýìå “primary master”. Áõôü åßíáé éäéáßôåñá âïëéêü ãéá êÜðïéïõò ÷ñÞóôåò ðïõ Ý÷ïõí áíáêáëýøåé üôé ï åõêïëüôåñïò êáé öôçíüôåñïò ôñüðïò íá Ý÷ïõí Ýíá áíôßãñáöï áóöáëåßáò ôïõ óõóôÞìáôüò ôïõò, åßíáé íá áãïñÜóïõí Ýíá äåýôåñï üìïéï óêëçñü äßóêï, êáé íá áíôéãñÜöïõí áíÜ ôáêôÜ äéáóôÞìáôá ôïí ðñþôï ôïõò äßóêï óôï äåýôåñï ÷ñçóéìïðïéþíôáò ðñïãñÜììáôá üðùò ôï **Ghost®** Þ ôï **XCOPY**. ¸ôóé, áí ï ðñþôïò äßóêïò ÷áëÜóåé, Þ äå÷èåß åðßèåóç áðü éü, Þ ðáñïõóéÜóåé ðñüâëçìá åîáéôßáò êÜðïéïõ åëáôôþìáôïò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò, ï ÷ñÞóôçò ìðïñåß åýêïëá íá åðáíáöÝñåé ôï óýóôçìá ñõèìßæïíôáò ôï BIOS íá áíôéóôñÝøåé ôç ëïãéêÞ óåéñÜ ôùí äßóêùí. Åßíáé óáí íá áíôéìåôáèÝôïõìå ôç óåéñÜ ôùí êáëùäßùí óôïõò äßóêïõò áëëÜ ÷ùñßò íá ÷ñåéÜæåôáé íá áíïßîïõìå ôï êïõôß.

Ôá ðéï áêñéâÜ óõóôÞìáôá ìå åëåãêôÝò SCSI, óõ÷íÜ ðåñéëáìâÜíïõí åðåêôÜóåéò óôï BIOS ðïõ åðéôñÝðïõí ôçí áëëáãÞ ôçò áñßèìçóçò ìÝ÷ñé åðôÜ äßóêùí SCSI, ìå ðáñüìïéï ôñüðï.

¸íáò ÷ñÞóôçò åîïéêåéùìÝíïò ìå ôçí ðáñáðÜíù äõíáôüôçôá, ìðïñåß íá âñåèåß ðñï åêðëÞîåùò üôáí ôá áðïôåëÝóìáôá ìå ôï FreeBSD äåí åßíáé ôá áíáìåíüìåíá. Ôï FreeBSD äåí ÷ñçóéìïðïéåß ôï BIOS êáé äåí ãíùñßæåé ôçí “êáôÜ ôï BIOS ëïãéêÞ äéÜôáîç ôùí ïäçãþí”. Áõôü ìðïñåß íá ïäçãÞóåé óå éäéáßôåñá ðåñßðëïêåò êáôáóôÜóåéò, åéäéêÜ áí ïé äßóêïé Ý÷ïõí ðáñüìïéá ãåùìåôñßá êáé Ý÷ïõí åðßóçò ôá ßäéá äåäïìÝíá (åßíáé ï Ýíáò êëþíïò ôïõ Üëëïõ).

¼ôáí ÷ñçóéìïðïéåßôå ôï FreeBSD åðéóôñÝøôå ôçí óåéñÜ ôùí ïäçãþí óôï BIOS óôçí öõóéïëïãéêÞ ôïõò ðñéí åãêáôáóôÞóåôå ôï FreeBSD êáé áöÞóôå ôçí Ýôóé. Áí ðñÝðåé íá åíáëëÜîåôå ôïõò äßóêïõò ìåôáîý ôïõò, êÜíôå ôï áëëÜ ìå ôï äýóêïëï ôñüðï: áíïßîôå ôï êïõôß êáé áëëÜîôå èÝóåéò óôá jumpers (âñá÷õêõêëùôÞñåò) êáé óôá êáëþäéá.

Ìéá Éóôïñßá áðü ôá Áñ÷åßá ôùí Åîáéñåôéêþí Ðåñéðåôåéþí ôïõ Bill êáé Fred:

O Bill äéáëýåé Ýíá ðáëéü ìç÷Üíçìá Wintel ãéá íá öôéÜîåé Ýíá áêüìá FreeBSD ìç÷Üíçìá ãéá ôï Fred. Ï Bill åãêáèéóôÜ Ýíá óêëçñü äßóêï SCSI ùò óõóêåõÞ ìå áñéèìü ìçäÝí êáé åãêáèéóôÜ óå áõôÞ ôï FreeBSD.

Ï Fred îåêéíÜ íá ÷ñçóéìïðïéåß ôï óýóôçìá, áëëÜ ìåôÜ áðü áñêåôÝò ìÝñåò ðáñáôçñåß üôé ï ðáëéüò SCSI äßóêïò áíáöÝñåé áñêåôÜ ìç êáôáóôñïöéêÜ ëÜèç (soft errors) êáé áíáöÝñåé ôï ãåãïíüò áõôü óôïí Bill.

ÌåôÜ áðü ìåñéêÝò áêüìá ìÝñåò, ï Bill áðïöáóßæåé üôé Ý÷åé Ýñèåé ç þñá íá áíôéìåôùðßóåé ôï ðñüâëçìá, êáé Ýôóé ðéÜíåé Ýíá áíôßóôïé÷ï SCSI äßóêï áðü ôï “áñ÷åßï” óôï ðßóù äùìÜôéï. ¸íáò áñ÷éêüò Ýëåã÷ïò åðéöÜíåéáò äåß÷íåé üôé ï äßóêïò ëåéôïõñãåß êáíïíéêÜ, êáé Ýôóé ï Bill åãêáèéóôÜ ôï äßóêï áõôü ùò SCSI ìïíÜäá ôÝóóåñá êáé áíôéãñÜöåé (ìÝóù image) ðëÞñùò ôá äåäïìÝíá áðü ôï äßóêï ìçäÝí óôï äßóêï ôÝóóåñá. Ôþñá ðïõ ï íÝïò äßóêïò åßíáé åãêáôåóôçìÝíïò êáé ëåéôïõñãåß óùóôÜ, ï Bill áðïöáóßæåé üôé åßíáé êáëÞ éäÝá íá áñ÷ßóåé íá ôïí ÷ñçóéìïðïéåß, êáé Ýôóé âÜæåé óå åöáñìïãÞ ôç äõíáôüôçôá ôïõ BIOS íá áëëÜæåé ôçí áñßèìçóç ôùí äßóêùí þóôå ôï óýóôçìá íá îåêéíÜåé áðü ôï äßóêï ôÝóóåñá. Ôï FreeBSD îåêéíÜåé êáé åêôåëåßôáé êáíïíéêÜ.

Ï Fred óõíå÷ßæåé ôç äïõëåéÜ ôïõ ãéá áñêåôÝò áêüìá ìÝñåò, êáé óýíôïìá ï Bill êáé o Fred áðïöáóßæïõí üôé Ý÷åé Ýñèåé ç þñá ãéá ìéá áêüìá ðåñéðÝôåéá — þñá íá áíáâáèìßóïõí óôçí íÝá Ýêäïóç ôïõ FreeBSD. Ï Bill áöáéñåß ôï äßóêï ìçäÝí ìéá êáé Þôáí åëáôôùìáôéêüò êáé ôïí áíôéêáèéóôÜ ìå Ýíá Üëëï üìïéï äßóêï áðü ôï “áñ÷åßï”. Ï Bill êáôüðéí åãêáèéóôÜ ôç íÝá Ýêäïóç ôïõ FreeBSD óôïí íÝï äßóêï ìçäÝí ÷ñçóéìïðïéþíôáò ôéò ìáãéêÝò Internet FTP äéóêÝôåò ôïõ Fred. Ç åãêáôÜóôáóç ãßíåôáé ÷ùñßò ðñïâëÞìáôá.

Ï Fred ÷ñçóéìïðïéåß ôçí íÝá Ýêäïóç ôïõ FreeBSD ãéá ìåñéêÝò ìÝñåò, êáé ðéóôïðïéåß üôé åßíáé áñêåôÜ êáëÞ ãéá ÷ñÞóç óôï ôìÞìá ìç÷áíéêÞò. ¸÷åé Ýñèåé ç þñá íá áíôéãñÜøåé üëç ôç äïõëåéÜ ôïõ áðü ôçí ðáëéÜ Ýêäïóç. ¸ôóé ï Fred ðñïóáñôÜ ôï äßóêï ìå áñéèìü ôÝóóåñá (ôï ôåëåõôáßï áíôßãñáöï ôçò ðáëéÜò Ýêäïóçò ôïõ FreeBSD). Ï Fred áðïãïçôåýåôáé üôáí áíáêáëýðôåé üôé äåí õðÜñ÷åé ôßðïôá áðü ôçí ðïëýôéìç åñãáóßá ôïõ óôï äßóêï ìå áñéèìü ôÝóóåñá.

Ðïõ ðÞãáí ôá äåäïìÝíá;

¼ôáí ï Bill Ýêáíå öùôïãñáöéêÞ áíôéãñáöÞ ôïõ áñ÷éêïý SCSI äßóêïõ ìçäÝí óôï SCSI äßóêï ôÝóóåñá, ï äßóêïò ôÝóóåñá Ýãéíå ï “íÝïò êëþíïò”. ¼ôáí ï Bill Üëëáîå ôçí áñßèìçóç óôï SCSI BIOS þóôå íá ìðïñÝóåé íá îåêéíÞóåé áðü ôç ìïíÜäá SCSI ôÝóóåñá, áðëþò êïñüéäåøå ôïí åáõôü ôïõ. To FreeBSD ÷ñçóéìïðïéïýóå áêüìá ôç ìïíÜäá SCSI ìçäÝí. ºóùò áõôÞ ç áëëáãÞ óôï BIOS íá ðñïêáëÝóåé ôçí ìåñéêÞ Þ ïëéêÞ öüñôùóç ôïõ êþäéêá Boot Þ êáé ôïõ Loader áðü ôïí åðéëåãìÝíï áðü ôï BIOS äßóêï, áëëÜ üôáí áíáëÜâïõí ôá ðñïãñÜììáôá ïäÞãçóçò ôïõ ðõñÞíá ôïõ FreeBSD ç áñßèìçóç ôïõ BIOS èá áãíïçèåß, êáé ôï FreeBSD èá åðáíÝëèåé óôç öõóéïëïãéêÞ áñßèìçóç ôùí äßóêùí. Óôï ðáñÜäåéãìá ìáò, ôï óýóôçìá óõíÝ÷éóå íá ëåéôïõñãåß óôïí áñ÷éêü SCSI äßóêï ìçäÝí, êáé üëá ôá äåäïìÝíá ôïõ Fred Þôáí åêåß, êáé ü÷é óôïí SCSI äßóêï ôÝóóåñá. Ôï ãåãïíüò üôé ôï óýóôçìá öáéíüôáí íá ëåéôïõñãåß áðü ôï SCSI äßóêï ôÝóóåñá Þôáí áðëþò Ýíá êáôáóêåýáóìá ôçò áíèñþðéíçò ðñïóäïêßáò.

Åßìáóôå åõôõ÷åßò íá áíáêïéíþóïõìå üôé äåí ÷Üèçêáí êáèüëïõ äåäïìÝíá êáôÜ ôçí áíáêÜëõøç ôïõ öáéíïìÝíïõ áõôïý. Ï ðáëéüò SCSI äßóêïò ìçäÝí áíáêôÞèçêå áðü ôï óùñü, êáé üëç ç åñãáóßá ôïõ Fred åðéóôñÜöçêå óå áõôüí (êáé ôþñá ï Bill îÝñåé üôé ìðïñåß íá ìåôñÜåé ùò ôï ìçäÝí).

Áí êáé óôçí éóôïñßá áõôÞ ÷ñçóéìïðïéÞèçêáí ïäçãïß SCSI, ïé áñ÷Ýò éó÷ýïõí åîßóïõ êáé ãéá ïäçãïýò IDE.

2.6.2 Äçìéïõñãþíôáò Slices ìå ×ñÞóç ôçò FDisk

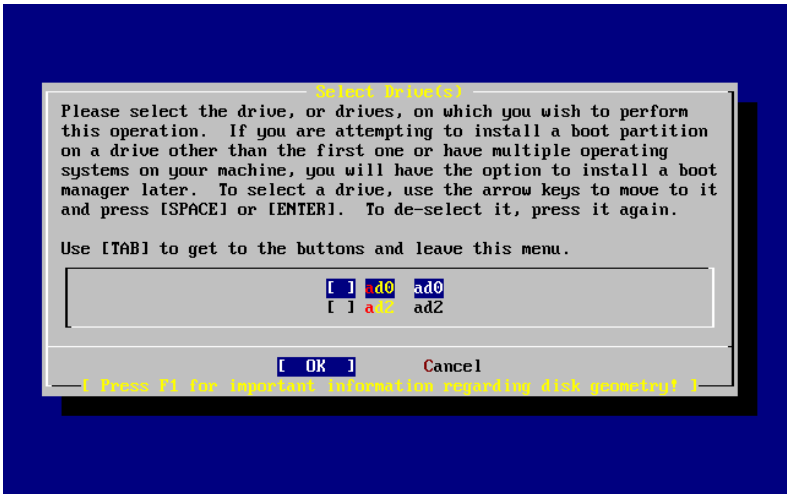
> **Óçìåßùóç:** ÊáìéÜ áëëáãÞ ðïõ èá êÜíåôå óå áõôü ôï óçìåßï äåí èá ãñáöåß óôï äßóêï. Áí íïìßæåôå üôé êÜíáôå êÜðïéï ëÜèïò êáé èÝëåôå íá îåêéíÞóåôå îáíÜ áðü ôçí áñ÷Þ, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá ìåíïý ãéá íá âãåßôå áðü ôï **sysinstall** êáé íá îåêéíÜóåôå îáíÜ Þ ðéÝóôå ôï **U** ãéá íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ Undo. Áí ìðåñäåõôåßôå êáé äåí ìðïñåßôå íá äåßôå ðùò íá âãåßôå, ìðïñåßôå ðÜíôá áðëÜ íá åðáíåêêéíÞóåôå ôïí õðïëïãéóôÞ óáò.

Áöïý åðéëÝîåôå íá îåêéíÞóåôå ìéá ôõðéêÞ åãêáôÜóôáóç (standard installation) óôï **sysinstall** èá äåßôå ôï ðáñáêÜôù ìÞíõìá:

```
                              Message
 In the next menu, you will need to set up a DOS-style ("fdisk")
 partitioning scheme for your hard disk. If you simply wish to devote
 all disk space to FreeBSD (overwriting anything else that might be on
 the disk(s) selected) then use the (A)ll command to select the default
 partitioning scheme followed by a (Q)uit. If you wish to allocate only
 free space to FreeBSD, move to a partition marked "unused" and use the
 (C)reate command.
                             [  OK  ]

                       [ Press enter or space ]
```

ÐéÝóôå **Enter** óýìöùíá ìå ôéò ïäçãßåò. Èá äåßôå ôüôå ìéá ëßóôá ìå üëïõò ôïõò óêëçñïýò äßóêïõò ðïõ áíß÷íåõóå ï ðõñÞíáò êáôÜ ôç äéÜñêåéá ôçò áíß÷íåõóçò óõóêåõþí. Óôï Ó÷Þìá 2-13 öáßíåôáé Ýíá ðáñÜäåéãìá áðü Ýíá óýóôçìá ìå äýï äßóêïõò IDE. ¸÷ïõí ôá ïíüìáôá `ad0` êáé `ad2`.

Ó÷Þìá 2-13. ÅðéëÝîôå Äßóêï ãéá ôçí FDisk



Select Drive(s)

Please select the drive, or drives, on which you wish to perform this operation. If you are attempting to install a boot partition on a drive other than the first one or have multiple operating systems on your machine, you will have the option to install a boot manager later. To select a drive, use the arrow keys to move to it and press [SPACE] or [ENTER]. To de-select it, press it again.

Use [TAB] to get to the buttons and leave this menu.

[ ] ad0 ad0
[ ] ad2 ad2

[OK]
Cancel
[Press F1 for important information regarding disk geometry!]

ºóùò íá áíáñùôéÝóôå ãéáôß äåí õðÜñ÷åé åäþ óõóêåõÞ ìå üíïìá `ad1`. Ôé åßíáé áõôü ðïõ ëåßðåé;

Óêåöôåßôå ôé èá ãéíüôáí áí åß÷áôå äýï IDE äßóêïõò, Ýíá ùò master óôï ðñþôï IDE åëåãêôÞ, êáé Ýíá ùò master óôï äåýôåñï IDE åëåãêôÞ. Áí ôï FreeBSD ôïõò áñéèìïýóå üðùò ôïõò Ýâñéóêå, äçë. ùò `ad0` êáé `ad1` üëá èá ëåéôïõñãïýóáí êáíïíéêÜ.

Áí üìùò ðñïóèÝôáìå ìåôÜ Ýíá ôñßôï äßóêï, ùò óõóêåõÞ slave óôïí ðñþôï IDE åëåãêôÞ, áõôÞ èá ãéíüôáí ðëÝïí `ad1`, êáé ç ðñïçãïýìåíç `ad1` èá ãéíüôáí `ad2`. ÅðåéäÞ ôá ïíüìáôá ôùí óõóêåõþí (üðùò `ad1s1a`) ÷ñçóéìïðïéïýíôáé ãéá ôçí åýñåóç ôùí óõóôçìÜôùí áñ÷åßùí, ìðïñåß íá áíáêáëýøåôå îáöíéêÜ üôé êÜðïéá áðü ôá óõóôÞìáôá áñ÷åßùí óáò äåí åìöáíßæïíôáé êáíïíéêÜ êáé ðñÝðåé íá áëëÜîåôå ôçí ñýèìéóç ôïõ FreeBSD óáò.

Ãéá íá îåðåñÜóåôå ôï ðñüâëçìá áõôü, ï ðõñÞíáò ìðïñåß íá ñõèìéóôåß íá ïíïìÜæåé ôïõò äßóêïõò IDE áíÜëïãá ìå ôçí èÝóç ôïõò, êáé ü÷é ìå ôç óåéñÜ ìå ôçí ïðïßá áíé÷íåýïíôáé. Ìå ôïí ôñüðï áõôü, ï master äßóêïò óôï äåýôåñï IDE åëåãêôÞ èá åßíáé *ðÜíôá*, `ad2`, áêüìá êáé áí äåí õðÜñ÷ïõí óõóêåõÝò `ad0` Þ `ad1`.

Ç ñýèìéóç áõôÞ åßíáé êáé ç ðñïåðéëåãìÝíç ãéá ôïí ðõñÞíá ôïõ FreeBSD, êáé ãéá ôï ëüãï áõôü ç ïèüíç äåß÷íåé `ad0` êáé `ad2`. Ôï ìç÷Üíçìá áðü ôï ïðïßï ëÞöèçêå ç åéêüíá åß÷å äßóêïõò master êáé óôïõò äýï åëåãêôÝò IDE, åíþ äåí åß÷å êáíÝíá äßóêï slave.

ÐñÝðåé íá åðéëÝîåôå ôï äßóêï óôïí ïðïßï èá ãßíåé ç åãêáôÜóôáóç ôïõ FreeBSD êáé íá ðéÝóåôå [OK]. Ôï **FDisk** èá îåêéíÞóåé, ìå ïèüíç áíôßóôïé÷ç ìå áõôÞ ðïõ öáßíåôáé óôï Ó÷Þìá 2-14.

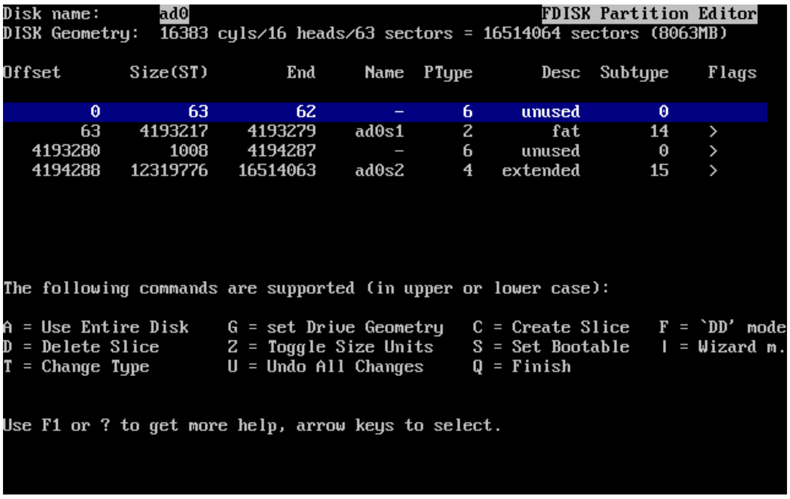
Ç ïèüíç ôïõ **FDisk** åßíáé ÷ùñéóìÝíç óå ôñßá ôìÞìáôá.

Ôï ðñþôï ôìÞìá, ôï ïðïßï êáëýðôåé ôéò äýï ðñþôåò ãñáììÝò ôçò ïèüíçò, äåß÷íåé ëåðôïìÝñåéåò ãéá ôïí åðéëåãìÝíï äßóêï, ðïõ ðåñéëáìâÜíïõí ôï üíïìá ôïõ óôï FreeBSD, ôç ãåùìåôñßá ôïõ, êáé ôï óõíïëéêü ìÝãåèïò ôïõ.

Ôï äåýôåñï ôìÞìá äåß÷íåé ôá slices ôá ïðïßá õðÜñ÷ïõí óôï äßóêï ôç äåäïìÝíç óôéãìÞ, ôá óçìåßá óôá ïðïßá îåêéíïýí êáé ôåëåéþíïõí, ðüóï ìåãÜëá åßíáé, ôçí ïíïìáóßá ðïõ Ý÷ïõí óôï FreeBSD êáé ôçí ðåñéãñáöÞ ôïõò êáé ôïí ôýðï ôïõò. Ôï ðáñÜäåéãìá áõôü äåß÷íåé äýï ìéêñÜ á÷ñçóéìïðïßçôá slices, ôá ïðïßá åßíáé ðáñåíÝñãåéåò ôïõ ôñüðïõ äéÜôáîçò ôùí äßóêùí óôá PC. Äåß÷íåé åðßóçò Ýíá ìåãÜëï FAT slice, ôï ïðïßï óßãïõñá åìöáíßæåôáé ùò `C:` óôá MS-DOS êáé Windows, êáèþò êáé ìéá åêôåôáìÝíç êáôÜôìçóç ç ïðïßá ìðïñåß íá ðåñéÝ÷åé êáé Üëëá ãñÜììáôá ïäçãþí ãéá ôï MS-DOS Þ ôá Windows.

Ôï ôñßôï ôìÞìá, äåß÷íåé ôéò åíôïëÝò ðïõ åßíáé äéáèÝóéìåò óôçí **FDisk**.

Ó÷Þìá 2-14. ÔõðéêÝò Fdisk ÊáôáôìÞóåéò ðñéí ôçí Åðåîåñãáóßá



```
Disk name:      ad0                               FDISK Partition Editor
DISK Geometry:  16383 cyls/16 heads/63 sectors = 16514064 sectors (8063MB)

Offset       Size(ST)        End     Name  PType       Desc  Subtype    Flags

         0         63         62        -      6     unused        0
        63    4193217    4193279    ad0s1      2        fat       14    >
   4193280       1008    4194287        -      6     unused        0    >
   4194288   12319776   16514063    ad0s2      4   extended       15    >




The following commands are supported (in upper or lower case):

A = Use Entire Disk    G = set Drive Geometry   C = Create Slice     F = `DD' mode
D = Delete Slice       Z = Toggle Size Units    S = Set Bootable     | = Wizard m.
T = Change Type        U = Undo All Changes     Q = Finish


Use F1 or ? to get more help, arrow keys to select.
```

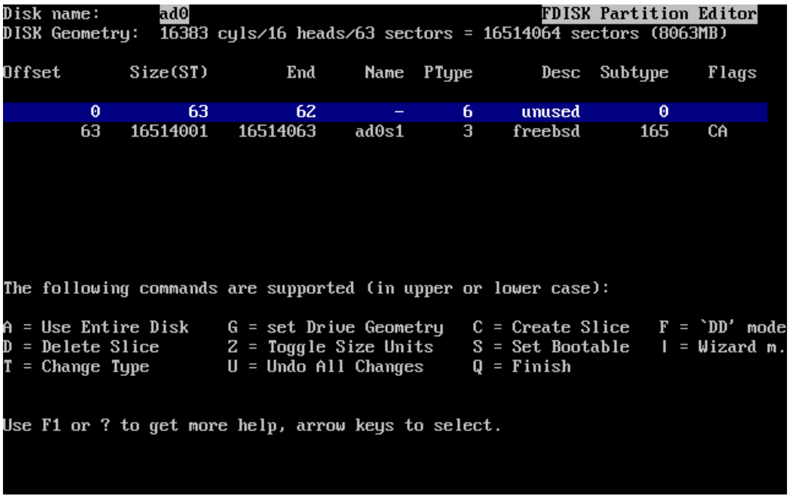
Ôï ôé èá êÜíåôå ôþñá åîáñôÜôáé áðü ôï ðùò èÝëåôå íá ÷ùñßóåôå ôï äßóêï óáò.

Áí èÝëåôå ôï FreeBSD íá ÷ñçóéìïðïéÞóåé üëï ôï äßóêï óáò (óâÞíïíôáò Ýôóé üëá ôá Üëëá äåäïìÝíá áðü áõôüí, üôáí åðéâåâáéþóåôå áñãüôåñá óôçí åãêáôÜóôáóç üôé èÝëåôå ôï **sysinstall** íá ðñï÷ùñÞóåé) ìðïñåßôå áðëþò íá ðéÝóåôå **A** ôï ïðïßï áíôéóôïé÷åß ìå ôçí åðéëïãÞ Use Entire Disk (×ñÞóç ïëüêëçñïõ ôïõ äßóêïõ). Ïé õðÜñ÷ïõóåò êáôáôìÞóåéò èá äéáãñáöïýí, êáé èá áíôéêáôáóôáèïýí ìå ìéá ìéêñÞ ðåñéï÷Þ ìáñêáñéóìÝíç ùò `unused (á÷ñçóéìïðïßçôç)` (îáíÜ, ìéá ðáñåíÝñãåéá ôùí äéáôÜîåùí äßóêïõ óôï PC) êáé ìå Ýíá ìåãÜëï slice ãéá ôï FreeBSD. Áí ôï êÜíåôå áõôü, èá ðñÝðåé íá åðéëÝîåôå ìå ôá âåëÜêéá ôï íÝï FreeBSD slice êáé íá ôï ìáñêÜñåôå ùò åêêéíÞóéìï (bootable) ðéÝæïíôáò ôï ðëÞêôñï **S**. Ç ïèüíç óáò èá åßíáé áñêåôÜ ðáñüìïéá ìå ôçí Ó÷Þìá 2-15. ÐáñáôçñÞóôå ôï `A` óôçí óôÞëç `Flags`, ôï ïðïßï äåß÷íåé üôé ôï slice åßíáé *active (åíåñãü)*, êáé ðñüêåéôáé íá åßíáé åêêßíçóç áðü áõôü.

Áí ðñüêåéôáé íá äéáãñÜøåôå Ýíá õðÜñ÷ïí slice ãéá íá äçìéïõñãÞóåôå ÷þñï ãéá ôï FreeBSD, èá ðñÝðåé íá åðéëÝîåôå ôï slice ìå ôá âåëÜêéá, êáé íá ðéÝóåôå **D**. Ìðïñåßôå êáôüðéí íá ðéÝóåôå **C**, êáé èá åñùôçèåßôå ãéá ôï ìÝãåèïò ôïõ slice ðïõ èÝëåôå íá äçìéïõñãÞóåôå. Ç ðñïåðéëåãìÝíç ôéìÞ óôï äéÜëïãï áíôéðñïóùðåýåé ôï ìÝãéóôï äõíáôü slice ðïõ ìðïñåßôå íá äçìéïõñãÞóåôå, ôï ïðïßï ìðïñåß íá åßíáé ôï ìÝãéóôï óõíå÷üìåíï ìðëïê åëåýèåñïõ ÷þñïõ Þ ôï ìÝãåèïò ïëüêëçñïõ ôïõ äßóêïõ.

Áí Ý÷åôå Þäç äçìéïõñãÞóåé ÷þñï ãéá ôï FreeBSD (ßóùò ìå ôç ÷ñÞóç êÜðïéïõ åñãáëåßïõ üðùò ôï **PartitionMagic**) ìðïñåßôå íá ðéÝóåôå **C** ãéá íá äçìéïõñãÞóåôå íÝï slice. Èá åñùôçèåßôå êáé ðÜëé ãéá ôï ìÝãåèïò ôïõ slice ðïõ èÝëåôå íá äçìéïõñãÞóåôå.

Ó÷Þìá 2-15. ÊáôÜôìçóç Fdisk ðïõ ×ñçóéìïðïéåß Ïëüêëçñï ôï Äßóêï



```
Disk name:      ad0                                 FDISK Partition Editor
DISK Geometry:  16383 cyls/16 heads/63 sectors = 16514064 sectors (8063MB)

Offset       Size(ST)        End     Name  PType       Desc  Subtype    Flags

         0         63         62        -      6     unused        0
        63   16514001   16514063    ad0s1      3    freebsd      165    CA





The following commands are supported (in upper or lower case):

A = Use Entire Disk    G = set Drive Geometry   C = Create Slice    F = `DD' mode
D = Delete Slice       Z = Toggle Size Units    S = Set Bootable    | = Wizard m.
T = Change Type        U = Undo All Changes     Q = Finish

Use F1 or ? to get more help, arrow keys to select.
```

¼ôáí ôåëåéþóåôå, ðéÝóôå **Q**. Ïé áëëáãÝò óáò èá áðïèçêåõôïýí óôï **sysinstall**, áëëÜ äåí èá ãñáöôïýí áêüìá óôï äßóêï.

2.6.3 ÅãêáôÜóôáóç Äéá÷åéñéóôÞ Åêêßíçóçò (Boot Manager)

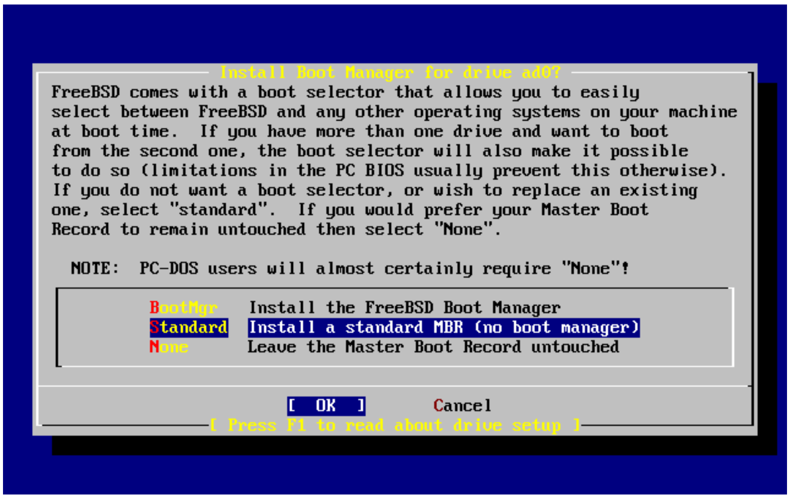
¸÷åôå ôþñá ôçí åðéëïãÞ íá åãêáôáóôÞóåôå äéá÷åéñéóôÞ åêêßíçóçò (boot manager). Óå ãåíéêÝò ãñáììÝò èá ðñÝðåé íá åðéëÝîåôå íá åãêáôáóôÞóåôå ôï äéá÷åéñéóôÞ åêêßíçóçò ôïõ FreeBSD áí:

- ¸÷åôå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò, êáé Ý÷åôå åðéëÝîåé íá åãêáôáóôÞóåôå ôï FreeBSD óå äßóêï ðïõ äåí åßíáé ï ðñþôïò.
- ¸÷åôå åãêáôáóôÞóåé ôï FreeBSD ìáæß ìå Ýíá Üëëï ëåéôïõñãéêü óýóôçìá óôïí ßäéï äßóêï, êáé èÝëåôå íá ìðïñåßôå íá åðéëÝãåôå áí èá îåêéíÞóåôå ôï FreeBSD Þ ôï Üëëï ëåéôïõñãéêü, üôáí îåêéíÜôå ôïí õðïëïãéóôÞ óáò.

Áí ôï FreeBSD ðñüêåéôáé íá åßíáé ôï ìïíáäéêü ëåéôïõñãéêü óýóôçìá óôïí õðïëïãéóôÞ óáò, êáé åßíáé åãêáôåóôçìÝíï óôïí ðñþôï óêëçñü äßóêï, ôüôå åßíáé åðáñêÞò ï Standard äéá÷åéñéóôÞò åêêßíçóçò. ÅðéëÝîôå None áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå äéá÷åéñéóôÞ åêêßíçóçò ôñßôïõ êáôáóêåõáóôÞ, ï ïðïßïò åßíáé éêáíüò íá åêêéíÞóåé ôï FreeBSD.

ÊÜíôå ôçí åðéëïãÞ óáò êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-16. Ôï ìåíïý Boot Manager ôïõ Sysinstall



```
Install Boot Manager for drive ad0?
FreeBSD comes with a boot selector that allows you to easily
select between FreeBSD and any other operating systems on your machine
at boot time.  If you have more than one drive and want to boot
from the second one, the boot selector will also make it possible
to do so (limitations in the PC BIOS usually prevent this otherwise).
If you do not want a boot selector, or wish to replace an existing
one, select "standard".  If you would prefer your Master Boot
Record to remain untouched then select "None".

  NOTE:  PC-DOS users will almost certainly require "None"!

          BootMgr   Install the FreeBSD Boot Manager
          Standard  Install a standard MBR (no boot manager)
          None      Leave the Master Boot Record untouched

                      [  OK  ]      Cancel
                [ Press F1 to read about drive setup ]
```

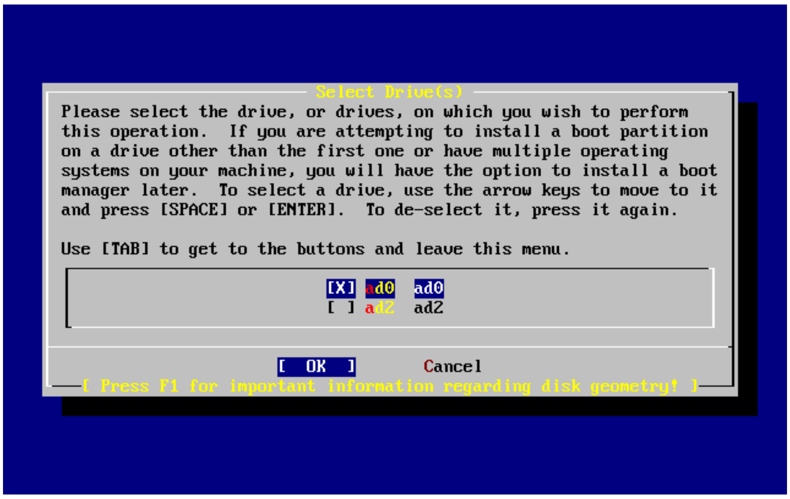
Ç ïèüíç âïÞèåéáò, óôçí ïðïßá Ý÷åôå ðñüóâáóç ðéÝæïíôáò ôï **F1**, óõæçôÜ ôá ðñïâëÞìáôá ôá ïðïßá åíäå÷ïìÝíùò èá áíôéìåôùðßóåôå üôáí åðé÷åéñÞóåôå íá ÷ñçóéìïðïéÞóåôå ôïí ßäéï äßóêï óå ðåñéóóüôåñá áðü Ýíá ëåéôïõñãéêÜ óõóôÞìáôá.

2.6.4 Äçìéïõñãþíôáò Slices óå ¸íá ¶ëëï Äßóêï

Áí õðÜñ÷ïõí ðåñéóóüôåñïé áðü Ýíáò äßóêïé, èá åðéóôñÝøåôå óôçí ïèüíç åðéëïãÞò äßóêùí (Select Driver) áìÝóùò ìåôÜ ôçí åðéëïãÞ ôïõ äéá÷åéñéóôÞ åêêßíçóçò. Áí èÝëåôå íá åãêáôáóôÞóåôå ôï FreeBSD óå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò, ìðïñåßôå åäþ íá åðéëÝîåôå Ýíá Üëëï äßóêï êáé íá åðáíáëÜâåôå ôçí äéáäéêáóßá êáôÜôìçóçò ìå ôçí ÷ñÞóç ôïõ **FDisk**.

> **Óçìáíôéêü:** Áí åãêáèéóôÜôå ôï FreeBSD óå ïðïéïäÞðïôå äßóêï åêôüò áðü ôïí ðñþôï èá ðñÝðåé íá åãêáôáóôÞóåôå ôï äéá÷åéñéóôÞ åêêßíçóçò ôïõ FreeBSD êáé óôïõò äýï äßóêïõò.

Ó÷Þìá 2-17. ¸îïäïò áðü ôçí ÅðéëïãÞ Äßóêùí (Select Drive)



```
Select Drive(s)
Please select the drive, or drives, on which you wish to perform
this operation.  If you are attempting to install a boot partition
on a drive other than the first one or have multiple operating
systems on your machine, you will have the option to install a boot
manager later.  To select a drive, use the arrow keys to move to it
and press [SPACE] or [ENTER].  To de-select it, press it again.

Use [TAB] to get to the buttons and leave this menu.

                    [X] ad0   ad0
                    [ ] ad2   ad2

              [  OK  ]        Cancel
[ Press F1 for important information regarding disk geometry! ]
```

Ôï ðëÞêôñï **Tab** åíáëëÜóóåé ìåôáîý ôïõ ôåëåõôáßïõ åðéëåãìÝíïõ äßóêïõ, ôïõ [OK], êáé ôïõ [Cancel].

ÐéÝóôå ìéá öïñÜ ôï **Tab** ãéá íá ìåôáöåñèåßôå óôï [OK], ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ôçí åãêáôÜóôáóç.

2.6.5 Äçìéïõñãþíôáò ÊáôáôìÞóåéò (Partitions) ìå ×ñÞóç ôïõ Disklabel

ÐñÝðåé ôþñá íá äçìéïõñãÞóåôå êáôáôìÞóåéò ìÝóá óå êÜèå slice ðïõ äçìéïõñãÞóáôå. Èõìçèåßôå üôé ïé êáôáôìÞóåéò ÷áñáêôçñßæïíôáé áðü ãñÜììáôá áðü a ùò h, êáé üôé ïé êáôáôìÞóåéò b, c, êáé d Ý÷ïõí ôõðïðïéçìÝíç óçìáóßá ôçí ïðïßá ðñÝðåé íá áêïëïõèÞóåôå.

ÊÜðïéåò åöáñìïãÝò ìðïñåß íá ùöåëçèïýí áðü óõãêåêñéìÝíï ôñüðï êáôÜôìçóçò, åéäéêÜ áí ðñüêåéôáé íá äçìéïõñãÞóåôå êáôáôìÞóåéò óå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò. Ùóôüóï, ãéá áõôÞ ôçí ðñþôç óáò åãêáôÜóôáóç ôïõ FreeBSD äåí ÷ñåéÜæåôáé íá åßóôå ôüóï ó÷ïëáóôéêïß óôçí êáôÜôìçóç ôïõ äßóêïõ óáò. Åßíáé ðéï óçìáíôéêü íá åãêáôáóôÞóåôå ôï FreeBSD êáé íá ìÜèåôå íá ôï ÷ñçóéìïðïéåßôå. Ìðïñåßôå ðÜíôá íá åðáíåãêáôáóôÞóåôå ôï FreeBSD áëëÜæïíôáò ôïí ôñüðï êáôÜôìçóçò, üôáí ðëÝïí èá åßóôå ðéï åîïéêåéùìÝíïò ìå ôï ëåéôïõñãéêü óýóôçìá.

Ï ôñüðïò áõôüò ÷ñçóéìïðïéåß ôÝóóåñéò êáôáôìÞóåéò—ìéá ãéá ÷þñï swap, êáé ôñåéò ãéá óõóôÞìáôá áñ÷åßùí.

Ðßíáêáò 2-2. ÄéÜôáîç ÊáôáôìÞóåùí ãéá ôïí Ðñþôï Äßóêï

ÊáôÜôìçóç	Óýóôçìá Áñ÷åßùí	ÌÝãåèïò	ÐåñéãñáöÞ
a	/	1 GB	Ðñüêåéôáé ãéá ôï root óýóôçìá áñ÷åßùí (root filesystem). ¼ëá ôá Üëëá óõóôÞìáôá áñ÷åßùí ðñïóáñôþíôáé óå êÜðïéï óçìåßï êÜôù áðü áõôü. Ôï 1 GB èåùñåßôáé ìéá öõóéïëïãéêÞ ôéìÞ ãéá áõôü ôï óýóôçìá áñ÷åßùí. Äåí ðñüêåéôáé íá âÜëåôå éäéáßôåñá äåäïìÝíá óå áõôü, êáèþò ìéá óõíçèéóìÝíç åãêáôÜóôáóç FreeBSD èá âÜëåé åäþ ðåñßðïõ 128 MB äåäïìÝíùí. Ï ÷þñïò ðïõ áðïìÝíåé ðñïïñßæåôáé ãéá ðñïóùñéíÜ äåäïìÝíá, êáé åðßóçò áöÞíåé ÷þñï åðÝêôáóçò óôçí ðåñßðôùóç ðïõ ïé ìåëëïíôéêÝò åêäüóåéò ôïõ FreeBSD áðáéôïýí ðåñéóóüôåñï ÷þñï óôï /.

ÊáôÜôìçóç	Óýóôçìá Áñ÷åßùí	ÌÝãåèïò	ÐåñéãñáöÞ
b	N/A	2-3 x RAM	Óå áõôÞ ôçí êáôÜôìçóç âñßóêåôáé ï ÷þñïò swap ôïõ óõóôÞìáôïò. Ç åðéëïãÞ óùóôïý ìåãÝèïõò swap ìðïñåß íá èåùñçèåß Ýíá åßäïò ôÝ÷íçò. ¸íáò êáëüò ãåíéêüò êáíüíáò åßíáé ï ÷þñïò áõôüò íá åßíáé äýï Þ ôñåéò öïñÝò ôï ìÝãåèïò ôçò äéáèÝóéìçò öõóéêÞò ìíÞìçò (RAM). Åðßóçò èá ðñÝðåé íá Ý÷åôå ôïõëÜ÷éóôïí 64 MB swap, Ýôóé áí Ý÷åôå ëéãüôåñá áðü 32 MB RAM óôïí õðïëïãéóôÞ óáò, ïñßóôå ôï swap óôá 64 MB. Áí Ý÷åôå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò ìðïñåßôå íá ïñßóåôå ÷þñï swap óå êÜèå äßóêï. Ôï FreeBSD èá ÷ñçóéìïðïéåß ôüôå êÜèå äßóêï ãéá swap, ôï ïðïßï åðéôá÷ýíåé ôç äéáäéêáóßá. Óôçí ðåñßðôùóç áõôÞ, õðïëïãßóôå ôï óõíïëéêü ìÝãåèïò ôïõ swap ðïõ ÷ñåéÜæåóôå (ð.÷. 128 MB) êáé ìïéñÜóôå ôï ìå ôï ðëÞèïò ôùí äßóêùí ðïõ Ý÷åôå (ð.÷., äýï äßóêïé) ãéá íá âñåßôå ôï ìÝãåèïò ôïõ swap ðïõ èá äçìéïõñãÞóåôå óå êÜèå äßóêï, óå áõôü ôï ðáñÜäåéãìá, 64 MB áíÜ äßóêï.
e	`/var`	512 ùò 4096 MB	Ï êáôÜëïãïò `/var` ðåñéÝ÷åé áñ÷åßá ôá ïðïßá óõíå÷þò ìåôáâÜëëïíôáé, üðùò áñ÷åßá êáôáãñáöÞò (log files) êáé Üëëá áñ÷åßá ðïõ Ý÷ïõí íá êÜíïõí ìå äéá÷åéñéóôéêÝò åñãáóßåò. ÐïëëÜ áðü ôá áñ÷åßá áõôÜ äéáâÜæïíôáé êáé ãñÜöïíôáé óõíÝ÷åéá êáôÜ ôçí êáèçìåñéíÞ ÷ñÞóç ôïõ FreeBSD. Ç ôïðïèÝôçóç ôùí áñ÷åßùí áõôþí óå ÷ùñéóôü óýóôçìá áñ÷åßùí åðéôñÝðåé óôï FreeBSD íá âåëôéóôïðïéåß ôçí ðñüóâáóç óå áõôÜ ÷ùñßò íá åðçñåÜæïíôáé áñ÷åßá óå Üëëïõò êáôáëüãïõò ðïõ äåí Ý÷ïõí ðáñüìïéá óõ÷íÞ ðñüóâáóç.
f	`/usr`	Õðüëïéðïò ×þñïò Äßóêïõ (ôïõëÜ÷éóôïí 8 GB)	¼ëá ôá õðüëïéðá áñ÷åßá óáò èá åßíáé ôõðéêÜ áðïèçêåõìÝíá óôï `/usr` êáé ôïõò õðïêáôáëüãïõò ôïõ.

Ðñïåéäïðïßçóç: Ïé ðáñáðÜíù ôéìÝò äßíïíôáé ìüíï ùò õðïäåßãìáôá êáé ðñïïñßæïíôáé ãéá åãêáôáóôÜóåéò áðü ðñï÷ùñçìÝíïõò ÷ñÞóôåò. Óáò óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ôç äõíáôüôçôá áõôüìáôçò êáôÜôìçóçò, ç ïðïßá áíáöÝñåôáé ùò `Auto Defaults` óôïí åðåîåñãáóôÞ êáôáôìÞóåùí ôïõ FreeBSD.

Áí ðñüêåéôáé íá åãêáôáóôÞóåôå ôï FreeBSD óå ðåñéóóüôåñïõò áðü Ýíá äßóêïõò, èá ðñÝðåé íá äçìéïõñãÞóåôå êáôáôìÞóåéò êáé óôá Üëëá slices ðïõ Ý÷åôå äçìéïõñãÞóåé. Ï åõêïëüôåñïò ôñüðïò åßíáé íá äçìéïõñãÞóåôå äýï êáôáôìÞóåéò óå êÜèå äßóêï, ìéá ãéá ôï swap, êáé ìéá ãéá Ýíá óýóôçìá áñ÷åßùí.

Ðßíáêáò 2-3. ÄéÜôáîç ÊáôáôìÞóåùí ãéá ôïõò Õðüëïéðïõò Äßóêïõò

ÊáôÜôìçóç	Óýóôçìá Áñ÷åßùí	ÌÝãåèïò	ÐåñéãñáöÞ

ÊáôÜôìçóç	Óýóôçìá Áñ÷åßùí	ÌÝãåèïò	ÐåñéãñáöÞ
b	N/A	Äåßôå ôçí ðåñéãñáöÞ	¼ðùò Ý÷åé Þäç óõæçôçèåß, ìðïñåßôå íá ÷ùñßóåôå ôï ÷þñï swap áíÜìåóá óå ðïëëïýò äßóêïõò. Áí êáé ç êáôÜôìçóç a åßíáé åëåýèåñç, ç óýìâáóç åðéâÜëëåé ôç ÷ñÞóç ôçò êáôÜôìçóçò b ãéá ôï ÷þñï swap.
e	/disk*n*	Õðüëïéðï ÔìÞìá ôïõ Äßóêïõ	Ôï õðüëïéðï êïììÜôé ôïõ äßóêïõ êáôáëáìâÜíåôáé áðü ìéá ìåãÜëç êáôÜôìçóç. Ìðïñåßôå åýêïëá íá ôçí âÜëåôå óôçí êáôÜôìçóç a áíôß ãéá ôçí e. Ùóôüóï, ç óýìâáóç ïñßæåé üôé ç êáôÜôìçóç a óå Ýíá slice äåóìåýåôáé ãéá ôï óýóôçìá áñ÷åßùí root (/). Äåí åßóôå õðï÷ñåùìÝíïé íá áêïëïõèÞóåôå áõôÞ ôç óýìâáóç, áëëÜ ôï **sysinstall** ôçí áêïëïõèåß, ïðüôå áí ôçí áêïëïõèÞóåôå êáé åóåßò ç åãêáôÜóôáóç èá åßíáé ðéï êáèáñÞ. Ìðïñåßôå íá ðñïóáñôÞóåôå áõôü ôï óýóôçìá áñ÷åßùí üðïõ èÝëåôå. Óôï ðáñÜäåéãìá ìáò, ç ðñïóÜñôçóç ãßíåôáé óôïõò êáôáëüãïõò `/disk`*n* , üðïõ ôï *n* åßíáé Ýíáò áñéèìüò ðïõ áëëÜæåé ãéá êÜèå äßóêï. ÁëëÜ ìðïñåßôå, áí ðñïôéìÜôå, íá ïñßóåôå äéêÞ óáò äéÜôáîç.

¸÷ïíôáò áðïöáóßóåé ôçí äéÜôáîç ôùí êáôáôìÞóåùí óáò, ìðïñåßôå ôþñá íá ôçí äçìéïõñãÞóåôå ÷ñçóéìïðïéþíôáò ôï **sysinstall**. Èá äåßôå ôï ðáñáêÜôù ìÞíõìá:

```
                            Message
Now, you need to create BSD partitions inside of the fdisk
partition(s) just created. If you have a reasonable amount of disk
space (1GB or more) and don’t have any special requirements, simply
use the (A)uto command to allocate space automatically. If you have
more specific needs or just don’t care for the layout chosen by
(A)uto, press F1 for more information on manual layout.

                           [  OK  ]
                     [ Press enter or space ]
```

ÐéÝóôå **Enter** ãéá íá îåêéíÞóåôå ôïí åðåîåñãáóôÞ êáôáôìÞóåùí ôïõ FreeBSD, ðïõ ïíïìÜæåôáé **Disklabel**.

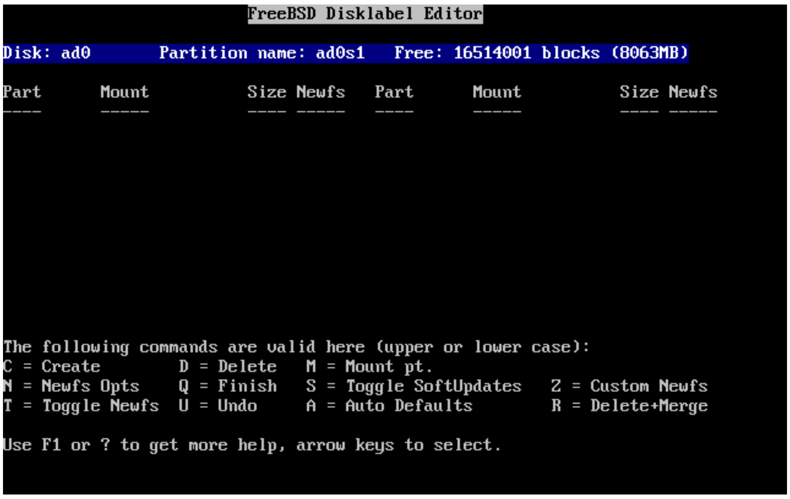
Ôï Ó÷Þìá 2-18 äåß÷íåé ôçí ïèüíç üôáí îåêéíÞóåôå ãéá ðñþôç öïñÜ ôï **Disklabel**. Ç ïèüíç ÷ùñßæåôáé óå ôñßá ôìÞìáôá.

Ïé ðñþôåò ãñáììÝò äåß÷íïõí ôï üíïìá ôïõ äßóêïõ óôïí ïðïßï äïõëåýåôå, êáé ôï slice ðïõ ðåñéÝ÷åé ôéò êáôáôìÞóåéò ðïõ äçìéïõñãåßôå (óôï óçìåßï áõôü ôï **Disklabel** ôéò ïíïìÜæåé `Partition name` áíôß ãéá ôï üíïìá ôïõ slice). Ç ïèüíç åðßóçò äåß÷íåé ôçí ðïóüôçôá åëåýèåñïõ ÷þñïõ ìÝóá óôï slice, äçë. ôï ÷þñï ðïõ Ý÷åé êñáôçèåß ìÝóá óôï slice áëëÜ äåí Ý÷åé áðïäïèåß áêüìá óå êÜðïéá êáôÜôìçóç.

Ôï ìÝóï ôçò ïèüíçò äåß÷íåé ôéò êáôáôìÞóåéò ðïõ Ý÷ïõí äçìéïõñãçèåß, ôï üíïìá ôïõ óõóôÞìáôïò áñ÷åßùí ðïõ ðåñéÝ÷åé êÜèå êáôÜôìçóç, ôï ìÝãåèïò ôïõò, êáé êÜðïéåò åðéëïãÝò ðïõ ó÷åôßæïíôáé ìå ôç äçìéïõñãßá ôïõ óõóôÞìáôïò áñ÷åßùí.

Ôï êÜôù ìÝñïò ôçò ïèüíçò äåß÷íåé ôá ðëÞêôñá ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå óôï **Disklabel**.

Ó÷Þìá 2-18. ÅðåîåñãáóôÞò Disklabel ôïõ Sysinstall

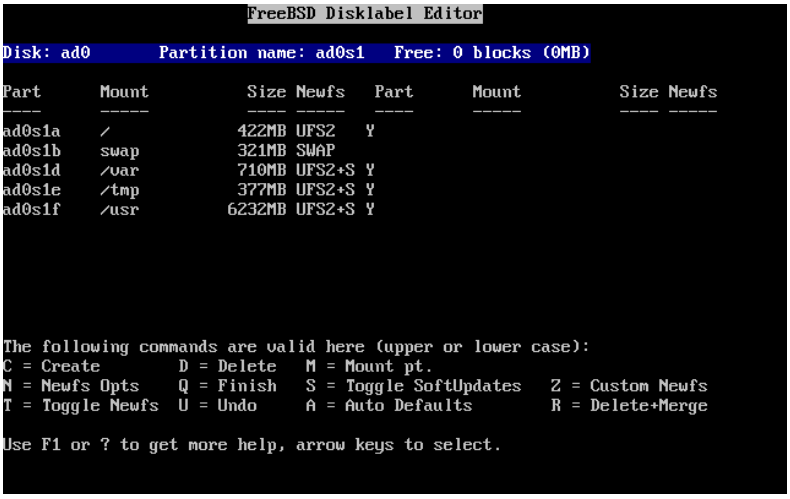


```
                          FreeBSD Disklabel Editor

Disk: ad0       Partition name: ad0s1   Free: 16514001 blocks (8063MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----












The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

Ôï **Disklabel** ìðïñåß íá äçìéïõñãÞóåé áõôüìáôá êáôáôìÞóåéò ãéá åóÜò, êáé íá ôïõò áðïäþóåé ðñïåðéëåãìÝíåò ôéìÝò. Ïé ðñïåðéëåãìÝíåò ôéìÝò õðïëïãßæïíôáé ìå ôçí âïÞèåéá åíüò åóùìáôùìÝíïõ áëãïñßèìïõ êáèïñéóìïý ìåãåèþí, ï ïðïßïò áðïöáóßæåé ìå âÜóç ôï ìÝãåèïò ôïõ äßóêïõ. ÄïêéìÜóôå ôï ôþñá ðéÝæïíôáò ôï **A**. Èá äåßôå ìéá ïèüíç üìïéá ìå áõôÞí óôï Ó÷Þìá 2-19. ÁíÜëïãá ìå ôï ìÝãåèïò ôïõ äßóêïõ ðïõ ÷ñçóéìïðïéåßôå, ïé ðñïåðéëåãìÝíåò ôéìÝò ìðïñåß íá åßíáé Þ êáé íá ìçí åßíáé êáôÜëëçëåò. Áõôü äåí Ý÷åé óçìáóßá, ãéáôß äåí ÷ñåéÜæåôáé íá ôéò áðïäå÷èåßôå.

> **Óçìåßùóç:** Ï ðñïåðéëåãìÝíïò ôñüðïò êáôÜôìçóçò áðïäßäåé óôïí êáôÜëïãï `/tmp` ôçí äéêÞ ôïõ êáôÜôìçóç áíôß íá ôïí êáèéóôÜ ìÝñïò ôçò êáôÜôìçóçò `/`. Áõôü âïçèÜåé óôçí áðïöõãÞ ðëÞñùóçò ôçò êáôÜôìçóçò `/` ìå ðñïóùñéíÜ áñ÷åßá.

Ó÷Þìá 2-19. Ï ÅðåîåñãáóôÞò ÊáôáôìÞóåùí Disklabel ôïõ Sysinstall ìå ôéò Áõôüìáôåò ÐñïåðéëïãÝò

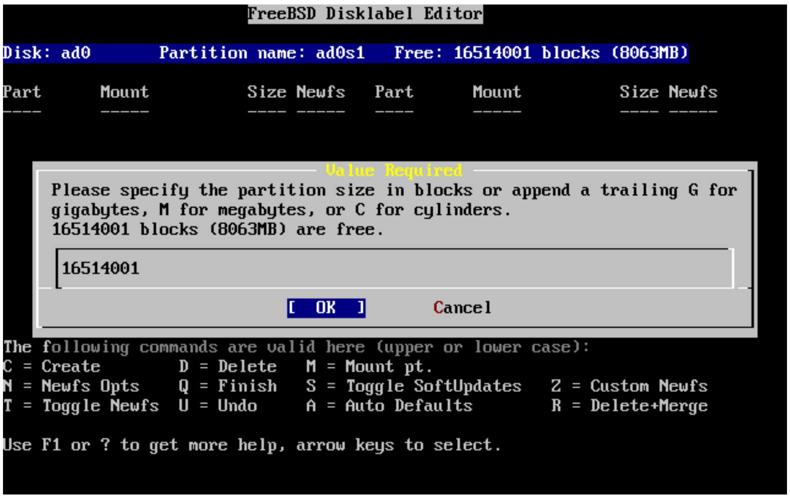


```
                          FreeBSD Disklabel Editor

Disk: ad0       Partition name: ad0s1   Free: 0 blocks (0MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----
ad0s1a    /             422MB UFS2    Y
ad0s1b    swap          321MB SWAP
ad0s1d    /var          710MB UFS2+S Y
ad0s1e    /tmp          377MB UFS2+S Y
ad0s1f    /usr         6232MB UFS2+S Y







The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

Áí åðéëÝîåôå íá ìç ÷ñçóéìïðïéÞóåôå ôéò ðñïåðéëåãìÝíåò êáôáôìÞóåéò êáé èÝëåôå íá ôéò áíôéêáôáóôÞóåôå ìå ôéò äéêÝò óáò, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå ôçí ðñþôç êáôÜôìçóç êáé ðéÝóôå **D** ãéá íá ôç óâÞóåôå. ÅðáíáëÜâåôå ãéá íá óâÞóåôå üëåò ôéò ðñïôåéíüìåíåò êáôáôìÞóåéò.

Ãéá íá äçìéïõñãÞóåôå ôçí ðñþôç êáôÜôìçóç (`a`, (ç ïðïßá ðñïóáñôÜôáé ùò `/` — root), âåâáéùèåßôå üôé Ý÷åôå åðéëÝîåé ôï óùóôü slice óôï ðÜíù ìÝñïò ôçò ïèüíçò, êáé ðéÝóôå **C**. Èá åìöáíéóôåß Ýíá ðëáßóéï äéáëüãïõ ãéá íá åéóÜãåôå ôï ìÝãåèïò ôçò íÝáò êáôÜôìçóçò (üðùò öáßíåôáé óôï Ó÷Þìá 2-20). Ìðïñåßôå íá åéóÜãåôå ôï ìÝãåèïò ùò ôïí áñéèìü ìðëïê ôïõ äßóêïõ ðïõ èÝëåôå íá ÷ñçóéìïðïéÞóåôå Þ ùò áñéèìü áêïëïõèïýìåíï áðü `M` ãéá megabytes, `G` ãéá gigabytes, Þ `C` ãéá êõëßíäñïõò.

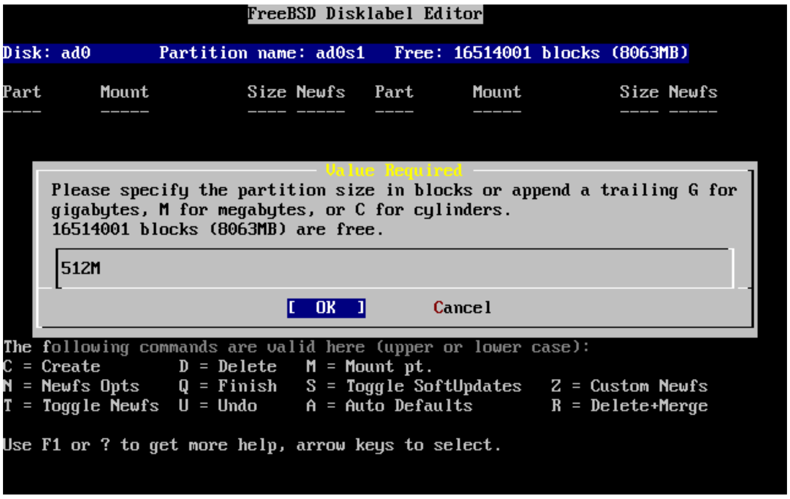
Ó÷Þìá 2-20. Åëåýèåñïò ×þñïò ãéá ôçí ÊáôÜôìçóç Root



```
                          FreeBSD Disklabel Editor

Disk: ad0         Partition name: ad0s1    Free: 16514001 blocks (8063MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----



   ---------------------------- Value Required ----------------------------
     Please specify the partition size in blocks or append a trailing G for
     gigabytes, M for megabytes, or C for cylinders.
     16514001 blocks (8063MB) are free.

     16514001

                          [  OK  ]          Cancel

The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

Ôï ðñïåðéëåãìÝíï ìÝãåèïò ðïõ öáßíåôáé èá äçìéïõñãÞóåé ìéá êáôÜôìçóç ðïõ êáôáëáìâÜíåé üëï ôïí õðüëïéðï åëåýèåñï ÷þñï ôïõ slice. Áí ÷ñçóéìïðïéåßôå ôá ìåãÝèç ôùí êáôáôìÞóåùí ðïõ ðåñéãñÜøáìå óôï ðñïçãïýìåíï ðáñÜäåéãìá, óâÞóôå ôïí áñéèìü ðïõ öáßíåôáé ìå ôï **Backspace**, êáé ðëçêôñïëïãÞóôå **`512M`**, üðùò öáßíåôáé óôï Ó÷Þìá 2-21. Êáôüðéí ðéÝóôå [OK].

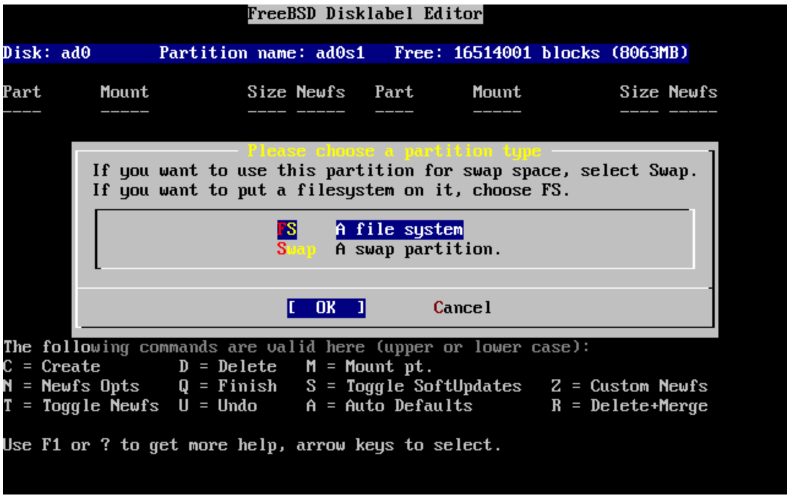
Ó÷Þìá 2-21. Åðåîåñãáóßá ÌåãÝèïõò ôçò ÊáôÜôìçóçò Root



```
                          FreeBSD Disklabel Editor

Disk: ad0         Partition name: ad0s1    Free: 16514001 blocks (8063MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----



   ---------------------------- Value Required ----------------------------
     Please specify the partition size in blocks or append a trailing G for
     gigabytes, M for megabytes, or C for cylinders.
     16514001 blocks (8063MB) are free.

     512M

                          [  OK  ]          Cancel

The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

¸÷ïíôáò åðéëÝîåé ôï ìÝãåèïò ôçò êáôÜôìçóçò, èá åñùôçèåßôå êáôüðéí ãéá ôï áí ç êáôÜôìçóç èá ðåñéÝ÷åé êÜðïéï óýóôçìá áñ÷åßùí, Þ èá ãßíåé ÷þñïò swap. Ï äéÜëïãïò öáßíåôáé óôï Ó÷Þìá 2-22. Ç ðñþôç áõôÞ êáôÜôìçóç èá ðåñéÝ÷åé óýóôçìá áñ÷åßùí, ãéá áõôü åðéëÝîôå üôé åßíáé åðéëåãìÝíï ôï FS êáé ðéÝóôå **Enter**.

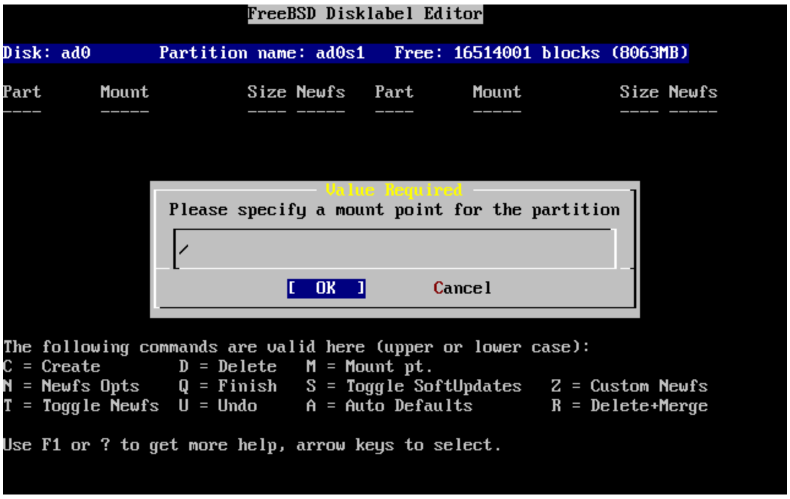
Ó÷Þìá 2-22. ÅðéëÝîôå ôïí Ôýðï ôçò ÊáôÜôìçóçò Root



```
                         FreeBSD Disklabel Editor

Disk: ad0       Partition name: ad0s1   Free: 16514001 blocks (8063MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----

       ┌──────────── Please choose a partition type ─────────────┐
       │ If you want to use this partition for swap space, select Swap.
       │ If you want to put a filesystem on it, choose FS.
       │ ┌─────────────────────────────────────────────────────────┐
       │ │                  FS    A file system                    │
       │ │                  Swap  A swap partition.                │
       │ └─────────────────────────────────────────────────────────┘
       ├─────────────────────────────────────────────────────────────┤
       │                 [  OK  ]        Cancel                      │
       └─────────────────────────────────────────────────────────────┘
The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

ÔÝëïò, åðåéäÞ äçìéïõñãåßôå óýóôçìá áñ÷åßùí, ðñÝðåé íá äçëþóåôå óôï **Disklabel** ðïõ èÝëåôå íá ãßíåé ç ðñïóÜñôçóç ôïõ. Ï áíôßóôïé÷ïò äéÜëïãïò öáßíåôáé óôï Ó÷Þìá 2-23. Ôï óçìåßï ðñïóÜñôçóçò ôçò êáôÜôìçóçò root åßíáé ôï `/`, ãéá áõôü ãñÜøôå `/`, êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-23. ÅðéëÝîôå ôï Óçìåßï ÐñïóÜñôçóçò ôïõ Root

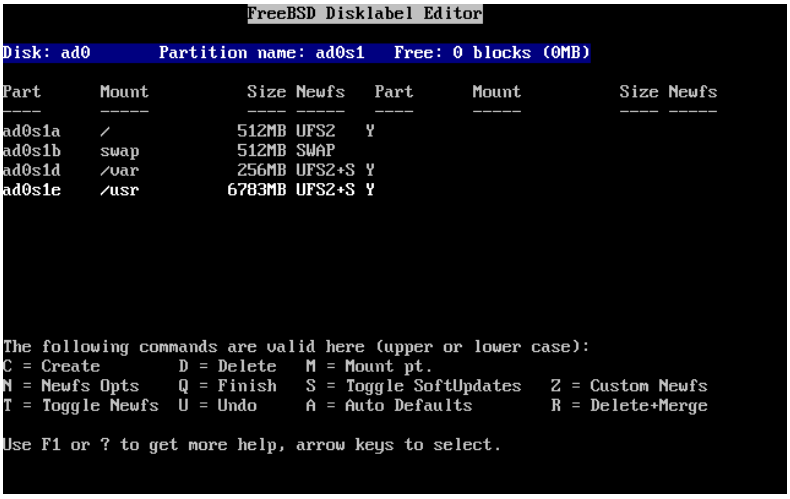


```
                         FreeBSD Disklabel Editor

Disk: ad0       Partition name: ad0s1   Free: 16514001 blocks (8063MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----



               ┌────────── Value Required ──────────┐
               │ Please specify a mount point for the partition
               │ ┌──────────────────────────────────┐
               │ │/                                 │
               │ └──────────────────────────────────┘
               │      [  OK  ]        Cancel        │
               └────────────────────────────────────┘

The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

Ç ïèüíç êáôüðéí èá áíáíåùèåß ãéá íá óáò äåßîåé ôçí êáôÜôìçóç ðïõ ìüëéò äçìéïõñãÞóáôå. Èá ðñÝðåé íá åðáíáëÜâåôå áõôÞ ôçí äéáäéêáóßá ãéá ôéò Üëëåò êáôáôìÞóåéò. ¼ôáí äçìéïõñãÞóåôå ôçí êáôÜôìçóç swap, äåí èá óáò æçôçèåß íá åðéëÝîåôå óçìåßï ðñïóÜñôçóçò, êáèþò ïé êáôáôìÞóåéò swap äåí ðñïóáñôþíôáé ðïôÝ. ¼ôáí äçìéïõñãÞóåôå ôçí ôåëåõôáßá êáôÜôìçóç, ôçí `/usr`, ìðïñåßôå íá áöÞóåôå ôï ðñïôåéíüìåíï ìÝãåèïò, ãéá íá ÷ñçóéìïðïéÞóåôå üëï ôïí õðüëïéðï ÷þñï ôïõ slice.

Ç ôåëåõôáßá ïèüíç ôïõ FreeBSD ÅðåîåñãáóôÞ DiskLabel, èá äåß÷íåé üìïéá ìå ôçí Ó÷Þìá 2-24, áí êáé ïé äéêÝò óáò ôéìÝò èá åßíáé äéáöïñåôéêÝò. ÐéÝóôå **Q** ãéá ôÝëïò.

Ó÷Þìá 2-24. Ï ÅðåîåñãáóôÞò Disklabel ôïõ Sysinstall



```
                         FreeBSD Disklabel Editor

Disk: ad0       Partition name: ad0s1   Free: 0 blocks (0MB)

Part      Mount          Size Newfs   Part      Mount          Size Newfs
----      -----          ---- -----   ----      -----          ---- -----
ad0s1a    /             512MB UFS2   Y
ad0s1b    swap          512MB SWAP
ad0s1d    /var          256MB UFS2+S Y
ad0s1e    /usr         6783MB UFS2+S Y







The following commands are valid here (upper or lower case):
C = Create        D = Delete   M = Mount pt.
N = Newfs Opts    Q = Finish   S = Toggle SoftUpdates   Z = Custom Newfs
T = Toggle Newfs  U = Undo     A = Auto Defaults        R = Delete+Merge

Use F1 or ? to get more help, arrow keys to select.
```

2.7 ÅðéëÝãïíôáò ôé èá ÅãêáôáóôÞóåôå

2.7.1 ÅðéëÝîôå Distribution Set (Óåô ÅãêáôÜóôáóçò)

Ç áðüöáóç ãéá ôï ðïéï distribution set èá ÷ñçóéìïðïéÞóåôå, åîáñôÜôáé êáôÜ êýñéï ëüãï áðü ôï åßäïò ÷ñÞóçò ôïõ ìç÷áíÞìáôïò êáé ôïí äéáèÝóéìï ÷þñï óôï äßóêï. Ïé ðñïêáèïñéóìÝíåò åðéëïãÝò êõìáßíïíôáé áðü ôçí åëÜ÷éóôç äõíáôÞ äéáìüñöùóç ìÝ÷ñé ôçí ðëÞñç. ¼óïé åßíáé êáéíïýñéïé óôï UNIX Þ / êáé óôï FreeBSD èá ðñÝðåé ó÷åäüí óßãïõñá íá åðéëÝîïõí ìéá áðü ôéò ôõðïðïéçìÝíåò åðéëïãÝò. Ç äéáìüñöùóç åîåéäéêåõìÝíïõ distribution set óõíßóôáôáé óõíÞèùò óôïí ðéï Ýìðåéñï ÷ñÞóôç.

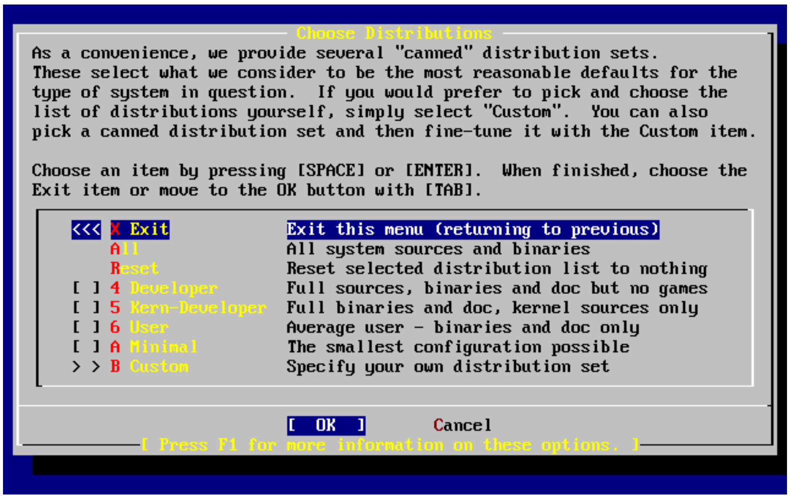
ÐéÝóôå ôï **F1** ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôéò åðéëïãÝò êÜèå distribution set êáèþò êáé ãéá ôá ðåñéå÷üìåíá ôïõò. ¼ôáí ôåëåéþóåôå ìå ôçí áíÜãíùóç ôçò âïÞèåéáò, ìå ôçí ðßåóç ôïõ **Enter** èá åðéóôñÝøåôå óôï ìåíïý Select Distributions.

Áí åðéèõìåßôå ãñáöéêü ðåñéâÜëëïí åñãáóßáò, èá ðñÝðåé íá ñõèìßóåôå ôïí X server êáé íá åðéëÝîåôå Ýíá ãñáöéêü ðåñéâÜëëïí (desktop) ìåôÜ ôçí åãêáôÜóôáóç ôïõ FreeBSD. Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç êáé ñýèìéóç ôïõ X server ìðïñåßôå íá äåßôå óôï ÊåöÜëáéï 6.

Áí áíáìÝíåôå üôé èá ìåôáãëùôôßóåôå äéêü óáò åîåéäéêåõìÝíï ðõñÞíá, äéáëÝîôå êÜðïéá áðü ôéò åðéëïãÝò ðïõ ðåñéÝ÷ïõí ôïí ðçãáßï êþäéêá. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï ãéáôß íá ìåôáãëùôôßóåôå äéêü óáò ðõñÞíá Þ ãéá ôï ðùò ãßíåôáé, äåßôå ôï ÊåöÜëáéï 9.

Ðñïöáíþò ôï ðéï åõÝëéêôï óýóôçìá åßíáé áõôü ðïõ ôá ðåñéÝ÷åé üëá. Áí Ý÷åôå áñêåôü ÷þñï óôï äßóêï, åðéëÝîôå All üðùò öáßíåôáé óôï Ó÷Þìá 2-25 ÷ñçóéìïðïéþíôáò ôá âåëÜêéá êáé ðéÝóôå **Enter**. Áí óáò ðñïâëçìáôßæåé ï äéáèÝóéìïò ÷þñïò óôï äßóêï, êÜíôå ìéá êáôÜëëçëç åðéëïãÞ ãéá ôçí ðåñßðôùóç. Ìçí ðñïâëçìáôßæåóôå éäéáßôåñá ó÷åôéêÜ ìå ôçí ôÝëåéá åðéëïãÞ, êáèþò ìðïñåßôå íá åãêáôáóôÞóåôå ðñüóèåôá óåô êáé ìåôÜ ôï ôÝëïò ôçò âáóéêÞò åãêáôÜóôáóçò.

Ó÷Þìá 2-25. ÅðéëÝîôå Distributions (Óåô ÅãêáôÜóôáóçò)



```
Choose Distributions
As a convenience, we provide several "canned" distribution sets.
These select what we consider to be the most reasonable defaults for the
type of system in question.  If you would prefer to pick and choose the
list of distributions yourself, simply select "Custom".  You can also
pick a canned distribution set and then fine-tune it with the Custom item.

Choose an item by pressing [SPACE] or [ENTER].  When finished, choose the
Exit item or move to the OK button with [TAB].

<<< X Exit               Exit this menu (returning to previous)
    All                  All system sources and binaries
    Reset                Reset selected distribution list to nothing
[ ] 4 Developer          Full sources, binaries and doc but no games
[ ] 5 Kern-Developer     Full binaries and doc, kernel sources only
[ ] 6 User               Average user - binaries and doc only
[ ] A Minimal            The smallest configuration possible
> > B Custom             Specify your own distribution set

                 [  OK  ]        Cancel
       [ Press F1 for more information on these options. ]
```

2.7.2 ÅãêáôÜóôáóç ôçò ÓõëëïãÞò Ports

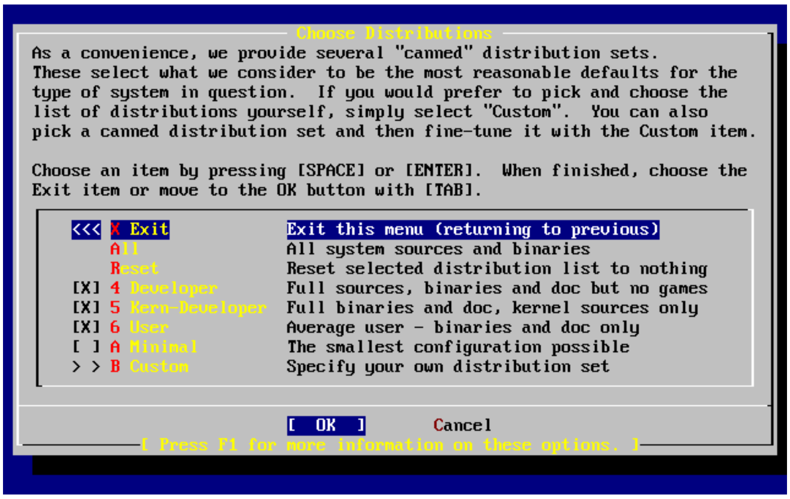
ÌåôÜ ôçí åðéëïãÞ ôïõ åðéèõìçôïý distribution set, èá Ý÷åôå ôçí åõêáéñßá íá åãêáôáóôÞóåôå ôçí óõëëïãÞ ports ôïõ FreeBSD. Ç óõëëïãÞ ports åßíáé ìéá åýêïëç êáé âïëéêÞ ìÝèïäïò ãéá íá åãêáôáóôÞóåôå ëïãéóìéêü. Ç óõëëïãÞ ôùí ports äåí ðåñéÝ÷åé ôïí ðçãáßï êþäéêá ðïõ áðáéôåßôáé ãéá íá ìåôáãëùôôßóåôå ôï ëïãéóìéêü. ÁðëÜ åßíáé ìéá óõëëïãÞ áñ÷åßùí ðïõ áõôïìáôïðïéåß ôï êáôÝâáóìá, ôç ìåôáãëþôôéóç êáé ôçí åãêáôÜóôáóç ðáêÝôùí ëïãéóìéêïý ôñßôïõ êáôáóêåõáóôÞ. Ôï ÊåöÜëáéï 5 ðåñéãñÜöåé ðùò íá ÷ñçóéìïðïéÞóåôå ôçí óõëëïãÞ ôùí ports.

Ôï ðñüãñáììá åãêáôÜóôáóçò äåí åëÝã÷åé áí õðÜñ÷åé áñêåôüò åëåýèåñïò ÷þñïò. ÊÜíôå ôçí åðéëïãÞ áõôÞ ìüíï áí õðÜñ÷åé áñêåôüò ÷þñïò. Áðü ôçí Ýêäïóç ôïõ FreeBSD 9.1, ç óõëëïãÞ ports ôïõ FreeBSD êáôáëáìâÜíåé ðåñßðïõ 500 MB ÷þñï óôï äßóêï. Ìðïñåßôå ìå áóöÜëåéá íá èåùñÞóåôå üôé ï ÷þñïò áõôüò èá åßíáé ìåãáëýôåñïò ãéá ðéï êáéíïýñéåò åêäüóåéò ôïõ FreeBSD.

```
                        User Confirmation Requested
 Would you like to install the FreeBSD ports collection?

 This will give you ready access to over 23,000 ported software packages,
 at a cost of around 500 MB of disk space when "clean" and possibly much
 more than that if a lot of the distribution tarballs are loaded
 (unless you have the extra CDs from a FreeBSD CD/DVD distribution
 available and can mount it on /cdrom, in which case this is far less
 of a problem).

 The Ports Collection is a very valuable resource and well worth having
 on your /usr partition, so it is advisable to say Yes to this option.

 For more information on the Ports Collection & the latest ports,
 visit:
     http://www.FreeBSD.org/ports

                             [ Yes ]     No
```

ÅðéëÝîôå [Yes] ìå ôá âåëÜêéá ãéá íá åãêáôáóôÞóåôå ôç óõëëïãÞ ôùí ports Þ [No] ãéá íá ôçí ðáñáëåßøåôå. ÐéÝóôå **Enter** ãéá íá óõíå÷ßóåôå. Èá åìöáíéóôåß îáíÜ ôï ìåíïý Choose Distributions (åðéëïãÞò Óåô ÅãêáôÜóôáóçò).

Ó÷Þìá 2-26. Åðéâåâáßùóç Distribution Set



```
Choose Distributions
As a convenience, we provide several "canned" distribution sets.
These select what we consider to be the most reasonable defaults for the
type of system in question.  If you would prefer to pick and choose the
list of distributions yourself, simply select "Custom".  You can also
pick a canned distribution set and then fine-tune it with the Custom item.

Choose an item by pressing [SPACE] or [ENTER].  When finished, choose the
Exit item or move to the OK button with [TAB].

    <<< X Exit             Exit this menu (returning to previous)
        All                All system sources and binaries
        Reset              Reset selected distribution list to nothing
    [X] 4 Developer        Full sources, binaries and doc but no games
    [X] 5 Kern-Developer   Full binaries and doc, kernel sources only
    [X] 6 User             Average user - binaries and doc only
    [ ] A Minimal          The smallest configuration possible
    > > B Custom           Specify your own distribution set

                       [  OK  ]       Cancel
            [ Press F1 for more information on these options. ]
```

Áí åßóôå éêáíïðïéçìÝíïé áðü ôéò åðéëïãÝò óáò, åðéëÝîôå Exit ìå ôá âåëÜêéá, åðéâåâáéþóôå üôé åßíáé öùôéóìÝíç ç åðéëïãÞ [OK] êáé ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå.

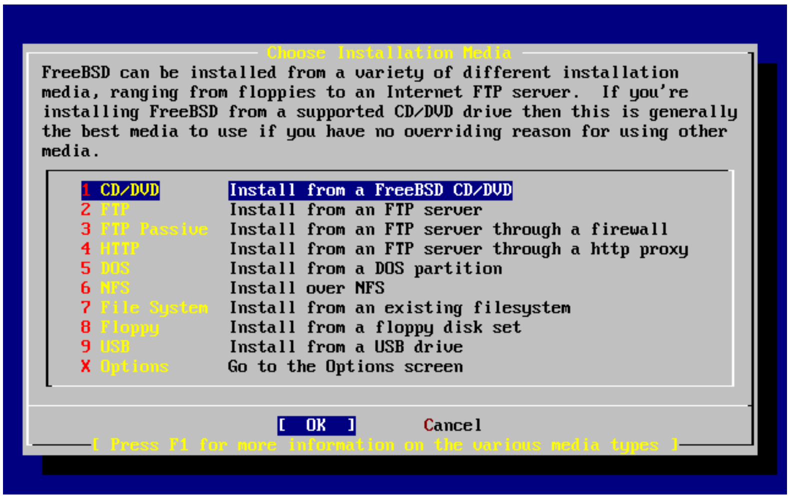
2.8 ÅðéëÝãïíôáò ôï ÌÝóï ÅãêáôÜóôáóçò

Áí åãêáèéóôÜôå áðü CDROM Þ DVD, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá öùôßóåôå ôçí åðéëïãÞ Install from a FreeBSD CD/DVD. Âåâáéùèåßôå üôé åßíáé öùôéóìÝíç ç åðéëïãÞ [OK] êáé ðéÝóôå **Enter** ãéá íá ðñï÷ùñÞóåôå ìå ôçí åãêáôÜóôáóç.

Ãéá Üëëåò ìåèüäïõò åãêáôÜóôáóçò, êÜíôå ôçí êáôÜëëçëç åðéëïãÞ êáé áêïëïõèÞóôå ôéò ïäçãßåò.

ÐéÝóôå ôï **F1** ãéá íá äåßôå ôçí âïÞèåéá ãéá ôá ìÝóá åãêáôÜóôáóçò. ÐéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï ìåíïý åðéëïãÞò ìÝóïõ åãêáôÜóôáóçò.

Ó÷Þìá 2-27. ÅðéëÝîôå ÌÝóï ÅãêáôÜóôáóçò (Installation Media)



```
Choose Installation Media
FreeBSD can be installed from a variety of different installation
media, ranging from floppies to an Internet FTP server.  If you're
installing FreeBSD from a supported CD/DVD drive then this is generally
the best media to use if you have no overriding reason for using other
media.

 1 CD/DVD          Install from a FreeBSD CD/DVD
 2 FTP             Install from an FTP server
 3 FTP Passive     Install from an FTP server through a firewall
 4 HTTP            Install from an FTP server through a http proxy
 5 DOS             Install from a DOS partition
 6 NFS             Install over NFS
 7 File System     Install from an existing filesystem
 8 Floppy          Install from a floppy disk set
 9 USB             Install from a USB drive
 X Options         Go to the Options screen

                  [  OK  ]        Cancel
        [ Press F1 for more information on the various media types ]
```

Ôñüðïé ÅãêáôÜóôáóçò ìÝóù FTP: ÕðÜñ÷ïõí ôñåéò ìÝèïäïé åãêáôÜóôáóçò ìÝóù FTP ãéá íá åðéëÝîåôå: åíåñãü (Active) FTP, ðáèçôéêü (Passive) FTP, Þ ìÝóù äéáêïìéóôÞ ìåóïëÜâçóçò (proxy) HTTP.

Åíåñãü FTP: Install from an FTP server

Ìå ôçí åðéëïãÞ áõôÞ ïé ìåôáöïñÝò ãßíïíôáé ìÝóù “Åíåñãïý (Active)” FTP. Ç åðéëïãÞ áõôÞ äåí èá ëåéôïõñãÞóåé ìÝóù firewalls áëëÜ óõ÷íÜ ëåéôïõñãåß ìå ðáëéüôåñïõò äéáêïìéóôÝò FTP ðïõ äåí õðïóôçñßæïõí ðáèçôéêÞ ìåôáöïñÜ. Áí ç óýíäåóç óáò êïëëÞóåé ìå ðáèçôéêü FTP (ôï ïðïßï åßíáé ç ðñïåðéëïãÞ), äïêéìÜóôå ôï åíåñãü!

Ðáèçôéêü FTP: Install from an FTP server through a firewall

H åðéëïãÞ áõôÞ ïäçãåß ôï **sysinstall** íá ÷ñçóéìïðïéÞóåé “ÐáèçôéêÞ (Passive)” ìåôáöïñÜ ãéá üëåò ôéò FTP ëåéôïõñãßåò. Áõôü åðéôñÝðåé óôï ÷ñÞóôç íá ðåñÜóåé ìÝóù firewalls ôá ïðïßá äåí åðéôñÝðïõí åéóåñ÷üìåíåò óõíäÝóåéò óå ôõ÷áßåò TCP èýñåò.

FTP ìÝóù HTTP ìåóïëÜâçóçò: Install from an FTP server through a http proxy

Ç åðéëïãÞ áõôÞ ïäçãåß ôï **sysinstall** óôçí ÷ñÞóç HTTP ðñùôïêüëëïõ (üðùò ïé öõëëïìåôñçôÝò) ãéá íá óõíäåèåß ìå Ýíá äéáêïìéóôÞ ìåóïëÜâçóçò ãéá üëåò ôéò ëåéôïõñãßåò ôïõ FTP. Ï äéáêïìéóôÞò ìåóïëÜâçóçò áíáëáìâÜíåé íá ìåôáöñÜóåé üëåò ôéò åíôïëÝò êáé íá ôéò óôåßëåé óôïí äéáêïìéóôÞ FTP. Áõôü åðéôñÝðåé óôï ÷ñÞóôç íá ðåñÜóåé ìÝóù firewalls ðïõ äåí åðéôñÝðïõí êáèüëïõ FTP, áëëÜ ðñïóöÝñïõí ëåéôïõñãßá äéáìåóïëÜâçóçò ìÝóù HTTP. Óôçí ðåñßðôùóç áõôÞ ðñÝðåé íá ïñßóåôå åêôüò áðü ôïí äéáêïìéóôÞ FTP, êáé ôï äéáêïìéóôÞ ìåóïëÜâçóçò.

Ãéá äéáêïìéóôÞ ìåóïëÜâçóçò FTP server, ðñÝðåé óõíÞèùò íá äþóåôå ôï üíïìá ôïõ äéáêïìéóôÞ ìå ôïí ïðïßï èÝëåôå óôçí ðñáãìáôéêüôçôá íá óõíäåèåßôå, ùò ìÝñïò ôïõ username, ìåôÜ áðü ôï óýìâïëï “@”. Ï äéáêïìéóôÞò ìåóïëÜâçóçò “ìéìåßôáé” ôüôå ôïí ðñáãìáôéêü äéáêïìéóôÞ. Ãéá ðáñÜäåéãìá, õðïèÝóôå üôé èÝëåôå íá êÜíåôå åãêáôÜóôáóç áðü ôï `ftp.FreeBSD.org`, ÷ñçóéìïðïéþíôáò FTP ìåóïëáâçôÞ ôïí `foo.example.com`, ï ïðïßïò ÷ñçóéìïðïéåß ôçí ðüñôá 1234.

Óôçí ðåñßðôùóç áõôÞ, ðçãáßíåôå óôï ìåíïý åðéëïãþí (options), èÝôåôå ùò FTP username ôï `ftp@ftp.FreeBSD.org`, êáé ùò êùäéêü (password) ôçí äéåýèõíóç email óáò. Óáí ìÝóï åãêáôÜóôáóçò (installation media) ïñßæåôå FTP (Þ ðáèçôéêü FTP áí ôï õðïóôçñßæåé ï ìåóïëáâçôÞò) êáé ôï URL `ftp://foo.example.com:1234/pub/FreeBSD`.

Êáèþò ôï `/pub/FreeBSD` áðü `ftp.FreeBSD.org` ãßíåôáé ïñáôü ìÝóù ôïõ `foo.example.com`, ìðïñåßôå íá åãêáôáóôÞóåôå áðü *åêåßíï* ôï ìç÷Üíçìá (ôï ïðïßï èá öÝñåé ôá áñ÷åßá áðü ôï `ftp.FreeBSD.org` üðùò áðáéôïýíôáé áðü ôçí åãêáôÜóôáóç óáò.

2.9 Åðéâåâáßùóç ôçò ÅãêáôÜóôáóçò

Ç åãêáôÜóôáóç ìðïñåß ôþñá íá ðñï÷ùñÞóåé, åöüóïí ôï åðéèõìåßôå. ÁõôÞ åßíáé åðßóçò ç ôåëåõôáßá óáò åõêáéñßá íá ôçí áêõñþóåôå åìðïäßæïíôáò Ýôóé êáé ôéò áëëáãÝò ðïõ ðñüêåéôáé íá ãßíïõí óôï óêëçñü óáò äßóêï.

```
                              User Confirmation Requested
 Last Chance! Are you SURE you want to continue the installation?

 If you’re running this on a disk with data you wish to save then WE
 STRONGLY ENCOURAGE YOU TO MAKE PROPER BACKUPS before proceeding!

 We can take no responsibility for lost disk contents!

                                    [ Yes ]    No
```

ÅðéëÝîôå [Yes] êáé ðéÝóôå **Enter** ãéá íá ðñï÷ùñÞóåôå.

Ï ÷ñüíïò åãêáôÜóôáóçò äéáöÝñåé áíÜëïãá ìå ôï distribution set ðïõ Ý÷åôå åðéëÝîåé, ôï ìÝóï åãêáôÜóôáóçò, êáé ôçí ôá÷ýôçôá ôïõ õðïëïãéóôÞ óáò. Èá äåßôå ìéá óåéñÜ áðü ìçíýìáôá ôá ïðïßá äåß÷íïõí ôçí êáôÜóôáóç ôçò åãêáôÜóôáóçò.

Ç åãêáôÜóôáóç èá Ý÷åé ïëïêëçñùèåß üôáí äåßôå ôï áêüëïõèï ìÞíõìá:

```
                               Message

Congratulations! You now have FreeBSD installed on your system.

We will now move on to the final configuration questions.
For any option you do not wish to configure, simply select No.

If you wish to re-enter this utility after the system is up, you may
do so by typing: /usr/sbin/sysinstall.

                                   [ OK ]

                      [  Press enter or space  ]
```

ÐéÝóôå **Enter** ãéá íá ðñï÷ùñÞóåôå ìå ôéò ñõèìßóåéò ìåôÜ ôçí åãêáôÜóôáóç.

Áí åðéëÝîåôå [No] êáé ðéÝóåôå **Enter** èá áêõñþóåôå ôçí åãêáôÜóôáóç êáé äåí èá ãßíåé êáìéÜ áëëáãÞ óôï óýóôçìá óáò. Èá åìöáíéóôåß ôï áêüëïõèï ìÞíõìá:

```
                                Message
Installation complete with some errors.  You may wish to scroll
through the debugging messages on VTY1 with the scroll-lock feature.
```

```
You can also choose "No" at the next prompt and go back into the
installation menus to retry whichever operations have failed.

                              [ OK ]
```

Ôï ìÞíõìá áõôü åìöáíßæåôáé åðåéäÞ äåí Ýãéíå êáìéÜ åãêáôÜóôáóç. ÐéÝæïíôáò **Enter** èá åðéóôñÝøåôå óôï Êõñßùò Ìåíý ÅãêáôÜóôáóçò (Main Installation Menu) ãéá íá âãåßôå áðü ôçí åãêáôÜóôáóç.

2.10 ÌåôÜ ôçí ÅãêáôÜóôáóç

ÌåôÜ áðü ìéá åðéôõ÷çìÝíç åãêáôÜóôáóç, áêïëïõèåß ç ñýèìéóç äéÜöïñùí ðñïáéñåôéêþí åðéëïãþí. Ïé ñõèìßóåéò ìðïñïýí íá ãßíïõí áí åéóÝëèåôå îáíÜ óôï áíôßóôïé÷ï ìåíý (configuration options) ðñéí åðáíåêêéíÞóåôå ôï íÝï FreeBSD óýóôçìá óáò Þ ìåôÜ ôçí åãêáôÜóôáóç, ÷ñçóéìïðïéþíôáò ôï `sysinstall` êáé åðéëÝãïíôáò Configure.

2.10.1 Ñýèìéóç Óõóêåõþí Äéêôýïõ

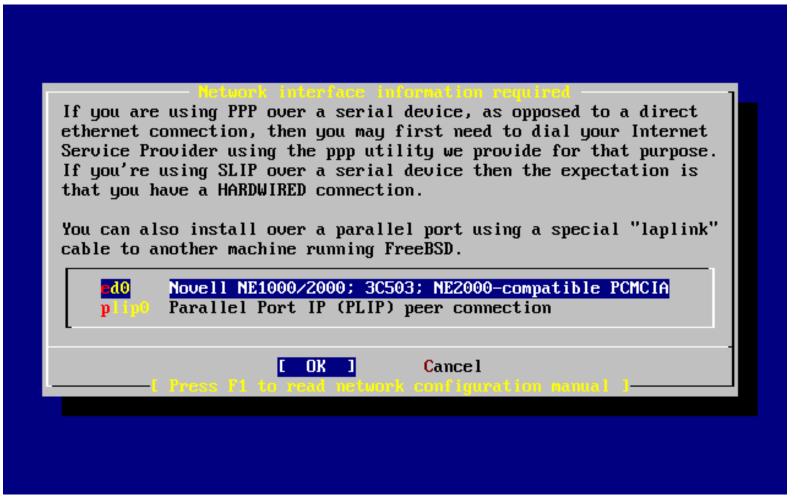
Áí Ý÷åôå ñõèìßóåé ðñïçãïõìÝíùò ôï PPP ãéá íá êÜíåôå åãêáôÜóôáóç ìÝóù FTP, ç ïèüíç áõôÞ äåí èá åìöáíéóôåß, áëëÜ ìðïñåßôå íá ôçí ñõèìßóåôå áñãüôåñá ìå ôïí ôñüðï ðïõ ðåñéãñÜøáìå ðáñáðÜíù.

Ãéá ëåðôïìåñåßò ðëçñïöïñßåò ó÷åôéêÜ ìå Ôïðéêü Äßêôõá (LAN) êáé ãéá ñýèìéóç ôïõ FreeBSD ùò ðýëç / äñïìïëïãçôÞ (gateway/router), áíáôñÝîôå óôï êåöÜëáéï Advanced Networking.

```
                    User Confirmation Requested
  Would you like to configure any Ethernet or PPP network devices?

                           [ Yes ]   No
```

Ãéá íá ñõèìßóåôå ìéá óõóêåõÞ äéêôýïõ, åðéëÝîôå [Yes] êáé ðéÝóôå **Enter**. ÄéáöïñåôéêÜ, åðéëÝîôå [No] ãéá íá óõíå÷ßóåôå.

Ó÷Þìá 2-28. ÅðéëÝãïíôáò ìéá ÓõóêåõÞ Ethernet



```
Network interface information required
If you are using PPP over a serial device, as opposed to a direct
ethernet connection, then you may first need to dial your Internet
Service Provider using the ppp utility we provide for that purpose.
If you're using SLIP over a serial device then the expectation is
that you have a HARDWIRED connection.

You can also install over a parallel port using a special "laplink"
cable to another machine running FreeBSD.

   ed0      Novell NE1000/2000; 3C503; NE2000-compatible PCMCIA
   plip0    Parallel Port IP (PLIP) peer connection

                    [  OK  ]          Cancel
           [ Press F1 to read network configuration manual ]
```

ÅðéëÝîôå ôï interface ðïõ èá ñõèìßóåôå ìå ôá âåëÜêéá, êáé ðéÝóôå **Enter**.

```
                     User Confirmation Requested
       Do you want to try IPv6 configuration of the interface?

                              Yes   [ No ]
```

Óôï óõãêåêñéìÝíï éäéùôéêü ôïðéêü äßêôõï, ôï ôñÝ÷ïí Internet ðñùôüêïëëï (IPv4) Þôáí áñêåôü. ÅðéëÝîáìå ôï [No] ìå ôá âåëÜêéá êáé ðéÝóáìå **Enter**.

Áí åßóôå óõíäåìÝíïé óå Ýíá õðÜñ÷ïí IPv6 äßêôõï ìå Ýíá äéáêïìéóôÞ RA, åðéëÝîôå [Yes] êáé ðéÝóôå **Enter**. Èá ÷ñåéáóôïýí áñêåôÜ äåõôåñüëåðôá ãéá ôçí áíß÷íåõóç äéáêïìéóôþí RA.

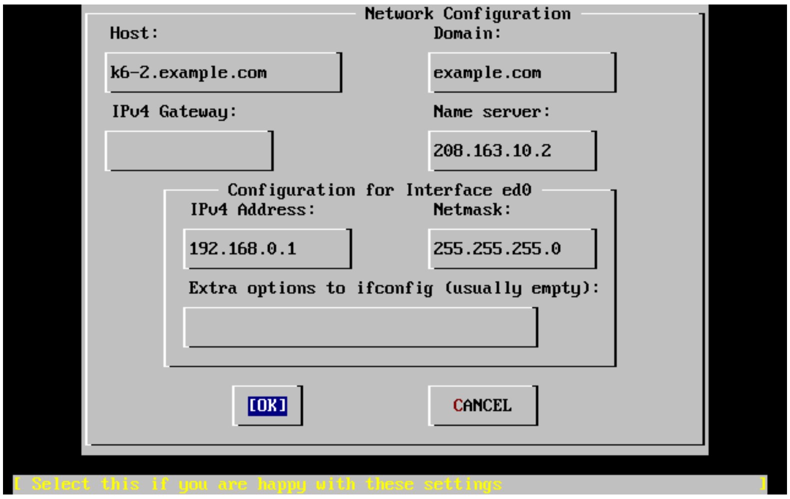
```
                     User Confirmation Requested
       Do you want to try DHCP configuration of the interface?

                              Yes   [ No ]
```

Áí äåí ÷ñåéÜæåóôå DHCP (Ðñùôüêïëëï Äõíáìéêþò Áðüäïóçò Ñõèìßóåùí, Dynamic Host Configuration Protocol) åðéëÝîôå [No] ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Áí åðéëÝîåôå [Yes] èá åêôåëåóôåß ç åöáñìïãÞ **dhclient**, êáé áí åßíáé åðéôõ÷Þò, èá ãßíåé áõôüìáôç ñýèìéóç ôùí ðáñáìÝôñùí ôïõ äéêôýïõ. ÁíáôñÝîôå óôï ÔìÞìá 30.5 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ç áêüëïõèç ïèüíç Ñõèìßóåùí Äéêôýïõ äåß÷íåé ôç ñýèìéóç ìéáò óõóêåõÞò Ethernet ãéá Ýíá óýóôçìá ôï ïðïßï èá ëåéôïõñãåß ùò ðýëç ãéá Ýíá Ôïðéêü Äßêôõï (LAN).

Ó÷Þìá 2-29. Ñýèìéóç ÐáñáìÝôñùí ÓõóêåõÞò ed0


Network Configuration

Host: k6-2.example.com

Domain: example.com

IPv4 Gateway:

Name server: 208.163.10.2

Configuration for Interface ed0

IPv4 Address: 192.168.0.1

Netmask: 255.255.255.0

Extra options to ifconfig (usually empty):

[Select this if you are happy with these settings]

×ñçóéìïðïéÞóôå ôï **Tab** ãéá íá åðéëÝîåôå áíÜìåóá óôá äéÜöïñá ðåäßá êáé íá óõìðëçñþóåôå ôéò êáôÜëëçëåò ðëçñïöïñßåò.

Host (¼íïìá ìç÷áíÞìáôïò)

Ôï ðëÞñåò üíïìá ôïõ ìç÷áíÞìáôïò, ð.÷. `k6-2.example.com` óå áõôÞ ôçí ðåñßðôùóç.

Domain (ÔïìÝáò)

Ôï üíïìá ôïõ ôïìÝá óôïí ïðïßï áíÞêåé ôï ìç÷Üíçìá, üðùò `example.com` óå áõôÞ ôçí ðåñßðôùóç.

IPv4 Gateway (Ðýëç)

> Ðñüêåéôáé ãéá ôçí äéåýèõíóç IP óôçí ïðïßá ðñïùèïýíôáé ôá ðáêÝôá ôá ïðïßá äåí ðñïïñßæïíôáé ãéá ôïðéêïýò ðñïïñéóìïýò. Èá ðñÝðåé íá óõìðëçñþóåôå ôï ðåäßï áõôü áí ï õðïëïãéóôÞò åßíáé êüìâïò óôï óõãêåêñéìÝíï äßêôõï. *ÁöÞóôå áõôü ôï ðåäßï êåíü* áí ï õðïëïãéóôÞò åßíáé ç ðýëç ãéá ôï Internet óôï óõãêåêñéìÝíï äßêôõï. Ç ðýëç IPv4 åßíáé åðßóçò ãíùóôÞ ùò ðñïåðéëåãìÝíç ðýëç Þ ðñïåðéëåãìÝíç äéáäñïìÞ (default gateway / default route).

Name server (ÄéáêïìéóôÞò ÏíïìÜôùí)

> Åßíáé ç IP äéåýèõíóç ôïõ ôïðéêïý óáò äéáêïìéóôÞ DNS. Óôï óõãêåêñéìÝíï éäéùôéêü ôïðéêü äßêôõï, äåí õðÜñ÷åé äéáêïìéóôÞò DNS êáé Ýôóé ÷ñçóéìïðïéÞèçêå ç IP äéåýèõíóç ôïõ äéáêïìéóôÞ DNS ðïõ äßíåé ï ðáñï÷Ýáò Internet (`208.163.10.2`).

IPv4 address (Äéåýèõíóç)

> Ç IP äéåýèõíóç ðïõ èá ÷ñçóéìïðïéçèåß óå áõôü ôï interface åßíáé `192.168.0.1`

Netmask (ÌÜóêá Õðïäéêôýïõ)

> Ôï ìðëïê äéåõèýíóåùí ðïõ ÷ñçóéìïðïéïýíôáé óå áõôü ôï äßêôõï åßíáé `192.168.0.0` - `192.168.0.255` ìå ìÜóêá õðïäéêôýïõ (netmask) `255.255.255.0`.

Extra options to ifconfig (ÅðéðëÝïí åðéëïãÝò ãéá ôçí ifconfig)

> ÐñïóèÝóôå åäþ åðéðëÝïí åðéëïãÝò ãéá ôçí `ifconfig` êáé ôï óõãêåêñéìÝíï interface. Óôçí óõãêåêñéìÝíç ðåñßðôùóç äåí õðÜñ÷åé êáìßá.

×ñçóéìïðïéÞóôå ôï **Tab** ãéá íá åðéëÝîåôå [OK] üôáí ôåëåéþóåôå, êáé ðéÝóôå **Enter**.

```
              User Confirmation Requested
Would you like to bring the ed0 interface up right now?

                     [ Yes ]   No
```

ÅðéëÝãïíôáò [Yes] êáé ðéÝæïíôáò **Enter** èá åíåñãïðïéÞóåôå ôï äßêôõï, Ýôïéìï ðñïò ÷ñÞóç óôï ìç÷Üíçìá óáò. Ùóôüóï áõôü äåí åðéôõã÷Üíåé êáé ðïëëÜ êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò, ïýôùò Þ Üëëùò èá ÷ñåéáóôåß íá êÜíåôå åðáíåêêßíçóç.

2.10.2 Ñýèìéóçò Ðýëçò (Gateway)

```
                User Confirmation Requested
Do you want this machine to function as a network gateway?

                       [ Yes ]    No
```

Áí ôï ìç÷Üíçìá ðñüêåéôáé íá ëåéôïõñãåß ùò ðýëç ãéá Ýíá ôüðéêï äßêôõï êáé íá ðñïùèåß ðáêÝôá ìåôáîý Üëëùí ìç÷áíçìÜôùí, åðéëÝîôå [Yes] êáé ðéÝóôå **Enter**. Áí ôï ìç÷Üíçìá åßíáé Ýíáò êüìâïò ôïõ äéêôýïõ, åðéëÝîôå [No] êáé ðéÝóôå **Enter**.

2.10.3 Ñýèìéóç Õðçñåóéþí Internet (Internet Services)

```
              User Confirmation Requested
```

```
Do you want to configure inetd and the network services that it provides?

                               Yes   [ No ]
```

Áí åðéëÝîåôå [No], êÜðïéåò õðçñåóßåò üðùò ôï **telnetd** äåí èá åíåñãïðïéçèïýí. Áõôü óçìáßíåé üôé áðïìáêñõóìÝíïé ÷ñÞóôåò äåí èá ìðïñïýí íá ÷ñçóéìïðïéÞóïõí ôï **telnet** ãéá íá åéóÝëèïõí óôï ìç÷Üíçìá. Ïé ôïðéêïß ÷ñÞóôåò èá ìðïñïýí ùóôüóï íá Ý÷ïõí ðñüóâáóç óå áðïìáêñõóìÝíá ìç÷áíÞìáôá ìÝóù ôïõ **telnet**.

Ïé õðçñåóßåò áõôÝò ìðïñïýí íá åíåñãïðïéçèïýí ìåôÜ ôçí åãêáôÜóôáóç ìå ôçí åðåîåñãáóßá ôïõ áñ÷åßïõ `/etc/inetd.conf` ìå ôïí ðñïôéìþìåíï óáò åðåîåñãáóôÞ êåéìÝíïõ. Äåßôå ôï ÔìÞìá 30.2.1 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

ÅðéëÝîôå [Yes] áí èÝëåôå íá ñõèìßóåôå ôéò õðçñåóßåò áõôÝò êáôÜ ôçí åãêáôÜóôáóç. Èá åñùôçèåßôå ãéá ìéá áêüìá åðéâåâáßùóç:

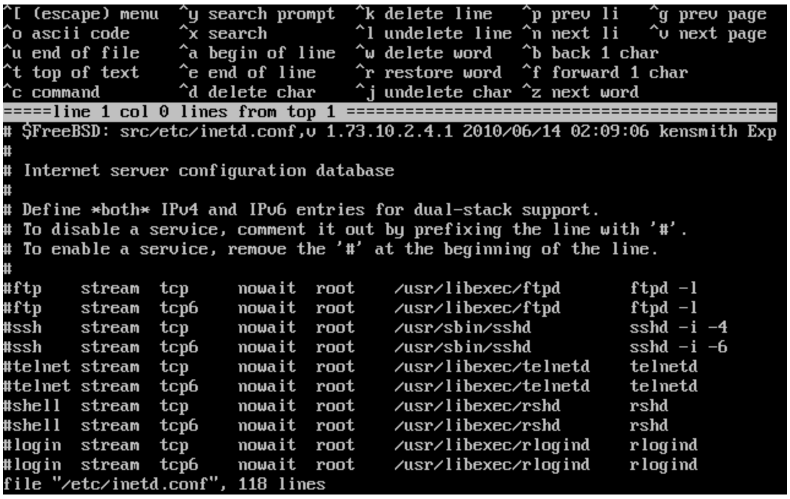
```
                      User Confirmation Requested
The Internet Super Server (inetd) allows a number of simple Internet
services to be enabled, including finger, ftp and telnetd.  Enabling
these services may increase risk of security problems by increasing
the exposure of your system.

With this in mind, do you wish to enable inetd?

                             [ Yes ]   No
```

ÅðéëÝîôå [Yes] ãéá íá óõíå÷ßóåôå.

```
                      User Confirmation Requested
inetd(8) relies on its configuration file, /etc/inetd.conf, to determine
which of its Internet services will be available.  The default FreeBSD
inetd.conf(5) leaves all services disabled by default, so they must be
specifically enabled in the configuration file before they will
function, even once inetd(8) is enabled.  Note that services for
IPv6 must be separately enabled from IPv4 services.

Select [Yes] now to invoke an editor on /etc/inetd.conf, or [No] to
use the current settings.

                             [ Yes ]   No
```

ÅðéëÝãïíôáò [Yes] èá ìðïñÝóåôå íá ðñïóèÝóåôå õðçñåóßåò óâÞíïíôáò ôï # áðü ôçí áñ÷Þ ìéáò ãñáììÞò.

Ó÷Þìá 2-30. Åðåîåñãáóßá ôïõ `inetd.conf`



```
^[ (escape) menu  ^y search prompt  ^k delete line   ^p prev li    ^g prev page
^o ascii code     ^x search         ^l undelete line ^n next li    ^v next page
^u end of file    ^a begin of line  ^w delete word   ^b back 1 char
^t top of text    ^e end of line    ^r restore word  ^f forward 1 char
^c command        ^d delete char    ^j undelete char ^z next word
=====line 1 col 0 lines from top 1 ==========================================
# $FreeBSD: src/etc/inetd.conf,v 1.73.10.2.4.1 2010/06/14 02:09:06 kensmith Exp
#
# Internet server configuration database
#
# Define *both* IPv4 and IPv6 entries for dual-stack support.
# To disable a service, comment it out by prefixing the line with '#'.
# To enable a service, remove the '#' at the beginning of the line.
#
#ftp    stream  tcp     nowait  root    /usr/libexec/ftpd       ftpd -l
#ftp    stream  tcp6    nowait  root    /usr/libexec/ftpd       ftpd -l
#ssh    stream  tcp     nowait  root    /usr/sbin/sshd          sshd -i -4
#ssh    stream  tcp6    nowait  root    /usr/sbin/sshd          sshd -i -6
#telnet stream  tcp     nowait  root    /usr/libexec/telnetd    telnetd
#telnet stream  tcp6    nowait  root    /usr/libexec/telnetd    telnetd
#shell  stream  tcp     nowait  root    /usr/libexec/rshd       rshd
#shell  stream  tcp6    nowait  root    /usr/libexec/rshd       rshd
#login  stream  tcp     nowait  root    /usr/libexec/rlogind    rlogind
#login  stream  tcp6    nowait  root    /usr/libexec/rlogind    rlogind
file "/etc/inetd.conf", 118 lines
```

ÌåôÜ ôçí ðñïóèÞêç ôùí åðéèõìçôþí õðçñåóéþí, êáé ìå ôçí ðßåóç ôïõ **Esc** èá åìöáíéóôåß Ýíá ìåíïý ôï ïðïßï óáò åðéôñÝðåé íá âãåßôå áðü ôï ðñüãñáììá, áðïèçêåýïíôáò êáé ôéò áëëáãÝò óáò.

2.10.4 Åíåñãïðïßçóç Åéóüäïõ ìÝóù SSH

```
                   User Confirmation Requested
               Would you like to enable SSH login?
                        Yes         [  No  ]
```

Áí åðéëÝîåôå [Yes] èá åíåñãïðïéçèåß ï sshd(8), ï äáßìïíáò ôïõ **OpenSSH**. Ìå ôïí ôñüðï áõôü èá åðéôñÝøåôå áóöáëÞ áðïìáêñõóìÝíç ðñüóâáóç óôï ìç÷Üíçìá óáò. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï **OpenSSH** äåßôå ôï ÔìÞìá 15.11.

2.10.5 Áíþíõìï FTP

```
                      User Confirmation Requested
 Do you want to have anonymous FTP access to this machine?

                            Yes    [ No ]
```

2.10.5.1 ¶ñíçóç Áíþíõìïõ FTP

ÅðéëÝãïíôáò ôï ðñïåðéëåãìÝíï [No] êáé ðáôþíôáò **Enter** èá åðéôñÝðåôáé ìüíï óôïõò ÷ñÞóôåò ðïõ Ý÷ïõí ëïãáñéáóìïýò ìå êùäéêïýò íá Ý÷ïõí FTP ðñüóâáóç óôï ìç÷Üíçìá.

2.10.5.2 ÅðéôñÝðïíôáò ôï Áíþíõìï FTP

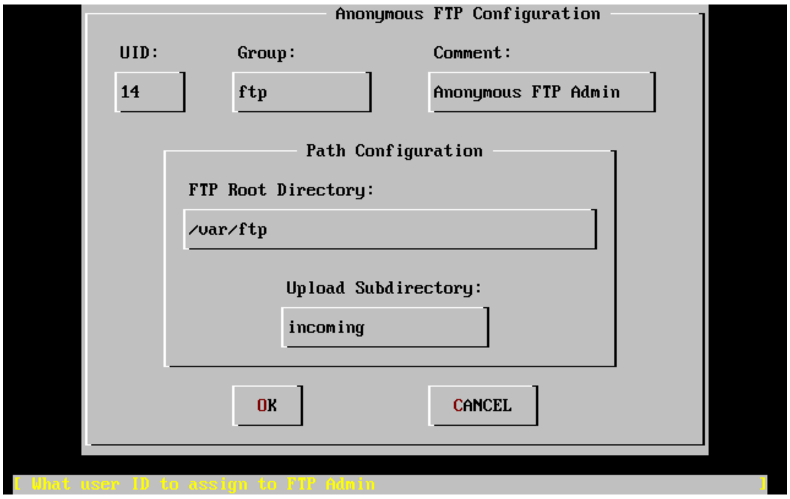
ÏðïéïóäÞðïôå ìðïñåß íá Ý÷åé ðñüóâáóç óôï ìç÷Üíçìá óáò, áí åðéëÝîåôå íá åðéôñÝøåôå ôéò áíþíõìåò óõíäÝóåéò FTP. Èá ðñÝðåé íá ëÜâåôå õðüøéí óáò ôéò åðéðëïêÝò óôçí áóöÜëåéá ðïõ èá åðéöÝñåé ìéá ôÝôïéá ñýèìéóç. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí áóöÜëåéá, äåßôå ôï ÊåöÜëáéï 15.

Ãéá íá åðéôñÝøåôå ôï áíþíõìï FTP, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå [Yes] êáé íá ðéÝóôå **Enter**. Èá ÷ñåéáóôåß íá åðéâåâáéþóåôå îáíÜ ôçí åðéëïãÞ óáò:

```
                      User Confirmation Requested
Anonymous FTP permits un-authenticated users to connect to the system
FTP server, if FTP service is enabled.  Anonymous users are
restricted to a specific subset of the file system, and the default
configuration provides a drop-box incoming directory to which uploads
are permitted.  You must separately enable both inetd(8), and enable
ftpd(8) in inetd.conf(5) for FTP services to be available.  If you
did not do so earlier, you will have the opportunity to enable inetd(8)
again later.

If you want the server to be read-only you should leave the upload
directory option empty and add the -r command-line option to ftpd(8)
in inetd.conf(5)

Do you wish to continue configuring anonymous FTP?

                         [ Yes ]         No
```

Ôï ìÞíõìá áõôü óáò åéäïðïéåß åðßóçò üôé ç õðçñåóßá FTP èá ðñÝðåé åðßóçò íá åíåñãïðïéçèåß óôï `/etc/inetd.conf` óå ðåñßðôùóç ðïõ èÝëåôå íá åíåñãïðïéçèïýí ïé áíþíõìåò óõíäÝóåéò FTP (äåßôå ôï ÔìÞìá 2.10.3). ÅðéëÝîôå [Yes] êáé ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå. Èá äåßôå ôçí áêüëïõèç ïèüíç:

Ó÷Þìá 2-31. ÐñïåðéëåãìÝíåò Ñõèìßóåéò Áíþíõìïõ FTP



UID: 14

Group: ftp

Comment: Anonymous FTP Admin

FTP Root Directory: /var/ftp

Upload Subdirectory: incoming

[What user ID to assign to FTP Admin]

×ñçóéìïðïéÞóôå ôï **Tab** ãéá íá åðéëÝîåôå êáé íá óõìðëçñþóåôå ôá áðáñáßôçôá ðåäßá ðëçñïöïñéþí:

UID

Ï áíáãíùñéóôéêüò áñéèìüò (user ID) ðïõ èÝëåôå íá áðïäþóåôå óôïí áíþíõìï FTP ÷ñÞóôç. ¼ëá ôá áñ÷åßá ðïõ èá áíåâáßíïõí óôïí äéáêïìéóôÞ FTP èá áíÞêïõí óå áõôü ôï ID.

Group

Óå ðïéá ïìÜäá ÷ñçóôþí (group) èÝëåôå íá áíÞêåé ï áíþíõìïò FTP ÷ñÞóôçò.

Comment

Êåßìåíï ðïõ ðåñéÝ÷åé ðåñéãñáöÞ ôïõ ÷ñÞóôç óôï áñ÷åßï `/etc/passwd`.

FTP Root Directory

Ç ôïðïèåóßá ðïõ ðåñéÝ÷åé ôá áñ÷åßá ðïõ åßíáé äéáèÝóéìá óôï áíþíõìï FTP.

Upload Subdirectory

Ç ôïðïèåóßá ðïõ èá áíåâáßíïõí ôá áñ÷åßá áðü áíþíõìïõò FTP ÷ñÞóôåò.

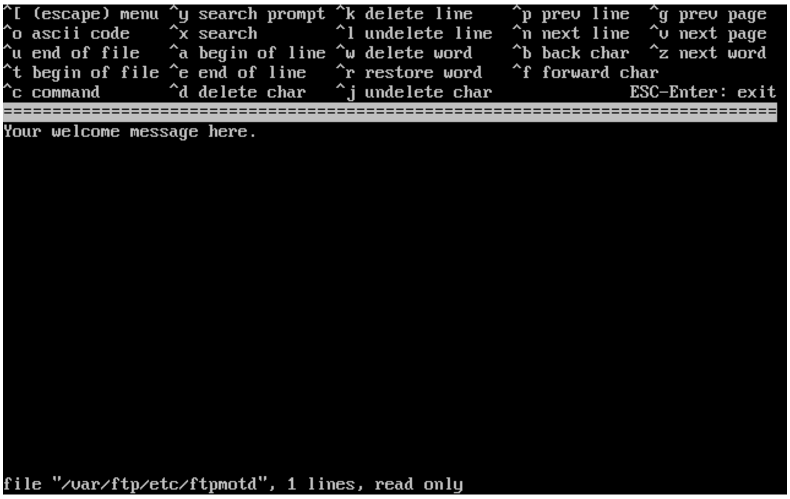
Ï ñéæéêüò (root) êáôÜëïãïò ôïõ FTP, áðü ðñïåðéëïãÞ, äçìéïõñãåßôáé óôï `/var`. Áí äåí õðÜñ÷åé åêåß áñêåôüò ÷þñïò ãéá ôçí áíáìåíüìåíç ÷ñÞóç ôïõ FTP, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôïí êáôÜëïãï `/usr` áëëÜæïíôáò ôïí ñéæéêü êáôÜëïãï (FTP Root Directory) óå `/usr/ftp`.

¼ôáí åßóôå éêáíïðïéçìÝíïò ìå ôéò ôéìÝò, ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå.

```
                        User Confirmation Requested
          Create a welcome message file for anonymous FTP users?

                            [ Yes ]    No
```

Áí åðéëÝîåôå [Yes] êáé ðéÝóåôå **Enter**, èá îåêéíÞóåé áõôüìáôá Ýíáò åðåîåñãáóôÞò êåéìÝíïõ þóôå íá ìðïñÝóåôå íá åðåîåñãáóôåßôå ôï ìÞíõìá.

Ó÷Þìá 2-32. Åðåîåñãáóßá ôïõ Ìçíýìáôïò Êáëùóïñßóìáôïò (Welcome Message) ôïõ FTP



```
^[ (escape) menu ^y search prompt ^k delete line   ^p prev line  ^g prev page
^o ascii code    ^x search        ^l undelete line ^n next line  ^v next page
^u end of file   ^a begin of line ^w delete word   ^b back char  ^z next word
^t begin of file ^e end of line   ^r restore word  ^f forward char
^c command       ^d delete char   ^j undelete char              ESC-Enter: exit
===============================================================================
Your welcome message here.


file "/var/ftp/etc/ftpmotd", 1 lines, read only
```

Ðñüêåéôáé ãéá ôïí åðåîåñãáóôÞ êåéìÝíïõ ee. ×ñçóéìïðïéÞóôå ôéò ïäçãßåò ãéá íá áëëÜîåôå ôï ìÞíõìá Þ áí èÝëåôå áëëÜîôå ôï ìÞíõìá áñãüôåñá, ÷ñçóéìïðïéþíôáò Ýíá åðåîåñãáóôÞ êåéìÝíïõ ôçò åðéëïãÞò óáò. Äåßôå ôï üíïìá ôïõ áñ÷åßïõ êáé ôç èÝóç ôïõ óôçí ôåëåõôáßá ãñáììÞ ôçò ïèüíçò ôïõ åðåîåñãáóôÞ êåéìÝíïõ.

ÐéÝæïíôáò **Esc** èá åìöáíéóôåß Ýíá áíáäõüìåíï ìåíïý ìå ðñïåðéëåãìÝíç ôçí åðéëïãÞ a) leave editor. ÐéÝóôå **Enter** ãéá Ýîïäï êáé óõíÝ÷åéá. ÐéÝóôå îáíÜ **Enter** ãéá íá áðïèçêåýóåôå ôõ÷üí áëëáãÝò ðïõ Ý÷åôå êÜíåé.

2.10.6 Ñýèìéóç ÓõóôÞìáôïò Áñ÷åßùí Äéêôýïõ (Network File System)

Ôï Óýóôçìá Áñ÷åßùí Äéêôýïõ (NFS) åðéôñÝðåé ôï äéáìïéñáóìü áñ÷åßùí óå Ýíá äßêôõï. ¸íá ìç÷Üíçìá ìðïñåß íá ñõèìéóôåß ùò åîõðçñåôçôÞò, ðåëÜôçò Þ êáé ôá äýï. ÁíáôñÝîôå óôï ÔìÞìá 30.3 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

2.10.6.1 ÄéáêïìéóôÞò NFS

```
                         User Confirmation Requested
 Do you want to configure this machine as an NFS server?

                                [ Yes ]   [ No ]
```

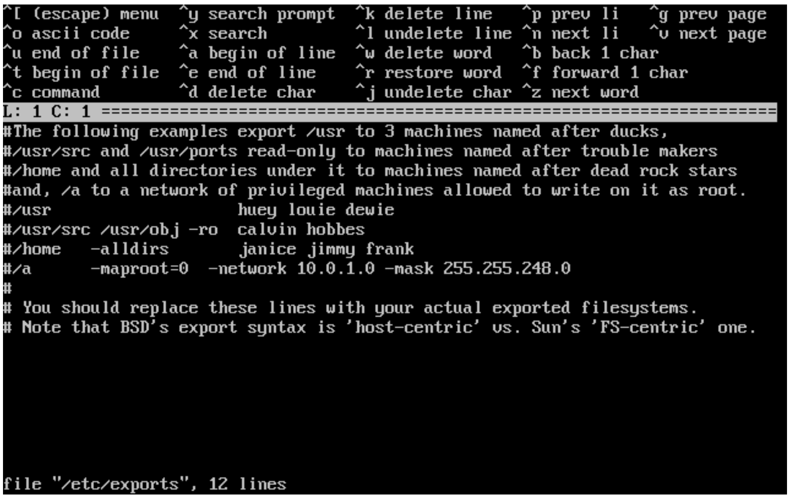
Áí äåí õðÜñ÷åé áíÜãêç ãéá åîõðçñåôçôÞ ÓõóôÞìáôïò Áñ÷åßùí Äéêôýïõ, åðéëÝîôå [No] êáé ðéÝóôå **Enter**.

Áí åðéëÝîåôå [Yes] èá åìöáíéóôåß Ýíá áíáäõüìåíï ìÞíõìá ðïõ óáò ðëçñïöïñåß üôé ðñÝðåé íá äçìéïõñãçèåß ôï áñ÷åßï `exports`.

```
                               Message
Operating as an NFS server means that you must first configure an
/etc/exports file to indicate which hosts are allowed certain kinds of
access to your local filesystems.
Press [Enter] now to invoke an editor on /etc/exports
                               [ OK ]
```

ÐéÝóôå **Enter** ãéá íá óõíå÷ßóåôå. Èá åìöáíéóôåß Ýíáò åðåîåñãáóôÞò êåéìÝíïõ ãéá íá ìðïñÝóåôå íá äçìéïõñãÞóåôå êáé íá åðåîåñãáóôåßôå ôï áñ÷åßï `exports`.

Ó÷Þìá 2-33. Åðåîåñãáóßá Áñ÷åßïõ `exports`



```
^[ (escape) menu  ^y search prompt  ^k delete line   ^p prev li    ^g prev page
^o ascii code     ^x search         ^l undelete line ^n next li    ^v next page
^u end of file    ^a begin of line  ^w delete word   ^b back 1 char
^t begin of file  ^e end of line    ^r restore word  ^f forward 1 char
^c command        ^d delete char    ^j undelete char ^z next word
L: 1 C: 1 ====================================================================
#The following examples export /usr to 3 machines named after ducks,
#/usr/src and /usr/ports read-only to machines named after trouble makers
#/home and all directories under it to machines named after dead rock stars
#and, /a to a network of privileged machines allowed to write on it as root.
#/usr                   huey louie dewie
#/usr/src /usr/obj -ro  calvin hobbes
#/home   -alldirs       janice jimmy frank
#/a      -maproot=0  -network 10.0.1.0 -mask 255.255.248.0
#
# You should replace these lines with your actual exported filesystems.
# Note that BSD's export syntax is 'host-centric' vs. Sun's 'FS-centric' one.







file "/etc/exports", 12 lines
```

×ñçóéìïðïéÞóôå ôéò ïäçãßåò ãéá íá ðñïóèÝóåôå ôá óõóôÞìáôá áñ÷åßùí ðïõ èÝëåôå íá äéáìïéñÜóåôå, ôþñá Þ áñãüôåñá ÷ñçóéìïðïéþíôáò Ýíá åðåîåñãáóôÞ êåéìÝíïõ ôçò åðéëïãÞò óáò. Óçìåéþóôå ôï üíïìá êáé ôçí ôïðïèåóßá ôïõ áñ÷åßïõ üðùò öáßíïíôáé óôï êÜôù ìÝñïò ôçò ïèüíçò.

ÐéÝæïíôáò **Esc** èá åìöáíéóôåß Ýíá áíáäõüìåíï ìåíïý ìå ðñïåðéëåãìÝíç ôçí åðéëïãÞ a) leave editor. ÐéÝóôå **Enter** ãéá Ýîïäï êáé óõíÝ÷åéá.

2.10.6.2 ÐåëÜôçò NFS

Ï ðåëÜôçò NFS åðéôñÝðåé óôï ìç÷Üíçìá óáò íá Ý÷åé ðñüóâáóç óå åîõðçñåôçôÝò NFS.

```
                      User Confirmation Requested
 Do you want to configure this machine as an NFS client?

                             Yes   [ No ]
```

Ìå ôá âåëÜêéá, åðéëÝîôå êáôÜ âïýëçóç [Yes] Þ [No] êáé ðéÝóôå **Enter**.

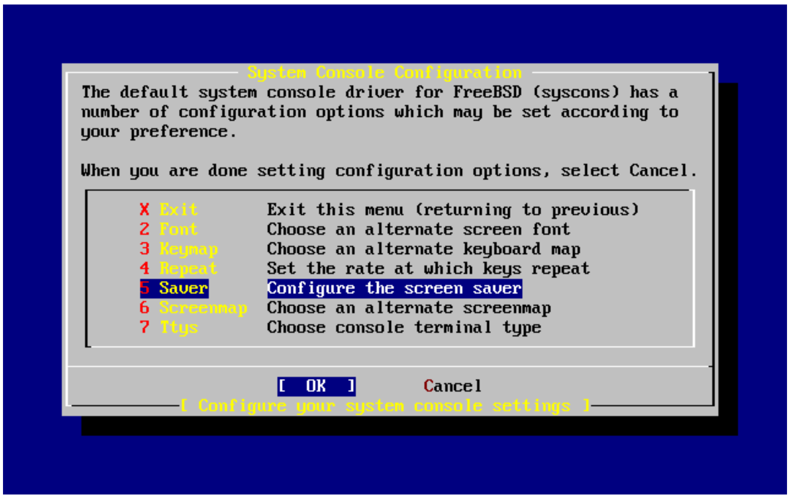
2.10.7 Ñõèìßóåéò Êïíóüëáò (System Console Settings)

ÕðÜñ÷ïõí äéáèÝóéìåò åðéëïãÝò ãéá ôç ñýèìéóç ôçò êïíóüëáò ôïõ óõóôÞìáôïò.

```
                      User Confirmation Requested
        Would you like to customize your system console settings?

                            [ Yes ]  No
```

Ãéá íá äåßôå êáé íá ñõèìßóåôå ôéò åðéëïãÝò, åðéëÝîôå [Yes] êáé ðéÝóôå **Enter**.

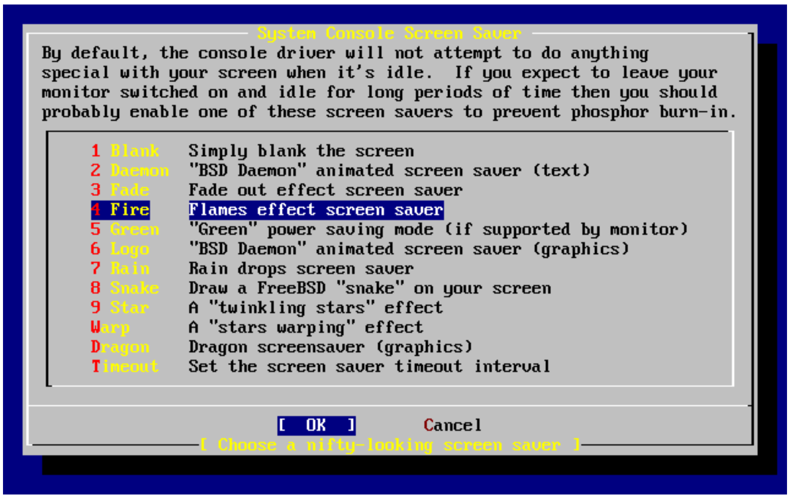
Ó÷Þìá 2-34. ÅðéëïãÝò Ñýèìéóçò Êïíóüëáò ÓõóôÞìáôïò



```
System Console Configuration
The default system console driver for FreeBSD (syscons) has a
number of configuration options which may be set according to
your preference.

When you are done setting configuration options, select Cancel.

     X Exit          Exit this menu (returning to previous)
     2 Font          Choose an alternate screen font
     3 Keymap        Choose an alternate keyboard map
     4 Repeat        Set the rate at which keys repeat
     5 Saver         Configure the screen saver
     6 Screenmap     Choose an alternate screenmap
     7 Ttys          Choose console terminal type

              [  OK  ]          Cancel
     [ Configure your system console settings ]
```

Ìéá óõíçèéóìÝíç åðéëïãÞ åßíáé ç ðñïóôáóßá ïèüíçò (screen saver). ×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Saver êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-35. ÅðéëïãÝò Ðñïóôáóßáò Ïèüíçò

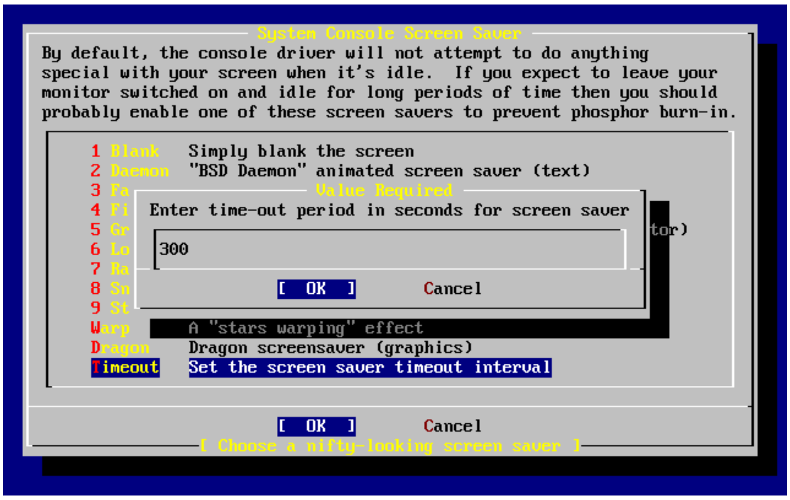


```
System Console Screen Saver
By default, the console driver will not attempt to do anything
special with your screen when it's idle.  If you expect to leave your
monitor switched on and idle for long periods of time then you should
probably enable one of these screen savers to prevent phosphor burn-in.

  1 Blank    Simply blank the screen
  2 Daemon   "BSD Daemon" animated screen saver (text)
  3 Fade     Fade out effect screen saver
  4 Fire     Flames effect screen saver
  5 Green    "Green" power saving mode (if supported by monitor)
  6 Logo     "BSD Daemon" animated screen saver (graphics)
  7 Rain     Rain drops screen saver
  8 Snake    Draw a FreeBSD "snake" on your screen
  9 Star     A "twinkling stars" effect
  Warp       A "stars warping" effect
  Dragon     Dragon screensaver (graphics)
  Timeout    Set the screen saver timeout interval

                [  OK  ]        Cancel
        [ Choose a nifty-looking screen saver ]
```

ÅðéëÝîôå ôçí åðéèõìçôÞ ðñïóôáóßá ïèüíçò ìå ôá âåëÜêéá, êáé ðéÝóôå **Enter**. Èá îáíáäåßôå ôï ìåíïý Ñýèìéóçò Êïíóüëáò ÓõóôÞìáôïò.

Ôï ðñïåðéëåãìÝíï ÷ñïíéêü äéÜóôçìá åßíáé 300 äåõôåñüëåðôá. Ãéá íá áëëÜîåôå ôï äéÜóôçìá, åðéëÝîôå îáíÜ Saver êáé áðü ôï ìåíïý Screen Saver Options åðéëÝîôå Timeout ìå ôá âåëÜêéá, êáé ðéÝóôå **Enter**. Èá åìöáíéóôåß Ýíá áíáäõüìåíï ìåíïý:

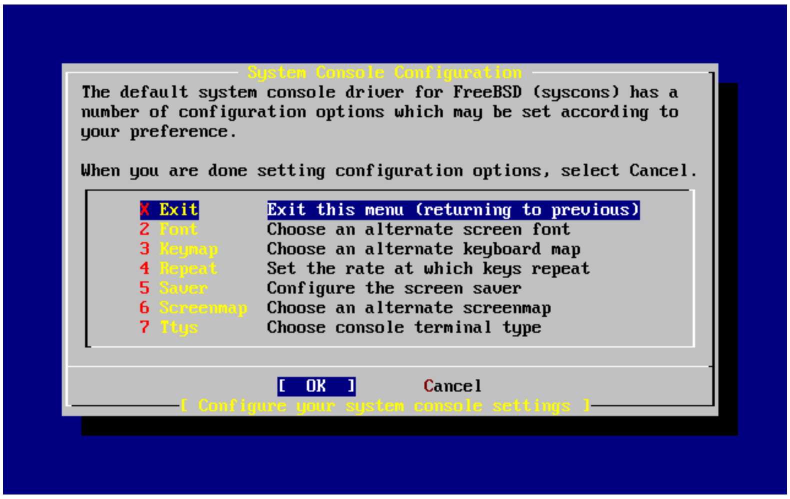
Ó÷Þìá 2-36. ×ñïíéêü ÄéÜóôçìá Ðñïóôáóßáò Ïèüíçò



```
Value Required
Enter time-out period in seconds for screen saver

300

                [  OK  ]        Cancel
```

ÁëëÜîôå ôçí ôéìÞ, åðéëÝîôå [OK] êáé ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï ìåíïý Ñýèìéóçò Êïíóüëáò ÓõóôÞìáôïò.

Ó÷Þìá 2-37. ¸îïäïò áðü ôéò Ñõèìßóåéò Êïíóüëáò ÓõóôÞìáôïò



```
System Console Configuration
The default system console driver for FreeBSD (syscons) has a
number of configuration options which may be set according to
your preference.

When you are done setting configuration options, select Cancel.

     X Exit        Exit this menu (returning to previous)
     2 Font        Choose an alternate screen font
     3 Keymap      Choose an alternate keyboard map
     4 Repeat      Set the rate at which keys repeat
     5 Saver       Configure the screen saver
     6 Screenmap   Choose an alternate screenmap
     7 Ttys        Choose console terminal type

                  [  OK  ]        Cancel
        [ Configure your system console settings ]
```

ÅðéëÝãïíôáò Exit êáé ðéÝæïíôáò **Enter** èá óõíå÷ßóåôå ìå ôéò õðüëïéðåò ñõèìßóåéò ðïõ ðñÝðåé íá ãßíïõí ìåôÜ ôçí åãêáôÜóôáóç.

2.10.8 Ñýèìéóç Æþíçò ¿ñáò (Time Zone)

Ç óùóôÞ ñýèìéóç ôçò æþíçò þñáò, èá åðéôñÝøåé óôï ìç÷Üíçìá óáò íá äéïñèþíåé áõôüìáôá ôçí þñá óýìöùíá ìå ôéò ôïðéêÝò ñõèìßóåéò, êáèþò êáé íá åêôåëåß Üëëåò ëåéôïõñãßåò ðïõ ó÷åôßæïíôáé ìå ôéò æþíåò þñáò.

Ôï ðáñÜäåéãìá ðïõ öáßíåôáé åßíáé ãéá Ýíá ìç÷Üíçìá ðïõ âñßóêåôáé óôéò ÁíáôïëéêÝò ÇíùìÝíåò Ðïëéôåßåò. Ïé åðéëïãÝò óáò èá äéáöÝñïõí áíÜëïãá ìå ôç ãåùãñáöéêÞ óáò èÝóç.

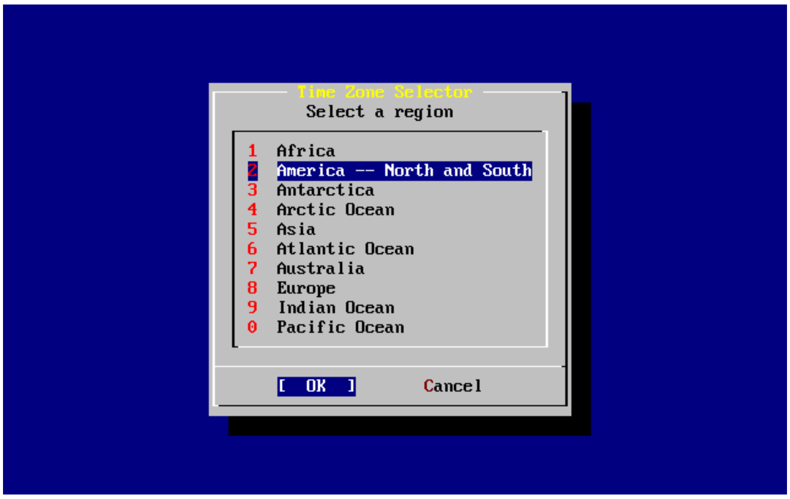
```
                      User Confirmation Requested
            Would you like to set this machine's time zone now?

                              [ Yes ]   No
```

ÅðéëÝîôå [Yes] êáé ðéÝóôå **Enter** ãéá íá ñõèìßóåôå ôç æþíç þñáò.

```
                       User Confirmation Requested
 Is this machine's CMOS clock set to UTC? If it is set to local time
 or you don't know, please choose NO here!

                               Yes   [ No ]
```

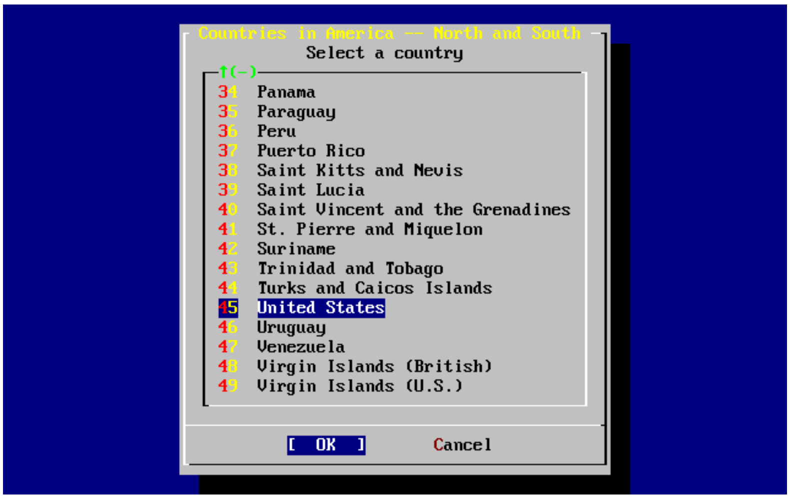
ÅðéëÝîôå [Yes] Þ [No] áíÜëïãá ìå ôï ðùò åßíáé ñõèìéóìÝíï ôï ñïëüé óôï ìç÷Üíçìá óáò êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-38. ÅðéëïãÞ ôçò Ðåñéï÷Þò óáò


Time Zone Selector
Select a region
1 Africa
2 America -- North and South
3 Antarctica
4 Arctic Ocean
5 Asia
6 Atlantic Ocean
7 Australia
8 Europe
9 Indian Ocean
0 Pacific Ocean
[OK]
Cancel

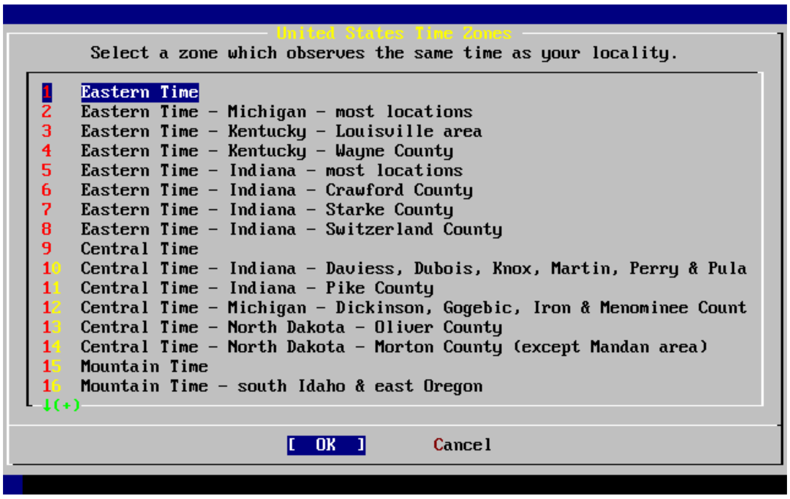
ÅðéëÝîôå ôçí êáôÜëëçëç ðåñéï÷Þ (region) ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-39. ÅðéëïãÞ ôçò ×þñáò óáò


Countries in America -- North and South
Select a country
↑(-)
34 Panama
35 Paraguay
36 Peru
37 Puerto Rico
38 Saint Kitts and Nevis
39 Saint Lucia
40 Saint Vincent and the Grenadines
41 St. Pierre and Miquelon
42 Suriname
43 Trinidad and Tobago
44 Turks and Caicos Islands
45 United States
46 Uruguay
47 Venezuela
48 Virgin Islands (British)
49 Virgin Islands (U.S.)
[OK]
Cancel

ÅðéëÝîôå ôçí êáôÜëëçëç ÷þñá ÷ñçóéìïðïéþíôáò ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-40. ÅðéëïãÞ Æþíçò ¿ñáò (Time Zone)



```
United States Time Zones
Select a zone which observes the same time as your locality.

1   Eastern Time
2   Eastern Time - Michigan - most locations
3   Eastern Time - Kentucky - Louisville area
4   Eastern Time - Kentucky - Wayne County
5   Eastern Time - Indiana - most locations
6   Eastern Time - Indiana - Crawford County
7   Eastern Time - Indiana - Starke County
8   Eastern Time - Indiana - Switzerland County
9   Central Time
10  Central Time - Indiana - Daviess, Dubois, Knox, Martin, Perry & Pula
11  Central Time - Indiana - Pike County
12  Central Time - Michigan - Dickinson, Gogebic, Iron & Menominee Count
13  Central Time - North Dakota - Oliver County
14  Central Time - North Dakota - Morton County (except Mandan area)
15  Mountain Time
16  Mountain Time - south Idaho & east Oregon
↓(+)

[  OK  ]          Cancel
```

ÅðéëÝîôå ôçí êáôÜëëçëç æþíç þñáò ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

```
                        Confirmation
          Does the abbreviation ’EDT’ look reasonable?

                        [ Yes ]   No
```

Åðéâåâáéþóôå üôé åßíáé óùóôÞ ç óõíôïìïãñáößá ãéá ôç æþíç þñáò ðïõ Ý÷åôå åðéëÝîåé. Áí öáßíåôáé åíôÜîåé, ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ìå ôéò õðüëïéðåò ñõèìßóåéò ìåôÜ ôçí åãêáôÜóôáóç.

2.10.9 Óõìâáôüôçôá ìå ôï Linux (Linux Compatibility)

> **Óçìåßùóç:** Ç åíüôçôá áõôÞ éó÷ýåé ìüíï ãéá ôçí åãêáôÜóôáóç FreeBSD ôçò óåéñÜò 7.*x*. Áí åãêáèéóôÜôå FreeBSD 8.*x* ç ïèüíç áõôÞ äåí èá åìöáíéóôåß.

```
                  User Confirmation Requested
        Would you like to enable Linux binary compatibility?

                        [ Yes ]   No
```

ÅðéëÝãïíôáò [Yes] êáé ðéÝæïíôáò **Enter** èá åðéôñÝøåôå ôçí åêôÝëåóç ðñïãñáììÜôùí Linux óôï FreeBSD. Ç åãêáôÜóôáóç èá ðñïóèÝóåé üëá ôá áðáñáßôçôá ðáêÝôá ãéá ôç óõìâáôüôçôá ìå åêôåëÝóéìá ðñïãñÜììáôá ãéá Linux.

Áí êÜíåôå åãêáôÜóôáóç ìÝóù FTP, ôï ìç÷Üíçìá èá ðñÝðåé íá åßíáé óõíäåìÝíï óôï Internet. ÌåñéêÝò öïñÝò, ìéá ôïðïèåóßá FTP äåí Ý÷åé üëåò ôéò áðáéôïýìåíåò äéáíïìÝò, üðùò ôç óõìâáôüôçôá ìå ôï Linux. Ìðïñåßôå ùóôüóï íá ôçí åãêáôáóôÞóåôå áñãüôåñá, áí ÷ñåéÜæåôáé.

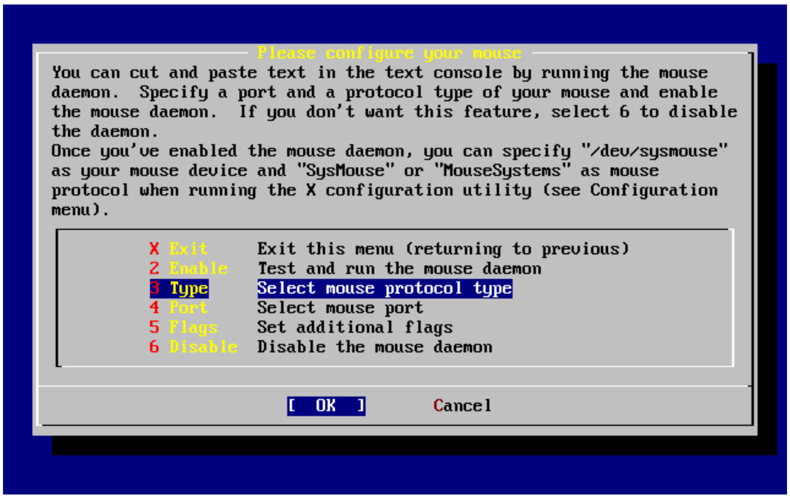
2.10.10 Ñõèìßóåéò Ðïíôéêéïý (Mouse Settings)

Ç åðéëïãÞ áõôÞ èá óáò åðéôñÝøåé íá êÜíåôå áðïêïðÞ êáé åðéêüëëçóç êåéìÝíïõ óôçí êïíóüëá êáé óå ðñïãñÜììáôá ÷ñçóéìïðïéþíôáò Ýíá ðïíôßêé ôñéþí ðëÞêôñùí. Áí ÷ñçóéìïðïéåßôå ðïíôßêé äýï ðëÞêôñùí, áíáôñÝîôå óôç óåëßäá âïÞèåéáò, moused(8), ìåôÜ ôçí åãêáôÜóôáóç ãéá íá äåßôå ðùò ìðïñåßôå íá åîïìïéþóåôå ðïíôßêé ôñéþí ðëÞêôñùí. Óôï ðáñÜäåéãìá áõôü öáßíåôáé ç ñýèìéóç åíüò ìç-USB ðïíôéêéïý (ð.÷. PS/2 ç óåéñéáêü - COM - ðïíôßêé):

```
                    User Confirmation Requested
            Does this system have a non-USB mouse attached to it?

                              [ Yes ]    No
```

ÅðéëÝîôå [Yes] ãéá ìç-USB ðïíôßêé, Þ [No] ãéá USB ðïíôßêé êáé ðéÝóôå **Enter**.

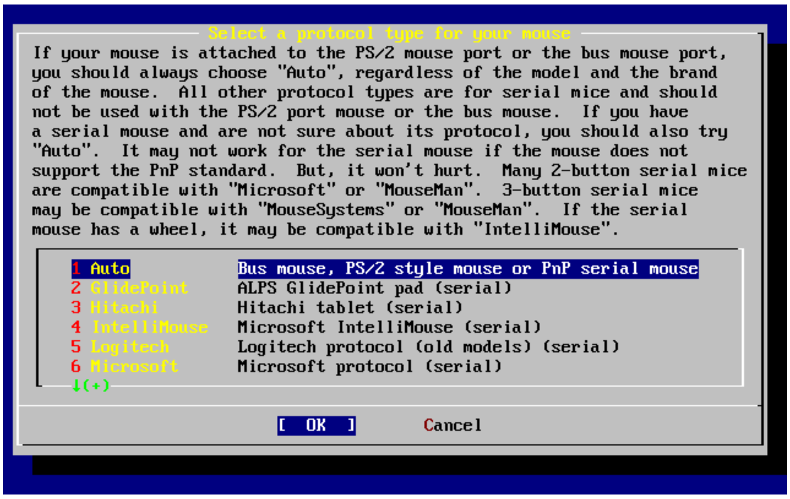
Ó÷Þìá 2-41. ÅðéëïãÞ Ðñùôïêüëëïõ Ðïíôéêéïý (Mouse Protocol Type)



```
Please configure your mouse
You can cut and paste text in the text console by running the mouse
daemon.  Specify a port and a protocol type of your mouse and enable
the mouse daemon.  If you don't want this feature, select 6 to disable
the daemon.
Once you've enabled the mouse daemon, you can specify "/dev/sysmouse"
as your mouse device and "SysMouse" or "MouseSystems" as mouse
protocol when running the X configuration utility (see Configuration
menu).

          X Exit      Exit this menu (returning to previous)
          2 Enable    Test and run the mouse daemon
          3 Type      Select mouse protocol type
          4 Port      Select mouse port
          5 Flags     Set additional flags
          6 Disable   Disable the mouse daemon

                    [  OK  ]       Cancel
```

×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Type êáé ðéÝóôå **Enter**.

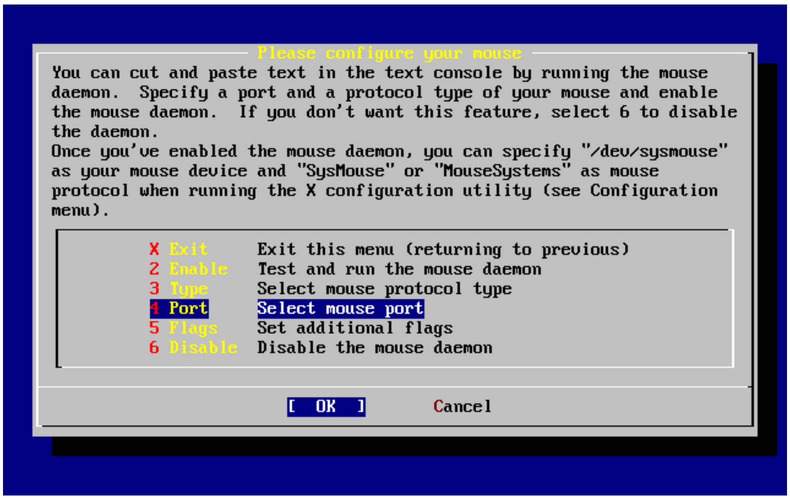
Ó÷Þìá 2-42. ÅðéëïãÞ Ðñùôïêüëëïõ Ðïíôéêéïý (Mouse Protocol)



```
Select a protocol type for your mouse
If your mouse is attached to the PS/2 mouse port or the bus mouse port,
you should always choose "Auto", regardless of the model and the brand
of the mouse.  All other protocol types are for serial mice and should
not be used with the PS/2 port mouse or the bus mouse.  If you have
a serial mouse and are not sure about its protocol, you should also try
"Auto".  It may not work for the serial mouse if the mouse does not
support the PnP standard.  But, it won't hurt.  Many 2-button serial mice
are compatible with "Microsoft" or "MouseMan".  3-button serial mice
may be compatible with "MouseSystems" or "MouseMan".  If the serial
mouse has a wheel, it may be compatible with "IntelliMouse".

   1 Auto           Bus mouse, PS/2 style mouse or PnP serial mouse
   2 GlidePoint     ALPS GlidePoint pad (serial)
   3 Hitachi        Hitachi tablet (serial)
   4 IntelliMouse   Microsoft IntelliMouse (serial)
   5 Logitech       Logitech protocol (old models) (serial)
   6 Microsoft      Microsoft protocol (serial)
   ↓(+)
```

Ôï ðïíôßêé ðïõ ÷ñçóéìïðïéåßôáé óå áõôü ôï ðáñÜäåéãìá, åßíáé ôýðïõ PS/2, êáé Ýôóé åßíáé óùóôÞ ç ðñïåðéëåãìÝíç ñýèìéóç Auto. Ãéá íá áëëÜîåôå ðñùôüêïëëï, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá êÜíåôå êÜðïéá Üëëç åðéëïãÞ. Âåâáéùèåßôå üôé åßíáé öùôéóìÝíç ç åðéëïãÞ [OK] êáé ðéÝóôå **Enter** ãéá Ýîïäï áðü áõôü ôï ìåíïý.

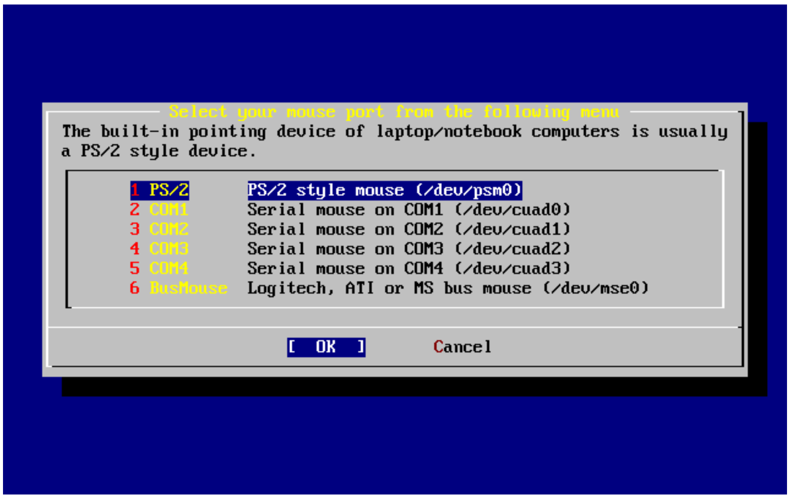
Ó÷Þìá 2-43. Ñýèìéóç Èýñáò Ðïíôéêéïý (Mouse Port)



```
Please configure your mouse
You can cut and paste text in the text console by running the mouse
daemon.  Specify a port and a protocol type of your mouse and enable
the mouse daemon.  If you don't want this feature, select 6 to disable
the daemon.
Once you've enabled the mouse daemon, you can specify "/dev/sysmouse"
as your mouse device and "SysMouse" or "MouseSystems" as mouse
protocol when running the X configuration utility (see Configuration
menu).

         X Exit      Exit this menu (returning to previous)
         2 Enable    Test and run the mouse daemon
         3 Type      Select mouse protocol type
         4 Port      Select mouse port
         5 Flags     Set additional flags
         6 Disable   Disable the mouse daemon
```

×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Port êáé ðéÝóôå **Enter**.

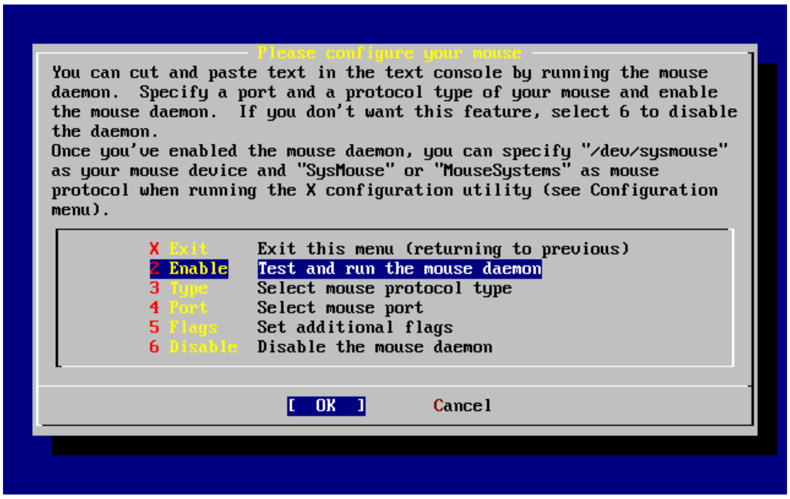
Ó÷Þìá 2-44. Ñýèìéóç Ðüñôáò Ðïíôéêéïý (Mouse Port)


Select your mouse port from the following menu
1 PS/2 PS/2 style mouse (/dev/psm0)
2 COM1 Serial mouse on COM1 (/dev/cuad0)
3 COM2 Serial mouse on COM2 (/dev/cuad1)
4 COM3 Serial mouse on COM3 (/dev/cuad2)
5 COM4 Serial mouse on COM4 (/dev/cuad3)
6 BusMouse Logitech, ATI or MS bus mouse (/dev/mse0)
[OK]
Cancel

The built-in pointing device of laptop/notebook computers is usually a PS/2 style device.

Ôï óýóôçìá áõôü åß÷å ðïíôßêé PS/2 êáé Ýôóé Þôáí êáôÜëëçëç ç ðñïåðéëåãìÝíç ñýèìéóç PS/2. Ãéá íá áëëÜîåôå ôçí ðüñôá, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

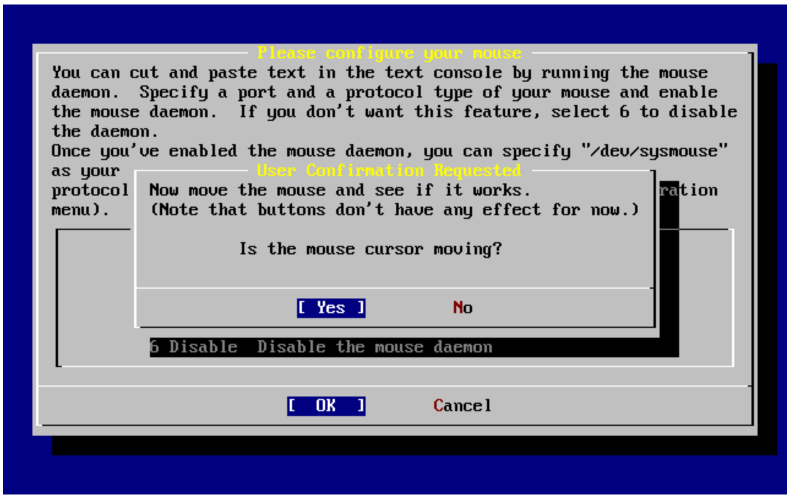
Ó÷Þìá 2-45. Åíåñãïðïßçóç ôïõ Äáßìïíá Ðïíôéêéïý (Mouse Daemon)


Please configure your mouse
X Exit Exit this menu (returning to previous)
2 Enable Test and run the mouse daemon
3 Type Select mouse protocol type
4 Port Select mouse port
5 Flags Set additional flags
6 Disable Disable the mouse daemon
[OK]
Cancel

You can cut and paste text in the text console by running the mouse daemon. Specify a port and a protocol type of your mouse and enable the mouse daemon. If you don't want this feature, select 6 to disable the daemon.
Once you've enabled the mouse daemon, you can specify "/dev/sysmouse" as your mouse device and "SysMouse" or "MouseSystems" as mouse protocol when running the X configuration utility (see Configuration menu).

ÔÝëïò, ÷ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá åðéëÝîåôå Enable, êáé ðéÝóôå **Enter** ãéá íá åíåñãïðïéÞóåôå êáé íá äïêéìÜóåôå ôïí äáßìïíá ôïõ ðïíôéêéïý (mouse daemon).

Ó÷Þìá 2-46. ¸ëåã÷ïò ôïõ Äáßìïíá Ðïíôéêéïý



```
                  Please configure your mouse
You can cut and paste text in the text console by running the mouse
daemon.  Specify a port and a protocol type of your mouse and enable
the mouse daemon.  If you don't want this feature, select 6 to disable
the daemon.
Once you've enabled the mouse daemon, you can specify "/dev/sysmouse"
as your       User Confirmation Requested
protocol  Now move the mouse and see if it works.                ration
menu).    (Note that buttons don't have any effect for now.)

                   Is the mouse cursor moving?

                      [ Yes ]          No

          6 Disable  Disable the mouse daemon

                       [  OK  ]         Cancel
```

ÌåôáêéíÞóôå ôï ðïíôßêé óôçí ïèüíç êáé âåâáéùèåßôå üôé ï äñïìÝáò áíôéäñÜ óùóôÜ. Áí åßíáé åíôÜîåé, åðéëÝîôå [Yes] êáé ðéÝóôå **Enter**. Áí ü÷é, ôï ðïíôßêé äåí Ý÷åé ñõèìéóôåß óùóôÜ — åðéëÝîôå [No] êáé îáíáäïêéìÜóôå ÷ñçóéìïðïéþíôáò äéáöïñåôéêÝò ñõèìßóåéò.

ÅðéëÝîôå Exit ìå ôá âåëÜêéá êáé ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå, þóôå íá óõíå÷ßóåôå ìå ôéò õðüëïéðåò ñõèìßóåéò ìåôÜ ôçí åãêáôÜóôáóç.

2.10.11 ÅãêáôÜóôáóç ÐáêÝôùí

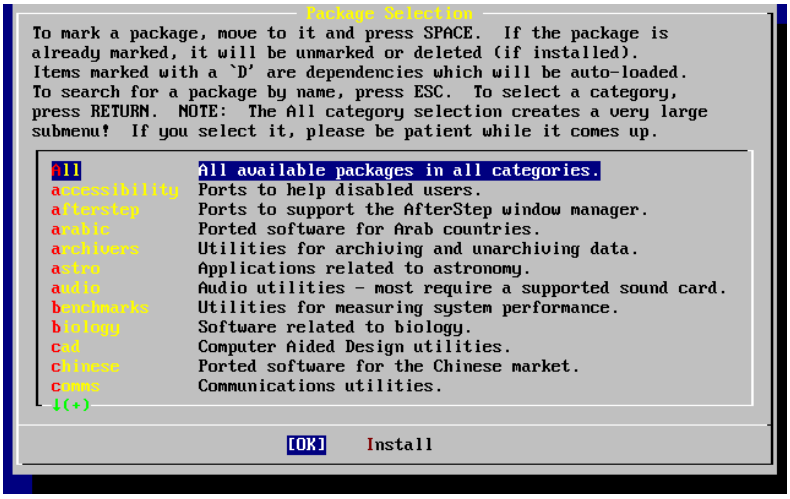
Ôá ðáêÝôá åßíáé ðñïìåôáãëùôôéóìÝíá åêôåëÝóéìá, êáé áðïôåëïýí Ýíá âïëéêü ôñüðï ãéá íá åãêáôáóôáèïýí ëïãéóìéêü.

Èá óáò äåßîïõìå ôçí åãêáôÜóôáóç åíüò ðáêÝôïõ ùò ðáñÜäåéãìá. Ìðïñåßôå åðßóçò íá åãêáôáóôáèïýí ôþñá êáé üðïéá Üëëá ðñüóèåôá ðáêÝôá åðéèõìåßôå. ÌåôÜ ôçí åãêáôÜóôáóç, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï `sysinstall` ãéá íá åãêáôáóôáèïýí ðñüóèåôá ðáêÝôá.

```
                     User Confirmation Requested
 The FreeBSD package collection is a collection of hundreds of
 ready-to-run applications, from text editors to games to WEB servers
 and more. Would you like to browse the collection now?

                              [ Yes ]   No
```

ÅðéëÝãïíôáò [Yes] êáé ðéÝæïíôáò **Enter** èá äåßôå ôéò ïèüíåò åðéëïãÞò ðáêÝôùí:

Ó÷Þìá 2-47. ÅðéëïãÞ Êáôçãïñßáò ÐáêÝôïõ

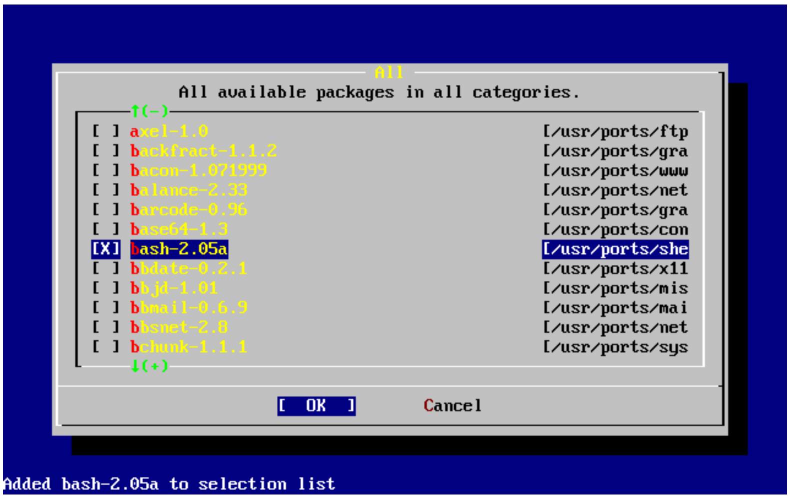

```
Package Selection
To mark a package, move to it and press SPACE.  If the package is
already marked, it will be unmarked or deleted (if installed).
Items marked with a `D' are dependencies which will be auto-loaded.
To search for a package by name, press ESC.  To select a category,
press RETURN.  NOTE:  The All category selection creates a very large
submenu!  If you select it, please be patient while it comes up.

All              All available packages in all categories.
accessibility    Ports to help disabled users.
afterstep        Ports to support the AfterStep window manager.
arabic           Ported software for Arab countries.
archivers        Utilities for archiving and unarchiving data.
astro            Applications related to astronomy.
audio            Audio utilities - most require a supported sound card.
benchmarks       Utilities for measuring system performance.
biology          Software related to biology.
cad              Computer Aided Design utilities.
chinese          Ported software for the Chinese market.
comms            Communications utilities.
↓(+)

              [OK]      Install
```

Ìðïñåßôå êÜèå äåäïìÝíç óôéãìÞ íá åãêáôáóôÞóåôå ìüíï ôá ðáêÝôá ðïõ åßíáé äéáèÝóéìá óôï ôñÝ÷ïí ìÝóï åãêáôÜóôáóçò.

Ìå ôçí åðéëïãÞ All èá äåßôå üëá ôá äéáèÝóéìá ðáêÝôá, Þ ìðïñåßôå íá åðéëÝîåôå óõãêåêñéìÝíç êáôçãïñßá. Öùôßóôå ôçí åðéëïãÞ óáò ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Èá åìöáíéóôåß Ýíá ìåíïý ôï ïðïßï äåß÷íåé üëá äéáèÝóéìá ðáêÝôá ãéá ôçí åðéëïãÞ ðïõ êÜíáôå:

Ó÷Þìá 2-48. ÅðéëïãÞ ÐáêÝôùí


```
                          All
         All available packages in all categories.
        ↑(-)
[ ] axel-1.0                          [/usr/ports/ftp
[ ] backfract-1.1.2                   [/usr/ports/gra
[ ] bacon-1.071999                    [/usr/ports/www
[ ] balance-2.33                      [/usr/ports/net
[ ] barcode-0.96                      [/usr/ports/gra
[ ] base64-1.3                        [/usr/ports/con
[X] bash-2.05a                        [/usr/ports/she
[ ] bbdate-0.2.1                      [/usr/ports/x11
[ ] bbjd-1.01                         [/usr/ports/mis
[ ] bbmail-0.6.9                      [/usr/ports/mai
[ ] bbsnet-2.8                        [/usr/ports/net
[ ] bchunk-1.1.1                      [/usr/ports/sys
        ↓(+)

         [  OK  ]          Cancel

Added bash-2.05a to selection list
```

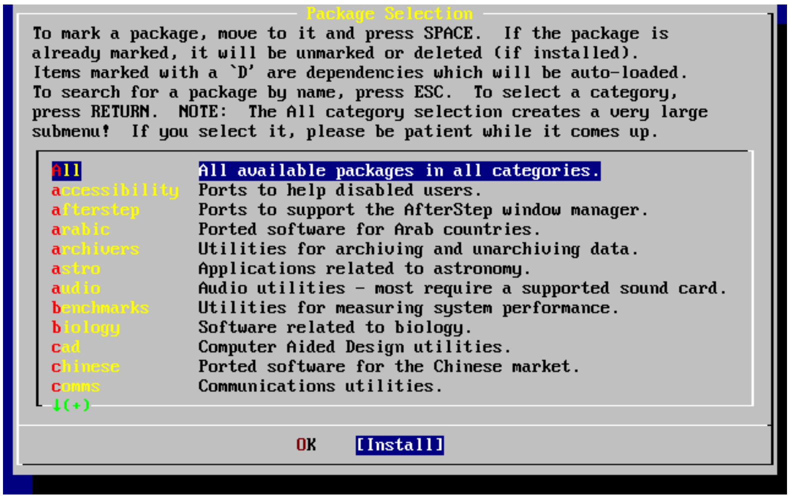
Ôï êÝëõöïò (shell) **bash** öáßíåôáé åðéëåãìÝíï. ÅðéëÝîôå üóá ðáêÝôá åðéèõìåßôå, öùôßæïíôáò ôï ðáêÝôï êáé ðéÝæïíôáò ôï ðëÞêôñï **Space**. Èá äåßôå ìéá óýíôïìç ðåñéãñáöÞ ãéá êÜèå ðáêÝôï óôï êÜôù áñéóôåñü ìÝñïò ôçò ïèüíçò.

Ç ðßåóç ôïõ ðëÞêôñïõ **Tab** åíáëëÜóóåé ìåôáîý ôïõ ôåëåõôáßïõ åðéëåãìÝíïõ ðáêÝôïõ, ôïõ [OK], êáé ôïõ [Cancel].

¼ôáí Ý÷åôå ôåëåéþóåé ìå ôï ìáñêÜñéóìá ôùí ðáêÝôùí ðñïò åãêáôÜóôáóç, ðéÝóôå ìéá öïñÜ **Tab** ãéá íá ìåôáêéíçèåßôå óôï [OK] êáé ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï ìåíïý ÅðéëïãÞò ÐáêÝôùí (Package Selection).

Ôï áñéóôåñü êáé äåîß âåëÜêé åíáëëÜóóåé åðßóçò ìåôáîý ôïõ [OK] êáé ôïõ [Cancel]. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áõôÞ ôç ìÝèïäï ãéá íá åðéëÝîåôå [OK] êáé ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï ìåíïý ÅðéëïãÞò ÐáêÝôùí.

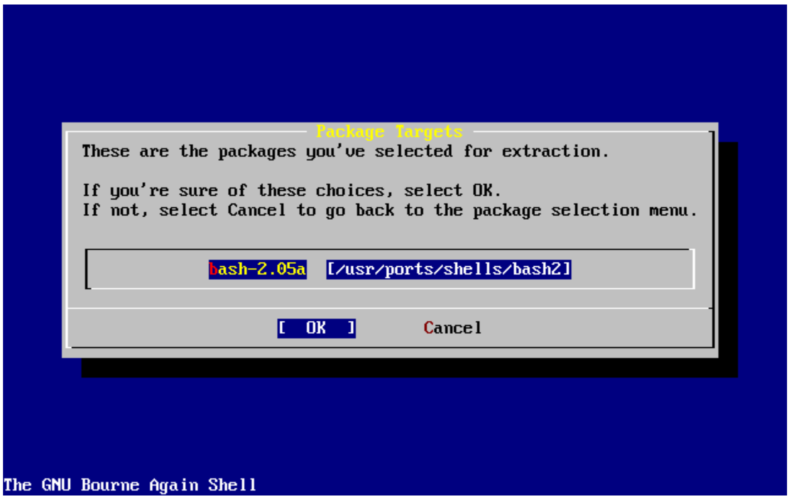
Ó÷Þìá 2-49. ÅãêáôÜóôáóç ÐáêÝôùí



```
Package Selection
To mark a package, move to it and press SPACE.  If the package is
already marked, it will be unmarked or deleted (if installed).
Items marked with a `D' are dependencies which will be auto-loaded.
To search for a package by name, press ESC.  To select a category,
press RETURN.  NOTE:  The All category selection creates a very large
submenu!  If you select it, please be patient while it comes up.

All            All available packages in all categories.
accessibility  Ports to help disabled users.
afterstep      Ports to support the AfterStep window manager.
arabic         Ported software for Arab countries.
archivers      Utilities for archiving and unarchiving data.
astro          Applications related to astronomy.
audio          Audio utilities - most require a supported sound card.
benchmarks     Utilities for measuring system performance.
biology        Software related to biology.
cad            Computer Aided Design utilities.
chinese        Ported software for the Chinese market.
comms          Communications utilities.
↓(+)

                    OK     [Install]
```

×ñçóéìïðïéÞóôå ôï **Tab** êáé ôá âåëÜêéá ãéá íá åðéëÝîåôå [Install] êáé ðéÝóôå **Enter**. Èá ÷ñåéáóôåß íá åðéâåâáéþóåôå üôé èÝëåôå íá åãêáôáóôÞóåôå ôá ðáêÝôá:

Ó÷Þìá 2-50. Åðéâåâáßùóç ÅãêáôÜóôáóçò ÐáêÝôùí



```
Package Targets
These are the packages you've selected for extraction.

If you're sure of these choices, select OK.
If not, select Cancel to go back to the package selection menu.

          bash-2.05a  [/usr/ports/shells/bash2]

          [  OK  ]        Cancel

The GNU Bourne Again Shell
```

ÅðéëÝãïíôáò [OK] êáé ðéÝæïíôáò **Enter** èá îåêéíÞóåé ç åãêáôÜóôáóç ðáêÝôùí. Èá âëÝðåôå ìçíýìáôá ôçò åãêáôÜóôáóçò ìÝ÷ñé ôçí ïëïêëÞñùóç ôçò. Óçìåéþóôå ôõ÷üí ìçíýìáôá ëÜèïõò ðïõ åìöáíßæïíôáé.

Ç ôåëéêÞ ñýèìéóç óõíå÷ßæåôáé ìåôÜ ôçí åãêáôÜóôáóç ôùí ðáêÝôùí. Áí êáôáëÞîåôå íá ìçí åãêáôáóôÞóåôå êáíÝíá ðáêÝôï, êáé åðéèõìåßôå íá åðéóôñÝøåôå óôçí ôåëéêÞ ñýèìéóç, åðéëÝîôå Install ïýôùò Þ Üëëùò.

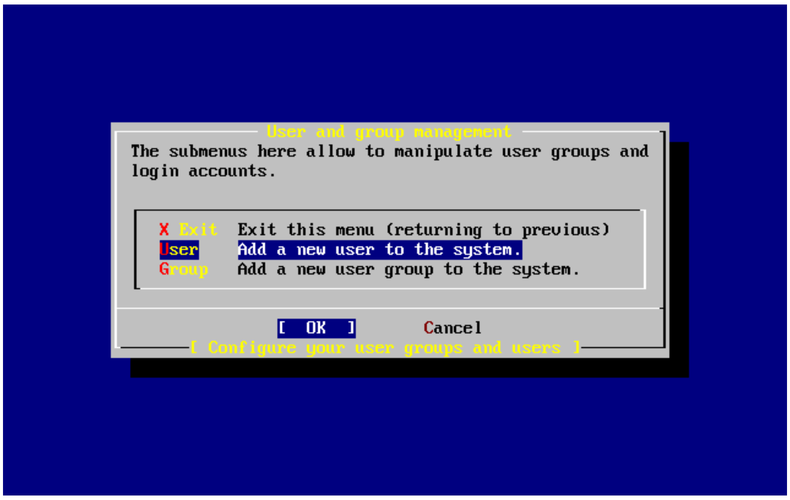
2.10.12 ÐñïóèÞêç ×ñçóôþí / ÏìÜäùí (Users/Groups)

Èá ðñÝðåé íá ðñïóèÝóåôå ôïõëÜ÷éóôïí Ýíá ÷ñÞóôç êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò, þóôå íá ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï óýóôçìá ÷ùñßò íá åéóÝñ÷åóôå ùò `root`. Ç root êáôÜôìçóç åßíáé ãåíéêÜ ìéêñÞ, êáé åêôåëþíôáò åöáñìïãÝò ùò `root` ìðïñåß ãñÞãïñá íá ãåìßóåé. ÐáñáêÜôù öáßíåôáé êáé Ýíáò ðéï óïâáñüò êßíäõíïò:

```
                     User Confirmation Requested
Would you like to add any initial user accounts to the system? Adding
at least one account for yourself at this stage is suggested since
working as the "root" user is dangerous (it is easy to do things which
adversely affect the entire system).

                            [ Yes ]   No
```

ÅðéëÝîôå [Yes] êáé ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ìå ôçí ðñïóèÞêç åíüò ÷ñÞóôç.

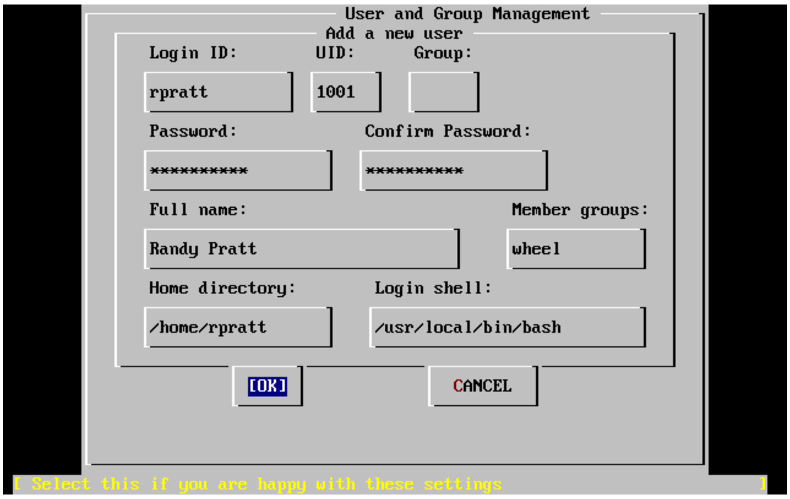
Ó÷Þìá 2-51. ÅðéëïãÞ ×ñÞóôç



```
User and group management
The submenus here allow to manipulate user groups and
login accounts.

   X Exit     Exit this menu (returning to previous)
   User       Add a new user to the system.
   Group      Add a new user group to the system.

              [  OK  ]           Cancel
[ Configure your user groups and users ]
```

ÅðéëÝîôå User ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Ó÷Þìá 2-52. ÐñïóèÞêç Ðëçñïöïñéþí ×ñÞóôç



Login ID: rpratt
UID: 1001
Group:
Password: ***********
Confirm Password: ***********
Full name: Randy Pratt
Member groups: wheel
Home directory: /home/rpratt
Login shell: /usr/local/bin/bash

[Select this if you are happy with these settings]

Êáèþò èá åéóÜãåôå ôá óôïé÷åßá ðéÝæïíôáò ôï **Tab** èá åìöáíßæïíôáé ïé ðáñáêÜôù ðåñéãñáöÝò óôï êÜôù ìÝñïò ôçò ïèüíçò ãéá íá óáò âïçèÞóïõí óôçí åéóáãùãÞ ôùí áðáéôïýìåíùí ðëçñïöïñéþí:

Login ID

To üíïìá ÷ñÞóôç (login name) ãéá ôï íÝï ÷ñÞóôç (õðï÷ñåùôéêü).

UID

Ï áíáãíùñéóôéêüò áñéèìüò (numerical ID) ãéá áõôü ôïí ÷ñÞóôç (áöÞóôå ôïí êåíü ãéá áõôüìáôç åðéëïãÞ).

Group

Ôï üíïìá ôçò ïìÜäáò (group name) ãéá áõôü ôï ÷ñÞóôç (áöÞóôå ôïí êåíü ãéá áõôüìáôç åðéëïãÞ).

Password

Ï êùäéêüò (password) ãéá áõôü ôï ÷ñÞóôç (äþóôå ðñïóï÷Þ óôï ðåäßï áõôü!).

Full name

Ôï ðëÞñåò üíïìá ôïõ ÷ñÞóôç (ó÷üëéï).

Member groups

Ïé õðüëïéðåò ïìÜäåò (groups) óôéò ïðïßåò áíÞêåé áõôüò ï ÷ñÞóôçò (Ý÷åé äçë. ôá äéêáéþìáôá ôïõò).

Home directory

Ï ðñïóùðéêüò êáôÜëïãïò áñ÷åßùí (home directory) ôïõ ÷ñÞóôç (áöÞóôå êåíü ãéá ôçí ðñïåðéëåãìÝíç åðéëïãÞ).

Login shell

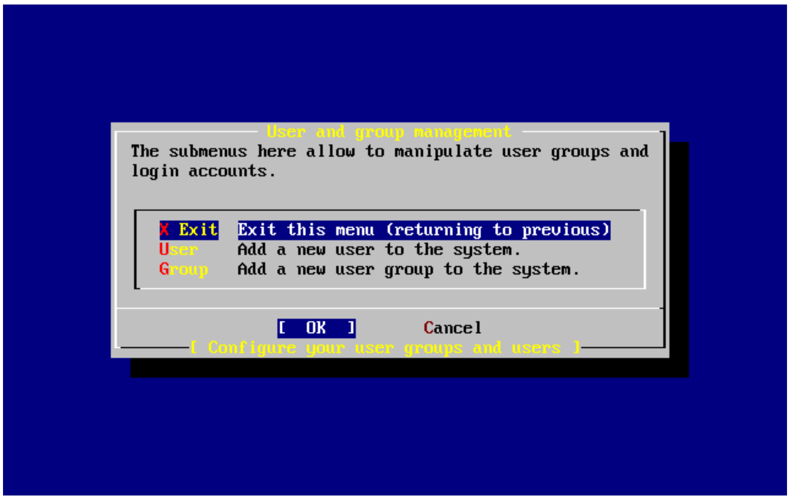
Ôï ðñïåðéëåãìÝíï êÝëõöïò (login shell) ôïõ ÷ñÞóôç (áöÞóôå êåíü ãéá ôçí ðñïåðéëïãÞ, ð.÷. `/bin/sh`).

Ôï êÝëõöïò åéóüäïõ áëëÜ÷èçêå áðü `/bin/sh` óå `/usr/local/bin/bash` ãéá íá ÷ñçóéìïðïéçèåß ôï êÝëõöïò **bash** ôï ïðïßï åãêáôáóôÞóáìå ðñïçãïõìÝíùò ìÝóù ðáêÝôïõ. Ìçí ðñïóðáèÞóåôå íá ÷ñçóéìïðïéÞóåôå êÜðïéï êÝëõöïò ðïõ äåí õðÜñ÷åé, äéáöïñåôéêÜ äåí èá ìðïñåßôå íá êÜíåôå login. Ôï ðëÝïí óõíçèéóìÝíï êÝëõöïò óôïí êüóìï ôïõ BSD åßíáé ôï C shell, ôï ïðïßï ìðïñåßôå íá ãñÜøåôå ùò `/bin/tcsh`.

Ï ÷ñÞóôçò ðñïóôÝèçêå åðßóçò óôçí ïìÜäá `wheel` ãéá íá Ý÷åé ôç äõíáôüôçôá íá ãßíåé õðåñ÷ñÞóôçò (superuser) ìå äéêáéþìáôá `root`.

¼ôáí åßóôå éêáíïðïéçìÝíïò áðü ôéò åðéëïãÝò óáò, ðéÝóôå [OK] êáé èá åìöáíéóôåß îáíÜ ôï ìåíïý User and Group Management:

Ó÷Þìá 2-53. ¸îïäïò áðü ôçí Äéá÷åßñéóç ×ñçóôþí êáé ÏìÜäùí



User and group management

The submenus here allow to manipulate user groups and login accounts.

X Exit Exit this menu (returning to previous)
User Add a new user to the system.
Group Add a new user group to the system.
[OK]
Cancel
[Configure your user groups and users]

Ìðïñåßôå åðßóçò ôç äçìéïõñãÞóôå ïìÜäåò ôþñá, áí ãíùñßæåôå ôéò óõãêåêñéìÝíåò áíÜãêåò. Äéáöïñåôéêü, ìðïñåßôå íá åðáíÝëèåôå óôéò ñõèìßóåéò áõôÝò ìåôÜ ôçí åãêáôÜóôáóç, ìÝóù ôïõ `sysinstall`.

¼ôáí ôåëåéþóåôå ìå ôçí ðñïóèÞêç ÷ñçóôþí, åðéëÝîôå Exit ìå ôá âåëÜêéá êáé ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ìå ôçí åãêáôÜóôáóç.

2.10.13 Ïñéóìüò ôïõ Êùäéêïý ãéá ôï ×ñÞóôç `root`

```
                              Message
 Now you must set the system manager’s password.
 This is the password you’ll use to log in as "root".

                               [ OK ]

                  [ Press enter to continue ]
```

ÐéÝóôå **Enter** ãéá íá ïñßóåôå ôïí êùäéêü ãéá ôï ÷ñÞóôç `root`.

Èá ðñÝðåé íá ðëçêôñïëïãÞóåôå äýï öïñÝò ôïí êùäéêü óùóôÜ. Äåí ÷ñåéÜæåôáé íá ðïýìå üôé ðñÝðåé íá Ý÷åôå ôñüðï íá âñåßôå ôïí êùäéêü áí ôïí îå÷Üóåôå. Ðáñáôçñçóôå üôé ï êùäéêüò äåí åìöáíßæåôáé êáèþò ôïí ðëçêôñïëïãåßôå, ïýôå êáé åìöáíßæïíôáé áóôåñÜêéá óôç èÝóç ôïõ.

```
Changing local password for root.
New password :
```

```
Retype new password :
```

Ç åãêáôÜóôáóç èá óõíå÷éóôåß ìåôÜ ôçí åðéôõ÷çìÝíç åéóáãùãÞ ôïõ êùäéêïý.

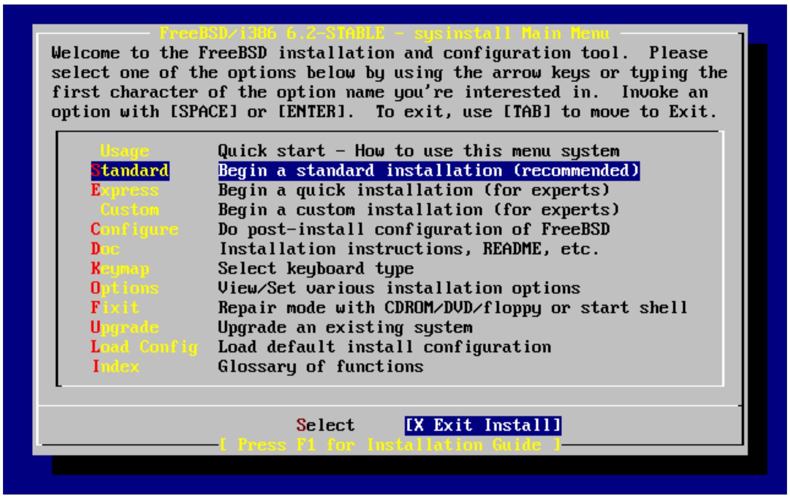
2.10.14 ¸îïäïò áðü ôçí ÅãêáôÜóôáóç

Áí ÷ñåéÜæåôáé íá ñõèìßóåôå ðñüóèåôåò äéêôõáêÝò õðçñåóßåò, Þ êÜðïéá Üëëç ñýèìéóç, ìðïñåßôå íá ôï êÜíåôå ôþñá Þ ìåôÜ ôçí åãêáôÜóôáóç ìå ôç ÷ñÞóç ôçò åíôïëÞò `sysinstall`.

```
                     User Confirmation Requested
 Visit the general configuration menu for a chance to set any last
 options?

                              Yes    [ No ]
```

ÅðéëÝîôå [No] ìå ôá âåëÜêéá êáé ðéÝóôå **Enter** ãéá íá åðéóôñÝøåôå óôï Êõñßùò Ìåíïý ÅãêáôÜóôáóçò (Main Installation Menu).

Ó÷Þìá 2-54. ¸îïäïò áðü ôçí ÅãêáôÜóôáóç



```
FreeBSD/i386 6.2-STABLE - sysinstall Main Menu
Welcome to the FreeBSD installation and configuration tool.  Please
select one of the options below by using the arrow keys or typing the
first character of the option name you're interested in.  Invoke an
option with [SPACE] or [ENTER].  To exit, use [TAB] to move to Exit.

   Usage         Quick start - How to use this menu system
  Standard       Begin a standard installation (recommended)
  Express        Begin a quick installation (for experts)
   Custom        Begin a custom installation (for experts)
  Configure      Do post-install configuration of FreeBSD
  Doc            Installation instructions, README, etc.
  Keymap         Select keyboard type
  Options        View/Set various installation options
  Fixit          Repair mode with CDROM/DVD/floppy or start shell
  Upgrade        Upgrade an existing system
  Load Config    Load default install configuration
  Index          Glossary of functions

                    Select    [X Exit Install]
                 [ Press F1 for Installation Guide ]
```

ÅðéëÝîôå [X Exit Install] ìå ôá âåëÜêéá êáé ðéÝóôå **Enter**. Èá êëçèåßôå íá åðéâåâáéþóåôå ôçí Ýîïäï áðü ôçí åãêáôÜóôáóç:

```
                     User Confirmation Requested
 Are you sure you wish to exit? The system will reboot.

                            [ Yes ]    No
```

ÅðéëÝîôå [Yes]. Áí åß÷áôå îåêéíÞóåé áðü ôï CDROM, èá äåßôå ôï ðáñáêÜôù ìÞíõìá ãéá íá óáò õðåíèõìßóåé íá áöáéñÝóåôå ôï CD:

```
                    Message
 Be sure to remove the media from the drive.
```

```
                     [ OK ]
          [ Press enter or space ]
```

Ï ïäçãüò CDROM èá ðáñáìåßíåé êëåéäùìÝíïò ìÝ÷ñé íá áñ÷ßóåé ç åðáíåêêßíçóç ôïõ ìç÷áíÞìáôïò. Êáôüðéí îåêëåéäþíåé êáé ìðïñåßôå (ãñÞãïñá) íá âãÜëåôå ôï CD áðü ôïí ïäçãü. ÐéÝóôå [OK] ãéá íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá.

Ôï óýóôçìá èá åðáíåêêéíÞóåé, êáé ðñïóÝîôå ãéá ôõ÷üí ìçíýìáôá ëÜèïõò ðïõ èá åìöáíéóôïýí.

2.10.15 Ñýèìéóç Ðñüóèåôùí Õðçñåóéþí Äéêôýïõ

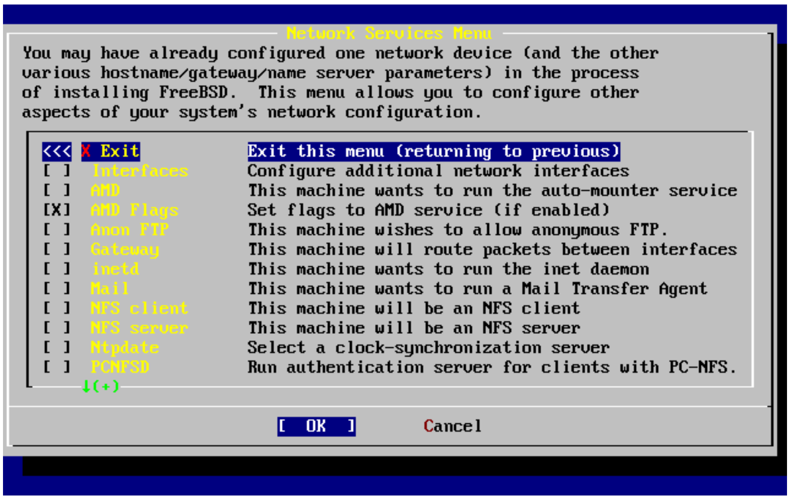
ÓõíåéóöïñÜ áðü ôïí Tom Rhodes.

Ç ñýèìéóç õðçñåóéþí äéêôýïõ ìðïñåß íá åßíáé ìéá äýóêïëç äéáäéêáóßá ãéá íÝïõò ÷ñÞóôåò ÷ùñßò åìðåéñßá óôïí áíôßóôïé÷ï ôïìÝá. Ç äéêôýùóç, ðåñéëáìâáíïìÝíïõ êáé ôïõ Internet, åßíáé êñßóéìç óå üëá ôá ìïíôÝñíá ëåéôïõñãéêÜ óõóôÞìáôá, ðåñéëáìâáíïìÝíïõ êáé ôïõ FreeBSD. Ãéá ôï ëüãï áõôü åßíáé ÷ñÞóéìï íá Ý÷åôå êÜðïéá êáôáíüçóç ôùí åêôåôáìÝíùí éêáíïôÞôùí äéêôýùóçò ôïõ FreeBSD. ÊÜíïíôáò ôï áõôü êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò åðéâåâáéþíåôáé ç äõíáôüôçôá ôùí ÷ñçóôþí íá êáôáíïÞóïõí ôéò äéÜöïñåò õðçñåóßåò ðïõ ôïõò ðáñÝ÷ïíôáé.

Ïé äéêôõáêÝò õðçñåóßåò åßíáé ðñïãñÜììáôá ðïõ äÝ÷ïíôáé åßóïäï áðü ïðïéïäÞðïôå óçìåßï óôï äßêôõï. ÊáôáâÜëëåôáé êÜèå ðñïóðÜèåéá ãéá íá åßíáé óßãïõñï üôé ôá ðñïãñÜììáôá áõôÜ äåí èá êÜíïõí ïôéäÞðïôå “åðéæÞìéï”. Äõóôõ÷þò ïé ðñïãñáììáôéóôÝò äåí åßíáé ôÝëåéïé êáé êáôÜ êáéñïýò Ý÷ïõí åìöáíéóôåß ðåñéðôþóåéò ðïõ óöÜëìáôá óå äéêôõáêÝò õðçñåóßåò Ý÷ïõí ãßíåé áíôéêåßìåíá åêìåôÜëëåõóçò áðü åéóâïëåßò ãéá ôçí åêôÝëåóç êáêüâïõëùí ðñÜîåùí. Åßíáé óçìáíôéêü íá ìçí åíåñãïðïéÞóåôå êáìéÜ äéêôõáêÞ õðçñåóßá ìÝ÷ñé íá áíáêáëýøåôå üôé ôçí ÷ñåéÜæåóôå. Ìðïñåßôå ðÜíôá íá ôçí åíåñãïðïéÞóåôå áñãüôåñá, åêôåëþíôáò îáíÜ ôçí åöáñìïãÞ **sysinstall** Þ ÷ñçóéìïðïéþíôáò ôéò äõíáôüôçôåò ðïõ ðáñÝ÷ïíôáé áðü ôï áñ÷åßï `/etc/rc.conf`.

Ìå ôçí åðéëïãÞ Networking èá äåßôå Ýíá ìåíïý ðáñüìïéï ìå ôï ðáñáêÜôù:

Ó÷Þìá 2-55. Ñýèìéóç Äéêôýïõ Upper-level (ÁíùôÝñïõ ÅðéðÝäïõ)



```
                    Network Services Menu
You may have already configured one network device (and the other
various hostname/gateway/name server parameters) in the process
of installing FreeBSD.  This menu allows you to configure other
aspects of your system's network configuration.

<<< X Exit             Exit this menu (returning to previous)
[ ]  Interfaces        Configure additional network interfaces
[ ]  AMD               This machine wants to run the auto-mounter service
[X]  AMD Flags         Set flags to AMD service (if enabled)
[ ]  Anon FTP          This machine wishes to allow anonymous FTP.
[ ]  Gateway           This machine will route packets between interfaces
[ ]  inetd             This machine wants to run the inet daemon
[ ]  Mail              This machine wants to run a Mail Transfer Agent
[ ]  NFS client        This machine will be an NFS client
[ ]  NFS server        This machine will be an NFS server
[ ]  Ntpdate           Select a clock-synchronization server
[ ]  PCNFSD            Run authentication server for clients with PC-NFS.
      ↓(+)

                 [  OK  ]         Cancel
```

Ç ðñþôç åðéëïãÞ, Interfaces, êáëýöèçêå ðñïçãïõìÝíùò óôï ÔìÞìá 2.10.1, êáé ìðïñåßôå ìå áóöÜëåéá íá ôçí áãíïÞóåôå.

ÅðéëÝãïíôáò AMD ðñïóôßèåôáé õðïóôÞñéîç ãéá ôï âïçèçôéêü ðñüãñáììá áõôüìáôçò ðñïóÜñôçóçò (automatic mount) BSD. Áõôü ÷ñçóéìïðïéåßôáé óõíÞèùò óå óõíäõáóìü ìå ôï ðñùôüêïëëï NFS (äåßôå ðáñáêÜôù) ãéá ôçí áõôüìáôç ðñïóÜñôçóç áðïìáêñõóìÝíùí óõóôçìÜôùí áñ÷åßùí. Äåí áðáéôåßôáé åäþ êÜðïéá éäéáßôåñç ñýèìéóç.

ÁìÝóùò ìåôÜ âñßóêåôáé ç åðéëïãÞ AMD Flags. ¼ôáí ôçí åðéëÝîåôå èá åìöáíéóôåß Ýíá áíáäõüìåíï ìåíïý ãéá íá ìðïñÝóåôå íá åéóÜãåôå óõãêåêñéìÝíåò ðáñáìÝôñïõò (flags) ãéá ôçí õðçñåóßá AMD. Ôï ìåíïý ðåñéÝ÷åé Þäç Ýíá óýíïëï áðü ðñïåðéëïãÝò:

```
-a /.amd_mnt -l syslog /host /etc/amd.map /net /etc/amd.map
```

Ç åðéëïãÞ `-a` èÝôåé ôï ðñïåðéëåãìÝíï óçìåßï ðñïóÜñôçóçò (mount point) ôï ïðïßï åäþ êáèïñßæåôáé ùò `/.amd_mnt`. Ç åðéëïãÞ `-l` êáèïñßæåé ôï ðñïåðéëåãìÝíï áñ÷åßï êáôáãñáöÞò `log`. Ùóôüóï üôáí ÷ñçóéìïðïéåßôáé ôï `syslogd` üëåò ïé åñãáóßåò êáôáãñáöÞò óôÝëíïíôáé óôïí äáßìïíá êáôáãñáöÞò óõóôÞìáôïò (system log daemon). Ï êáôÜëïãïò `/host` ÷ñçóéìïðïéåßôáé ãéá ôçí ðñïóÜñôçóç åíüò äéáìïéñáóìÝíïõ óõóôÞìáôïò áñ÷åßùí áðü Ýíá áðïìáêñõóìÝíï êüìâï, åíþ ï êáôÜëïãïò `/net` ÷ñçóéìïðïéåßôáé ãéá ôçí ðñïóÜñôçóç åíüò äéáìïéñáóìÝíïõ óõóôÞìáôïò áñ÷åßùí áðü ìéá IP äéåýèõíóç. Ôï áñ÷åßï `/etc/amd.map` êáèïñßæåé ôéò ðñïåðéëåãìÝíåò åðéëïãÝò ãéá ôéò ðñïóáñôÞóåéò ìÝóù ôïõ AMD.

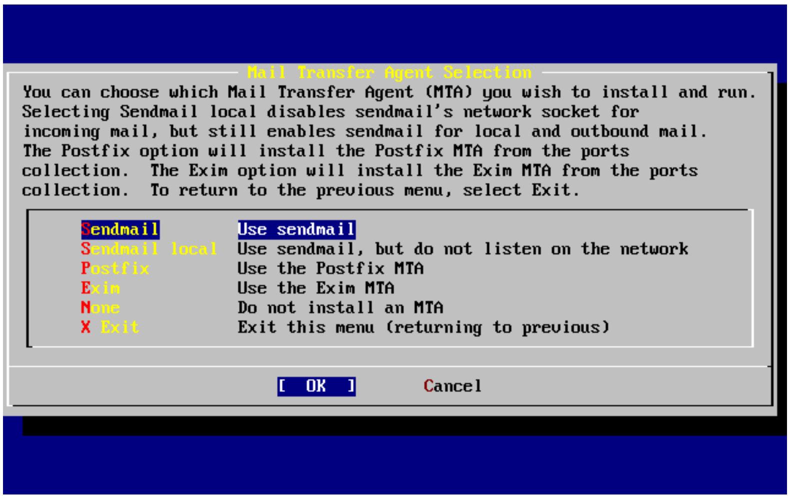
Ç åðéëïãÞ Anon FTP åðéôñÝðåé áíþíõìåò óõíäÝóåéò FTP. ÅðéëÝîôå ôçí ãéá íá êÜíåôå ôï ìç÷Üíçìá áíþíõìï åîõðçñåôçôÞ FTP. Èá ðñÝðåé ùóôüóï íá áíôéëçöèåßôå ôéò åðéðôþóåéò ãéá ôçí áóöÜëåéá ðñéí åíåñãïðïéÞóåôå ôçí åðéëïãÞ áõôÞ. Èá åìöáíéóôåß Ýíá Üëëï ìåíïý ãéá íá åîçãÞóåé ôéò åðéðôþóåéò áõôÝò ìáæß ìå ôéò ñõèìßóåéò óå âÜèïò.

Ôï ìåíïý ñõèìßóåùí Gateway èá ñõèìßóåé ôï ìç÷Üíçìá óáò íá ëåéôïõñãåß ùò ðýëç üðùò åîçãÞóáìå ðñïçãïõìÝíùò. Áí åðéëÝîáôå ôçí åðéëïãÞ Gateway êáôÜ ëÜèïò êáôÜ ôç äéáäéêáóßá åãêáôÜóôáóçò, ìðïñåßôå íá ôçí áðïåðéëÝîåôå åäþ.

Ç åðéëïãÞ Inetd ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá ñõèìßóåé Þ íá áðåíåñãïðïéÞóåé ðëÞñùò ôï äáßìïíá inetd(8) üðùò åîçãÞèçêå ðáñáðÜíù.

Ç åðéëïãÞ Mail ÷ñçóéìïðïéåßôáé ãéá ôçí ñýèìéóç ôïõ ðñïåðéëåãìÝíïõ MTA Þ ÁíôéðñïóþðïõÌåôáöïñÜò Ôá÷õäñïìåßïõ (Mail Transfer Agent) ôïõ óõóôÞìáôïò. Ìå ôçí åðéëïãÞ áõôÞ èá åìöáíéóôåß ôï ðáñáêÜôù ìåíïý:

Ó÷Þìá 2-56. ÅðéëïãÞ ÐñïåðéëåãìÝíïõ MTA



```
You can choose which Mail Transfer Agent (MTA) you wish to install and run.
Selecting Sendmail local disables sendmail's network socket for
incoming mail, but still enables sendmail for local and outbound mail.
The Postfix option will install the Postfix MTA from the ports
collection.  The Exim option will install the Exim MTA from the ports
collection.  To return to the previous menu, select Exit.

Sendmail         Use sendmail
Sendmail local   Use sendmail, but do not listen on the network
Postfix          Use the Postfix MTA
Exim             Use the Exim MTA
None             Do not install an MTA
X Exit           Exit this menu (returning to previous)
```

Óôï óçìåßï áõôü óáò äßíåôáé ç äõíáôüôçôá íá åðéëÝîåôå ðïéï MTA íá åãêáôáóôÞóåôå êáé íá ñõèìßóåôå ùò ðñïåðéëåãìÝíï Ôï MTA äåí åßíáé ôßðïôá ðåñéóóüôåñï áðü ôïí äéáêïìéóôÞ ôá÷õäñïìåßïõ ï ïðïßïò ðáñáäßäåé ôá ìçíýìáôá óôïõò ÷ñÞóôåò ôïõ óõóôÞìáôïò Þ ôï Internet.

Áí åðéëÝîåôå Sendmail èá åãêáôáóôÞóåôå ôçí äçìïöéëÞ åöáñìïãÞ äéáêïìéóôÞ **sendmail** ç ïðïßá åßíáé êáé ç ðñïåðéëåãìÝíç ãéá ôï FreeBSD. Ìå ôçí åðéëïãÞ Sendmail local èá ñõèìßóåôå ôï **sendmail** íá åßíáé ôï ðñïåðéëåãìÝíï MTA, áëëÜ èá áðåíåñãïðïéçèåß ç éêáíüôçôá ôïõ íá ëáìâÜíåé email áðü ôï Internet. Ïé Üëëåò åðéëïãÝò åäþ, Postfix êáé

Exim ãñïõí ðáñüìïéá ìå ôï Sendmail. Êáé ïé äýï äéáíÝìïõí email. Ùóôüóï êÜðïéïé ÷ñÞóôåò ðñïôéìïýí áõôÝò ôéò åíáëëáêôéêÝò ëýóåéò MTA áðü ôï **sendmail**.

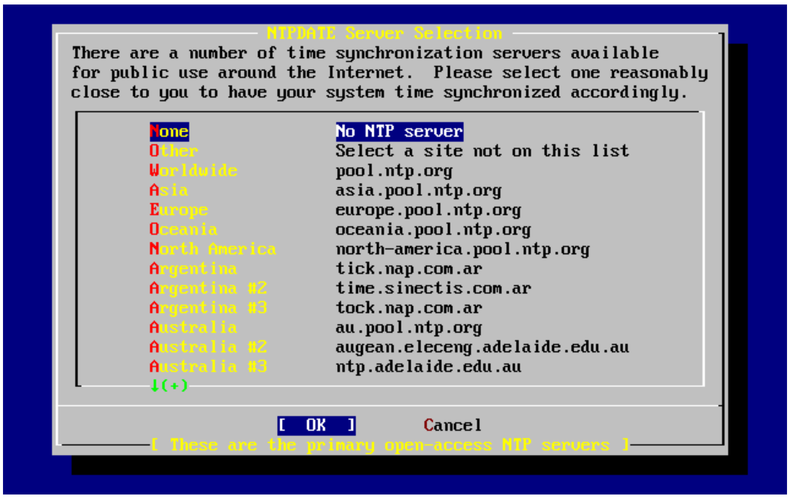
ÌåôÜ ôçí åðéëïãÞ åíüò MTA, Þ áí áðïöáóßóåôå íá ìçí åðéëÝîåôå Ýíá MTA, èá åìöáíéóôåß ôï ìåíïý ñýèìéóçò äéêôýïõ, ìå ôçí åðüìåíç åðéëïãÞ ðïõ åßíáé NFS client.

Ç åðéëïãÞ NFS client èá ñõèìßóåé ôï óýóôçìá óáò íá åðéêïéíùíåß ìå Ýíá åîõðçñåôçôÞ ìÝóù NFS. ¿áò åîõðçñåôçôÞò NFS êáèéóôÜ óõóôÞìáôá áñ÷åßùí äéáèÝóéìá ðñïò Üëëá ìç÷áíÞìáôá ìÝóù ôïõ äéêôýïõ, ÷ñçóéìïðïéþíôáò ôï ðñùôüêïëëï NFS. Áí ôï ìç÷Üíçìá óáò äåí äéáèÝôåé óýíäåóç ôïðéêïý äéêôýïõ, ìðïñåßôå íá áöÞóåôå ôçí ëåéôïõñãßá áõôÞ áðåíåñãïðïéçìÝíç. Ôï óýóôçìá ìðïñåß íá ÷ñåéáóôåß ðåñéóóüôåñåò ñõèìßóåéò áñãüôåñá. Äåßôå óôï ÔìÞìá 30.3 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ñýèìéóçò ôïõ ðåëÜôç êáé ôïõ äéáêïìéóôÞ.

ÊÜôù áðü ôçí åðéëïãÞ áõôÞ õðÜñ÷åé ç áíôßóôïé÷ç NFS server ç ïðïßá åðéôñÝðåé íá ñõèìßóåôå ôï óýóôçìá óáò ùò åîõðçñåôçôÞ NFS. Ðñïóôßèåíôáé ìå ôïí ôñüðï áõôü ïé áðáñáßôçôåò ðëçñïöïñßåò ãéá ôçí åêêßíçóç ôçò õðçñåóßáò RPC (remote procedure call). Ôï RPC ÷ñçóéìïðïéåßôáé ãéá ôïí óõíôïíéóìü ôùí óõíäÝóåùí ìåôáîý ôùí êüìâùí êáé ôùí ðñïãñáììÜôùí.

Óôçí åðüìåíç ãñáììÞ âñßóêåôáé ç åðéëïãÞ Ntpdate ç ïðïßá ÷åéñßæåôáé ôïí óõã÷ñïíéóìü þñáò. ¼ôáí åðéëå÷èåß, åìöáíßæåôáé Ýíá ìåíïý üðùò ôï ðáñáêÜôù:

Ó÷Þìá 2-57. Ñýèìéóç Ntpdate



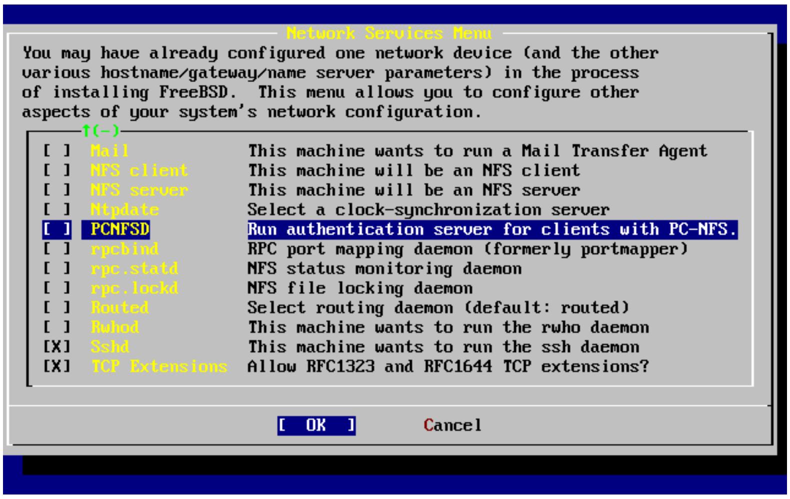
```
NTPDATE Server Selection
There are a number of time synchronization servers available
for public use around the Internet.  Please select one reasonably
close to you to have your system time synchronized accordingly.

None            No NTP server
Other           Select a site not on this list
Worldwide       pool.ntp.org
Asia            asia.pool.ntp.org
Europe          europe.pool.ntp.org
Oceania         oceania.pool.ntp.org
North America   north-america.pool.ntp.org
Argentina       tick.nap.com.ar
Argentina #2    time.sinectis.com.ar
Argentina #3    tock.nap.com.ar
Australia       au.pool.ntp.org
Australia #2    augean.eleceng.adelaide.edu.au
Australia #3    ntp.adelaide.edu.au
↓(+)

[  OK  ]        Cancel
[ These are the primary open-access NTP servers ]
```

Áðü ôï ìåíïý áõôü, åðéëÝîôå ôïí äéáêïìéóôÞ ðïõ åßíáé ðëçóéÝóôåñïò óôçí ôïðïèåóßá óáò. ÅðéëÝãïíôáò ôïí ðëçóéÝóôåñï, ï óõã÷ñïíéóìüò ôçò þñáò èá åßíáé ðéï áêñéâÞò, êáèþò Ýíáò áðïìáêñõóìÝíïò äéáêïìéóôÞò èá Ý÷åé åíäå÷ïìÝíùò ìåãáëýôåñç êáèõóôÝñçóç óôç óýíäåóç.

Ç åðüìåíç åðéëïãÞ åßíáé ôï PCNFSD. Ìå áõôÞí èá åãêáôáóôáèåß ôï ðáêÝôï `net/pcnfsd` áðü ôç óõëëïãÞ Ports. Ðñüêåéôáé ãéá Ýíá ÷ñÞóéìï âïçèçôéêü ðñüãñáììá ôï ïðïßï ðáñÝ÷åé õðçñåóßåò ðéóôïðïßçóçò (authentication) ãéá ôï NFS ãéá óõóôÞìáôá ðïõ äåí Ý÷ïõí äõíáôüôçôá íá ðáñÝ÷ïõí ôéò äéêÝò ôïõò, üðùò ôï ëåéôïõñãéêü óýóôçìá MS-DOS ôçò Microsoft.

Ôþñá èá ðñÝðåé íá ìåôáêéíçèåßôå ðñïò ôá êÜôù ãéá íá äåßôå ôéò Üëëåò åðéëïãÝò:

Ó÷Þìá 2-58. Ñýèìéóç Äéêôýïõ Lower-level (Êáôþôåñïõ ÅðéðÝäïõ)



```
                     Network Services Menu
You may have already configured one network device (and the other
various hostname/gateway/name server parameters) in the process
of installing FreeBSD.  This menu allows you to configure other
aspects of your system's network configuration.
  ↑(-)
 [ ] Mail           This machine wants to run a Mail Transfer Agent
 [ ] NFS client     This machine will be an NFS client
 [ ] NFS server     This machine will be an NFS server
 [ ] Ntpdate        Select a clock-synchronization server
 [ ] PCNFSD         Run authentication server for clients with PC-NFS.
 [ ] rpcbind        RPC port mapping daemon (formerly portmapper)
 [ ] rpc.statd      NFS status monitoring daemon
 [ ] rpc.lockd      NFS file locking daemon
 [ ] Routed         Select routing daemon (default: routed)
 [ ] Rwhod          This machine wants to run the rwho daemon
 [X] Sshd           This machine wants to run the ssh daemon
 [X] TCP Extensions Allow RFC1323 and RFC1644 TCP extensions?

                    [  OK  ]        Cancel
```

Ôá ðñïãñÜììáôá rpcbind(8), rpc.statd(8), êáé rpc.lockd(8) ÷ñçóéìïðïéïýíôáé üëá ãéá Remote Procedure Calls (RPC). Ôï ðñüãñáììá `rpcbind` êáôåõèýíåé ôçí åðéêïéíùíßá ìåôáîý åîõðçñåôçôþí êáé ðåëáôþí NFS êáé áðáéôåßôáé ãéá ôç óùóôÞ ëåéôïõñãßá ôùí åîõðçñåôçôþí NFS. Ï äáßìïíáò **rpc.statd** áëëçëåðéäñÜ ìå ôï äáßìïíá **rpc.statd** Üëëùí ìç÷áíçìÜôùí ãéá íá ðáñÝ÷åé ðëçñïöïñßåò êáôÜóôáóçò. Ç êáôÜóôáóç ðïõ ëáìâÜíåôáé, óõíÞèùò öõëÜóóåôáé óôï áñ÷åßï `/var/db/statd.status`. Ç åðüìåíç åðéëïãÞ ðïõ åìöáíßæåôáé åßíáé ôï rpc.lockd, ôï ïðïßï áí åðéëå÷èåß èá ðáñÝ÷åé õðçñåóßåò êëåéäþìáôïò áñ÷åßùí (file locking). ÓõíÞèùò ÷ñçóéìïðïéåßôáé ìáæß ìå ôï **rpc.statd** ãéá íá ðáñáêïëïõèåß ðïéá ìç÷áíÞìáôá æçôïýí êëåéäþìáôá êáé ðüóï óõ÷íÜ ôá áðáéôïýí. Áí êáé ïé äõï ôåëåõôáßåò åðéëïãÝò åßíáé èáõìÜóéåò ãéá åêóöáëìÜôùóç êáé áíôéìåôþðéóç ðñïâëçìÜôùí, äåí áðáéôïýíôáé ãéá ôç óùóôÞ ëåéôïõñãßá ôùí äéáêïìéóôþí êáé ðåëáôþí NFS.

Êáèþò ðñï÷ùñÜìå ôç ëßóôá ðñïò ôá êÜôù, ç åðüìåíç åðéëïãÞ åßíáé ôï Routed, ðïõ åßíáé ï äáßìïíáò äñïìïëüãçóçò. Ôï ðñüãñáììá routed(8) äéá÷åéñßæåôáé ôïõò ðßíáêåò äñïìïëüãçóçò ôïõ äéêôýïõ, áíáêáëýðôåé äñïìïëïãçôÝò multicast êáé ðáñÝ÷åé, êáôüðéí áéôÞóåùò, áíôßãñáöï ôïõ ðßíáêá äñïìïëüãçóçò óå êÜèå óõíäåìÝíï óôï äßêôõï êüìâï. Ç ÷ñÞóç ôïõ ðñïôåßíåôáé êõñßùò ãéá ìç÷áíÞìáôá ôá ïðïßá äñïõí ùò ðýëç (gateway) óå Ýíá ôïðéêü äßêôõï. ¼ôáí ôï åðéëÝîåôå, èá åìöáíéóôåß Ýíá ìåíïý ôï ïðïßï èá óáò æçôÞóåé ôçí ðñïåðéëåãìÝíç ôïðïèåóßá ãéá ôï ðñüãñáììá. Åßíáé Þäç êáèïñéóìÝíç ãéá óáò, êáé ìðïñåßôå íá ôçí åðéëÝîåôå ðéÝæïíôáò ôï ðëÞêôñï **Enter**. Èá åìöáíéóôåß ôüôå Üëëï Ýíá ìåíïý, ðïõ èá óáò æçôÜ áõôÞ ôç öïñÜ ôõ÷üí åðéðëÝïí ñõèìßóåéò (flags) ðïõ èÝëåôå íá ðåñÜóåôå óôçí åöáñìïãÞ **routed**. Ç ðñïåðéëïãÞ åßíáé ôï `-q` êáé ðñÝðåé Þäç íá öáßíåôáé óôçí ïèüíç óáò.

Óôçí åðüìåíç ãñáììÞ âñßóêåôáé ç åðéëïãÞ Rwhod ç ïðïßá, üôáí åðéëå÷èåß, èá îåêéíÞóåé ôïí äáßìïíá rwhod(8) êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ç åíôïëÞ `rwhod` åêðÝìðåé ðåñéïäéêÜ ìçíýìáôá ôïõ óõóôÞìáôïò óôï äßêôõï, Þ êáé ôá óõëëÝãåé üôáí åßíáé óå êáôÜóôáóç “êáôáíáëùôÞ (consumer)”. Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò óôéò óåëßäåò âïÞèåéáò ruptime(1) êáé rwho(1).

Ç ðñïôåëåõôáßá åðéëïãÞ óôç ëßóôá åßíáé ãéá ôï äáßìïíá sshd(8). Ðñüêåéôáé ãéá ôïí åîõðçñåôçôÞ secure shell Þ **OpenSSH** ï ïðïßïò óõíßóôáôáé éäéáßôåñá óå ó÷Ýóç ìå ôïõò óôÜíôáñ åîõðçñåôçôÝò **telnet** êáé FTP. Ï åîõðçñåôçôÞò **sshd** ÷ñçóéìïðïéåßôáé ãéá ôçí äçìéïõñãßá áóöáëÞò óýíäåóçò ìåôáîý äýï ìç÷áíçìÜôùí, ìå ôç ÷ñÞóç êñõðôïãñáöçìÝíùí óõíäÝóåùí.

ÔÝëïò, õðÜñ÷åé ç åðéëïãÞ TCP Extensions. ÁõôÞ åðéôñÝðåé ôçí ÷ñÞóç ôùí ÅðåêôÜóåùí TCP ðïõ ïñßæïíôáé óôá RFC 1323 êáé RFC 1644. Áí êáé óå ðïëëÜ ìç÷áíÞìáôá, ç ÷ñÞóç ôïõò ìðïñåß íá åðéôá÷ýíåé ôéò óõíäÝóåéò, ìðïñåß åðßóçò íá ðñïêáëÝóåé êáé ôçí êáôÜññåõóç êÜðïéùí áðü áõôÝò. Äåí óõíßóôáôáé ãéá åîõðçñåôçôÝò, ìðïñåß üìùò íá åßíáé ÷ñÞóéìç óå áíåîÜñôçôá ìç÷áíÞìáôá.

Ôþñá ðïõ Ý÷åôå ñõèìßóåé ôéò äéêôõáêÝò õðçñåóßåò, ìðïñåßôå íá ìåôáêéíçèåßôå óôï ðñþôï óôïé÷åßï ôçò ëßóôáò, ôï Exit êáé íá óõíå÷ßóåôå ìå ôï åðüìåíï èÝìá ñõèìßóåùí.

2.10.16 Åêêßíçóç ôïõ FreeBSD

2.10.16.1 Åêêßíçóç FreeBSD/i386

Áí üëá ðÞãáí êáëÜ, èá äåßôå ìçíýìáôá íá êõëïýí óôçí ïèüíç óáò ìÝ÷ñé íá öôÜóåôå óôçí ðñïôñïðÞ åéóüäïõ (login prompt). Ìðïñåßôå íá äåßôå ôï ðåñéå÷üìåíï ôùí ìçíõìÜôùí ìå ôçí ðßåóç ôïõ ðëÞêôñïõ **Scroll-Lock** êáé ÷ñçóéìïðïéþíôáò ôá ðëÞêôñá **PgUp** êáé **PgDn**. ÐéÝæïíôáò îáíÜ ôï **Scroll-Lock** èá åðáíÝëèåôå óôçí ðñïôñïðÞ.

Ìðïñåß íá ìçí êáôáöÝñåôå íá äåßôå üëá ôá ìçíýìáôá (ëüãù ðåñéïñéóìÝíçò ôçò ðñïóùñéíÞò ìíÞìçò buffer) áëëÜ ìðïñåßôå íá ôá äåßôå ìåôÜ ôçí åßóïäï óáò, ìå ôç ÷ñÞóç ôçò åíôïëÞò `dmesg` óôç ãñáììÞ åíôïëþí.

ÊÜíôå login ìå ôç ÷ñÞóç ôïõ ïíüìáôïò ÷ñÞóôç êáé êùäéêïý ðïõ äçìéïõñãÞóáôå êáôÜ ôçí åãêáôÜóôáóç (óôï ðáñÜäåéãìá ìáò, `rpratt`). Áðïöýãåôå íá åéóÝñ÷åóôå ùò `root` áí äåí åßíáé áðáñáßôçôï.

ÔõðéêÜ ìçíýìáôá åêêßíçóçò (Ý÷ïõí ðáñáëåéöèåß ïé ðëçñïöïñßåò Ýêäïóçò):

```
Copyright (c) 1992-2002 The FreeBSD Project.
Copyright (c) 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994
        The Regents of the University of California. All rights reserved.

Timecounter "i8254"  frequency 1193182 Hz
CPU: AMD-K6(tm) 3D processor (300.68-MHz 586-class CPU)
  Origin = "AuthenticAMD"  Id = 0x580  Stepping = 0
  Features=0x8001bf<FPU,VME,DE,PSE,TSC,MSR,MCE,CX8,MMX>
  AMD Features=0x80000800<SYSCALL,3DNow!>
real memory  = 268435456 (262144K bytes)
config> di sn0
config> di lnc0
config> di le0
config> di ie0
config> di fe0
config> di cs0
config> di bt0
config> di aic0
config> di aha0
config> di adv0
config> q
avail memory = 256311296 (250304K bytes)
Preloaded elf kernel "kernel" at 0xc0491000.
Preloaded userconfig_script "/boot/kernel.conf" at 0xc049109c.
md0: Malloc disk
Using $PIR table, 4 entries at 0xc00fde60
npx0: <math processor> on motherboard
npx0: INT 16 interface
pcib0: <Host to PCI bridge> on motherboard
pci0: <PCI bus> on pcib0
pcib1: <VIA 82C598MVP (Apollo MVP3) PCI-PCI (AGP) bridge> at device 1.0 on pci0
pci1: <PCI bus> on pcib1
pci1: <Matrox MGA G200 AGP graphics accelerator> at 0.0 irq 11
```

```
isab0: <VIA 82C586 PCI-ISA bridge> at device 7.0 on pci0
isa0: <ISA bus> on isab0
atapci0: <VIA 82C586 ATA33 controller> port 0xe000-0xe00f at device 7.1 on pci0
ata0: at 0x1f0 irq 14 on atapci0
ata1: at 0x170 irq 15 on atapci0
uhci0: <VIA 83C572 USB controller> port 0xe400-0xe41f irq 10 at device 7.2 on pci0
usb0: <VIA 83C572 USB controller> on uhci0
usb0: USB revision 1.0
uhub0: VIA UHCI root hub, class 9/0, rev 1.00/1.00, addr 1
uhub0: 2 ports with 2 removable, self powered
chip1: <VIA 82C586B ACPI interface> at device 7.3 on pci0
ed0: <NE2000 PCI Ethernet (RealTek 8029)> port 0xe800-0xe81f irq 9 at
device 10.0 on pci0
ed0: address 52:54:05:de:73:1b, type NE2000 (16 bit)
isa0: too many dependant configs (8)
isa0: unexpected small tag 14
fdc0: <NEC 72065B or clone> at port 0x3f0-0x3f5,0x3f7 irq 6 drq 2 on isa0
fdc0: FIFO enabled, 8 bytes threshold
fd0: <1440-KB 3.5” drive> on fdc0 drive 0
atkbdc0: <keyboard controller (i8042)> at port 0x60-0x64 on isa0
atkbd0: <AT Keyboard> flags 0x1 irq 1 on atkbdc0
kbd0 at atkbd0
psm0: <PS/2 Mouse> irq 12 on atkbdc0
psm0: model Generic PS/2 mouse, device ID 0
vga0: <Generic ISA VGA> at port 0x3c0-0x3df iomem 0xa0000-0xbffff on isa0
sc0: <System console> at flags 0x1 on isa0
sc0: VGA <16 virtual consoles, flags=0x300>
sio0 at port 0x3f8-0x3ff irq 4 flags 0x10 on isa0
sio0: type 16550A
sio1 at port 0x2f8-0x2ff irq 3 on isa0
sio1: type 16550A
ppc0: <Parallel port> at port 0x378-0x37f irq 7 on isa0
ppc0: SMC-like chipset (ECP/EPP/PS2/NIBBLE) in COMPATIBLE mode
ppc0: FIFO with 16/16/15 bytes threshold
ppbus0: IEEE1284 device found /NIBBLE
Probing for PnP devices on ppbus0:
plip0: <PLIP network interface> on ppbus0
lpt0: <Printer> on ppbus0
lpt0: Interrupt-driven port
ppi0: <Parallel I/O> on ppbus0
ad0: 8063MB <IBM-DHEA-38451> [16383/16/63] at ata0-master using UDMA33
ad2: 8063MB <IBM-DHEA-38451> [16383/16/63] at ata1-master using UDMA33
acd0: CDROM <DELTA OTC-H101/ST3 F/W by OIPD> at ata0-slave using PIO4
Mounting root from ufs:/dev/ad0s1a
swapon: adding /dev/ad0s1b as swap device
Automatic boot in progress...
/dev/ad0s1a: FILESYSTEM CLEAN; SKIPPING CHECKS
/dev/ad0s1a: clean, 48752 free (552 frags, 6025 blocks, 0.9% fragmentation)
/dev/ad0s1f: FILESYSTEM CLEAN; SKIPPING CHECKS
/dev/ad0s1f: clean, 128997 free (21 frags, 16122 blocks, 0.0% fragmentation)
/dev/ad0s1g: FILESYSTEM CLEAN; SKIPPING CHECKS
/dev/ad0s1g: clean, 3036299 free (43175 frags, 374073 blocks, 1.3% fragmentation)
/dev/ad0s1e: filesystem CLEAN; SKIPPING CHECKS
```

```
/dev/ad0s1e: clean, 128193 free (17 frags, 16022 blocks, 0.0% fragmentation)
Doing initial network setup: hostname.
ed0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet 192.168.0.1 netmask 0xffffff00 broadcast 192.168.0.255
        inet6 fe80::5054::5ff::fede:731b%ed0 prefixlen 64 tentative scopeid 0x1
        ether 52:54:05:de:73:1b
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x8
        inet6 ::1 prefixlen 128
        inet 127.0.0.1 netmask 0xff000000
Additional routing options: IP gateway=YES TCP keepalive=YES
routing daemons:.
additional daemons: syslogd.
Doing additional network setup:.
Starting final network daemons: creating ssh RSA host key
Generating public/private rsa1 key pair.
Your identification has been saved in /etc/ssh/ssh_host_key.
Your public key has been saved in /etc/ssh/ssh_host_key.pub.
The key fingerprint is:
cd:76:89:16:69:0e:d0:6e:f8:66:d0:07:26:3c:7e:2d root@k6-2.example.com
 creating ssh DSA host key
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
f9:a1:a9:47:c4:ad:f9:8d:52:b8:b8:ff:8c:ad:2d:e6 root@k6-2.example.com.
setting ELF ldconfig path: /usr/lib /usr/lib/compat /usr/X11R6/lib
/usr/local/lib
a.out ldconfig path: /usr/lib/aout /usr/lib/compat/aout /usr/X11R6/lib/aout
starting standard daemons: inetd cron sshd usbd sendmail.
Initial rc.i386 initialization:.
rc.i386 configuring syscons: blank_time screensaver moused.
Additional ABI support: linux.
Local package initialization:.
Additional TCP options:.

FreeBSD/i386 (k6-2.example.com) (ttyv0)

login: rpratt
Password:
```

Ç äçìéïõñãßá ôùí êëåéäéþí RSA êáé DSA ìðïñåß íá ðÜñåé êÜðïéï ÷ñüíï óå áñãÜ ìç÷áíÞìáôá. Áõôü óõìâáßíåé ìüíï óôçí ðñþôç åêêßíçóç åíüò íÝïõ óõóôÞìáôïò. Ïé åðüìåíåò åêêéíÞóåéò èá åßíáé ðéï ãñÞãïñåò.

Áí Ý÷åôå ñõèìßóåé ôïí X server êáé Ý÷åôå åðéëÝîåé ãñáöéêü ðåñéâÜëëïí åñãáóßáò, ìðïñåßôå íá ôï îåêéíÞóåôå äßíïíôáò ôçí åíôïëÞ `startx` óôçí ãñáììÞ åíôïëþí.

2.10.17 Ôåñìáôéóìüò ôïõ FreeBSD

Åßíáé ðïëý óçìáíôéêü íá ôåñìáôßæåôå óùóôÜ ôï ëåéôïõñãéêü óýóôçìá. Ìçí óâÞíåôå áðëþò ôïí õðïëïãéóôÞ áðü ôï äéáêüðôç ñåýìáôïò. Ðñþôá áðü üëá, ãßíåôå õðåñ÷ñÞóôçò (superuser) ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `su` óôç ãñáììÞ åíôïëþí êáé äßíïíôáò ôïí êùäéêü ôïõ `root`. Áõôü ìðïñåß íá ãßíåé ìüíï áí ï ÷ñÞóôçò áíÞêåé óôçí ïìÜäá `wheel`. Äéáöïñåôéêü, êÜíôå êáíïíéêÜ login óáí `root` êáé ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `shutdown -h now`.

```
The operating system has halted.
Please press any key to reboot.
```

Åßíáé áóöáëÝò íá äéáêüøåôå ôçí ôñïöïäïóßá áöïý äþóåôå ôçí åíôïëÞ shutdown êáé äåßôå ôï ìÞíõìá “Please press any key to reboot”. Áí ðéÝóåôå ïðïéïäÞðïôå ðëÞêôñï áíôß íá äéáêüøåôå ôçí ôñïöïäïóßá, ôï óýóôçìá èá åðáíåêêéíÞóåé.

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôï óõíäõáóìü ðëÞêôñùí **Ctrl**+**Alt**+**Del** ãéá íá åðáíåêêéíÞóåôå ôï óýóôçìá, ùóôüóï áõôü äåí óõíßóôáôáé êáôÜ ôç äéÜñêåéá ôçò êáíïíéêÞò ëåéôïõñãßáò.

2.11 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Ôï åðüìåíï ôìÞìá êáëýðôåé âáóéêÞ áíôéìåôþðéóç ðñïâëçìÜôùí êáôÜ ôçí åãêáôÜóôáóç, ìå âÜóç óõíçèéóìÝíá ðñïâëÞìáôá ðïõ Ý÷ïõí áíáöåñèåß áðü ÷ñÞóôåò. ÕðÜñ÷ïõí åðßóçò ìåñéêÝò åñùôÞóåéò êáé áðáíôÞóåéò ãéá üóïõò åðéèõìïýí íá äçìéïõñãÞóïõí óýóôçìá dual-boot ôïõ FreeBSD ìå ôï MS-DOS.

2.11.1 Ôé íá ÊÜíåôå áí ÊÜôé ÐÜåé ÓôñáâÜ

Ëüãù ôùí äéÜöïñùí ðåñéïñéóìþí ôçò áñ÷éôåêôïíéêÞò ôïõ PC, äåí åßíáé äõíáôüí ç áíß÷íåõóç óõóêåõþí íá åßíáé 100% áîéüðéóôç, ùóôüóï õðÜñ÷ïõí êÜðïéá ðñÜãìáôá ðïõ ìðïñåßôå íá êÜíåôå áí áðïôý÷åé.

ÅëÝãîôå ôï Ýããñáöï Óçìåéþóåùí Õëéêïý (Hardware Notes) (http://www.FreeBSD.org/releases/index.html) ãéá ôçí Ýêäïóç ôïõ FreeBSD ðïõ Ý÷åôå, ãéá íá óéãïõñåõôåßôå üôé ôï õëéêü óáò õðïóôçñßæåôáé.

Áí ôï õëéêü óáò õðïóôçñßæåôáé, áëëÜ ðÜëé áíôéìåôùðßæåôå êïëëÞìáôá Þ Üëëá ðñïâëÞìáôá, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå åîåéäéêåõìÝíï ðõñÞíá. Èá ìðïñÝóåôå ìå ôïí ôñüðï áõôü íá ðñïóèÝóåôå õðïóôÞñéîç ãéá óõóêåõÝò ðïõ äåí õðÜñ÷ïõí óôï ðõñÞíá `GENERIC`. Ï ðõñÞíáò óôéò äéóêÝôåò åêêßíçóçò åßíáé ñõèìéóìÝíïò õðïèÝôïíôáò üôé ïé ðåñéóóüôåñåò óõóêåõÝò õëéêïý åßíáé óôéò åñãïóôáóéáêÝò ôïõò ñõèìßóåéò, üóï áöïñÜ ôá IRQs, ôéò äéåõèýíóåéò IO êáé ôá DMA êáíÜëéá. Áí Ý÷åôå áëëÜîåé ôéò ñõèìßóåéò áõôÝò óôï óýóôçìá óáò, èá ÷ñåéáóôåß êáôÜ ðÜóá ðéèáíüôçôá, íá áëëÜîåôå ôï áñ÷åßï ñõèìßóåùí êáé íá ìåôáãëùôôßóåôå îáíÜ ôïí ðõñÞíá ãéá íá ïäçãÞóåôå ôï FreeBSD íá ôéò âñåé.

Åßíáé åðßóçò ðéèáíüí ç áíß÷íåõóç ãéá ìéá óõóêåõÞ ðïõ äåí õðÜñ÷åé, íá ïäçãÞóåé óå áðïôõ÷ßá ìéá ìåôáãåíÝóôåñç áíß÷íåõóç ãéá ìéá Üëëç óõóêåõÞ. Óôçí ðåñßðôùóç áõôÞ, èá ðñÝðåé íá áðåíåñãïðïéçèåß ç áíß÷íåõóç ãéá ôçí óõóêåõÞ ðïõ äçìéïõñãåß ôï ðñüâëçìá.

> **Óçìåßùóç:** ÊÜðïéá ðñïâëÞìáôá åãêáôÜóôáóçò ìðïñåß íá áðïöå÷èïýí Þ íá åîáëåéöèïýí áí áíáíåþóåôå ôï firmware óå äéÜöïñåò óõóêåõÝò õëéêïý, êáé êáôÜ êýñéï ëüãï ôçò ìçôñéêÞò. Ôï firmware ôçò ìçôñéêÞò áíáöÝñåôáé åðßóçò ùò BIOS êáé ïé ðåñéóóüôåñïé êáôáóêåõáóôÝò ìçôñéêþí Þ õðïëïãéóôþí äéáèÝôïõí äéêôõáêü ôüðï óôïí ïðïßï ìðïñåßôå íá âñåßôå ðëçñïöïñßåò ãéá áíáâáèìßóåéò Þ áíáíåþóåéò.
>
> Ïé ðåñéóóüôåñïé êáôáóêåõáóôÝò äåí óõíéóôïýí ôçí áíáâÜèìéóç ôïõ BIOS ôçò ìçôñéêÞò áí äå õðÜñ÷åé óïâáñüò ëüãïò, êáèþò ç áíáâÜèìéóç ìðïñåß íá åßíáé ìéá êñßóéìç äéáäéêáóßá. Ç äéáäéêáóßá áíáâÜèìéóçò *ìðïñåß* íá ðÜåé óôñáâÜ, êáé íá ðñïêëçèåß ìüíéìç æçìéÜ óôï êýêëùìá ôïõ BIOS.

2.11.2 ×ñçóéìïðïéþíôáò ÓõóôÞìáôá Áñ÷åßùí MS-DOS® êáé Windows

Ôç äåäïìÝíç óôéãìÞ, ôï FreeBSD äåí õðïóôçñßæåé óõóôÞìáôá áñ÷åßùí ðïõ åßíáé óõìðéåóìÝíá ìå ôçí åöáñìïãÞ **Double Space™**. Ãéá ôï ëüãï áõôü èá ðñÝðåé íá ôá áðïóõìðéÝóåôå þóôå ôï FreeBSD íá Ý÷åé ðñüóâáóç óôá äåäïìÝíá. Áõôü ìðïñåß íá ãßíåé åêôåëþíôáò ôçí åöáñìïãÞ **Compression Agent** ðïõ âñßóêåôáé óôï ìåíïý Start (¸íáñîç)> Programs (ÐñïãñÜììáôá) > System Tools (Åñãáëåßá ÓõóôÞìáôïò).

Ôï FreeBSD ìðïñåß íá õðïóôçñßîåé óõóôÞìáôá áñ÷åßùí ôýðïõ MS-DOS (ïñéóìÝíåò öïñÝò áíáöÝñïíôáé êáé ùò FAT). Ç åíôïëÞ mount_msdosfs(8) ìðïñåß íá ðñïóáñôÞóåé áõôÜ ôá óõóôÞìáôá áñ÷åßùí óå êÜðïéï Þäç õðÜñ÷ïí êáôÜëïãï, åðéôñÝðïíôáò Ýôóé ôçí ðñüóâáóç óôá ðåñéå÷üìåíá ôïõò. Äåí óõíçèßæåôáé íá ãßíåôáé Üìåóá êëÞóç ôïõ ðñïãñÜììáôïò mount_msdosfs(8). ÓõíÞèùò, êáèïñßæåôáé áðü ôï óýóôçìá ìÝóù ìéáò ãñáììÞò óôï áñ÷åßï `/etc/fstab` Þ ìå êëÞóç ôïõ âïçèçôéêïý ðñïãñÜììáôïò mount(8) ìå ôéò áðáñáßôçôåò ðáñáìÝôñïõò. Ìéá ôõðéêÞ ñýèìéóç óôï áñ÷åßï `/etc/fstab` åßíáé ç ðáñáêÜôù:

```
/dev/ad0sN  /dos   msdosfs  rw  0    0
```

Óçìåßùóç: Ãéá íá äïõëÝøåé ôï ðáñáðÜíù, ï êáôÜëïãïò `/dos` èá ðñÝðåé íá õðÜñ÷åé Þäç. Ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôç ìïñöÞ ôùí êáôá÷ùñÞóåùí óôï áñ÷åßï `/etc/fstab`, äåßôå ôç óåëßäá manual fstab(5).

ÐáñáêÜôù öáßíåôáé ìéá ôõðéêÞ êëÞóç óôçí mount(8) ãéá ôçí ðñïóÜñôçóç åíüò óõóôÞìáôïò áñ÷åßùí MS-DOS:

```
# mount -t msdosfs /dev/ad0s1 /mnt
```

Óôï ðáñÜäåéãìá áõôü, ôï óýóôçìá áñ÷åßùí ôïõ MS-DOS åßíáé óôçí ðñþôç êáôÜôìçóç ôïõ ðñùôåýïíôïò äßóêïõ. Ç äéêÞ óáò ðåñßðôùóç ìðïñåß íá åßíáé äéáöïñåôéêÞ, åëÝãîôå ôï áðïôÝëåóìá ôùí åíôïëþí `dmesg` êáé `mount`. Ïé ðëçñïöïñßåò áðü áõôÝò ôéò åíôïëÝò ðñÝðåé íá åßíáé áñêåôÝò ãéá íá ðÜñåôå ìéá éäÝá ôçò äéÜôáîçò ôùí êáôáôìÞóåùí.

Óçìåßùóç: Ôï FreeBSD ßóùò íá áñéèìÞóåé ôá slices ôïõ äßóêïõ (ðïõ óôï MS-DOS êáëïýíôáé êáôáôìÞóåéò) äéáöïñåôéêÜ áðü Üëëá ëåéôïõñãéêÜ óõóôÞìáôá. Åéäéêüôåñá, ôá åêôåôáìÝíá (extended) äéáìåñßóìáôá MS-DOS ðáßñíïõí óõíÞèùò ìåãáëýôåñç áñßèìçóç áðü ôá ðñùôåýïíôá äéáìåñßóìáôá ôïõ MS-DOS. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï âïçèçôéêü ðñüãñáììá fdisk(8) ãéá íá áíáãíùñßóåôå ðïéåò êáôáôìÞóåéò áíÞêïõí óôï FreeBSD, êáé ðïéåò óå Üëëá ëåéôïõñãéêÜ óõóôÞìáôá.

Ìðïñåßôå åðßóçò íá ðñïóáñôÞóåôå NTFS êáôáôìÞóåéò ìå ðáñüìïéï ôñüðï, ìå ôç ÷ñÞóç ôçò åíôïëÞò mount_ntfs(8).

2.11.3 ÅñùôÞóåéò êáé ÁðáíôÞóåéò Áíôéìåôþðéóçò ÐñïâëçìÜôùí

1. Ôï óýóôçìá ìïõ êñåìÜåé êáôÜ ôçí áíáãíþñéóç õëéêïý óôç äéÜñêåéá ôçò åêêßíçóçò Þ óõìðåñéöÝñåôáé ðåñßåñãá êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò Þ äåí áíé÷íåýåôáé ç ìïíÜäá äéóêÝôáò.

Óôï FreeBSD ãßíåôáé åêôåôáìÝíç ÷ñÞóç ôïõ ACPI (åöüóïí áíé÷íåõèåß óôçí åêêßíçóç) óôéò ðëáôöüñìåò i386, amd64 êáé ia64 ãéá äéåõêüëõíóç ôçò ñýèìéóçò õëéêïý. Äõóôõ÷þò õðÜñ÷ïõí áêüìá êÜðïéá ðñïâëÞìáôá ôüóï óôï ðñüãñáììá ïäÞãçóçò ôïõ ACPI üóï êáé óôá BIOS êáé ôéò ìçôñéêÝò. Ìðïñåßôå íá áðåíåñãïðïéÞóåôå ôï ACPI, ìå ôçí ñýèìéóç `hint.acpi.0.disabled` óôï ôñßôï óôÜäéï ôïõ öïñôùôÞ (boot loader):

```
set hint.acpi.0.disabled="1"
```

Ç ñýèìéóç áõôÞ ÷Üíåôáé óå êÜèå åðáíåêêßíçóç, êáé Ýôóé åßíáé áðáñáßôçôï íá ðñïóèÝóåôå `hint.acpi.0.disabled="1"` óôï áñ÷åßï `/boot/loader.conf`. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôïí boot loader ìðïñåßôå íá âñåßôå óôï ÔìÞìá 13.1.

2. ÊáôÜöåñá íá îåêéíÞóù áðü ôï óêëçñü äßóêï ãéá ðñþôç öïñÜ ìåôÜ ôçí åãêáôÜóôáóç ôïõ FreeBSD, ï ðõñÞíáò öïñôþíåé êáé áíé÷íåýåé ôï õëéêü ìïõ, áëëÜ óôáìáôÜåé ìå ìçíýìáôá üðùò:

```
changing root device to ad1s1a panic: cannot mount root
```

Ôé åßíáé ëÜèïò; Ôé ìðïñþ íá êÜíù;

Ôé åßíáé ôï ìÞíõìá `bios_drive:interface(unit,partition)kernel_name` ðïõ åìöáíßæåôáé óôç âïÞèåéá ôçò åêêßíçóçò;

ÕðÜñ÷åé áðü ðáëéÜ Ýíá ðñüâëçìá üôáí ï óêëçñüò äßóêïò áðü ôïí ïðïßï ãßíåôáé ç åêêßíçóç äåí åßíáé ï ðñþôïò äßóêïò ôïõ óõóôÞìáôïò. Ôï BIOS ÷ñçóéìïðïéåß äéáöïñåôéêü óýóôçìá áñßèìçóçò áðü ôï FreeBSD êáé ç åýñåóç ôïõ óùóôïý áñéèìïý ãéá êÜèå óõóêåõÞ åßíáé äýóêïëç.

Óôçí ðåñßðôùóç ðïõ ï äßóêïò åêêßíçóçò äåí åßíáé ï ðñþôïò äßóêïò ôïõ óõóôÞìáôïò, ôï FreeBSD ìðïñåß íá ÷ñåéáóôåß êÜðïéá âïÞèåéá ãéá íá ôïí âñåé. ÕðÜñ÷ïõí äýï óõíçèéóìÝíåò ðåñéðôþóåéò, áëëÜ êáé óôéò äýï ðñÝðåé íá ðåßôå óôï FreeBSD ðïõ èá âñåé ôï ñéæéêü (root) óýóôçìá áñ÷åßùí. Áõôü ãßíåôáé ïñßæïíôáò ôïí áñéèìü ôïõ äßóêïõ óýìöùíá ìå ôï BIOS, ôïí ôýðï ôïõ äßóêïõ, êáé ôïí áñéèìü ôïõ äßóêïõ óôï FreeBSD áíÜëïãá ìå ôïí ôýðï ôïõ.

Ç ðñþôç ðåñßðôùóç åßíáé áí Ý÷åôå äýï äßóêïõò IDE, êáèÝíáò ñõèìéóìÝíïò ùò master óôï áíôßóôïé÷ï IDE êáíÜëé, êáé èÝëåôå íá îåêéíÞóåôå ôï FreeBSD áðü ôï äåýôåñï äßóêï. Ôï BIOS ôïõò âëÝðåé ùò äßóêïõò 0 êáé 1, åíþ ôï FreeBSD ôïõò âëÝðåé ùò `ad0` êáé `ad2`.

Ôï FreeBSD âñßóêåôáé óôï äßóêï 1 ôïõ BIOS, ôýðïõ `ad` åíþ óôï FreeBSD öáßíåôáé ùò äßóêïò 2, Üñá ðñÝðåé íá äþóåôå:

```
1:ad(2,a)kernel
```

Óçìåéþóôå üôé áí Ý÷åôå äßóêï slave óôï ðñùôåýïí êáíÜëé, ôï ðáñáðÜíù äåí åßíáé áðáñáßôçôï (êáé åßíáé ïõóéáóôéêÜ ëÜèïò).

Ç äåýôåñç ðåñßðôùóç ðåñéëáìâÜíåé ôçí åêêßíçóç áðü äßóêï SCSI, üôáí Ý÷åôå åðßóçò Ýíá Þ ðåñéóóüôåñïõò IDE äßóêïõò óôï óýóôçìá. Óôçí ðåñßðôùóç áõôÞ ï áñéèìüò ôïõ äßóêïõ óôï FreeBSD åßíáé ÷áìçëüôåñïò áðü ôïí áíôßóôïé÷ï ôïõ BIOS. Áí Ý÷åôå äýï äßóêïõò IDE êáé ôï SCSI äßóêï, ï SCSI äßóêïò öáßíåôáé óôï BIOS ùò äßóêïò 2, ôýðïõ `da` êáé áíáãíùñßæåôáé óôï FreeBSD ùò äßóêïò 0, èá ãñÜöåôå:

```
2:da(0,a)kernel
```

Ãéá íá ðåßôå óôï FreeBSD üôé èÝëåôå íá åêêéíÞóåôå áðü ôïí äßóêï 2 ôïõ BIOS ðïõ åßíáé ï ðñþôïò SCSI äßóêïò ôïõ óõóôÞìáôïò. Áí åß÷áôå ìüíï Ýíá IDE äßóêï, èá ÷ñçóéìïðïéïýóáôå ôï `1:` áíôß ãéá `2:`.

Ìüëéò âñåßôå ôéò óùóôÝò ôéìÝò, ìðïñåßôå íá âÜëåôå ôçí åíôïëÞ, áêñéâþò üðùò èá ôç ãñÜöáôå, óôï áñ÷åßï `/boot.config` ÷ñçóéìïðïéþíôáò Ýíá óõíçèéóìÝíï åðåîåñãáóôÞ êåéìÝíïõ. Áí äåí ïñßóåôå äéáöïñåôéêÜ, ôï FreeBSD èá ÷ñçóéìïðïéåß ôá ðåñéå÷üìåíá ôïõ áñ÷åßïõ áõôïý ùò ðñïåðéëïãÞ óôçí ðñïôñïðÞ `boot:`.

3. Îåêßíçóá áðü ôï óêëçñü äßóêï ãéá ðñþôç öïñÜ ìåôÜ ôçí åãêáôÜóôáóç ôïõ FreeBSD, áëëÜ ï Äéá÷åéñéóôÞò Åêêßíçóçò (Boot Manager) ôõðþíåé áðëþò `F?` êÜèå öïñÜ óôï ìåíïý åêêßíçóçò êáé äåí óõíå÷ßæåé ðåñéóóüôåñï.

Äåí ñõèìßóáôå óùóôÜ ôç ãåùìåôñßá ôïõ óêëçñïý äßóêïõ óôïí åðåîåñãáóôÞ êáôáôìÞóåùí üôáí åãêáôáóôÞóáôå ôï FreeBSD. Ðçãáßíåôå îáíÜ óôïí åðåîåñãáóôÞ êáôáôìÞóåùí êáé ïñßóôå ôç óùóôÞ ãåùìåôñßá ôïõ óêëçñïý óáò äßóêïõ. ÐñÝðåé íá åðáíåãêáôáóôÞóåôå ôï FreeBSD áðü ôçí áñ÷Þ, ìå ôç óùóôÞ ãåùìåôñßá.

Áí äåí ìðïñåßôå íá âñåßôå ìå êáíÝíá ôñüðï ôç óùóôÞ ãåùìåôñßá ãéá ôï ìç÷Üíçìá óáò, äïêéìÜóôå ôïí áêüëïõèï ôñüðï: Äçìéïõñãåßóôå ìéá ìéêñÞ êáôÜôìçóç MS-DOS óôçí áñ÷Þ ôïõ äßóêïõ, êáé åãêáôáóôÞóôå ôï FreeBSD ìåôÜ áðü áõôü. Ôï ðñüãñáììá åãêáôÜóôáóçò èá äåé ôçí êáôÜôìçóç ôïõ MS-DOS êáé èá ðñïóðáèÞóåé íá áíé÷íåýóåé áðü áõôÞí ôçí óùóôÞ ãåùìåôñßá, êÜôé ôï ïðïßï óõíÞèùò ðåôõ÷áßíåé.

Äåí óáò óõíéóôïýìå íá áêïëïõèÞóåôå ôï ðáñáêÜôù, áëëÜ ôï áöÞíïõìå åäþ áðëþò ùò áíáöïñÜ:

> Áí öôéÜ÷íåôå Ýíá ìç÷Üíçìá desktop Þ åîõðçñåôçôÞ ãéá áðïêëåéóôéêÞ ÷ñÞóç áðü ôï FreeBSD êáé äåí óáò åíäéáöÝñåé ðéèáíÞ (ìåëëïíôéêÞ) óõìâáôüôçôá ìå MS-DOS, Linux Þ Üëëï ëåéôïõñãéêü óýóôçìá, Ý÷åôå åðßóçò ôçí åðéëïãÞ íá ÷ñçóéìïðïéÞóåôå ïëüêëçñï ôï äßóêï (ðéÝæïíôáò ôï A óôïí åðåîåñãáóôÞ êáôáôìÞóåùí), êáé åðéëÝãïíôáò ôç ìç-óôÜíôáñ åðéëïãÞ üðïõ ôï FreeBSD êáôáëáìâÜíåé ïëüêëçñï ôï äßóêï áðü ôïí ðñþôï ùò ôïí ôåëåõôáßï ôïìÝá. Ìå ôïí ôñüðï áõôü åîáëåßöïíôáé üëá ôá ðñïâëÞìáôá ðïõ áíáöÝñïíôáé óôç ãåùìåôñßá, áëëÜ õðÜñ÷ïõí êÜðïéïé ðåñéïñéóìïß, åêôüò áí äåí ðñüêåéôáé ðïôÝ íá ÷ñçóéìïðïéÞóåôå ïðïéïäÞðïôå Üëëï ëåéôïõñãéêü åêôüò áðü FreeBSD óôï óõãêåêñéìÝíï äßóêï.

4. Ôï óýóôçìá áíé÷íåýåé ôçí êÜñôá äéêôýïõ ìïõ ed(4), áëëÜ ðáßñíù óõíÝ÷åéá ìçíýìáôá ëÜèïõò (device timeout).

Ç êÜñôá óáò åßíáé ðéèáíþò óå äéáöïñåôéêü IRQ áðü áõôü ðïõ Ý÷åé ïñéóèåß óôï áñ÷åßï `/boot/device.hints` Ôï ðñüãñáììá ïäÞãçóçò ed(4), áðü ðñïåðéëïãÞ, äåí ÷ñçóéìïðïéåß ôéò ñõèìßóåéò ðïõ åíäå÷ïìÝíùò Ý÷åôå êÜíåé óôçí êÜñôá ìÝóù ôïõ ðñïãñÜììáôïò ñýèìéóçò ðïõ ðáñÝ÷åé ï êáôáóêåõáóôÞò (“soft configuration”, ôéò ôéìÝò ðïõ äþóáôå ìÝóù EZSETUP óôï MS-DOS). Ùóôüóï èá ôéò ÷ñçóéìïðïéÞóåé áí ïñßóåôå ôçí ôéìÞ `-1` óôá hints ôçò óõóêåõÞò.

Åßôå ìåôáêéíÞóôå ôï âñá÷õêõêëùôÞñá (jumper) ðÜíù óôçí êÜñôá þóôå íá äþóåôå ÷åéñïêßíçôåò (hard) ñõèìßóåéò (áëëÜæïíôáò êáé ôéò ñõèìßóåéò ôïõ ðõñÞíá áí áõôü åßíáé áðáñáßôçôï), Þ áëëÜîôå ôï IRQ óôçí ôéìÞ `-1` ñõèìßæïíôáò ôï hint `hint.ed.0.irq="-1"`. Ìå ôïí ôñüðï áõôü, ï ðõñÞíáò èá ÷ñçóéìïðïéÞóåé ôéò ñõèìßóåéò ðïõ êÜíáôå ìÝóù ôïõ ðñïãñÜììáôïò ñýèìéóçò.

Ìéá Üëëç ðéèáíüôçôá åßíáé ç êÜñôá óáò íá ÷ñçóéìïðïéåß ôï IRQ 9 ôï ïðïßï åßíáé êïéíü ìå ôï IRQ 2 êáé áðïôåëåß óõ÷íÜ ðçãÞ ðñïâëçìÜôùí (åéäéêÜ áí Ý÷åôå êÜñôá ãñáöéêþí ðïõ ÷ñçóéìïðïéåß ôï IRQ 2!). Ðñïóðáèåßóôå, áí åßíáé äõíáôüí, íá áðïöýãåôå åíôåëþò ôç ÷ñÞóç ôùí IRQ 2 Þ 9.

5. ¼ôáí ÷ñçóéìïðïéåßôáé ôï **sysinstall** óå Ýíá ôåñìáôéêü X11, ç êßôñéíç ãñáììáôïóåéñÜ ðÜíù óôï áíïé÷ôü ãêñé öüíôï åßíáé äõóáíÜãíùóôç. ÕðÜñ÷åé ôñüðïò íá âåëôéùèåß ç áíôßèåóç óå áõôÞ ôçí åöáñìïãÞ;

Áí Ý÷åôå Þäç åãêáôåóôçìÝíï ôï X11, êáé ôá ðñïåðéëåãìÝíá ÷ñþìáôá ôïõ **sysinstall** êÜíïõí ôï êåßìåíï äõóáíÜãíùóôï óôï xterm(1) Þ ôï rxvt(1), ðñïóèÝóôå ôï ðáñáêÜôù óôï `~/.Xdefaults` ãéá íá äçìéïõñãÞóåôå Ýíá ðéï óêïýñï ãêñé öüíôï: `XTerm*color7:#c0c0c0`

2.12 Ïäçãüò ÅãêáôÜóôáóçò ãéá Ðñï÷ùñçìÝíïõò

ÓõíåéóöïñÜ áðü ôïí Valentino Vaschetto. Áíáíåþèçêå áðü ôïí Marc Fonvieille.

Ôï ôìÞìá áõôü ðåñéãñÜöåé ðùò íá åãêáôáóôÞóåôå ôï FreeBSD óå éäéáßôåñá ìç÷áíÞìáôá Þ / êáé ìå ìç óõíçèéóìÝíïõò ôñüðïõò.

2.12.1 Åãêáèéóôþíôáò ôï FreeBSD óå Ýíá Óýóôçìá ÷ùñßò Ïèüíç Þ Ðëçêôñïëüãéï

Ôï åßäïò áõôü ôçò åãêáôÜóôáóçò ïíïìÜæåôáé “headless install (áêÝöáëç åãêáôÜóôáóç)”, åðåéäÞ ôï ìç÷Üíçìá óôï ïðïßï åãêáèßóôáôáé ôï FreeBSD åßôå äåí Ý÷åé óõíäåìÝíç ïèüíç, åßôå äåí Ý÷åé êáí Ýîïäï VGA. Áíáñùôéέóôå ðùò åßíáé ðéèáíü êÜôé ôÝôïéï, ãßíåôáé ìå ôçí ÷ñÞóç óåéñéáêÞò êïíóüëáò. Ç óåéñéáêÞ êïíóüëá âáóéêÜ ÷ñçóéìïðïéåß Ýíá Üëëï ìç÷Üíçìá ôï ïðïßï äñá ùò êýñéá ïèüíç êáé ðëçêôñïëüãéï ãéá ôï óýóôçìá. Ãéá ôï óêïðü áõôü, áðëþò áêïëïõèÞóôå ôá âÞìáôá ãéá ôçí äçìéïõñãßá ìéáò USB ìíÞìçò flash, üðùò åîçãåßôáé óôï ÔìÞìá 2.3.7 Þ êáôåâÜóôå ôï óùóôü áñ÷åßï ISO ãéá ôçí åãêáôÜóôáóç (äåßôå ôï ÔìÞìá 2.13.1).

¸ðåéôá, ãéá íá ìåôáôñÝøåôå ôï ìÝóï åãêáôÜóôáóçò þóôå íá îåêéíÜ óå óå óåéñéáêÞ êïíóüëá, áêïëïõèÞóôå ôá åðüìåíá âÞìáôá (áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå CDROM, ìðïñåßôå íá ðáñáëåßøåôå ôï ðñþôï âÞìá):

1. Äçìéïõñãßá USB ÌíÞìçò Flash ãéá ÓåéñéáêÞ Êïíóüëá

   Áí åðñüêåéôï íá åêêéíÞóåôå áðü ôï USB flash ðïõ ìüëéò öôéÜîáôå, ôï FreeBSD èá îåêßíáãå óôçí êáíïíéêÞ êáôÜóôáóç åãêáôÜóôáóçò. ÈÝëïõìå ôï FreeBSD íá îåêéíÞóåé óå óåéñéáêÞ êïíóüëá ãéá ôçí åãêáôÜóôáóç ìáò. Ãéá íá ôï êÜíåôå áõôü, èá ðñÝðåé íá ðñïóáñôÞóåôå ôï USB flash óôï FreeBSD óýóôçìá óáò, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ mount(8).

   ```
   # mount /dev/da0a /mnt
   ```

   > **Óçìåßùóç:** Ðñïóáñìüóôå êáôÜëëçëá ôï üíïìá ôçò óõóêåõÞò êáé ôï óçìåßï ðñïóÜñôçóçò, áíÜëïãá ìå ôï óýóôçìá óáò.

   Ôþñá ðïõ Ý÷åôå ðñïóáñôÞóåé ôç ìíÞìç USB, èá ðñÝðåé íá ôç ñõèìßóåôå þóôå íá åêêéíåß óôç óåéñéáêÞ êïíóüëá. Èá ðñÝðåé íá ðñïóèÝóåôå ìéá ãñáììÞ óôï áñ÷åßï `loader.conf` ðïõ ðåñéÝ÷åôáé óôï óýóôçìá áñ÷åßùí ôçò USB ìíÞìçò, þóôå íá ïñßóåôå ôç óåéñéáêÞ êïíóüëá ùò êïíóüëá óõóôÞìáôïò:

   ```
   # echo 'console="comconsole"' >> /mnt/boot/loader.conf
   ```

   Ôþñá ðïõ Ý÷åôå ñõèìßóåé óùóôÜ ôç ìíÞìç USB, ðñÝðåé íá ôçí áðïðñïóáñôÞóåôå, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ umount(8):

   ```
   # umount /mnt
   ```

   Ìðïñåßôå ôþñá íá áöáéñÝóåôå ôç ìíÞìç USB. Óõíå÷ßóôå ìå ôéò ðáñáêÜôù ïäçãßåò, îåêéíþíôáò áðü ôï ôñßôï âÞìá.

2. Åíåñãïðïßçóç ôçò ÓåéñéáêÞò Êïíóüëáò ìÝóù ôïõ CD ÅãêáôÜóôáóçò

   Áí åðñüêåéôï íá åêêéíÞóåôå áðü ôï CD ðïõ äçìéïõñãÞóáôå áðü ôï ISO áñ÷åßï ðïõ êáôåâÜóáôå (äåßôå ôï ÔìÞìá 2.13.1), ôï FreeBSD èá îåêéíïýóå êáíïíéêÜ êáé èá ÷ñçóéìïðïéïýóå ôç óõíÞèç ìÝèïäï åãêáôÜóôáóçò. ÈÝëïõìå üìùò íá îåêéíÞóïõìå óå êáôÜóôáóç óåéñéáêÞò êïíóüëáò ãéá ôçí åãêáôÜóôáóç. Ãéá íá ãßíåé áõôü, èá ðñÝðåé íá åîÜãïõìå ôá áñ÷åßá ðïõ ðåñéÝ÷åé ôï ISO, íá áëëÜîïõìå êÜðïéá áðü áõôÜ êáé íá ôï áíáäçìéïõñãÞóïõìå ðñéí ôï ãñÜøïõìå óå êáíïíéêü CD.

Óôï FreeBSD óýóôçìá ðïõ Ý÷åôå áðïèçêåýóåé ôï áñ÷åßï ISO, ð.÷. `FreeBSD-9.1-RELEASE-i386-disc1.iso` ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ tar(1) ãéá íá êÜíåôå åîáãùãÞ ôùí áñ÷åßùí ðïõ ðåñéÝ÷åé:

```
# mkdir /path/to/headless-iso
# tar -C /path/to/headless-iso -pxvf FreeBSD-9.1-RELEASE-i386-disc1.iso
```

Èá ðñÝðåé ôþñá íá áëëÜîïõìå ôï ìÝóï åãêáôÜóôáóçò þóôå íá îåêéíÜåé óå óåéñéáêÞ êïíóüëá. Èá ðñÝðåé íá ðñïóèÝóåôå ìéá ãñáììÞ óôï áñ÷åßï `loader.conf` ðïõ áíáêôÞóáôå áðü ôï áñ÷åßï ISO, þóôå íá åíåñãïðïéÞóåôå ôçí óåéñéáêÞ êïíóüëá ùò êïíóüëá óõóôÞìáôïò:

```
# echo 'console="comconsole"' >> /path/to/headless-iso/boot/loader.conf
```

Ìðïñïýìå Ýðåéôá íá äçìéïõñãÞóïõìå Ýíá íÝï áñ÷åßï ISO ðïõ íá ðåñéëáìâÜíåé ôéò ôñïðïðïéÞóåéò ìáò. Ãéá ôï óêïðü áõôü èá ÷ñçóéìïðïéÞóïõìå ôï åñãáëåßï mkisofs(8) ôï ïðïßï ðåñéëáìâÜíåôáé óôï port `sysutils/cdrtools`:

```
# mkisofs -v -b boot/cdboot -no-emul-boot -r -J -V "Headless_install" \
     -o Headless-FreeBSD-9.1-RELEASE-i386-disc1.iso /path/to/headless-iso
```

Ìðïñåßôå ôþñá íá ãñÜøåôå ôï íÝï áñ÷åßï ISO óå CD, ÷ñçóéìïðïéþíôáò ôçí åöáñìïãÞ åããñáöÞò ðïõ ðñïôéìÜôå.

3. ÓõíäÝóôå Êáëþäéï Ôýðïõ Null-modem

   ×ñåéÜæåôáé ôþñá íá óõíäÝóåôå Ýíá êáëþäéï ôýðïõ null-modem ìåôáîý ôùí äýï ìç÷áíçìÜôùí. Áðëþò óõíäÝóôå ôï êáëþäéï óôéò óåéñéáêÝò èýñåò ôùí äýï ìç÷áíçìÜôùí. *Äåí ðñüêåéôáé íá äïõëÝøåé êáíïíéêü óåéñéáêü êáëþäéï*, ÷ñåéÜæåôáé êáëþäéï ôýðïõ null modem, üðïõ êÜðïéá áðü ôá æåýãç êáëùäßùí äéáóôáõñþíïíôáé åóùôåñéêÜ.

4. Åêêßíçóç ãéá ôçí ÅãêáôÜóôáóç

   ¸÷åé Ýñèåé ç þñá íá ðñï÷ùñÞóïõìå óôçí åãêáôÜóôáóç. ÓõíäÝóôå ôç USB ìíÞìç flash óôï ìç÷Üíçìá ðïõ èÝëåôå íá åãêáôáóôÞóåôå ÷ùñßò ïèüíç êáé ðëçêôñïëüãéï êáé åíåñãïðïéÞóôå ôï. Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ôï CD ðïõ åôïéìÜóáôå, åíåñãïðïéÞóôå ôï ìç÷Üíçìá êáé ôïðïèåôÞóôå ôï CD óôïí ïäçãü CDROM.

5. Óõíäåèåßôå ìå ôï Headless Ìç÷Üíçìá

   Èá ðñÝðåé ôþñá íá óõíäåèåßôå ìå ôï ìç÷Üíçìá óáò, ÷ñçóéìïðïéþíôáò ôçí cu(1):

   ```
   # cu -l /dev/cuau0
   ```

   Óôï FreeBSD 7.*X* ÷ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ:

   ```
   # cu -l /dev/cuad0
   ```

Áõôü åßíáé! Ìðïñåßôå ôþñá íá åëÝãîåôå ôï headless ìç÷Üíçìá ìÝóù ôçò óýíäåóçò `cu`. ÌåôÜ ôç öüñôùóç ôïõ ðõñÞíá, èá óáò æçôçèåß íá åðéëÝîåôå ôï åßäïò ôïõ ôåñìáôéêïý ðïõ èá ÷ñçóéìïðïéçèåß. ÅðéëÝîôå ôçí Ýã÷ñùìç êïíóüëá (FreeBSD color console) êáé óõíå÷ßóôå ìå ôçí åãêáôÜóôáóç óáò.

2.13 ÐñïåôïéìÜæïíôáò ôá ÄéêÜ óáò ÌÝóá ÅãêáôÜóôáóçò

Óçìåßùóç: Ãéá íá áðïöýãïõìå ôçí åðáíÜëçøç, ëÝãïíôáò "FreeBSD CD-ROM" óôï ôìÞìá áõôü, åííïïýìå Ýíá CD-ROM Þ DVD ôïõ FreeBSD ðïõ Ý÷åôå áãïñÜóåé Þ äçìéïõñãÞóåé ìüíï óáò.

ÕðÜñ÷ïõí êÜðïéåò ðåñéðôþóåéò óôéò ïðïßåò ÷ñåéÜæåôáé íá äçìéïõñãÞóåôå ôá äéêÜ óáò ìÝóá Þ ðçãÝò åãêáôÜóôáóçò ôïõ FreeBSD. Ìðïñåß íá åßíáé öõóéêÜ ìÝóá, üðùò ãéá ðáñÜäåéãìá ìéá ôáéíßá, Þ ðçãÝò ðïõ ìðïñåß íá

÷ñçóéìïðïéÞóåé ôï **sysinstall** ãéá íá áíáêôÞóåé ôá áñ÷åßá, üðùò ð.÷. ìéá ôïðéêÞ ôïðïèåóßá FTP, Þ ìéá êáôÜôìçóç MS-DOS

Ãéá ðáñÜäåéãìá:

- ¸÷åôå ðïëëÜ ìç÷áíÞìáôá óõíäåäåìÝíá óôï ôïðéêü óáò äßêôõï, êáé Ýíá ìüíï CD-ROM ôïõ FreeBSD. ÈÝëåôå íá äçìéïõñãÞóåôå ìéá ôïðéêÞ ôïðïèåóßá FTP ÷ñçóéìïðïéþíôáò ôá ðåñéå÷üìåíá ôïõ FreeBSD CD-ROM, êáé Ýðåéôá íá ñõèìßóåôå ôá ìç÷áíÞìáôá óáò íá ÷ñçóéìïðïéïýí áõôü ôï FTP site áíôß ãéá íá óõíäÝïíôáé óôï Internet.
- ¸÷åôå Ýíá CD-ROM ôïõ FreeBSD áëëÜ ôï FreeBSD äåí áíáãíùñßæåé ôï ïäçãü óáò CD/DVD, åíþ ôï MS-DOS / Windows ôï áíáãíùñßæåé. ÈÝëåôå íá áíôéãñÜøåôå ôá áñ÷åßá ôïõ FreeBSD óå ìéá êáôÜôìçóç MS-DOS óôï ßäéï ìç÷Üíçìá êáé íá åãêáôáóôÞóåôå ôï FreeBSD ÷ñçóéìïðïéþíôáò áõôÜ ôá áñ÷åßá.
- Ï õðïëïãéóôÞò ðïõ èÝëåôå íá åãêáôáóôÞóåôå äåí Ý÷åé ïäçãü CD/DVD Þ êÜñôá äéêôýïõ, áëëÜ ìðïñåßôå íá óõíäÝóåôå Ýíá óåéñéáêü Þ ðáñÜëëçëï êáëþäéï ôýðïõ “Laplink” ðñïò Ýíá õðïëïãéóôÞ ðïõ äéáèÝôåé.
- ÈÝëåôå íá äçìéïõñãÞóåôå ìéá ôáéíßá, ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD.

2.13.1 Äçìéïõñãþíôáò Ýíá CD-ROM ÅãêáôÜóôáóçò

Ùò ôìÞìá êÜèå Ýêäïóçò, ôï FreeBSD project äçìéïõñãåß äýï åéêüíåò CD-ROM (“ISO image”). Ïé åéêüíåò áõôÝò ìðïñïýí íá ãñáöïýí óå CD áí Ý÷åôå åããñáöÝá CD-ROM, êáé áêïëïýèùò íá ÷ñçóéìïðïéçèïýí ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD. Áí Ý÷åôå åããñáöÝá CD-ROM êáé ãñÞãïñç óýíäåóç óôï Internet, áõôüò åßíáé ï åõêïëüôåñïò ôñüðïò íá åãêáôáóôÞóåôå ôï FreeBSD.

1. ÊáôåâÜóôå ôá ÓùóôÜ ISO Images

   Ìðïñåßôå íá êáôåâÜóåôå ôá ISO images ãéá êÜèå Ýêäïóç áðü ôçí ôïðïèåóßá `ftp://ftp.FreeBSD.org/pub/FreeBSD/ISO-IMAGES-arch/version` Þ ôï ðëçóéÝóôåñï óå óáò mirror. ÕðïêáôáóôÞóôå ôï *`arch`* êáé *`version`* üðùò áðáéôåßôáé.

   Ï êáôÜëïãïò èá ðåñéÝ÷åé ôõðéêÜ ôá áêüëïõèá images:

   Ðßíáêáò 2-4. Ïíïìáôïëïãßá êáé ÅðåîçãÞóåéò ôùí ISO Images ãéá FreeBSD 7.*X* êáé 8.*X*

¼íïìá Áñ÷åßïõ	Ðåñéå÷üìåíá
`FreeBSD-version-RELEASE-arch-bootonly.iso`	Áõôü ôï áñ÷åßï ISO óáò åðéôñÝðåé íá îåêéíÞóåôå ôçí åãêáôÜóôáóç ìÝóù CDROM, áëëÜ äåí ðåñéÝ÷åé ôç äõíáôüôçôá íá åãêáôáóôÞóåôå ôï FreeBSD ìüíï ìÝóù ôïõ CD. Èá ðñÝðåé íá êÜíåôå åãêáôÜóôáóç ìÝóù äéêôýïõ (ð.÷. ìÝóù åíüò åîõðçñåôçôÞ FTP) ìåôÜ ôçí åêêßíçóç áðü ôï CD.
`FreeBSD-version-RELEASE-arch-dvd1.iso.gz`	Áõôü ôï áñ÷åßï ISO, ìåãÝèïõò DVD, ðåñéÝ÷åé üëá ôá áðáéôïýìåíá áñ÷åßá ãéá ôçí åãêáôÜóôáóç åíüò âáóéêïý óõóôÞìáôïò FreeBSD, êáèþò êáé ìéá óõëëïãÞ áðü Ýôïéìá ðáêÝôá êáé ôåêìçñßùóç. Õðïóôçñßæåé åðßóçò åêêßíçóç óå êáôÜóôáóç “livefs” ç ïðïßá åßíáé ÷ñÞóéìç óå ðåñßðôùóç ðïõ èÝëåôå íá äéïñèþóåôå ðñïâëÞìáôá êÜðïéáò õðÜñ÷ïõóáò åãêáôÜóôáóçò.

¼íïìá Áñ÷åßïõ	**Ðåñéå÷üìåíá**
FreeBSD-*version*-RELEASE-*arch*-memstick.img	Ìðïñåßôå íá ãñÜøåôå áõôÞ ôçí åéêüíá óå ìéá USB ìíÞìç flash êáé íá ôç ÷ñçóéìïðïéÞóåôå ãéá íá åãêáôáóôÞóåôå FreeBSD óå ìç÷áíÞìáôá ðïõ õðïóôçñßæïõí åêêßíçóç áðü ïäçãïýò USB. Õðïóôçñßæåôáé åðßóçò åêêßíçóç óå êáôÜóôáóç “livefs”. ÐåñéÝ÷åé ôá ðáêÝôá ôçò ôåêìçñßùóçò, áëëÜ äåí ðåñéÝ÷åé Üëëá ðáêÝôá ðñïò åãêáôÜóôáóç. Ôï áñ÷åßï áõôü äåí äéáôßèåôáé ãéá FreeBSD 7.*X*.
FreeBSD-*version*-RELEASE-*arch*-disc1.iso	Ôï ISO áõôü ðåñéÝ÷åé ôï âáóéêü óýóôçìá ôïõ FreeBSD êáé ôá ðáêÝôá ôçò ôåêìçñßùóçò. Äåí ðåñéÝ÷åé Üëëá ðáêÝôá ðñïò åãêáôÜóôáóç.
FreeBSD-*version*-RELEASE-*arch*-disc2.iso	Áõôü ôï ISO ðåñéÝ÷åé üóï ðáêÝôá åöáñìïãþí ìðïñïýí íá ÷ùñÝóïõí óôï äéáèÝóéìï ÷þñï ôïõ. Äåí äéáôßèåôáé ãéá FreeBSD 8.*X*.
FreeBSD-*version*-RELEASE-*arch*-disc3.iso	Áêüìá Ýíá ISO ôï ïðïßï ðåñéÝ÷åé üóá ðáêÝôá ìðïñïýí íá ÷ùñÝóïõí óôï äéáèÝóéìï ÷þñï ôïõ. Äåí äéáôßèåôáé ãéá FreeBSD 8.0 êáé ìåôáãåíÝóôåñåò åêäüóåéò.
version-RELEASE-*arch*-docs.iso	H ôåêìçñßùóç ôïõ FreeBSD.
FreeBSD-*version*-RELEASE-*arch*-livefs.iso	Áõôü ôï ISO ðáñÝ÷åé õðïóôÞñéîç ãéá åêêßíçóç óå êáôÜóôáóç “livefs” (ãéá ëåéôïõñãßåò áíÜêôçóçò) áëëÜ äåí õðïóôçñßæåé åãêáôÜóôáóç ôïõ ëåéôïõñãéêïý áðü áõôü.

> **Óçìåßùóç:** Ïé åêäüóåéò ôïõ êëÜäïõ 7.*x* ðñéí áðü ôï FreeBSD 7.3 êáé ïé åêäüóåéò ôïõ êëÜäïõ 8.× ðñéí áðü ôï FreeBSD 8.0 ÷ñçóéìïðïéïýóáí äéáöïñåôéêÞ ïíïìáôïëïãßá áñ÷åßùí. Ôï üíïìá ôïõ áñ÷åßïõ ISO óå áõôÝò ôéò åêäüóåéò äåí îåêéíÜåé ìå `FreeBSD-`.

Èá *ðñÝðåé* íá êáôåâÜóåôå åßôå ôï `bootonly` ISO, åßôå ôï `disc1`. Ìçí êáôåâÜóåôå êáé ôá äýï, êáèþò ôï `disc1` ðåñéÝ÷åé ôá ðÜíôá ðïõ ðåñéÝ÷åé êáé ôï `bootonly`.

×ñçóéìïðïéÞóôå ôï `bootonly` áí Ý÷åôå öèçíÞ êáé ãñÞãïñç ðñüóâáóç óôï Internet. Èá óáò åðéôñÝøåé íá åãêáôáóôÞóåôå ôï FreeBSD êáé ìðïñåßôå Ýðåéôá íá åãêáôáóôÞóåôå åöáñìïãÝò ôñßôùí êáôáóêåõáóôþí ðïõ ÷ñåéÜæåóôå, êáôåâÜæïíôáò ôéò ìÝóù ôïõ óõóôÞìáôïò ðáêÝôùí êáé ports (äåßôå ôï ÊåöÜëáéï 5).

×ñçóéìïðïéÞóôå ôï `dvd1` áí èÝëåôå íá åãêáôáóôÞóåôå ìéá Ýêäïóç ôïõ FreeBSD êáé èÝëåôå ôáõôü÷ñïíá íá Ý÷åôå óôï ßäéï DVD êáé ìéá óåâáóôÞ óõëëïãÞ áðü ðáêÝôá ôñßôïõ êáôáóêåõáóôÞ.

Ôá ðñüóèåôá CD-ROM åßíáé ÷ñÞóéìá áëëÜ ü÷é áðáñáßôçôá, åéäéêÜ áí Ý÷åôå ðñüóâáóç õøçëÞò ôá÷ýôçôáò óôï Internet.

2. ÃñÜøôå ôá CD

   ÐñÝðåé êáôüðéí íá ãñÜøåôå ôéò åéêüíåò (images) ôùí CD óå Üäåéá CD. Áí ôï êÜíåôå áõôü óå Üëëï FreeBSD óýóôçìá, äåßôå ôï ÔìÞìá 19.6 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò (åéäéêüôåñá, ÔìÞìá 19.6.3 êáé ÔìÞìá 19.6.4).

   Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå Üëëï ëåéôïõñãéêü ãéá ôçí åñãáóßá áõôÞ, èá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå ôéò äõíáôüôçôåò ðïõ ðáñÝ÷ïíôáé áðü ôá áíôßóôïé÷á ðñïãñÜììáôá åããñáöÞò CD ôïõ ëåéôïõñãéêïý áõôïý. Ôá images ðïõ ðáñÝ÷ïíôáé åßíáé óå óôÜíôáñ ISO ìïñöÞ êáé õðïóôçñßæïíôáé áðåõèåßáò áðü ðïëëÝò åöáñìïãÝò åããñáöÞò CD.

Óçìåßùóç: Áí åíäéáöÝñåóôå íá äçìéïõñãÞóåôå ìéá åîåéäéêåõìÝíç Ýêäïóç ôïõ FreeBSD, äåßôå ôï Release Engineering Article (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/releng).

2.13.2 ÄçìéïõñãÞóôå ìéá ÔïðéêÞ FTP Ôïðïèåóßá ìå ôï CD-ROM ôïõ FreeBSD

Ôá CD-ROM ôïõ FreeBSD Ý÷ïõí ôçí ßäéá äïìÞ ìå ôçí ôïðïèåóßá FTP. Ãéá ôï ëüãï áõôü åßíáé ðïëý åýêïëï íá äçìéïõñãÞóåôå ìéá ôïðéêÞ ôïðïèåóßá FTP ðïõ íá ìðïñåß íá ÷ñçóéìïðïéçèåß áðü Üëëá ìç÷áíÞìáôá ôïõ äéêôýïõ óáò êáôÜ ôçí åãêáôÜóôáóç ôïõ FreeBSD.

1. Óôï FreeBSD ìç÷Üíçìá ðïõ èá öéëïîåíÞóåé ôçí FTP ôïðïèåóßá, âåâáéùèåßôå üôé ôï CD-ROM åßíáé ìÝóá óôïí ïäçãü êáé Ý÷åé ãßíåé ðñïóÜñôçóç ôïõ óôïí êáôÜëïãï `/cdrom`.

   ```
   # mount /cdrom
   ```

2. ÄçìéïõñãÞóôå Ýíá ëïãáñéáóìü ãéá áíþíõìï FTP óôï `/etc/passwd`. Ãéá ôï óêïðü áõôü, åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/passwd` ÷ñçóéìïðïéþíôáò ôï vipw(8) êáé ðñïóèÝôïíôáò ôçí áêüëïõèç ãñáììÞ:

   ```
   ftp:*:99:99::0:0:FTP:/cdrom:/nonexistent
   ```

3. Âåâáéùèåßôå üôé åßíáé åíåñãïðïéçìÝíç ç õðçñåóßá FTP óôï `/etc/inetd.conf`.

Ïðïéïóäçðïôå Ý÷åé ôþñá äéêôõáêÞ óýíäåóç ìå ôï ìç÷Üíçìá óáò, ìðïñåß ôþñá íá åðéëÝîåé ùò ìÝóï åãêáôÜóôáóçò ôï FTP êáé íá ãñÜøåé **`ftp://your machine`** áöïý åðéëÝîåé “Other” óôï ìåíïý FTP sites êáôÜ ôçí äéÜñêåéá ôçò åãêáôÜóôáóçò.

Óçìåßùóç: Áí ôï ìÝóï åêêßíçóçò (óõíÞèùò äéóêÝôåò) ãéá ôïõò ðåëÜôåò FTP äåí åßíáé áêñéâþò ç ßäéá Ýêäïóç ìå áõôÞ ðïõ ðáñÝ÷åôáé áðü ôï ôïðéêü FTP, ç åöáñìïãÞ **sysinstall** äåí èá óáò åðéôñÝøåé íá ïëïêëçñþóåôå ôçí åãêáôÜóôáóç. Áí ïé åêäüóåéò äåí åßíáé üìïéåò êáé åðéèõìåßôå íá ðñïóðåñÜóåôå áõôü ôïí ðåñéïñéóìü, èá ðñÝðåé íá ðÜôå óôï ìåíïý Options êáé íá áëëÜîåôå ôï üíïìá ôçò äéáíïìÞò (distribution name) óå any.

Ðñïåéäïðïßçóç: Ç ðáñáðÜíù ôáêôéêÞ åßíáé êáôÜëëçëç ãéá Ýíá ìç÷Üíçìá ðïõ åßíáé óôï ôïðéêü óáò äßêôõï êáé ðñïóôáôåýåôáé áðü firewall. Áí ðñïóöÝñåôå õðçñåóßåò FTP óå Üëëá ìç÷áíÞìáôá óôï Internet (êáé ü÷é óôï ôïðéêü óáò äßêôõï) èá åêèÝóåôå ôï ìç÷Üíçìá óáò óå crackers êáé Üëëïõò áíåðéèýìçôïõò. Áí ôï êÜíåôå áõôü, óáò óõíéóôïýìå ïðùóäÞðïôå íá áêïëïõèÞóåôå óùóôÝò ôáêôéêÝò áóöáëåßáò.

2.13.3 Äçìéïõñãþíôáò ÄéóêÝôåò ÅãêáôÜóôáóçò

Áí èá ðñÝðåé íá åãêáôáóôÞóåôå áðü äéóêÝôåò (ôï ïðïßï óáò óõíéóôïýìå íá *ìçí* êÜíåôå), åßôå ëüãù ìç õðïóôçñéæüìåíïõ õëéêïý, åßôå áðëÜ åðåéäÞ åðéìÝíåôå íá êÜíåôå ôá ðñÜãìáôá ìå ôï äýóêïëï ôñüðï, èá ðñÝðåé ðñþôá íá ðñïåôïéìÜóåôå êÜðïéåò äéóêÝôåò ãéá ôçí åãêáôÜóôáóç.

ÊáôÜ åëÜ÷éóôï, èá ÷ñåéáóôåßôå ôüóåò äéóêÝôåò 1.44 MB üóåò ÷ñåéÜæïíôáé ãéá íá êñáôÞóïõí üëá ôá áñ÷åßá ôïõ êáôáëüãïõ `base` (base distribution). Áí ðñïåôïéìÜæåôå ôéò äéóêÝôåò áðü ôï MS-DOS, èá *ðñÝðåé* íá ôéò äéáìïñöþóåôå ìå ôçí åíôïëÞ ôïõ MS-DOS `FORMAT`. Áí ÷ñçóéìïðïéåßôå Windows, ÷ñçóéìïðïéÞóôå ôïí Explorer ãéá íá äéáìïñöþóåôå ôéò äéóêÝôåò (äåîß êëéê óôïí ïäçãü `A:` êáé åðéëÝîôå “Format (Äéáìüñöùóç)”).

Íá *ìçí* åìðéóôåýåóôå ôéò ðñïäéáìïñöùìÝíåò áðü ôï åñãïóôÜóéï äéóêÝôåò. Íá ôéò äéáìïñöþóåôå îáíÜ åóåßò ãéá íá åßóôå óßãïõñïò. ÐïëëÜ ðñïâëÞìáôá ðïõ Ý÷ïõí áíáöåñèåß áðü ÷ñÞóôåò óôï ðáñåëèüí Ý÷ïõí ðñïêýøåé áðü ôç ÷ñÞóç áêáôÜëëçëá äéáìïñöùìÝíùí ìÝóùí, êáé ãéá ôï ëüãï áõôü ôï ôïíßæïõìå éäéáßôåñá ôþñá.

Áí äçìéïõñãåßôå ôéò äéóêÝôåò óå Üëëï ìç÷Üíçìá FreeBSD ç äéáìüñöùóç äåí åßíáé Üó÷çìç éäÝá, áí êáé äå ÷ñåéÜæåôáé íá äçìéïõñãÞóåôå óýóôçìá áñ÷åßùí MS-DOS óå êÜèå ìéá. Ìðïñåßôå áíôß ãéá áõôü, íá ÷ñçóéìïðïéÞóåôå ôéò åíôïëÝò `bsdlabel` êáé `newfs` ãéá íá äçìéïõñãÞóåôå óýóôçìá áñ÷åßùí UFS óå áõôÝò, üðùò öáßíåôáé áðü ôçí ðáñáêÜôù áêïëïõèßá åíôïëþí:

```
# fdformat -f 1440 fd0.1440
# bsdlabel -w fd0.1440 floppy3
# newfs -t 2 -u 18 -l 1 -i 65536 /dev/fd0
```

Ìðïñåßôå Ýðåéôá íá ôéò ðñïóáñôÞóåôå êáé íá ôéò ãñÜøåôå óáí ïðïéïäÞðïôå Üëëï óýóôçìá áñ÷åßùí.

Áöïý äéáìïñöþóåôå ôéò äéóêÝôåò, èá ðñÝðåé íá ãñÜøåôå ôá áñ÷åßá óå áõôÝò. Ôá áñ÷åßá ôçò åãêáôÜóôáóçò åßíáé êïììÝíá óå ôìÞìáôá ìå êáôÜëëçëï ìÝãåèïò þóôå ðÝíôå áðü áõôÜ íá ÷ùñÜíå óå ìéá óõíçèéóìÝíç äéóêÝôá 1.44 MB. ÄéáôñÝîôå üëåò ôéò äéóêÝôåò óáò, ãñÜöïíôáò óå êÜèå ìéá üóá áñ÷åßá ÷ùñÜíå, ìÝ÷ñé íá ãñÜøåôå üëá ôá distribution sets ðïõ åðéèõìåßôå ìå ôïí ôñüðï áõôü. ÊÜèå distribution set èá ðñÝðåé íá áðïèçêåõôåß óå Ýíá õðïêáôÜëïãï ôçò äéóêÝôáò, ð.÷.: `a:\base\base.aa`, `a:\base\base.ab`, ê.ï.ê.

> **Óçìáíôéêü:** Ôï áñ÷åßï `base.inf` ðñÝðåé åðßóçò íá âñßóêåôáé óôçí ðñþôç äéóêÝôá ôïõ óåô `base` êáèþò ôï ðñüãñáììá åãêáôÜóôáóçò ôï ÷ñåéÜæåôáé ãéá íá ãíùñßæåé ðüóá åðéðëÝïí ôìÞìáôá áñ÷åßùí ðñÝðåé íá äéáâÜóåé êáé íá óõíåíþóåé ãéá ôï ó÷çìáôéóìü ôçò äéáíïìÞò.

¼ôáí öôÜóåôå óôçí ïèüíç Media êáôÜ ôç äéáäéêáóßá åãêáôÜóôáóçò, åðéëÝîôå Floppy êáé èá åñùôçèåßôå ãéá ôá õðüëïéðá.

2.13.4 ÅãêáôÜóôáóç áðü ÊáôÜôìçóç MS-DOS

Ãéá íá ðñïåôïéìáóôåßôå ãéá ìéá åãêáôÜóôáóç áðü êáôÜôìçóç MS-DOS, áíôéãñÜøôå ôá áñ÷åßá ôçò äéáíïìÞò óå Ýíá êáôÜëïãï ðïõ èá ïíïìÜóåôå `freebsd` óôïí ñéæéêü êáôÜëïãï ôçò êáôÜôìçóçò. Ãéá ðáñÜäåéãìá, `c:\freebsd`. Ç äïìÞ ôùí êáôáëüãùí ôïõ CDROM Þ ôçò ôïðïèåóßáò FTP èá ðñÝðåé íá áíáðáñá÷èåß ìåñéêþò ìÝóá óå áõôü ôïí êáôÜëïãï, ãéá ôï ëüãï áõôü óáò óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `xcopy` áí êÜíåôå ôçí áíôéãñáöÞ áðü CD. Ãéá ðáñÜäåéãìá, ãéá íá ðñïåôïéìÜóåôå ìéá åëÜ÷éóôç åãêáôÜóôáóç ôïõ FreeBSD:

```
C:\> md c:\freebsd
C:\> xcopy e:\bin c:\freebsd\bin\ /s
C:\> xcopy e:\manpages c:\freebsd\manpages\ /s
```

õðïèÝôïíôáò üôé ï äéáèÝóéìïò åëåýèåñïò ÷þñïò óáò âñßóêåôáé óôï `C:` êáé ç ìïíÜäá óáò CDROM åßíáé óôï `E:`.

Áí äåí Ý÷åôå ïäçãü CDROM, ìðïñåßôå íá êáôåâÜóåôå ôçí äéáíïìÞ áðü ôçí ôïðïèåóßá ftp.FreeBSD.org (ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/i386/9.1-RELEASE/). ÊÜèå distribution set åßíáé óôï äéêü ôïõ êáôÜëïãï. Ãéá ðáñÜäåéãìá ôï óåô *base* ìðïñåß íá âñåèåß óôïí êáôÜëïãï 9.1/base/ (ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/i386/9.1-RELEASE/base/).

Ãéá üóá distribution set èÝëåôå íá åãêáôáóôÞóåôå áðü ìéá êáôÜôìçóç MS-DOS (êáé ãéá ôá ïðïßá Ý÷åôå äéáèÝóéìï åëåýèåñï ÷þñï), åãêáôáóôÞóôå ôá êÜôù áðü ôï `c:\freebsd` — To óåô `BIN` åßíáé ôï ìüíï ðïõ áðáéôåßôáé ãéá ìéá åëÜ÷éóôç åãêáôÜóôáóç.

2.13.5 Äçìéïõñãþíôáò Ôáéíßá ÅãêáôÜóôáóçò

Ç åãêáôÜóôáóç áðü ôáéíßá, åßíáé ßóùò ç åõêïëüôåñç ìÝèïäïò åêôüò áðü ôçí åãêáôÜóôáóç ìÝóù FTP Þ CDROM. Ôï ðñüãñáììá åãêáôÜóôáóçò áðëþò áíáìÝíåé ôá áñ÷åßá íá Ý÷ïõí ãñáöôåß óôçí ôáéíßá ìå ìïñöÞ tar. Áöïý åðéëÝîåôå ôá óåô åãêáôÜóôáóçò ðïõ óáò åíäéáöÝñïõí, áðëþò êÜíôå ôá tar óôçí ôáéíßá:

```
# cd /freebsd/distdir
# tar cvf /dev/rwt0 dist1 ... dist2
```

¼ôáí êÜíåôå ôçí åãêáôÜóôáóç, èá ðñÝðåé íá âåâáéùèåßôå üôé Ý÷åôå áöÞóåé áñêåôü åëåýèåñï ÷þñï óå êÜðïéï ðñïóùñéíü êáôÜëïãï (ôïí ïðïßï èá ìðïñÝóåôå íá åðéëÝîåôå) ãéá íá ÷ùñÝóåé ôá *ðëÞñç* ðåñéå÷üìåíá ôçò ôáéíßáò ðïõ Ý÷åôå äçìéïõñãÞóåé. Åîáéôßáò ôçò öýóçò ôçò ôáéíßáò, ðïõ äåí åðéôñÝðåé ôõ÷áßá ðñüóâáóç, áõôÞ ç ìÝèïäïò åãêáôÜóôáóçò ÷ñåéÜæåôáé áñêåôü ðñïóùñéíü ÷þñï áðïèÞêåõóçò.

> **Óçìåßùóç:** Êáèþò îåêéíÜôå ôçí åãêáôÜóôáóç, ç ôáéíßá ðñÝðåé íá åßíáé óôïí ïäçãü *ðñéí* îåêéíÞóåôå áðü ôç äéóêÝôá åêêßíçóçò. Äéáöïñåôéêü, ìðïñåß íá áðïôý÷åé ç áíß÷íåõóç ôçò áðü ôç äéáäéêáóßá åãêáôÜóôáóçò.

2.13.6 Ðñéí ÅãêáôáóôÞóåôå ìÝóù Äéêôýïõ

ÕðÜñ÷ïõí ôñåéò äéáèÝóéìïé ôýðïé äéêôõáêÞò åãêáôÜóôáóçò. Ethernet (ôõðïðïéçìÝíïò åëåãêôÞò Ethernet), ÓåéñéáêÞò Èýñáò (PPP), ÐáñÜëëçëçò Èýñáò (PLIP (êáëþäéï laplink)).

Ãéá ôçí ãñçãïñüôåñç äõíáôÞ åãêáôÜóôáóç ìÝóù äéêôýïõ, Ýíáò åëåãêôÞò Ethernet åßíáé ðÜíôá êáëÞ åðéëïãÞ! Ôï FreeBSD õðïóôçñßæåé ôéò ðåñéóóüôåñåò êïéíÝò êÜñôåò Ethernet. Ìðïñåßôå íá âñåßôå Ýíá ðßíáêá ôùí õðïóôçñéæüìåíùí êáñôþí (êáé ôéò áðáéôïýìåíåò ñõèìßóåéò ôïõò) óôéò Óçìåéþóåéò Õëéêïý (Hardware Notes) êÜèå Ýêäïóçò FreeBSD. Áí ÷ñçóéìïðïéåßôå êÜðïéá áðü ôéò õðïóôçñéæüìåíåò êÜñôåò Ethernet PCMCIA âåâáéùèåßôå üôé ôçí Ý÷åôå âÜëåé óôçí õðïäï÷Þ *ðñéí* åíåñãïðïéÞóåôå ôï öïñçôü õðïëïãéóôÞ óáò! Ôï FreeBSD äåí õðïóôçñßæåé äõóôõ÷þò áõôÞ ôç óôéãìÞ ôçí åðéôüðïõ åéóáãùãÞ êáñôþí PCMCIA êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò.

èá ðñÝðåé åðßóçò íá îÝñåôå ãéá ôï äßêôõï óáò, ôç äéåýèõíóç IP óáò, ôçí ôéìÞ ôçò ìÜóêáò õðïäéêôýïõ (netmask) ãéá ôç êëÜóç ôïõ äéêôýïõ óáò, êáé ôï üíïìá ôïõ ìç÷áíÞìáôïò óáò. Áí êÜíåôå åãêáôÜóôáóç ìÝóù óýíäåóçò PPP êáé äåí Ý÷åôå óôáôéêÞ äéåýèõíóç, ìçí áíçóõ÷åßôå êáèþò ï ISP óáò ìðïñåß íá óáò äþóåé äéåýèõíóç äõíáìéêÜ. Ï äéá÷åéñéóôÞò ôïõ óõóôÞìáôïò óáò, ìðïñåß íá óáò äþóåé ôéò ôéìÝò ðïõ ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ãéá ôï äßêôõï óáò. Áí ðñüêåéôáé íá áíáöåñèåßôå óå Üëëá ìç÷áíÞìáôá ìå ÷ñÞóç ôïõ ïíüìáôïò ôïõò áíôß ãéá ôçí äéåýèõíóç IP ôïõò, èá ÷ñåéáóôåßôå åðßóçò Ýíá äéáêïìéóôÞ ïíïìÜôùí (DNS) êáé ðéèáíüí ôç äéåýèõíóç ìéáò ðýëçò (gateway) (áí ÷ñçóéìïðïéåßôå PPP, ðñüêåéôáé ãéá ôç äéåýèõíóç IP ôïõ ðáñï÷Ýá óáò) ãéá íá åðéêïéíùíÞóåôå ìå áõôüí. Áí èÝëåôå íá êÜíåôå FTP åãêáôÜóôáóç äéáìÝóïõ ìåóïëáâçôÞ HTTP, èá ðñÝðåé íá îÝñåôå åðßóçò ôç äéåýèõíóç ôïõ ìåóïëáâçôÞ (proxy). Áí äåí îÝñåôå ôéò áðáíôÞóåéò óå üëåò Þ ôéò ðåñéóóüôåñåò áðü áõôÝò ôéò áðáíôÞóåéò, èá ðñÝðåé ðñÜãìáôé íá ìéëÞóåôå óôï äéá÷åéñéóôÞ ôïõ óõóôÞìáôïò óáò Þ ôïí ISP óáò *ðñéí* åðé÷åéñÞóåôå áõôü ôïí ôýðï åãêáôÜóôáóçò.

Áí ÷ñçóéìïðïéåßôå modem, ôüôå ôï PPP åßíáé ó÷åäüí óßãïõñá ç ìüíç óáò åðéëïãÞ. Âåâáéùèåßôå üôé Ý÷åôå Üìåóá äéáèÝóéìåò ôéò ðëçñïöïñßåò ãéá ôïí ðáñï÷Ýá óáò, êáèþò èá ôéò ÷ñåéáóôåßôå ó÷åôéêÜ íùñßò óôç äéáäéêáóßá åãêáôÜóôáóçò.

Áí ÷ñçóéìïðïéåßôå PAP Þ CHAP ãéá íá óõíäåèåßôå ìå ôïí ISP óáò (ìå Üëëá ëüãéá, ìðïñåßôå óôá Windows íá óõíäåèåßôå ìå ôïí ISP óáò ÷ùñßò íá ÷ñçóéìïðïéÞóåôå script), ôüôå ôï ìüíï ðïõ èá ÷ñåéáóôåßôå åßíáé íá ãñÜøåôå ôçí åíôïëÞ `dial` óôçí ðñïôñïðÞ ôçò åöáñìïãÞò **ppp**. ÄéáöïñåôéêÜ, èá ðñÝðåé íá îÝñåôå ðùò íá êáëÝóåôå ôïí ISP óáò, ÷ñçóéìïðïéþíôáò åíôïëÝò “AT commands” ïé ïðïßåò åßíáé óõãêåêñéìÝíåò ãéá ôï modem óáò, êáèþò ôï ðñüãñáììá êëÞóåùí ôïõ PPP (dialer) ðáñÝ÷åé Ýíá ðïëý áðëü åîïìïéùôÞ ôåñìáôéêïý. ÁíáôñÝîôå óôï user-ppp handbook êáé FAQ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/faq/ppp.html) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò. Áí Ý÷åôå ðñïâëÞìáôá, ìðïñåßôå íá êáôåõèýíåôå ôçí êáôáãñáöÞ (logging) óôçí ïèüíç ìå ôçí åíôïëÞ `set log local ....`

Áí õðÜñ÷åé äéáèÝóéìç öõóéêÞ óýíäåóç ìå Üëëï ìç÷Üíçìá FreeBSD, ìðïñåßôå åðßóçò íá åãêáôáóôÞóåôå ìÝóù ðáñÜëëçëïõ êáëùäßïõ “laplink”. Ç ôá÷ýôçôá ìåôÜäïóçò äåäïìÝíùí ìÝóù ôçò ðáñÜëëçëçò èýñáò åßíáé áñêåôÜ õøçëüôåñç óõíÞèùò áðü üôé ôçò óåéñéáêÞò (ìÝ÷ñé 50 kbytes/sec), ìå áðïôÝëåóìá ãñçãïñüôåñç åãêáôÜóôáóç.

2.13.6.1 Ðñéí ÅãêáôáóôÞóåôå ìÝóù NFS

Ç åãêáôÜóôáóç ìÝóù NFS åßíáé áñêåôÜ áðëÞ. Áðëþò áíôéãñÜøôå ôá áñ÷åßá ôçò äéáíïìÞò ôïõ FreeBSD óå Ýíá åîõðçñåôçôÞ NFS êáé äåßîôå ðñïò áõôüí êáôÜ ôçí åðéëïãÞ ìÝóïõ NFS.

Áí ï åîõðçñåôçôÞò áõôüò õðïóôçñßæåé ìüíï ðñïíïìéáêÞ èýñá (“privileged port”) (áõôÞ åßíáé ç ôõðéêÞ ñýèìéóç óå óôáèìïýò åñãáóßáò ôçò SUN), èá ÷ñåéáóôåß íá èÝóåôå ôçí åðéëïãÞ `NFS Secure` óôï ìåíïý Options ðñéí ìðïñÝóåôå íá ðñï÷ùñÞóåôå ìå ôçí åãêáôÜóôáóç.

Áí ç êÜñôá óáò Ethernet åßíáé ÷áìçëÞò ðïéüôçôáò êáé õðïöÝñåé áðü ðïëý áñãïýò ñõèìïýò ìåôáöïñÜò, ßóùò èåëÞóåôå íá åíåñãïðïéÞóåôå êáé ôçí åðéëïãÞ `NFS Slow`.

Ãéá íá ëåéôïõñãÞóåé ç åãêáôÜóôáóç NFS, ï åîõðçñåôçôÞò èá ðñÝðåé íá õðïóôçñßæåé ðñïóáñôÞóåéò õðïêáôáëüãùí (subdir mounts), ãéá ðáñÜäåéãìá, áí ï êáôÜëïãïò ôçò äéáíïìÞò óáò FreeBSD 9.1 âñßóêåôáé óôï: `ziggy:/usr/archive/stuff/FreeBSD`, ôüôå ï `ziggy` èá ðñÝðåé íá åðéôñÝðåé ôçí áðåõèåßáò ðñïóÜñôçóç ôïõ `/usr/archive/stuff/FreeBSD`, êáé ü÷é ìüíï ôïõ `/usr` Þ ôïõ `/usr/archive/stuff`.

Óôï áñ÷åßï `/etc/exports` ôïõ FreeBSD, áõôü åëÝã÷åôáé áðü ôéò åðéëïãÝò `-alldirs`. ¶ëëïé åîõðçñåôçôÝò NFS ìðïñåß íá áêïëïõèïýí äéáöïñåôéêÝò óõìâÜóåéò. Áí ëáìâÜíåôå ìçíýìáôá ôïõ ôýðïõ `permission denied` áðü ôïí åîõðçñåôçôÞ, åßíáé ðéèáíüí íá ìçí Ý÷åôå ñõèìßóåé óùóôÜ ôï ðáñáðÜíù.

ÊåöÜëáéï 3 ÅãêáôÜóôáóç ôïõ FreeBSD 9.*x* êáé ÌåôáãåíÝóôåñùí Åêäüóåùí

Áíáäéïñãáíþèçêå êáé ôìÞìáôá ôïõ îáíáãñÜöçêáí áðü ôïí Jim Mock. Ç âÞìá ðñïò âÞìá åãêáôÜóôáóç sysinstall, ïé åéêüíåò êáé êáé ãåíéêÜ áíôéãñáöÞ áðü Randy Pratt. Áíáíåþèçêå ãéá ôï bsdinstall áðü ôïí Gavin Atkinson êáé Warren Block.

3.1 Óýíïøç

Ôï FreeBSD Ýñ÷åôáé ìå Ýíá ìç-ãñáöéêü áëëÜ åýêïëï óôç ÷ñÞóç ðñüãñáììá åãêáôÜóôáóçò. Áðü ôï FreeBSD 9.0-RELEASE êáé ìåôÜ, ÷ñçóéìïðïéåßôáé ôï ðñüãñáììá **bsdinstall** åíþ ïé ðñïçãïýìåíåò åêäüóåéò ÷ñçóéìïðïéïýí ôï **sysinstall**. Ôï êåöÜëáéï áõôü ðåñéãñÜöåé ôç ÷ñÞóç ôïõ **bsdinstall**. Ç ÷ñÞóç ôïõ **sysinstall** ðåñéãñÜöåôáé óôï ÊåöÜëáéï 2.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ãíùñßæåôå:

- Ðùò íá äçìéïõñãÞóåôå ìÝóá åãêáôÜóôáóçò ãéá ôï FreeBSD.
- Ðùò ôï FreeBSD õðïäéáéñåß ôïõò óêëçñïýò äßóêïõò êáé ðùò áíáöÝñåôáé óå áõôïýò.
- Ðùò íá åêêéíÞóåôå ôï **bsdinstall**.
- Ôéò åñùôÞóåéò ðïõ èá óáò êÜíåé ôï **bsdinstall**, ôé óçìáßíïõí êáé ðùò íá ôéò áðáíôÞóåôå.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï èá ðñÝðåé:

- Íá äéáâÜóåôå ôç ëßóôá ôïõ õëéêïý ðïõ õðïóôçñßæåôáé áðü ôçí Ýêäïóç ôïõ FreeBSD ðïõ åãêáèéóôÜôå êáé íá åðáëçèåýóåôå üôé ôï õëéêü ôïõ õðïóôçñßæåôáé.

> **Óçìåßùóç:** Óå ãåíéêÝò ãñáììÝò, áõôÝò ïé ïäçãßåò åãêáôÜóôáóçò áíáöÝñïíôáé óôçí áñ÷éôåêôïíéêÞ i386 (“PC óõìâáôÞ”). ¼ðïõ ÷ñåéÜæåôáé, äßíåôáé áíáöïñÜ êáé óå Üëëåò áñ÷éôåêôïíéêÝò. Ðéèáíüí íá õðÜñ÷ïõí ìéêñÝò äéáöïñÝò óôï ðñüãñáììá åãêáôÜóôáóçò óå ó÷Ýóç ìå ôï ðáñüí êåßìåíï êáé ãéá ôï ëüãï áõôü óáò óõíéóôïýìå íá ôï ÷ñçóéìïðïéÞóåôå ùò ãåíéêü ïäçãü ðáñÜ óáí êõñéïëåêôéêÜ áêñéâåßò ïäçãßåò.

3.2 ÁðáéôÞóåéò Õëéêïý

3.2.1 ÅëÜ÷éóôåò ÁðáéôÞóåéò ÅãêáôÜóôáóçò

Ïé åëÜ÷éóôåò áðáéôÞóåéò ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD ðïéêßëïõí áíÜëïãá ìå ôçí Ýêäïóç ôïõ ëåéôïõñãéêïý êáé ôçí áñ÷éôåêôïíéêÞ ôïõ õëéêïý ðïõ ÷ñçóéìïðïéåßôáé.

Óôéò åðüìåíåò åíüôçôåò èá óáò ðáñïõóéÜóïõìå ìéá óýíïøç áõôþí ôùí ðëçñïöïñéþí. ÁíÜëïãá ìå ôç ìÝèïäï ðïõ èá ÷ñçóéìïðïéÞóåôå ãéá íá åãêáôáóôÞóåôå ôï FreeBSD, ìðïñåß íá ÷ñåéáóôåßôå Ýíá õðïóôçñéæüìåíï ïäçãü CDROM êáé — óå êÜðïéåò ðåñéðôþóåéò — ìéá êÜñôá äéêôýïõ. Ôá èÝìáôá áõôÜ êáëýðôïíôáé óôï ÔìÞìá 3.3.5.

3.2.1.1 FreeBSD/i386

Ôï FreeBSD/i386 áðáéôåß 486 Þ êáëýôåñï åðåîåñãáóôÞ êáé ôïõëÜ÷éóôïí 64 MB RAM. Ãéá ôçí åëÜ÷éóôç äõíáôÞ åãêáôÜóôáóç áðáéôåßôáé 1.1 GB åëåýèåñïõ ÷þñïõ óôï óêëçñü äßóêï.

Óçìåßùóç: Óå ðåñéðôþóåéò ðáëéþí ìç÷áíçìÜôùí, ôéò ðåñéóóüôåñåò öïñÝò, ç áðüäïóç ôïõ óõóôÞìáôïò âåëôéþíåôáé ðåñéóóüôåñï ìå áýîçóç ôçò ìíÞìçò RAM êáé ôïõ åëåýèåñïõ ÷þñïõ óôï äßóêï, ðáñÜ ìå Ýíá ôá÷ýôåñï åðåîåñãáóôÞ.

3.2.1.2 FreeBSD/amd64

ÕðÜñ÷ïõí äýï êëÜóåéò åðåîåñãáóôþí éêáíÝò íá åêôåëÝóïõí ôï FreeBSD/amd64. Ç ðñþôç åßíáé ïé åðåîåñãáóôÝò AMD64 ðïõ ðåñéëáìâÜíïõí ôïõò AMD Athlon64, AMD Athlon64-FX, AMD Opteron Þ êáëýôåñïõò.

Ç äåýôåñç êëÜóç åðåîåñãáóôþí ðïõ ìðïñïýí íá åêôåëÝóïõí ôï FreeBSD/amd64 ðåñéëáìâÜíåé üóïõò ÷ñçóéìïðïéïýí ôçí áñ÷éôåêôïíéêÞ Intel EM64T. Ðáñáäåßãìáôá ôÝôïéùí åðåîåñãáóôþí áõôþí ðåñéëáìâÜíïõí ôéò ïéêïãÝíåéåò Intel Core 2 Duo, Quad, Extreme processor, ôç óåéñÜ åðåîåñãáóôþí Intel Xeon 3000, 5000 êáé 7000 êáèþò êáé ôïõò åðåîåñãáóôÝò Intel Core i3, i5 êáé i7.

Áí ôï ìç÷Üíçìá óáò åßíáé âáóéóìÝíï óå nVidia nForce3 Pro-150, èá *ðñÝðåé* íá ÷ñçóéìïðïéÞóåôå ôçí êáôÜëëçëç åðéëïãÞ óôï BIOS ãéá íá áðåíåñãïðïéÞóåôå ôï IO APIC. Áí ç åðéëïãÞ áõôÞ äåí õðÜñ÷åé, èá ðñÝðåé íá áðåíåñãïðïéÞóåôå áíôß áõôïý ôï ACPI. ÕðÜñ÷ïõí ðñïâëÞìáôá óôï Pro-150 ãéá ôá ïðïßá ìÝ÷ñé óôéãìÞò äåí Ý÷åé âñåèåß ëýóç ðïõ íá ôá ðáñáêÜìðôåé.

3.2.1.3 FreeBSD/powerpc Apple® Macintosh®

Õðïóôçñßæïíôáé üëïé ïé íÝïé õðïëïãéóôÝò Apple® Macintosh® ðïõ äéáèÝôïõí åíóùìáôùìÝíåò USB. Õðïóôçñßæåôáé åðßóçò ç ëåéôïõñãßá SMP óå ìç÷áíÞìáôá ìå ðïëëáðëïýò åðåîåñãáóôÝò.

¸íáò 32-bit ðõñÞíáò ìðïñåß íá ÷ñçóéìïðïéÞóåé ìüíï ôá ðñþôá 2 GB RAM. Ôï FireWire® äåí õðïóôçñßæåôáé óôá Ìðëå êáé ËåõêÜ PowerMac G3.

3.2.1.4 FreeBSD/sparc64

Ìðïñåßôå íá äåßôå ôá óõóôÞìáôá ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD/sparc64 óôï FreeBSD/sparc64 (http://www.freebsd.org/platforms/sparc.html) Project.

Èá ÷ñåéáóôåßôå Ýíá äßóêï ãéá áðïêëåéóôéêÞ ÷ñÞóç áðü ôï FreeBSD/sparc64. Ôç äåäïìÝíç óôéãìÞ, äåí åßíáé äõíáôüí ôï FreeBSD íá ìïéñÜæåôáé ôïí ßäéï äßóêï ìå Ýíá Üëëï ëåéôïõñãéêü óýóôçìá.

3.2.2 Õðïóôçñéæüìåíï Õëéêü

Óôéò Óçìåéþóåéò Õëéêïý (Hardware Notes) ìðïñåßôå íá âñåßôå ðëçñïöïñßåò ãéá ôéò áñ÷éôåêôïíéêÝò êáé ôéò óõóêåõÝò ðïõ õðïóôçñßæïíôáé áðü ìéá åðßóçìç Ýêäïóç ôïõ FreeBSD. Ôï áñ÷åßï áõôü ïíïìÜæåôáé óõíÞèùò `HARDWARE.TXT`, êáé âñßóêåôáé óôïí êåíôñéêü êáôÜëïãï ôïõ ìÝóïõ åãêáôÜóôáóçò. Ìðïñåßôå åðßóçò íá âñåßôå áíôßãñáöá áõôïý ôïõ êáôáëüãïõ óôç óåëßäá Ðëçñïöïñéþí ¸êäïóçò (http://www.FreeBSD.org/releases/index.html) óôï äéêôõáêü ôüðï ôïõ FreeBSD.

3.3 Åñãáóßåò ðñéí ôçí ÅãêáôÜóôáóç

3.3.1 ÊñáôÞóôå Áíôßãñáöá Áóöáëåßáò ôùí ÄåäïìÝíùí óáò

ÊñáôÞóôå áíôßãñáöá áóöáëåßáò üëùí ôùí óçìáíôéêþí äåäïìÝíùí ôïõ õðïëïãéóôÞ óôïí ïðïßï èá êÜíåôå åãêáôÜóôáóç ôïõ FreeBSD. ÅëÝãîôå ôç óùóôÞ ëåéôïõñãßá ôùí áíôéãñÜöùí áóöáëåßáò ðñéí óõíå÷ßóåôå. Ôï ðñüãñáììá åãêáôÜóôáóçò ôïõ FreeBSD èá æçôÞóåé åðéâåâáßùóç ðñéí êÜíåé ïðïéáäÞðïôå áëëáãÞ óôï äßóêï óáò, áëëÜ áöïý ôç óôéãìÞ ðïõ áõôÞ ç äéáäéêáóßá îåêéíÞóåé, äåí õðÜñ÷åé äõíáôüôçôá åðéóôñïöÞò.

3.3.2 Áðïöáóßóôå ðïõ èá ÅãêáôáóôÞóåôå ôï FreeBSD

Áí ôï FreeBSD ðñüêåéôáé íá åßíáé ôï ìïíáäéêü ëåéôïõñãéêü óýóôçìá ôïõ õðïëïãéóôÞ êáé óêïðåýåôå íá äéáèÝóåôå óå áõôü ïëüêëçñï ôï ÷þñï ôïõ óêëçñïý óáò äßóêïõ, ìðïñåßôå íá ðñïóðåñÜóåôå ôï õðüëïéðï áõôÞò ôçò åíüôçôáò. Áí ùóôüóï èÝëåôå íá óõíõðÜñ÷åé ôï FreeBSD ìå Üëëá ëåéôïõñãéêÜ óõóôÞìáôá, åßíáé ÷ñÞóéìï íá êáôáíïÞóåôå ãåíéêÜ ôïí ôñüðï äéÜôáîçò ôùí äåäïìÝíùí óôï äßóêï.

3.3.2.1 ÊáôáôìÞóåéò Äßóêùí ãéá ôéò Áñ÷éôåêôïíéêÝò FreeBSD/i386 êáé FreeBSD/amd64

Ïé óêëçñïß äßóêïé ìðïñïýí íá ÷ùñéóôïýí óå äéáêñéôÜ ôìÞìáôá. Ôá ôìÞìáôá áõôÜ ïíïìÜæïíôáé *êáôáôìÞóåéò (partitions)*.

ÕðÜñ÷ïõí äýï ôñüðïé ãéá íá ÷ùñéóôåß Ýíáò äßóêïò óå êáôáôìÞóåéò. Ï ðáñáäïóéáêüò ôñüðïò ÷ñçóéìïðïéåß ôï *Master Boot Record (ÂáóéêÞ ÅããñáöÞ Åêêßíçóçò)* Þ MBR, Ýíá ðßíáêá êáôáôìÞóåùí éêáíü íá áðïèçêåýóåé ùò ôÝóóåñéò *ðñùôåýïõóåò êáôáôìÞóåéò (primary partitions)*. (Ãéá éóôïñéêïýò ëüãïõò, ôï FreeBSD ïíïìÜæåé ôéò ðñùôåýïõóåò êáôáôìÞóåéò *slices Þ öÝôåò*.) Ôï üñéï ôùí ôåóóÜñùí êáôáôìÞóåùí åßíáé ðïëý ðåñéïñéóôéêü ãéá ìåãÜëïõò äßóêïõò, Ýôóé ìéá áðü áõôÝò ôéò êáôáôìÞóåéò ìðïñåß íá ìåôáôñáðåß óå *åêôåôáìÝíç êáôÜôìçóç (extended partition)*. ÌÝóá óôçí åêôåôáìÝíç êáôÜôìçóç ìðïñïýí íá äçìéïõñãçèïýí ðïëëáðëÝò *ëïãéêÝò êáôáôìÞóåéò (logical partitions)*. Áõôü áêïýãåôáé êÜðùò ðåñßðëïêï, êáé ìÜëëïí åßíáé.

Ï *Ðßíáêáò ÊáôáôìÞóåùí GUID (GUID Partition Table)* Þ GPT, áðïôåëåß ìéá íÝá êáé áðëïýóôåñç ìÝèïäï êáôÜôìçóçò åíüò äßóêïõ. Ôï GPT åßíáé ðïëý ðéï âïëéêü áðü ôïí ðáñáäïóéáêü ðßíáêá êáôáôìÞóåùí MBR. Ïé óõíÞèåéò õëïðïéÞóåéò ôïõ GPT åðéôñÝðïõí ùò êáé 128 êáôáôìÞóåéò áíÜ äßóêï, åîáëåßöïíôáò Ýôóé ôçí áíÜãêç ãéá Üâïëåò ëýóåéò üðùò ïé ëïãéêÝò êáôáôìÞóåéò.

> **Ðñïåéäïðïßçóç:** ÊÜðïéá ðáëéüôåñá ëåéôïõñãéêÜ óõóôÞìáôá üðùò ôá Windows XP äåí åßíáé óõìâáôÜ ìå ôï óýóôçìá êáôáôìÞóåùí GPT. Áí ôï FreeBSD ðñüêåéôáé íá åãêáôáóôáèåß óå Ýíá äßóêï áðü êïéíïý ìå Ýíá ôÝôïéï ëåéôïõñãéêü, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï óýóôçìá MBR.

Ï ôõðéêüò öïñôùôÞò åêêßíçóçò (boot loader) ôïõ FreeBSD ÷ñåéÜæåôáé åßôå ìéá ðñùôåýïõóá åßôå ìéá GPT êáôÜôìçóç. (Äåßôå ôï ÊåöÜëáéï 13 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD.) Áí üëåò ïé ðñùôåýïõóåò Þ GPT êáôáôìÞóåéò åßíáé Þäç óå ÷ñÞóç, èá ðñÝðåé íá åëåõèåñþóåôå ìßá ãéá ÷ñÞóç ìå ôï FreeBSD.

Ç åëÜ÷éóôç åãêáôÜóôáóç ôïõ FreeBSD êáôáëáìâÜíåé ìüëéò ðåñßðïõ 1 GB ÷þñï óôï äßóêï. Ðñüêåéôáé üìùò ãéá ôçí *áðüëõôá* åëÜ÷éóôç åãêáôÜóôáóç ç ïðïßá äåí áöÞíåé ó÷åäüí êáèüëïõ åëåýèåñï ÷þñï. Ìéá ðéï ñåáëéóôéêÞ åëÜ÷éóôç åãêáôÜóôáóç êáôáëáìâÜíåé ðåñßðïõ 3 GB ÷ùñßò ãñáöéêü ðåñéâÜëëïí êáé ðåñßðïõ 5 GB ìå ÷ñÞóç êÜðïéïõ ãñáöéêïý ðåñéâÜëëïíôïò. Ç åãêáôÜóôáóç ëïãéóìéêïý ôñßôùí êáôáóêåõáóôþí áðáéôåß áêüìá ðåñéóóüôåñï ÷þñï óôï äßóêï.

ÕðÜñ÷åé ðëçèþñá åëåýèåñùí êáé åìðïñéêþí åñãáëåßùí áíáäéáíïìÞò ÷þñïõ êáôáôìÞóåùí (http://en.wikipedia.org/wiki/List_of_disk_partitioning_software). Ôï GParted Live (http://gparted.sourceforge.net/livecd.php) åßíáé Ýíá äùñåÜí Live CD ôï ïðïßï ðåñéëáìâÜíåé ôïí åðåîåñãáóôÞ êáôáôìÞóåùí GParted. Ôï GParted ðåñéëáìâÜíåôáé åðßóçò óå ðïëëÝò Üëëåò Live äéáíïìÝò Linux.

> **Ðñïåéäïðïßçóç:** Ïé åöáñìïãÝò ðïõ äéá÷åéñßæïíôáé êáôáôìÞóåéò óêëçñïý äßóêïõ ìðïñïýí íá êáôáóôñÝøïõí ôá äåäïìÝíá óáò. ÐÜñôå ðëÞñç áíôßãñáöá áóöáëåßáò êáé åðéâåâáéþóôå ôçí ïñèÞ ëåéôïõñãßá ôïõò ðñéí îåêéíÞóåôå ôçí ôñïðïðïßçóç ôùí êáôáôìÞóåùí ôïõ äßóêïõ óáò.

Ç áëëáãÞ ìåãÝèïõò êáôáôìÞóåùí ôùí Microsoft Vista åíäÝ÷åôáé íá åßíáé äýóêïëç. Åßíáé ÷ñÞóéìï íá Ý÷åôå äéáèÝóéìï Ýíá DVD åãêáôÜóôáóçò ôùí Vista ðñéí îåêéíÞóåôå ìéá ôÝôïéá äéáäéêáóßá.

ÐáñÜäåéãìá 3-1. ×ñçóéìïðïéþíôáò ìéá ÕðÜñ÷ïõóá ÊáôÜôìçóç

¸íáò õðïëïãéóôÞò Windows äéáèÝôåé Ýíá ìïíáäéêü äßóêï 40 GB ï ïðïßïò Ý÷åé ÷ùñéóôåß óå äýï êáôáôìÞóåéò ôùí 20 GB. Óôá Windows ïíïìÜæïíôáé `C:` êáé `D:`. Ç êáôÜôìçóç `C:` ðåñéÝ÷åé 10 GB äåäïìÝíùí, åíþ ç êáôÜôìçóç `D:` 5 GB.

Ç ìåôáêßíçóç ôùí äåäïìÝíùí áðü ôï `D:` óôï `C:` åëåõèåñþíåé ôç äåýôåñç êáôÜôìçóç þóôå íá ìðïñåß íá ÷ñçóéìïðïéçèåß áðü ôï FreeBSD.

ÐáñÜäåéãìá 3-2. Óõññéêíþíïíôáò ìéá ÕðÜñ÷ïõóá ÊáôÜôìçóç

¸íáò õðïëïãéóôÞò Windows Ý÷åé Ýíá ìïíáäéêü óêëçñü äßóêï 40 GB êáé ìéá ìåãÜëç êáôÜôìçóç ðïõ ôïí êáôáëáìâÜíåé åî’ ïëïêëÞñïõ. Ôá Windows äåß÷íïõí áõôÞ ôçí êáôÜôìçóç ôùí 40 GB ùò Ýíá ìïíáäéêü ïäçãü `C:`. Ôç äåäïìÝíç óôéãìÞ ÷ñçóéìïðïéïýíôáé 15 GB ÷þñïõ. Óêïðüò åßíáé íá êáôáëÞîïõìå ìå ìéá êáôÜôìçóç ôùí 20 GB ãéá ôá Windows êáé Üëëá 20 GB ãéá ôï FreeBSD.

ÕðÜñ÷ïõí äýï ôñüðïé ãéá íá ãßíåé áõôü.

1. ÊñáôÞóôå áíôßãñáöï ôùí äåäïìÝíùí ðïõ Ý÷åôå äçìéïõñãÞóåé óôá Windows. ¸ðåéôá åðáíåãêáôáóôÞóôå ôá Windows äçìéïõñãþíôáò ìéá êáôÜôìçóç ìåãÝèïõò 20 GB êáôÜ ôçí äéáäéêáóßá åãêáôÜóôáóçò.
2. ×ñçóéìïðïéÞóôå êÜðïéï åñãáëåßï áëëáãÞò ìåãÝèïõò êáôáôìÞóåùí üðùò ôï **GParted** ãéá íá óõññéêíþóåôå ôçí êáôÜôìçóç ôùí Windows êáé íá äçìéïõñãÞóåôå ìéá íÝá êáôÜôìçóç ãéá ôï FreeBSD óôïí åëåýèåñï ÷þñï.

Ç åãêáôÜóôáóç äéáöïñåôéêþí ëåéôïõñãéêþí óõóôçìÜôùí óå Üëëåò êáôáôìÞóåéò, åðéôñÝðåé ôçí åêôÝëåóç åíüò áðü áõôÜ óå ìéá äåäïìÝíç ÷ñïíéêÞ óôéãìÞ. Ìéá åíáëëáêôéêÞ ìÝèïäïò ðïõ åðéôñÝðåé ôçí ôáõôü÷ñïíç åêôÝëåóç ðïëëþí ëåéôïõñãéêþí ðåñéãñÜöåôáé óôï ÊåöÜëáéï 23.

3.3.3 ÓõëëÝîôå Ðëçñïöïñßåò ãéá ôï Äßêôõï

ÊÜðïéåò ìÝèïäïé åãêáôÜóôáóçò ôïõ FreeBSD ÷ñåéÜæïíôáé ìéá óýíäåóç äéêôýïõ ãéá íá êáôåâÜóïõí áñ÷åßá. Ãéá íá óõíäåèåßôå ìå Ýíá äßêôõï Ethernet (Þ ìÝóù êáëùäéáêïý Þ DSL modem ìå äéåðáöÞ Ethernet), ôï ðñüãñáììá åãêáôÜóôáóçò èá óáò æçôÞóåé ðëçñïöïñßåò ó÷åôéêÜ ìå ôï äßêôõï óáò.

Óõ÷íÜ, ãßíåôáé ÷ñÞóç ôïõ *DHCP* þóôå ïé ñõèìßóåéò ôïõ äéêôýïõ íá ãßíïíôáé áõôüìáôá. Áí äåí äéáèÝôåôå DHCP, èá ðñÝðåé íá âñåßôå ôéò ðáñáêÜôù ðëçñïöïñßåò áðü ôïí ôïðéêü óáò äéá÷åéñéóôÞ äéêôýïõ Þ ôïí ðáñï÷Ýá ôùí õðçñåóéþí óáò:

Ðëçñïöïñßåò Äéêôýïõ

1. Äéåýèõíóç IP
2. ÌÜóêá Õðïäéêôýïõ
3. Äéåýèõíóç IP ðñïåðéëåãìÝíïõ äñïìïëïãçôÞ
4. ¼íïìá ôïìÝá ãéá ôï ôïðéêü äßêôõï
5. Äéåõèýíóåéò IP ôùí äéáêïìéóôþí DNS

3.3.4 ÅëÝãîôå ãéá ÐáñïñÜìáôá (Errata) óôï FreeBSD

Áí êáé ôï FreeBSD Project ðáó÷ßæåé ãéá íá åîáóöáëßóåé üôé êÜèå íÝá Ýêäïóç ôïõ FreeBSD èá åßíáé üóï ðéï óôáèåñÞ ãßíåôáé, ïñéóìÝíåò öïñÝò óôç äéáäéêáóßá áõôÞ åéóÝñ÷ïíôáé ëÜèç. Óå ðïëý óðÜíéåò ðåñéðôþóåéò, ôá ëÜèç áõôÜ åðçñåÜæïõí ôç äéáäéêáóßá åãêáôÜóôáóçò. Êáèþò ôá ðñïâëÞìáôá áõôÜ ãßíïíôáé áíôéëçðôÜ êáé åðéäéïñèþíïíôáé, óçìåéþíïíôáé óôá ÐáñïñÜìáôá ôïõ FreeBSD (http://www.FreeBSD.org/releases/9.0R/errata.html) óôç äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD. ÅëÝãîôå ôá ðáñïñÜìáôá ðñéí îåêéíÞóåôå ôçí åãêáôÜóôáóç, ãéá íá âåâáéùèåßôå üôé äåí õðÜñ÷ïõí ðñïâëÞìáôá ðïõ ìðïñïýí íá åðçñåÜóïõí ôç äéáäéêáóßá.

Ìðïñåßôå íá âñåßôå ðëçñïöïñßåò êáé ðáñïñÜìáôá ãéá üëåò ôéò åêäüóåéò óôç óåëßäá ðëçñïöïñéþí Ýêäïóçò (http://www.FreeBSD.org/releases/index.html) óôçí äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD (http://www.FreeBSD.org/index.html).

3.3.5 ÐñïåôïéìÜóôå ôá ÌÝóá ÅãêáôÜóôáóçò

Ç åãêáôÜóôáóç ôïõ FreeBSD îåêéíÜåé ìå ôçí åêêßíçóç ôïõ õðïëïãéóôÞ ìå ôç ÷ñÞóç åíüò FreeBSD CD, DVD Þ ìíÞìçò USB. Ôï ðñüãñáììá åãêáôÜóôáóçò äåí ìðïñåß íá åêôåëåóôåß ìÝóá áðü êÜðïéï Üëëï ëåéôïõñãéêü óýóôçìá.

Åêôüò áðü ôá ôõðïðïéçìÝíá ìÝóá åãêáôÜóôáóçò ðïõ ðåñéÝ÷ïõí üëá ôá áðáñáßôçôá áñ÷åßá åãêáôÜóôáóçò ôïõ FreeBSD, äéáôßèåôáé åðßóçò êáé ç åêäï÷Þ *bootonly*. Áõôü ôï ìÝóï åãêáôÜóôáóçò äåí ðåñéÝ÷åé ôá áðáñáßôçôá áñ÷åßá, áëëÜ ôá êáôåâÜæåé áðü ôï äßêôõï êáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò. ÊáôÜ óõíÝðåéá, ôï óõãêåêñéìÝíï CD åßíáé áñêåôÜ ìéêñüôåñï óå ìÝãåèïò åíþ êáé ôï áðáéôïýìåíï åýñïò æþíçò ôïõ äéêôýïõ ðåñéïñßæåôáé êáèþò êáôåâáßíïõí ìüíï ôá áñ÷åßá ðïõ áðáéôïýíôáé.

Ìðïñåßôå íá âñåßôå Ýôïéìá ìÝóá åãêáôÜóôáóçò ãéá ôï FreeBSD óôçí äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD. (http://www.FreeBSD.org/where.html#download).

> **Õðüäåéîç:** Áí äéáèÝôåôå Þäç Ýíá CDROM, DVD Þ USB ïäçãü åãêáôÜóôáóçò FreeBSD, ìðïñåßôå íá ðáñáëåßøåôå áõôÞ ôçí åíüôçôá.

Ôá CD êáé DVD áñ÷åßá ISO ôïõ FreeBSD åßíáé åêêéíÞóéìá. ×ñåéÜæåóôå ìüíï Ýíá áðü áõôÜ ãéá ôçí åãêáôÜóôáóç. ÃñÜøôå ôï áñ÷åßï ISO óå Ýíá CD Þ DVD ÷ñçóéìïðïéþíôáò ôá áíôßóôïé÷á ðñïãñÜììáôá åããñáöÞò ðïõ äéáèÝôåé ôï ôñÝ÷ïí ëåéôïõñãéêü óáò óýóôçìá.

Ãéá íá äçìéïõñãÞóåôå ìéá åêêéíÞóéìç ìíÞìç Flash (USB), áêïëïõèÞóôå ôá ðáñáêÜôù âÞìáôá:

1. ÁíáêôÞóôå ôï Áñ÷åßï ISO ãéá ôç ÌíÞìç Flash

   Ìðïñåßôå íá êáôåâÜóåôå ôï áñ÷åßï áðü ôïí êáôÜëïãï `ISO-IMAGES/` óôçí ôïðïèåóßá `ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/arch/arch/ISO-IMAGES/version/FreeBSD-version-RELEASE` ÁíôéêáôáóôÞóôå ôï *`arch`* êáé ôï *`version`* ìå ôçí áñ÷éôåêôïíéêÞ êáé ôçí Ýêäïóç ðïõ èÝëåôå íá åãêáôáóôÞóåôå. Ãéá ðáñÜäåéãìá, ôï áñ÷åßï ãéá ôï FreeBSD/i386 9.0-RELEASE âñßóêåôáé óôç èÝóç ftp://ftp.FreeBSD.org/pub/FreeBSD/releases/i386/i386/ISO-IMAGES/9.0/FreeBSD-9.0-RELEASE-i386-memstick.img.

   Ôï áñ÷åßï ãéá ôç ìíÞìç Flash Ý÷åé åðÝêôáóç `.img`. Ï êáôÜëïãïò `ISO-IMAGES/` ðåñéÝ÷åé ðëÞèïò áðü äéáöïñåôéêÜ áñ÷åßá. Èá ðñÝðåé íá êáôåâÜóåôå ôï êáôÜëëçëï áíÜëïãá ìå ôçí Ýêäïóç ôïõ FreeBSD êáé ôï õëéêü ôïõ õðïëïãéóôÞ ðïõ ðñüêåéôáé íá ÷ñçóéìïðïéçèåß.

   > **Óçìåßùóç:** Ðñéí ðñï÷ùñÞóåôå, *áíôéãñÜøôå* ôõ÷üí äåäïìÝíá ðïõ Ý÷åôå Þäç óôç ìíÞìç USB, êáèþò ç ðáñáêÜôù äéáäéêáóßá èá ôá *äéáãñÜøåé*.

2. ÃñÜøôå ôï Áñ÷åßï óôç ÌíÞìç USB

   ÅããñáöÞ ôïõ Áñ÷åßïõ ìå ×ñÞóç ôïõ FreeBSD

   > **Ðñïåéäïðïßçóç:** Ôï ðáñáêÜôù ðáñÜäåéãìá äåß÷íåé ôç óõóêåõÞ `/dev/da0` ùò ôïí ðñïïñéóìü åããñáöÞò ôïõ áñ÷åßïõ. Èá ðñÝðåé íá åßóôå ðïëý ðñïóåêôéêïß êáé íá âåâáéùèåßôå ãéá ôï üíïìá ôçò óõóêåõÞò ðïõ ÷ñçóéìïðïéåßôå, äéáöïñåôéêÜ åíäÝ÷åôáé íá äéáãñÜøåôå äåäïìÝíá ðïõ ÷ñåéÜæåóôå.

   1. ÅããñáöÞ ôïõ Áñ÷åßïõ ìå ôçí dd(1)

      Ôï áñ÷åßï `.img` *äåí* åßíáé Ýíá óõíçèéóìÝíï áñ÷åßï. Åßíáé Ýíá áñ÷åßï *åéêüíáò (image)* ìå üëï ôï ðåñéå÷üìåíï ðïõ ÷ñåéÜæåôáé ç ìíÞìç USB. *Äåí ìðïñåßôå* íá ôï áíôéãñÜøåôå ùò Ýíá êáíïíéêü áñ÷åßï, èá ÷ñåéáóôåß íá ôï ãñÜøåôå áðåõèåßáò óôç óõóêåõÞ ðñïïñéóìïý ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ dd(1):

      ```
      # dd if=FreeBSD-9.0-RELEASE-i386-memstick.img of=/dev/da0 bs=64k
      ```

   ÅããñáöÞ ôïõ Áñ÷åßïõ ÌÝóù Windows

   > **Ðñïåéäïðïßçóç:** Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôï óùóôü üíïìá ïäçãïý ãéá ôçí ìíÞìç USB, äéáöïñåôéêÜ ìðïñåß íá ðñïêëçèåß áðþëåéá äåäïìÝíùí.

   1. ÁíÜêôçóç ôïõ ÐñïãñÜììáôïò **Image Writer ãéá Windows**

      Ôï **Image Writer ãéá Windows** åßíáé ìéá äùñåÜí åöáñìïãÞ ðïõ ìðïñåß íá ãñÜøåé óùóôÜ Ýíá áñ÷åßï image óå ìéá ìíÞìç USB. Ìðïñåßôå íá ôï êáôåâÜóåôå áðü ôçí ôïðïèåóßá https://launchpad.net/win32-image-writer/ êáé íá ôï áðïóõìðéÝóåôå óå Ýíá öÜêåëï.

   2. ÅããñáöÞ ôïõ Áñ÷åßïõ ìå ôï Image Writer

      ÊÜíôå äéðëü êëéê óôï åéêïíßäéï **Win32DiskImager** ãéá íá îåêéíÞóåôå ôï ðñüãñáììá. Âåâáéùèåßôå üôé ôï ãñÜììá ôïõ ïäçãïý ðïõ öáßíåôáé óôçí åðéëïãÞ `Device` áíôéóôïé÷åß óôç ìíÞìç USB. ÊÜíôå êëéê óôï åéêïíßäéï ìå ôï öÜêåëï êáé åðéëÝîôå ôï áñ÷åßï åéêüíáò ðïõ èá ãñáöåß óôç ìíÞìç USB. ÊÜíôå êëéê óôï [Save] ãéá íá áðïäå÷èåßôå ôï üíïìá ôïõ áñ÷åßïõ åéêüíáò. Âåâáéùèåßôå üôé ïé ðáñáðÜíù åíÝñãåéåò åßíáé óùóôÝò êáé üôé äåí õðÜñ÷ïõí áíïéêôÜ ðáñÜèõñá óôï óýóôçìá óáò ðïõ íá áðåéêïíßæïõí öáêÝëïõò ôçò ìíÞìçò USB. ÔÝëïò, êÜíôå êëéê óôï [Write] ãéá íá ãñÜøåôå ôï áñ÷åßï åéêüíáò óôç ìíÞìç USB.

Óçìåßùóç: Äåí õðïóôçñßæåôáé ðëÝïí ç åãêáôÜóôáóç áðü äéóêÝôåò

Åßóôå ðëÝïí Ýôïéìïé íá îåêéíÞóåôå ôçí åãêáôÜóôáóç ôïõ FreeBSD.

3.4 Îåêéíþíôáò ôçí ÅãêáôÜóôáóç

Óçìáíôéêü: Áðü ðñïåðéëïãÞ, ç åãêáôÜóôáóç äåí èá êÜíåé áëëáãÝò óôï óýóôçìá óáò ìÝ÷ñé íá äåßôå ôï ðáñáêÜôù ìÞíõìá:

```
Your changes will now be written to disk.  If you
have chosen to overwrite existing data, it will
be PERMANENTLY ERASED. Are you sure you want to
commit your changes?
```

Ìðïñåßôå íá åãêáôáëåßøåôå ôçí åãêáôÜóôáóç ïðïéáäÞðïôå óôéãìÞ ðñéí áðü ôçí ðáñáðÜíù ðñïåéäïðïßçóç, ÷ùñßò íá Ý÷ïõí ãßíåé áëëáãÝò óôá ðåñéå÷üìåíá ôïõ äßóêïõ óáò. Áí áíçóõ÷åßôå üôé åíäå÷ïìÝíùò Ý÷åôå êÜíåé êÜôé ëÜèïò, ìðïñåßôå áðëÜ íá óâÞóåôå ôïí õðïëïãéóôÞ óáò ðñéí áðü áõôü ôï óçìåßï êáé äåí èá ãßíåé êáìéÜ æçìéÜ.

3.4.1 Åêêßíçóç

3.4.1.1 Åêêßíçóç óôéò Áñ÷éôåêôïíéêÝò i386 êáé amd64

1. Áí ðñïåôïéìÜóáôå ìéá “åêêéíÞóéìç” ìíÞìç USB üðùò ðåñéãñÜöåôáé óôï ÔìÞìá 3.3.5, ôïðïèåôÞóôå ôç ìíÞìç óôçí õðïäï÷Þ ôïõ õðïëïãéóôÞ óáò ðñéí ôïí åíåñãïðïéÞóåôå.

   Áí ðñüêåéôáé íá åêêéíÞóåôå áðü ôï CDROM, èá ÷ñåéáóôåß íá åíåñãïðïéÞóåôå ôïí õðïëïãéóôÞ óáò êáé íá åéóÜãåôå ôï CDROM óôçí ðñþôç äõíáôÞ åõêáéñßá.

2. Ñõèìßóôå ôï ìç÷Üíçìá óáò íá îåêéíÜåé åßôå áðü ôï CDROM åßôå áðü ôçí USB, áíÜëïãá ìå ôï ìÝóï åãêáôÜóôáóçò ðïõ ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå. ÃåíéêÜ, áõôü åðéôõã÷Üíåôáé áëëÜæïíôáò ôç ó÷åôéêÞ ñýèìéóç óôï BIOS. Ôá ðåñéóóüôåñá óõóôÞìáôá åðéôñÝðïõí åðßóçò ôçí åðéëïãÞ ìéáò óõóêåõÞò åêêßíçóçò êáèþò îåêéíïýí, ôõðéêÜ ìå ôá ðëÞêôñá **F10**, **F11**, **F12**, Þ **Escape**.

3. Áí ï õðïëïãéóôÞò óáò îåêéíÞóåé üðùò óõíÞèùò êáé öïñôþóåé ôï Þäç õðÜñ÷ïí ëåéôïõñãéêü óýóôçìá, ìðïñåß íá óõìâáßíåé êÜôé áðü ôá ðáñáêÜôù:

   1. Äåí ôïðïèåôÞóáôå ôï CD Þ DVD áñêåôÜ íùñßò êáôÜ ôçí åêêßíçóç. ÁöÞóôå ôï ìÝóï óôïí ïäçãü êáé äïêéìÜóôå íá åðáíåêêéíÞóåôå ôïí õðïëïãéóôÞ óáò.

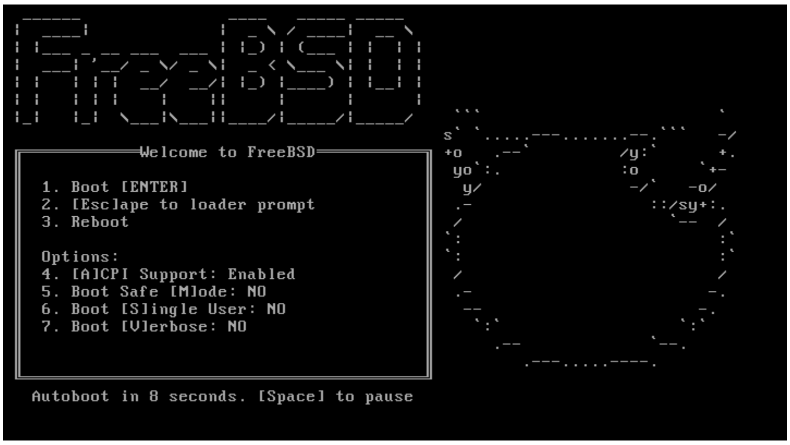
   2. Ïé áëëáãÝò ñõèìßóåùí ðïõ êÜíáôå óôï BIOS äåí ëåéôïýñãçóáí óùóôÜ. Èá ðñÝðåé íá îáíáäïêéìÜóåôå ìÝ÷ñé íá ðåôý÷åôå ôéò óùóôÝò ñõèìßóåéò.
   3. Ôï BIOS ôçò ìçôñéêÞò óáò äåí õðïóôçñßæåé åêêßíçóç áðü ôï ìÝóï ðïõ Ý÷åôå åðéëÝîåé. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôïí Plop Boot Manager (http://www.plop.at/en/bootmanager.html) ãéá íá åêêéíÞóåôå ðáëéÜ ìç÷áíÞìáôá áðü CD Þ USB.

4. Èá áñ÷ßóåé ç åêêßíçóç ôïõ FreeBSD. Áí îåêéíÜôå áðü CDROM, èá äåßôå ìéá ïèüíç óáí ôçí ðáñáêÜôù (Ý÷ïõìå ðáñáëåßøåé ôéò ðëçñïöïñßåò Ýêäïóçò):

```
Booting from CD-ROM...
645MB medium detected
CD Loader 1.2

Building the boot loader arguments
Looking up /BOOT/LOADER... Found
Relocating the loader and the BTX
Starting the BTX loader

BTX loader 1.00 BTX version is 1.02
Consoles: internal video/keyboard
BIOS CD is cd0
BIOS drive C: is disk0
BIOS drive D: is disk1
BIOS 636kB/261056kB available memory

FreeBSD/i386 bootstrap loader, Revision 1.1

Loading /boot/defaults/loader.conf
/boot/kernel/kernel text=0x64daa0 data=0xa4e80+0xa9e40 syms=[0x4+0x6cac0+0x4+0x88e9d]
\
```

5. Åìöáíßæåôáé ç ïèüíç ôïõ ìåíïý åêêßíçóçò ôïõ FreeBSD:

Ó÷Þìá 3-1. Ìåíïý ÖïñôùôÞ Åêêßíçóçò ôïõ FreeBSD



```
Welcome to FreeBSD

 1. Boot [ENTER]
 2. [Esc]ape to loader prompt
 3. Reboot

 Options:
 4. [A]CPI Support: Enabled
 5. Boot Safe [M]ode: NO
 6. Boot [S]ingle User: NO
 7. Boot [V]erbose: NO

Autoboot in 8 seconds. [Space] to pause
```

ÐåñéìÝíåôå äÝêá äåõôåñüëåðôá, Þ ðéÝóôå **Enter**.

3.4.1.2 Åêêßíçóç óôïí Macintosh PowerPC®

Óôá ðåñéóóüôåñá ìç÷áíÞìáôá, ìðïñåßôå íá êñáôÞóåôå ðéåóìÝíï ôï ðëÞêôñï **C** êáôÜ ôçí åêêßíçóç êáé èá îåêéíÞóåôå áðü ôï CD. Óå äéáöïñåôéêÞ ðåñßðôùóç, êñáôÞóôå ðéåóìÝíá ôá ðëÞêôñá **Command**+**Option**+**O**+**F**, Þ **Windows**+**Alt**+**O**+**F** áí ÷ñçóéìïðïéåßôå ðëçêôñïëüãéï ðïõ äåí åßíáé Apple. Óôçí ðñïôñïðÞ `0 >` ãñÜøôå:

```
boot cd:,\ppc\loader cd:0
```

Óå ìç÷áíÞìáôá Xserve ÷ùñßò ðëçêôñïëüãéï, äåßôå ôçí óåëßäá ôå÷íéêÞò õðïóôÞñéîçò ôçò Apple (http://support.apple.com/kb/TA26930) ãéá ðëçñïöïñßåò åêêßíçóçò óôï Open Firmware.

3.4.1.3 Åêêßíçóç óôïí SPARC64

Ôá ðåñéóóüôåñá óõóôÞìáôá SPARC64 åßíáé ñõèìéóìÝíá íá åêêéíïýí áõôüìáôá áðü ôï óêëçñü äßóêï. Ãéá íá åãêáôáóôÞóåôå ôï FreeBSD, èá ðñÝðåé íá åêêéíÞóåôå áðü ôï äßêôõï Þ áðü Ýíá CDROM. Èá ÷ñåéáóôåß íá åéóÝëèåôå óôéò ñõèìßóåéò ôçò PROM (OpenFirmware).

Ãéá íá ãßíåé áõôü, åðáíåêêéíÞóôå ôï óýóôçìá êáé ðåñéìÝíåôå ìÝ÷ñé íá åìöáíéóôåß ôï ìÞíõìá åêêßíçóçò. Ôï áêñéâÝò ìÞíõìá åîáñôÜôáé áðü ôï ìïíôÝëï, áëëÜ ãåíéêÜ èá äåß÷íåé üðùò ôï ðáñáêÜôù:

```
Sun Blade 100 (UltraSPARC-IIe), Keyboard Present
Copyright 1998-2001 Sun Microsystems, Inc.  All rights reserved.
OpenBoot 4.2, 128 MB memory installed, Serial #51090132.
Ethernet address 0:3:ba:b:92:d4, Host ID: 830b92d4.
```

Áí ìåôÜ áðü áõôü ôï óçìåßï ôï óýóôçìá óáò óõíå÷ßæåé ìå åêêßíçóç áðü ôï óêëçñü äßóêï, èá ðñÝðåé íá ðéÝóåôå **L1**+**A** Þ **Stop**+**A** óôï ðëçêôñïëüãéï, Þ íá óôåßëåôå óÞìá BREAK ìÝóù ôçò óåéñéáêÞò êïíóüëáò (÷ñçóéìïðïéþíôáò ð.÷. ôï ~# óôï tip(1) Þ cu(1)) ãéá íá âãåßôå óôçí ðñïôñïðÞ ôçò PROM ç ïðïßá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
ok          ❶
ok {0}      ❷
```

❶ ÁõôÞ ç ðñïôñïðÞ öáßíåôáé óå óõóôÞìáôá ìå ìüíï ìßá CPU.

❷ ÁõôÞ ç ðñïôñïðÞ öáßíåôáé óå óõóôÞìáôá SMP. Ôï øçößï äåß÷íåé ôïí áñéèìü ôçò åíåñãÞò CPU.

Óôï óçìåßï áõôü, ôïðïèåôÞóôå ôï CDROM óôïí ïäçãü êáé óôçí ðñïôñïðÞ ôçò PROM ãñÜøôå `boot cdrom`.

3.4.2 Åðéóêüðçóç ôùí ÁðïôåëåóìÜôùí Áíß÷íåõóçò Óõóêåõþí

Ïé ôåëåõôáßåò åêáôïíôÜäåò ãñáììÝò ðïõ ðÝñáóáí áðü ôçí ïèüíç óáò áðïèçêåýïíôáé êáé ìðïñåßôå íá ôéò îáíáäåßôå.

Ãéá íá äåßôå ôá ðåñéå÷üìåíá ôçò ðñïóùñéíÞò ìíÞìçò (buffer) ðéÝóôå **Scroll Lock**. Ìå ôïí ôñüðï áõôü åíåñãïðïéåßôáé ç êýëéóç ôçò ïèüíçò. Ìðïñåßôå Ýðåéôá íá ÷ñçóéìïðïéÞóåôå ôá ðëÞêôñá ìå ôá âåëÜêéá Þ ôá **PageUp** êáé **PageDown** ãéá íá äåßôå ôá áðïôåëÝóìáôá. ÐéÝóôå îáíÜ ôï **Scroll Lock** ãéá íá óôáìáôÞóåôå ôçí êýëéóç.

ÊÜíôå ôï áõôü ôþñá, ãéá íá îáíáäåßôå ôï êåßìåíï ðïõ êýëçóå åêôüò ïèüíçò êáèþò ï ðõñÞíáò åêôåëïýóå ôçí áíß÷íåõóç óõóêåõþí. Èá äåßôå êåßìåíï áíôßóôïé÷ï ìå ôï Ó÷Þìá 3-2, áí êáé èá õðÜñ÷ïõí äéáöïñÝò áíÜëïãá ìå ôéò óõóêåõÝò ðïõ äéáèÝôåé ï õðïëïãéóôÞò óáò.

Ó÷Þìá 3-2. ÔõðéêÜ ÁðïôåëÝóìáôá Áíß÷íåõóçò Óõóêåõþí

```
Copyright (c) 1992-2011 The FreeBSD Project.
Copyright (c) 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994
        The Regents of the University of California. All rights reserved.
FreeBSD is a registered trademark of The FreeBSD Foundation.
FreeBSD 9.0-RELEASE #0 r225473M: Sun Sep 11 16:07:30 BST 2011
    root@psi:/usr/obj/usr/src/sys/GENERIC amd64
CPU: Intel(R) Core(TM)2 Duo CPU     T9400  @ 2.53GHz (2527.05-MHz K8-class CPU)
  Origin = "GenuineIntel"  Id = 0x10676  Family = 6  Model = 17  Stepping = 6
  Features=0xbfebfbff<FPU,VME,DE,PSE,TSC,MSR,PAE,MCE,CX8,APIC,SEP,MTRR,PGE,MCA,CMOV,PAT,PSE36,CLF
  Features2=0x8e3fd<SSE3,DTES64,MON,DS_CPL,VMX,SMX,EST,TM2,SSSE3,CX16,xTPR,PDCM,SSE4.1>
  AMD Features=0x20100800<SYSCALL,NX,LM>
  AMD Features2=0x1<LAHF>
  TSC: P-state invariant, performance statistics
real memory  = 3221225472 (3072 MB)
avail memory = 2926649344 (2791 MB)
Event timer "LAPIC" quality 400
ACPI APIC Table: <TOSHIB A0064   >
FreeBSD/SMP: Multiprocessor System Detected: 2 CPUs
FreeBSD/SMP: 1 package(s) x 2 core(s)
 cpu0 (BSP): APIC ID:  0
 cpu1 (AP): APIC ID:  1
ioapic0: Changing APIC ID to 1
ioapic0 <Version 2.0> irqs 0-23 on motherboard
kbd1 at kbdmux0
acpi0: <TOSHIB A0064> on motherboard
acpi0: Power Button (fixed)
acpi0: reservation of 0, a0000 (3) failed
acpi0: reservation of 100000, b6690000 (3) failed
Timecounter "ACPI-safe" frequency 3579545 Hz quality 850
acpi_timer0: <24-bit timer at 3.579545MHz> port 0xd808-0xd80b on acpi0
cpu0: <ACPI CPU> on acpi0
ACPI Warning: Incorrect checksum in table [ASF!] - 0xFE, should be 0x9A (20110527/tbutils-282)
cpu1: <ACPI CPU> on acpi0
pcib0: <ACPI Host-PCI bridge> port 0xcf8-0xcff on acpi0
pci0: <ACPI PCI bus> on pcib0
vgapci0: <VGA-compatible display> port 0xcff8-0xcfff mem 0xff400000-0xff7fffff,0xe0000000-0xeffff
agp0: <Intel GM45 SVGA controller> on vgapci0
agp0: aperture size is 256M, detected 131068k stolen memory
vgapci1: <VGA-compatible display> mem 0xffc00000-0xffcfffff at device 2.1 on pci0
pci0: <simple comms> at device 3.0 (no driver attached)
em0: <Intel(R) PRO/1000 Network Connection 7.2.3> port 0xcf80-0xcf9f mem 0xff9c0000-0xff9dffff,0x
em0: Using an MSI interrupt
em0: Ethernet address: 00:1c:7e:6a:ca:b0
uhci0: <Intel 82801I (ICH9) USB controller> port 0xcf60-0xcf7f irq 16 at device 26.0 on pci0
usbus0: <Intel 82801I (ICH9) USB controller> on uhci0
uhci1: <Intel 82801I (ICH9) USB controller> port 0xcf40-0xcf5f irq 21 at device 26.1 on pci0
usbus1: <Intel 82801I (ICH9) USB controller> on uhci1
uhci2: <Intel 82801I (ICH9) USB controller> port 0xcf20-0xcf3f irq 19 at device 26.2 on pci0
usbus2: <Intel 82801I (ICH9) USB controller> on uhci2
ehci0: <Intel 82801I (ICH9) USB 2.0 controller> mem 0xff9ff800-0xff9ffbff irq 19 at device 26.7
usbus3: EHCI version 1.0
```

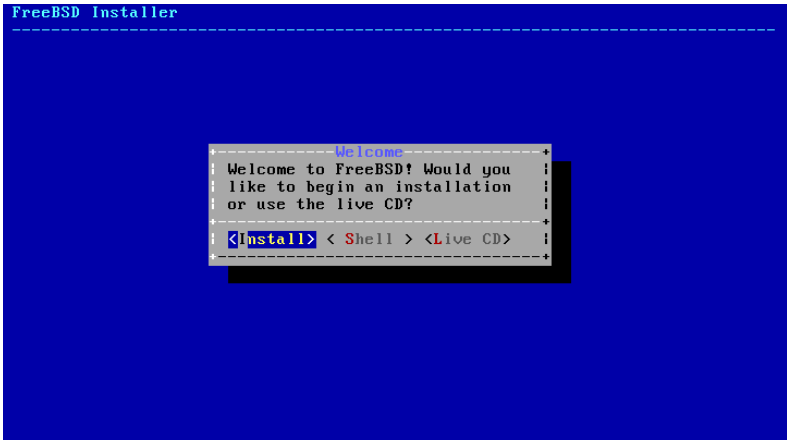
```
usbus3: <Intel 82801I (ICH9) USB 2.0 controller> on ehci0
hdac0: <Intel 82801I High Definition Audio Controller> mem 0xff9f8000-0xff9fbfff irq 22 at device
pcib1: <ACPI PCI-PCI bridge> irq 17 at device 28.0 on pci0
pci1: <ACPI PCI bus> on pcib1
iwn0: <Intel(R) WiFi Link 5100> mem 0xff8fe000-0xff8fffff irq 16 at device 0.0 on pci1
pcib2: <ACPI PCI-PCI bridge> irq 16 at device 28.1 on pci0
pci2: <ACPI PCI bus> on pcib2
pcib3: <ACPI PCI-PCI bridge> irq 18 at device 28.2 on pci0
pci4: <ACPI PCI bus> on pcib3
pcib4: <ACPI PCI-PCI bridge> at device 30.0 on pci0
pci5: <ACPI PCI bus> on pcib4
cbb0: <RF5C476 PCI-CardBus Bridge> at device 11.0 on pci5
cardbus0: <CardBus bus> on cbb0
pccard0: <16-bit PCCard bus> on cbb0
isab0: <PCI-ISA bridge> at device 31.0 on pci0
isa0: <ISA bus> on isab0
ahci0: <Intel ICH9M AHCI SATA controller> port 0x8f58-0x8f5f,0x8f54-0x8f57,0x8f48-0x8f4f,0x8f44-
ahci0: AHCI v1.20 with 4 3Gbps ports, Port Multiplier not supported
ahcich0: <AHCI channel> at channel 0 on ahci0
ahcich1: <AHCI channel> at channel 1 on ahci0
ahcich2: <AHCI channel> at channel 4 on ahci0
acpi_lid0: <Control Method Lid Switch> on acpi0
battery0: <ACPI Control Method Battery> on acpi0
acpi_button0: <Power Button> on acpi0
acpi_acad0: <AC Adapter> on acpi0
acpi_toshiba0: <Toshiba HCI Extras> on acpi0
acpi_tz0: <Thermal Zone> on acpi0
attimer0: <AT timer> port 0x40-0x43 irq 0 on acpi0
Timecounter "i8254" frequency 1193182 Hz quality 0
Event timer "i8254" frequency 1193182 Hz quality 100
atkbdc0: <Keyboard controller (i8042)> port 0x60,0x64 irq 1 on acpi0
atkbd0: <AT Keyboard> irq 1 on atkbdc0
kbd0 at atkbd0
atkbd0: [GIANT-LOCKED]
psm0: <PS/2 Mouse> irq 12 on atkbdc0
psm0: [GIANT-LOCKED]
psm0: model GlidePoint, device ID 0
atrtc0: <AT realtime clock> port 0x70-0x71 irq 8 on acpi0
Event timer "RTC" frequency 32768 Hz quality 0
hpet0: <High Precision Event Timer> iomem 0xfed00000-0xfed003ff on acpi0
Timecounter "HPET" frequency 14318180 Hz quality 950
Event timer "HPET" frequency 14318180 Hz quality 450
Event timer "HPET1" frequency 14318180 Hz quality 440
Event timer "HPET2" frequency 14318180 Hz quality 440
Event timer "HPET3" frequency 14318180 Hz quality 440
uart0: <16550 or compatible> port 0x3f8-0x3ff irq 4 flags 0x10 on acpi0
sc0: <System console> at flags 0x100 on isa0
sc0: VGA <16 virtual consoles, flags=0x300>
vga0: <Generic ISA VGA> at port 0x3c0-0x3df iomem 0xa0000-0xbffff on isa0
ppc0: cannot reserve I/O port range
est0: <Enhanced SpeedStep Frequency Control> on cpu0
p4tcc0: <CPU Frequency Thermal Control> on cpu0
est1: <Enhanced SpeedStep Frequency Control> on cpu1
```

```
p4tcc1: <CPU Frequency Thermal Control> on cpu1
Timecounters tick every 1.000 msec
hdac0: HDA Codec #0: Realtek ALC268
hdac0: HDA Codec #1: Lucent/Agere Systems (Unknown)
pcm0: <HDA Realtek ALC268 PCM #0 Analog> at cad 0 nid 1 on hdac0
pcm1: <HDA Realtek ALC268 PCM #1 Analog> at cad 0 nid 1 on hdac0
usbus0: 12Mbps Full Speed USB v1.0
usbus1: 12Mbps Full Speed USB v1.0
usbus2: 12Mbps Full Speed USB v1.0
usbus3: 480Mbps High Speed USB v2.0
ugen0.1: <Intel> at usbus0
uhub0: <Intel UHCI root HUB, class 9/0, rev 1.00/1.00, addr 1> on usbus0
ugen1.1: <Intel> at usbus1
uhub1: <Intel UHCI root HUB, class 9/0, rev 1.00/1.00, addr 1> on usbus1
ugen2.1: <Intel> at usbus2
uhub2: <Intel UHCI root HUB, class 9/0, rev 1.00/1.00, addr 1> on usbus2
ugen3.1: <Intel> at usbus3
uhub3: <Intel EHCI root HUB, class 9/0, rev 2.00/1.00, addr 1> on usbus3
uhub0: 2 ports with 2 removable, self powered
uhub1: 2 ports with 2 removable, self powered
uhub2: 2 ports with 2 removable, self powered
uhub3: 6 ports with 6 removable, self powered
ugen2.2: <vendor 0x0b97> at usbus2
uhub8: <vendor 0x0b97 product 0x7761, class 9/0, rev 1.10/1.10, addr 2> on usbus2
ugen1.2: <Microsoft> at usbus1
ada0 at ahcich0 bus 0 scbus1 target 0 lun 0
ada0: <Hitachi HTS543225L9SA00 FBEOC43C> ATA-8 SATA 1.x device
ada0: 150.000MB/s transfers (SATA 1.x, UDMA6, PIO 8192bytes)
ada0: Command Queueing enabled
ada0: 238475MB (488397168 512 byte sectors: 16H 63S/T 16383C)
ada0: Previously was known as ad4
ums0: <Microsoft Microsoft 3-Button Mouse with IntelliEyeTM, class 0/0, rev 1.10/3.00, addr 2> o
SMP: AP CPU #1 Launched!
cd0 at ahcich1 bus 0 scbus2 target 0 lun 0
cd0: <TEAC DV-W28S-RT 7.0C> Removable CD-ROM SCSI-0 device
cd0: 150.000MB/s transfers (SATA 1.x, ums0: 3 buttons and [XYZ] coordinates ID=0
UDMA2, ATAPI 12bytes, PIO 8192bytes)
cd0: cd present [1 x 2048 byte records]
ugen0.2: <Microsoft> at usbus0
ukbd0: <Microsoft Natural Ergonomic Keyboard 4000, class 0/0, rev 2.00/1.73, addr 2> on usbus0
kbd2 at ukbd0
uhid0: <Microsoft Natural Ergonomic Keyboard 4000, class 0/0, rev 2.00/1.73, addr 2> on usbus0
Trying to mount root from cd9660:/dev/iso9660/FREEBSD_INSTALL [ro]...
```

ÅëÝãîôå ðñïóåêôéêÜ ôá áðïôåëÝóìáôá ôçò áíß÷íåõóçò óõóêåõþí ãéá íá âåâáéùèåßôå üôé ôï FreeBSD âñÞêå üëåò ôéò óõóêåõÝò ðïõ áíáìÝíáôå. Áí êÜðïéá óõóêåõÞ äåí âñÝèçêå, äåí èá öáßíåôáé óôçí ðáñáðÜíù ëßóôá. Ôá Áñèñþìáôá ÐõñÞíá óáò åðéôñÝðïõí íá ðñïóèÝóåôå õðïóôÞñéîç ãéá óõóêåõÝò ðïõ äåí õðÜñ÷ïõí óôïí ðõñÞíá `GENERIC`.

ÌåôÜ ôç äéáäéêáóßá áíß÷íåõóçò óõóêåõþí èá äåßôå ôï Ó÷Þìá 3-3. Ôï ìÝíïõ åãêáôÜóôáóçò ìðïñåß íá ÷ñçóéìïðïéçèåß ìå ôñåéò ôñüðïõò: ãéá íá åãêáôáóôÞóåôå ôï FreeBSD, ùò “live CD” Þ áðëÜ ãéá íá áðïêôÞóåôå ðñüóâáóç óå Ýíá êÝëõöïò ôïõ FreeBSD. ×ñçóéìïðïéÞóôå ôá âåëÜêéá ãéá íá êÜíåôå ìéá åðéëïãÞ êáé ôï **Enter** ãéá íá ôçí åðéâåâáéþóåôå.

Ó÷Þìá 3-3. ÅðéëïãÞ Ôñüðïõ Ëåéôïõñãßáò ÌÝóïõ ÅãêáôÜóôáóçò



```
FreeBSD Installer
------------------------------------------------------------------------------

                    Welcome
     Welcome to FreeBSD! Would you
     like to begin an installation
     or use the live CD?

     <Install> < Shell > <Live CD>
```

ÅðéëÝîôå [Install] ãéá íá îåêéíÞóåôå ôï ðñüãñáììá åãêáôÜóôáóçò.

3.5 ÅéóáãùãÞ óôï bsdinstall

Ôï **bsdinstall** åßíáé ìéá åöáñìïãÞ åãêáôÜóôáóçò ãéá ôï FreeBSD ðïõ âáóßæåôáé óå ðåñéâÜëëïí êåéìÝíïõ. ÃñÜöôçêå áðü ôïí Nathan Whitehorn <nwhitehorn@FreeBSD.org> êáé ÷ñçóéìïðïéÞèçêå ðñþôç öïñÜ ôï 2011 óôï FreeBSD 9.0.

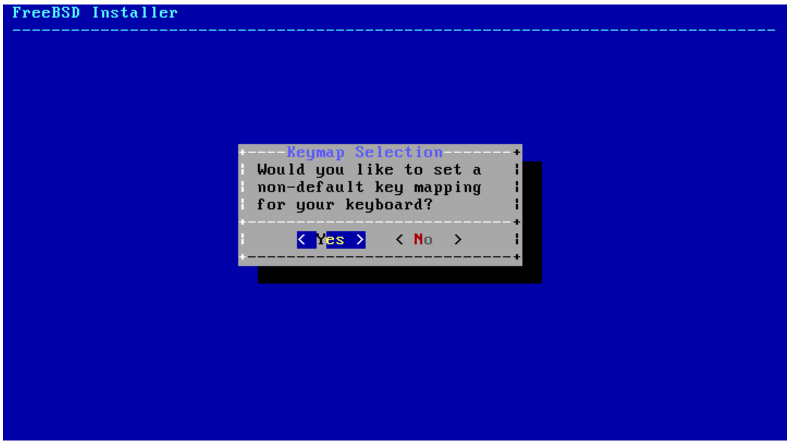
> **Óçìåßùóç:** Ç åöáñìïãÞ **pc-sysinstall** ôïõ Kris Moore <kmoore@FreeBSD.org> óõìðåñéëáìâÜíåôáé ìå ôï PC-BSD (http://pcbsd.org) êáé ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD (http://wiki.pcbsd.org/index.php/Use_PC-BSD_Installer_to_Install_FreeBSD). Áí êáé ìåñéêÝò öïñÝò óõã÷Ýåôáé ìå ôï **bsdinstall** ïé åöáñìïãÝò áõôÝò äåí ó÷åôßæïíôáé.

Ôï óýóôçìá ìåíïý ôïõ **bsdinstall** åëÝã÷åôáé ìÝóù ôùí ðëÞêôñùí ìå ôá âåëÜêéá êáé ôá ðëÞêôñá **Enter**, **Tab**, **Space** êáé ìåñéêÜ áêüìá.

3.5.1 ÅðéëïãÝò óôï Ìåíïý Keymap

ÁíÜëïãá ìå ôï åßäïò ôçò êïíóüëáò ðïõ ÷ñçóéìïðïéåßôå, ôï **bsdinstall** ßóùò óáò ñùôÞóåé áí åðéèõìåßôå íá åðéëÝîåôå ìéá äéÜôáîç ðëçêôñïëïãßïõ äéáöïñåôéêÞ áðü ôçí ðñïåðéëåãìÝíç.

Ó÷Þìá 3-4. ÅðéëïãÞ ÄéÜôáîçò Ðëçêôñïëïãßïõ

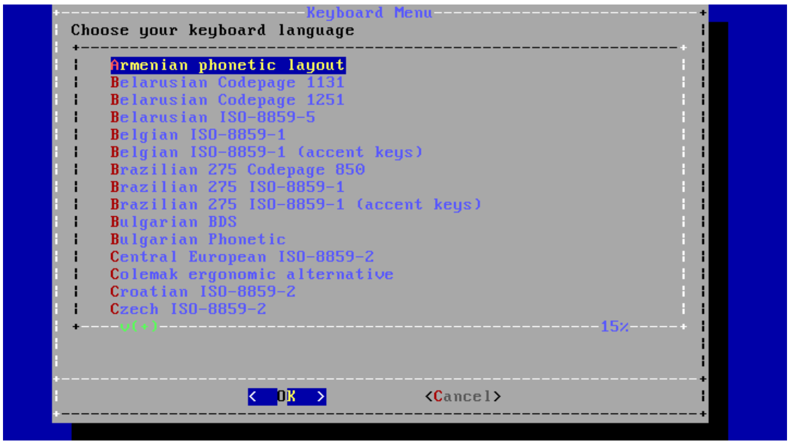


FreeBSD Installer
Keymap Selection
< Yes >
< No >

Would you like to set a non-default key mapping for your keyboard?

Áí åðéëÝîåôå [YES] èá åìöáíéóôåß ç ïèüíç åðéëïãÞò ðïõ öáßíåôáé ðáñáêÜôù. Óå äéáöïñåôéêÞ ðåñßðôùóç, ç ïèüíç áõôÞ äåí èá åìöáíéóôåß êáé èá ÷ñçóéìïðïéçèåß ç ðñïåðéëåãìÝíç äéÜôáîç ðëçêôñïëïãßïõ.

Ó÷Þìá 3-5. Ìåíïý ÅðéëïãÞò ÄéÜôáîçò Ðëçêôñïëïãßïõ



Keyboard Menu
Armenian phonetic layout
Belarusian Codepage 1131
Belarusian Codepage 1251
Belarusian ISO-8859-5
Belgian ISO-8859-1
Belgian ISO-8859-1 (accent keys)
Brazilian 275 Codepage 850
Brazilian 275 ISO-8859-1
Brazilian 275 ISO-8859-1 (accent keys)
Bulgarian BDS
Bulgarian Phonetic
Central European ISO-8859-2
Colemak ergonomic alternative
Croatian ISO-8859-2
Czech ISO-8859-2
v(+)
15%
< OK >
<Cancel>

Choose your keyboard language

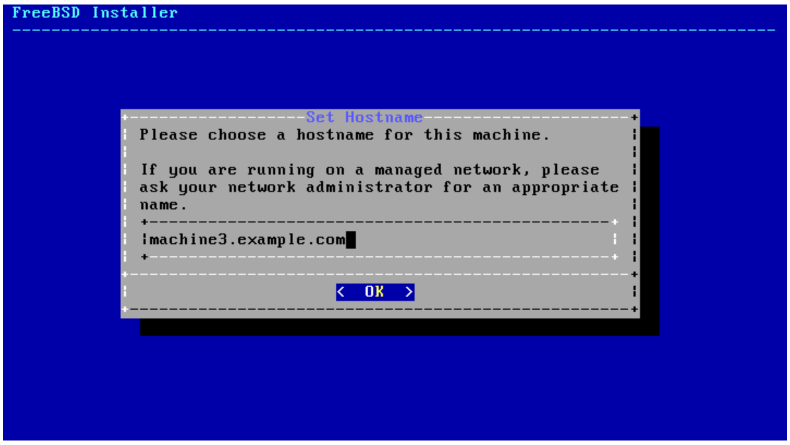
ÅðéëÝîôå ôçí äéÜôáîç ðëçêôñïëïãßïõ ðïõ åßíáé ðéï êïíôÜ óôï ðëçêôñïëüãéï ðïõ äéáèÝôåôå, ÷ñçóéìïðïéþíôáò ôá ðÜíù êáé êÜôù âåëÜêéá êáé åðéâåâáéþíïíôáò ìå ôï **Enter**.

> **Óçìåßùóç:** Áí ðéÝóåôå **Esc** èá ÷ñçóéìïðïéçèåß ç ðñïåðéëåãìÝíç äéÜôáîç. Áí ç äéÜôáîç ôïõ ôñÝ÷ïíôïò ðëçêôñïëïãßïõ äåí åßíáé ðñïöáíÞò, ìéá áóöáëÞò åðéëïãÞ åßíáé ôï United States of America ISO-8859-1.

3.5.2 Êáèïñéóìüò Ïíüìáôïò ÕðïëïãéóôÞ (hostname)

Óôï åðüìåíï âÞìá, ôï **bsdinstall** èá óáò æçôÞóåé ãéá ôï üíïìá õðïëïãéóôÞ (hostname) ôï ïðïßï èá äïèåß óôï íÝï óýóôçìá.

Ó÷Þìá 3-6. Êáèïñéóìüò Ïíüìáôïò ÕðïëïãéóôÞ



FreeBSD Installer

Set Hostname

Please choose a hostname for this machine.

If you are running on a managed network, please ask your network administrator for an appropriate name.

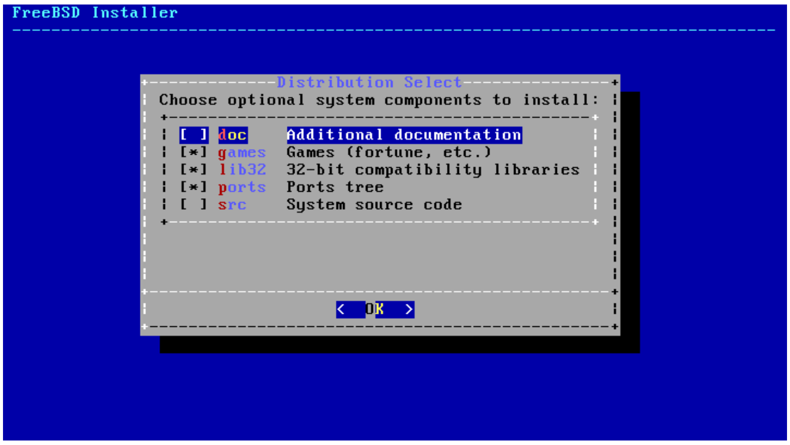
machine3.example.com

Ôï üíïìá ðïõ èá äþóåôå ðñÝðåé íá ðåñéëáìâÜíåé êáé ôïí ôïìÝá (fully-qualified) üðùò ãéá ðáñÜäåéãìá `machine3.example.com`

3.5.3 ÅðéëïãÞ Óôïé÷åßùí ÅãêáôÜóôáóçò

Óôï åðüìåíï âÞìá, ôï **bsdinstall** èá óáò êáëÝóåé íá åðéëÝîåôå ðïéá ðñïáéñåôéêÜ óôïé÷åßá ôïõ ëåéôïõñãéêïý åðéèõìåßôå íá åãêáôáóôÞóåôå.

Ó÷Þìá 3-7. ÅðéëïãÞ Óôïé÷åßùí ÅãêáôÜóôáóçò



FreeBSD Installer

Distribution Select

Choose optional system components to install:

- [ ] doc Additional documentation
- [*] games Games (fortune, etc.)
- [*] lib32 32-bit compatibility libraries
- [*] ports Ports tree
- [ ] src System source code

Ç åðéëïãÞ ôùí óôïé÷åßùí åãêáôÜóôáóçò åîáñôÜôáé êõñßùò áðü ôçí ÷ñÞóç ðïõ èá Ý÷åé ôï óýóôçìá êáé ôï äéáèÝóéìï åëåýèåñï ÷þñï óôï äßóêï. Ï ðõñÞíáò êáé ôá âáóéêÜ ðñïãñÜììáôá ôïõ FreeBSD (ãíùóôÜ êáé ùò “base system” Þ âáóéêü óýóôçìá) åãêáèßóôáíôáé õðï÷ñåùôéêÜ.

ÁíÜëïãá ìå ôï åßäïò ôçò åãêáôÜóôáóçò, êÜðïéá áðü ôá ðáñáêÜôù óôïé÷åßá ìðïñåß íá ìçí åìöáíéóôïýí.

ÐñïáéñåôéêÜ Óôïé÷åßá

- `doc` - Åðéðñüóèåôç ôåêìçñßùóç, êõñßùò éóôïñéêÞò óçìáóßáò. Ç ôåêìçñßùóç ðïõ ðáñÝ÷åôáé áðü ôçí ÏìÜäá Ôåêìçñßùóçò ôïõ FreeBSD åãêáèßóôáôáé ÷ùñéóôÜ óå åðüìåíï óôÜäéï.
- `games` - ÊÜðïéá ðáñáäïóéáêÜ BSD ðáé÷íßäéá ðïõ ðåñéëáìâÜíïõí ôá **fortune**, **rot13** êáé Üëëá.
- `lib32` - ÂéâëéïèÞêåò óõìâáôüôçôáò ãéá åêôÝëåóç åöáñìïãþí 32-bit óå 64-bit åêäüóåéò ôïõ FreeBSD.
- `ports` - Ç ÓõëëïãÞ ôùí Ports ôïõ FreeBSD.

  Ç ÓõëëïãÞ ôùí Ports áðïôåëåß Ýíá åýêïëï êáé âïëéêü ôñüðï åãêáôÜóôáóçò ëïãéóìéêïý. Ç ÓõëëïãÞ ôùí Ports äåí ðåñéÝ÷åé ôïí ðçãáßï êþäéêá ðïõ áðáéôåßôáé ãéá ôç ìåôáãëþôôéóç ôïõ ëïãéóìéêïý. Ðñüêåéôáé óôçí ðñáãìáôéêüôçôá ãéá ìéá óõëëïãÞ áñ÷åßùí ðïõ áõôïìáôïðïéåß ôç ìåôáöüñôùóç, ìåôáãëþôôéóç êáé åãêáôÜóôáóç ëïãéóìéêïý ôñßôùí êáôáóêåõáóôþí. Ôï ÊåöÜëáéï 5 áíáëýåé ôïí ôñüðï ÷ñÞóçò ôçò ÓõëëïãÞò ôùí Ports.

  > **Ðñïåéäïðïßçóç:** Ôï ðñüãñáììá åãêáôÜóôáóçò äåí åëÝã÷åé ãéá íá äåé áí äéáèÝôåôå áñêåôü åëåýèåñï ÷þñï óôï äßóêï. ÅðéëÝîôå áõôü ôï óôïé÷åßï ìüíï áí Ý÷åôå áñêåôü ÷þñï. Áðü ôï FreeBSD 9.0 êáé ìåôÜ, ç ÓõëëïãÞ ôùí Ports êáôáëáìâÜíåé ðåñßðïõ 500 MB ÷þñï óôï äßóêï. Ìðïñåßôå ìå âåâáéüôçôá íá èåùñÞóåôå üôé ï ÷þñïò áõôüò èá åßíáé áêüìá ìåãáëýôåñïò óôéò íåþôåñåò åêäüóåéò ôïõ FreeBSD.

- `src` - Ï Ðçãáßïò Êþäéêáò ôïõ ÓõóôÞìáôïò.

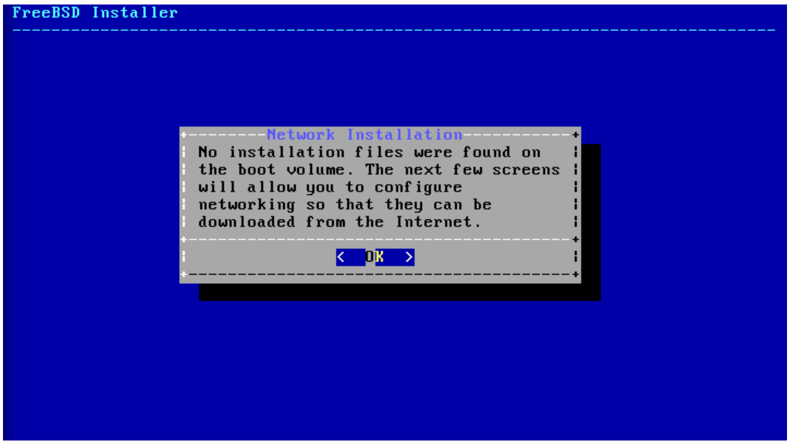
  Ôï FreeBSD Ýñ÷åôáé ìå ðëÞñç ðçãáßï êþäéêá, ôüóï ãéá ôïí ðõñÞíá üóï êáé ãéá ôá âáóéêÜ ðñïãñÜììáôá. Áí êáé ï ðçãáßïò êþäéêáò äåí áðáéôåßôáé ãéá ôçí ðëåéïíüôçôá ôùí åöáñìïãþí, ßóùò íá ôïí ÷ñåéáóôåßôå ãéá ôç ìåôáãëþôôéóç óõãêåêñéìÝíùí ðñïãñáììÜôùí ðïõ ðáñÝ÷ïíôáé ùò ðçãáßïò êþäéêáò (ð.÷. ïäçãïýò óõóêåõþí Þ áñèñþìáôá ðõñÞíá), Þ ãéá åñãáóßåò áíÜðôõîçò ôïõ ßäéïõ ôïõ FreeBSD.

  Ôï ðëÞñåò äÝíôñï ôïõ ðçãáßïõ êþäéêá êáôáëáìâÜíåé 1 GB ÷þñïõ óôï äßóêï, åíþ ìéá ðëÞñçò ìåôáãëþôôéóç üëïõ ôïõ FreeBSD áðáéôåß åðéðëÝïí 5 GB ÷þñïõ.

3.6 ÅãêáôÜóôáóç áðü ôï Äßêôõï

Ôï ìÝóï åãêáôÜóôáóçò *bootonly* äåí äéáèÝôåé áíôßãñáöá ôùí áñ÷åßùí åãêáôÜóôáóçò. ¼ôáí ÷ñçóéìïðïéåßôå ôçí ìÝèïäï *bootonly*, ôá áñ÷åßá ìåôáöïñôþíïíôáé áðü ôï äßêôõï êáôÜ áðáßôçóç.

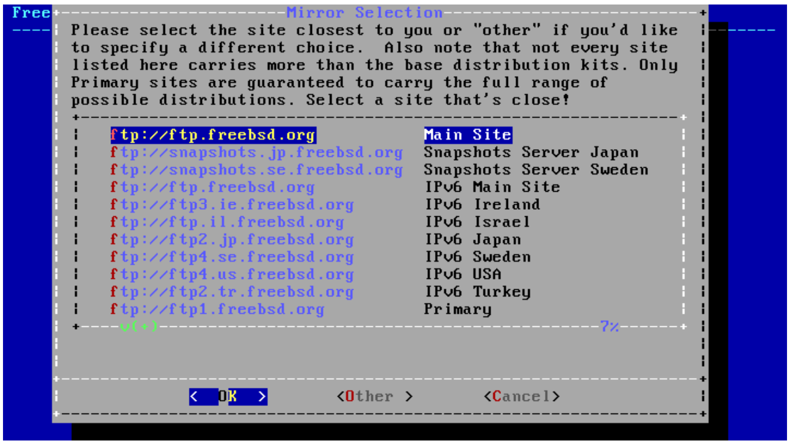
Ó÷Þìá 3-8. ÅãêáôÜóôáóç áðü ôï Äßêôõï



No installation files were found on the boot volume. The next few screens will allow you to configure networking so that they can be downloaded from the Internet.

ÌåôÜ ôçí ñýèìéóç ôùí ðáñáìÝôñùí äéêôýïõ üðùò öáßíåôáé óôï ÔìÞìá 3.9.2, ãßíåôáé ç åðéëïãÞ åíüò mirror site. Ôá mirror sites äéáèÝôïõí áíôßãñáöá ôùí áñ÷åßùí ôïõ FreeBSD. ÅðéëÝîôå Ýíá mirror site ôï ïðïßï âñßóêåôáé üóï ôï äõíáôüí ðéï êïíôÜ óôçí ðåñéï÷Þ óáò. Ìå ôïí ôñüðï áõôü, ç ìåôáöüñôùóç ôùí áñ÷åßùí èá åßíáé ôá÷ýôåñç êáé èá ìåéùèåß ï ÷ñüíïò åãêáôÜóôáóçò.

Ó÷Þìá 3-9. ÅðéëïãÞ Mirror



Please select the site closest to you or "other" if you'd like to specify a different choice. Also note that not every site listed here carries more than the base distribution kits. Only Primary sites are guaranteed to carry the full range of possible distributions. Select a site that's close!

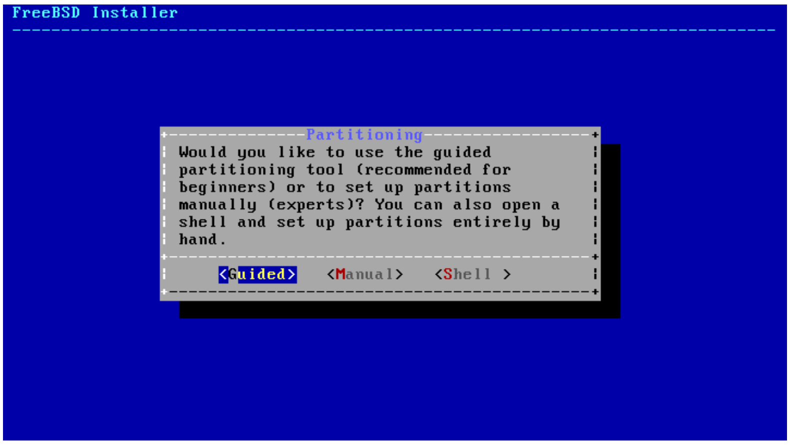
```
ftp://ftp.freebsd.org            Main Site
ftp://snapshots.jp.freebsd.org   Snapshots Server Japan
ftp://snapshots.se.freebsd.org   Snapshots Server Sweden
ftp://ftp.freebsd.org            IPv6 Main Site
ftp://ftp3.ie.freebsd.org        IPv6 Ireland
ftp://ftp.il.freebsd.org         IPv6 Israel
ftp://ftp2.jp.freebsd.org        IPv6 Japan
ftp://ftp4.se.freebsd.org        IPv6 Sweden
ftp://ftp4.us.freebsd.org        IPv6 USA
ftp://ftp2.tr.freebsd.org        IPv6 Turkey
ftp://ftp1.freebsd.org           Primary
```

Ç åãêáôÜóôáóç èá óõíå÷éóôåß ìå ôïí ïñéóìü ôïõ ÷þñïõ óôï äßóêï ðïõ èá ãßíåé ç åãêáôÜóôáóç.

3.7 Åê÷þñçóç ×þñïõ óôïí Äßóêï

ÕðÜñ÷ïõí ôñåéò ôñüðïé ãéá íá ãßíåé ç åãêáôÜóôáóç. Ìå ôç ìÝèïäï *Guided (êáèïäçãïýìåíç)*, ïé êáôáôìÞóåéò äçìéïõñãïýíôáé áõôüìáôá, åíþ ìå ôç ìÝèïäï *Manual (÷åéñïêßíçôç)* ïé ðñï÷ùñçìÝíïé ÷ñÞóôåò ìðïñïýí íá äçìéïõñãÞóïõí ðñïóáñìïóìÝíåò êáôáôìÞóåéò. ÔÝëïò, õðÜñ÷åé ç åðéëïãÞ íá åêêéíÞóåôå Ýíá êÝëõöïò êáé íá äçìéïõñãÞóåôå ôéò êáôáôìÞóåéò ìå áðåõèåßáò ÷ñÞóç ðñïãñáììÜôùí ôçò ãñáììÞò åíôïëþí üðùò gpart(8), fdisk(8), êáé bsdlabel(8).

Ó÷Þìá 3-10. ÅðéëïãÞ Guided Þ Manual Partitioning



FreeBSD Installer

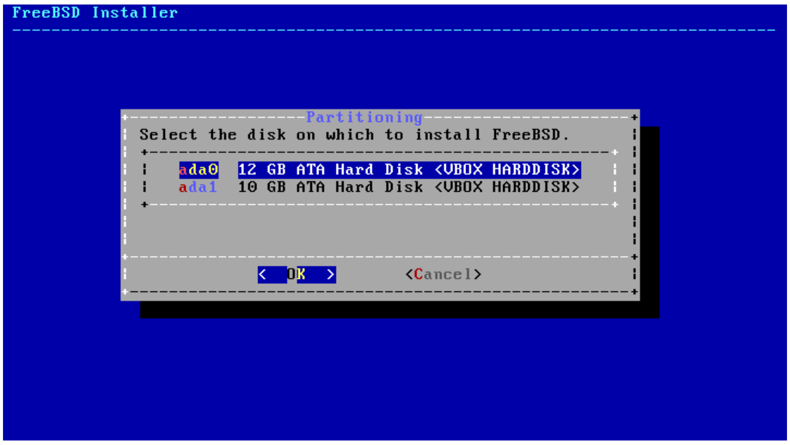
Partitioning

Would you like to use the guided partitioning tool (recommended for beginners) or to set up partitions manually (experts)? You can also open a shell and set up partitions entirely by hand.

3.7.1 Êáèïäçãïýìåíç (Guided) ÊáôÜôìçóç

Áí Ý÷åôå óõíäÝóåé ðïëëáðëïýò äßóêïõò, åðéëÝîôå áõôüí óôïí ïðïßï èá åãêáôáóôÞóåôå ôï FreeBSD.

Ó÷Þìá 3-11. ÅðéëïãÞ áðü Ðïëëáðëïýò Äßóêïõò



FreeBSD Installer

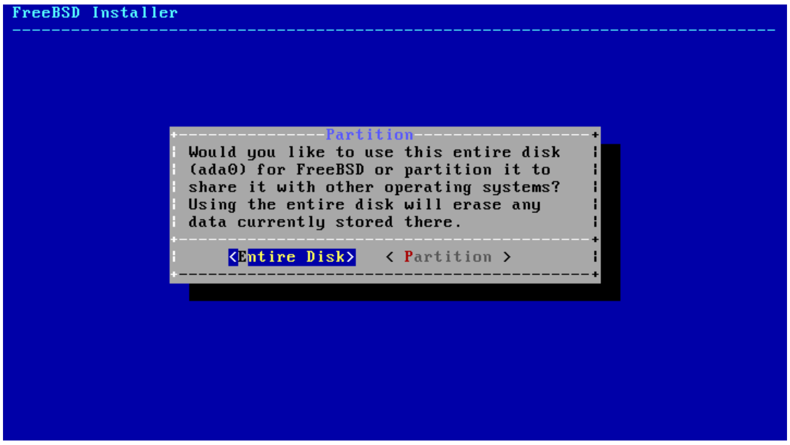
Partitioning

Select the disk on which to install FreeBSD.

ada0 12 GB ATA Hard Disk <VBOX HARDDISK>
ada1 10 GB ATA Hard Disk <VBOX HARDDISK>

Ìðïñåßôå íá åê÷ùñÞóåôå åßôå ïëüêëçñï ôï äßóêï, åßôå Ýíá ìÝñïò ôïõ óôï FreeBSD. Áí åðéëÝîåôå [Entire Disk], èá äçìéïõñãçèåß ìéá êáôÜëëçëç äéÜôáîç êáôáôìÞóåùí þóôå íá ÷ñçóéìïðïéçèåß ïëüêëçñïò ï äßóêïò. Áí åðéëÝîåôå [Partition], èá äçìéïõñãçèåß ìéá äéÜôáîç ðïõ èá êáôáëáìâÜíåé ôïí åëåýèåñï ÷þñï ôïõ äßóêïõ.

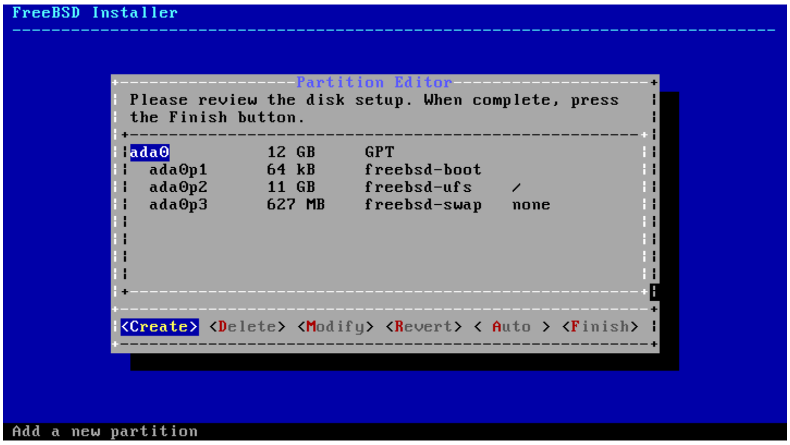
Ó÷Þìá 3-12. ÅðéëïãÞ Ïëüêëçñïõ Äßóêïõ Þ ÊáôÜôìçóçò



```
Would you like to use this entire disk
(ada0) for FreeBSD or partition it to
share it with other operating systems?
Using the entire disk will erase any
data currently stored there.
```

ÅëÝãîôå ðñïóåêôéêÜ ôç äéÜôáîç ôùí êáôáôìÞóåùí ðïõ äçìéïõñãÞèçêå. Áí âñåßôå êÜðïéï ëÜèïò, ðéÝóôå [Revert] ãéá íá åðáíáöÝñåôå ôéò ðñïçãïýìåíåò êáôáôìÞóåéò Þ [Auto] ãéá íá äçìéïõñãÞóåôå ôéò êáôáôìÞóåéò ðïõ ðñïôåßíïíôáé áõôüìáôá áðü ôï FreeBSD. Ìðïñåßôå íá äçìéïõñãÞóåôå, íá ôñïðïðïéÞóåôå êáé íá äéáãñÜøåôå êáôáôìÞóåéò ÷åéñïêßíçôá. ¼ôáí ïé êáôáôìÞóåéò åßíáé ïé óùóôÝò, ðéÝóôå [Finish] ãéá íá óõíå÷ßóåôå ìå ôçí åãêáôÜóôáóç.

Ó÷Þìá 3-13. Åðéóêüðçóç ÊáôáôìÞóåùí

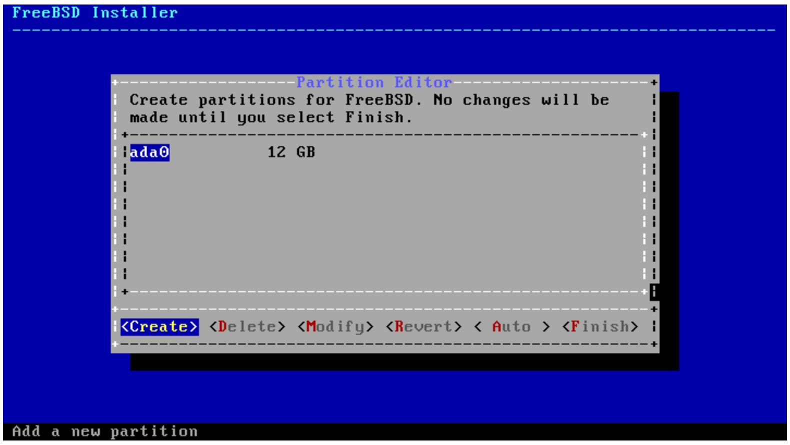


```
Please review the disk setup. When complete, press
the Finish button.

ada0          12 GB     GPT
  ada0p1      64 kB     freebsd-boot
  ada0p2      11 GB     freebsd-ufs      /
  ada0p3      627 MB    freebsd-swap     none

Add a new partition
```

3.7.2 ×åéñïêßíçôç Äçìéïõñãßá ÊáôáôìÞóåùí

ÅðéëÝãïíôáò ÷åéñïêßíçôç äçìéïõñãßá êáôáôìÞóåùí, èá ìåôáöåñèåßôå áðåõèåßáò óôïí åðåîåñãáóôÞ êáôáôìÞóåùí.

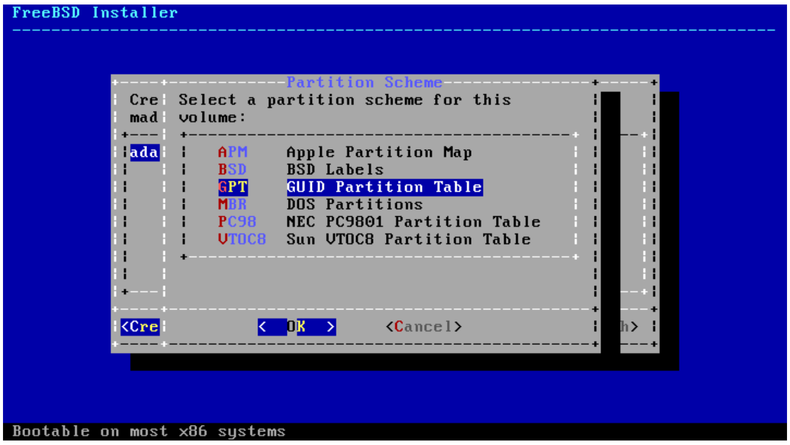
Ó÷Þìá 3-14. ×åéñïêßíçôç Äçìéïõñãßá ÊáôáôìÞóåùí



```
FreeBSD Installer

Partition Editor
Create partitions for FreeBSD. No changes will be
made until you select Finish.

ada0            12 GB

<Create> <Delete> <Modify> <Revert> < Auto > <Finish>

Add a new partition
```

ÅðéëÝãïíôáò Ýíá ïäçãü (`ada0` óôï ðáñÜäåéãìá ìáò) êáé ôï ðëÞêôñï [Create] èá äåßôå Ýíá ìåíïý ãéá ôçí åðéëïãÞ ôïõ ó÷Þìáôïò êáôáôìÞóåùí (*partitioning scheme*).

Ó÷Þìá 3-15. ×åéñïêßíçôç Äçìéïõñãßá ÊáôáôìÞóåùí



```
FreeBSD Installer

Partition Scheme
Cre  Select a partition scheme for this
mad  volume:

ada      APM     Apple Partition Map
         BSD     BSD Labels
         GPT     GUID Partition Table
         MBR     DOS Partitions
         PC98    NEC PC9801 Partition Table
         VTOC8   Sun VTOC8 Partition Table

<Cre          <  OK  >        <Cancel>           h>

Bootable on most x86 systems
```

Ôï óýóôçìá êáôáôìÞóåùí GPT åßíáé óõíÞèùò ôï êáôáëëçëüôåñï ãéá ôá ðåñéóóüôåñïõò PC-óõìâáôïýò õðïëïãéóôÝò. Ðáëáéüôåñá ëåéôïõñãéêÜ óõóôÞìáôá äåí åßíáé óõìâáôÜ ìå ôç ìÝèïäï GPT êáé ÷ñåéÜæïíôáé êáôáôìÞóåéò ôýðïõ MBR. Ôá õðüëïéðá åßäç êáôáôìÞóåùí ÷ñçóéìïðïéïýíôáé óå ðáëéÜ Þ ìç-óõíçèéóìÝíá óõóôÞìáôá õðïëïãéóôþí.

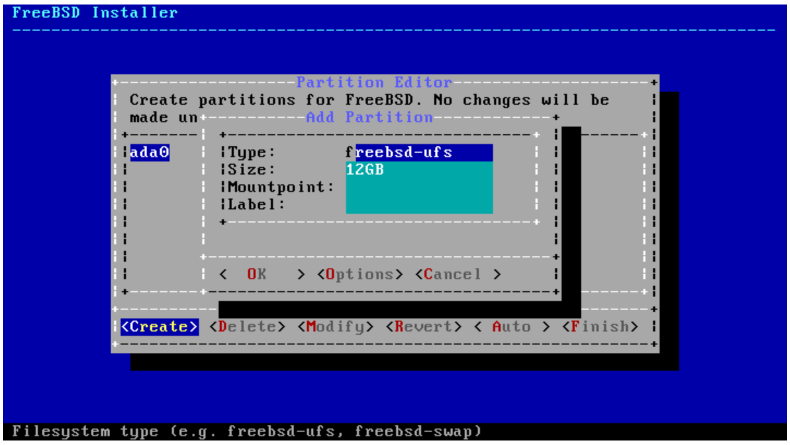
Ðßíáêáò 3-1. Êáôçãïñßåò ÊáôáôìÞóåùí

Óõíôïìïãñáößá	ÐåñéãñáöÞ
APM	Apple Partition Map, ÷ñçóéìïðïéåßôáé óôï PowerPC® Macintosh. (http://support.apple.com/kb/TA21692)
BSD	ÊáôáôìÞóåéò BSD ÷ùñßò MBR, ïñéóìÝíåò öïñÝò êáëïýíôáé êáé "åðéêßíäõíá áöïóéùìÝíç êáôÜóôáóç". Äåßôå ôï bsdlabel(8).

Óõíôïìïãñáößá	**ÐåñéãñáöÞ**
GPT	ÐßíáêáòÊáôáôìÞóåùí GUID. (http://en.wikipedia.org/wiki/GUID_Partition_Table)
MBR	Master Boot Record. (http://en.wikipedia.org/wiki/Master_boot_record)
PC98	ÐáñáëëáãÞ ôïõ MBR ðïõ ÷ñçóéìïðïéåßôáé óå õðïëïãéóôÝò NEC PC-98. (http://en.wikipedia.org/wiki/Pc9801)
VTOC8	Volume Table Of Contents, ÷ñçóéìïðïéåßôáé óôá Sun SPARC64 êáé UltraSPARC.

ÌåôÜ ôç äçìéïõñãßá ôïõ ó÷Þìáôïò êáôáôìÞóåùí, áí åðéëÝîåôå îáíÜ [Create] èá äçìéïõñãÞóåôå íÝåò êáôáôìÞóåéò.

Ó÷Þìá 3-16. ×åéñïêßíçôç Äçìéïõñãßá ÊáôáôìÞóåùí



```
FreeBSD Installer
------------------------------------------------------------------------

          +-----------------Partition Editor------------------+
          | Create partitions for FreeBSD. No changes will be |
          | made un+---------Add Partition----------+         |
          |+-------|+------------------------------+|-------+||
          ||ada0   ||Type:        freebsd-ufs      ||       |||
          ||       ||Size:        12GB             ||       |||
          ||       ||Mountpoint:                   ||       |||
          ||       ||Label:                        ||       |||
          ||       |+------------------------------+|       |||
          ||       |                                |       |||
          ||       +--------------------------------+       |||
          ||       | <  OK   > <Options> <Cancel >  |       |||
          |+-------+--------------------------------+-------+||
          +-------------------------------------------------+|
          |<Create> <Delete> <Modify> <Revert> < Auto > <Finish> |
          +---------------------------------------------------+

Filesystem type (e.g. freebsd-ufs, freebsd-swap)
```

Ç ôõðïðïéçìÝíç åãêáôÜóôáóç FreeBSD ìå ÷ñÞóç GPT äçìéïõñãåß ôïõëÜ÷éóôïí ôñåéò êáôáôìÞóåéò:

Ôõðïðïéçìíåò FreeBSD GPT ÊáôáôìÞóåéò

- `freebsd-boot` - Ï êþäéêáò åêêßíçóçò ôïõ FreeBSD. Ç êáôÜôìçóç áõôÞ ðñÝðåé íá åßíáé ç ðñþôç óôï äßóêï.
- `freebsd-ufs` - Óýóôçìá áñ÷åßùí FreeBSD UFS.
- `freebsd-swap` - ×þñïò swap FreeBSD.

Ìðïñåßôå íá äçìéïõñãÞóåôå ðïëëáðëÜ óõóôÞìáôá áñ÷åßùí. ÊÜðïéïé ÷ñÞóôåò ðñïôéìïýí ôç äçìéïõñãßá ôùí ðáñáäïóéáêþí êáôáôìÞóåùí ìå ÷ùñéóôÜ óõóôÞìáôá áñ÷åßùí ãéá ôá `/`, `/var`, êáé `/usr`.

Äåßôå ôï gpart(8) ãéá ðëÞñç ëßóôá ôùí äéáèÝóéìùí ôýðùí êáôáôìÞóåùí GPT.

Ìðïñåßôå íá åéóÜãåôå ôï ìÝãåèïò ìå ôç âïÞèåéá êïéíþí óõíôïìåýóåùí: *K* ãéá kilobytes, *M* ãéá megabytes, Þ *G* ãéá gigabytes.

> **Õðüäåéîç:** Ç êáëýôåñç áðüäïóç åðéôõã÷Üíåôáé ìå åõèõãñÜììéóç ôùí ôïìÝùí ôïõ äßóêïõ (sector alignment). Ç óùóôÞ åõèõãñÜììéóç åðéôõã÷Üíåôáé ìå ôç äçìéïõñãßá êáôáôìÞóåùí ìå ìåãÝèç ðïëëáðëÜóéá ôùí 4K bytes óå ïäçãïýò ðïõ ÷ñçóéìïðïéïýí ôïìåßò ôùí 512 bytes Þ 4K-byte. Óå ãåíéêÝò ãñáììÝò, ç ÷ñÞóç êáôáôìÞóåùí ìå ìåãÝèç ðïëëáðëÜóéá ôïõ 1Ì Þ áêüìá êáé 1G åßíáé ï åõêïëüôåñïò ôñüðïò íá åðéâåâáéþóïõìå üôé êÜèå êáôÜôìçóç

> îåêéíÜ óå æõãü ðïëëáðëÜóéï ôùí 4Ê. Ìéá åîáßñåóç: ôçí ðáñïýóá óôéãìÞ ç êáôÜôìçóç *freebsd-boot* äåí ìðïñåß íá åßíáé ìåãáëýôåñç ôùí 512Ê ëüãùí ðåñéïñéóìþí ôïõ êþäéêá åêêßíçóçò.

Óå êÜèå êáôÜôìçóç ðïõ ðåñéÝ÷åé óýóôçìá áñ÷åßùí, ÷ñåéÜæåôáé Ýíá óçìåßï ðñïóÜñôçóçò. Áí ÷ñçóéìïðïéçèåß ìüíï ìéá êáôÜôìçóç UFS, ôï óçìåßï ðñïóÜñôçóçò èá åßíáé ç `/`.

èá óáò æçôçèåß åðßóçò ìéá åôéêÝôá (*label*). Ç åôéêÝôá åßíáé Ýíá üíïìá ôï ïðïßï äßíåôáé óå ìéá êáôÜôìçóç. Ôï üíïìá åíüò äßóêïõ Þ ïé áñéèìïß ðïõ ðåñéãñÜöïõí ôéò êáôáôìÞóåéò ìðïñåß íá áëëÜîïõí áí ï äßóêïò óõíäåèåß óå Üëëç èýñá Þ åëåãêôÞ, áëëÜ ç åôéêÝôá ôïõ ðáñáìÝíåé óôáèåñÞ. Ìå ÷ñÞóç ôçò åôéêÝôáò óå áñ÷åßá üðùò ôï `/etc/fstab` ôï óýóôçìá ãßíåôáé ðéï áíåêôéêü óå áëëáãÝò ôïõ õëéêïý. Ïé åôéêÝôåò GPT åìöáíßæïíôáé óôïí êáôÜëïãï `/dev/gpt/` üôáí ãßíåôáé ç ðñïóÜñôçóç ôçò óõóêåõÞò. Óå Üëëá åßäç êáôáôìÞóåùí õðÜñ÷ïõí äéáöïñåôéêÝò äõíáôüôçôåò üóï áöïñÜ ôéò åôéêÝôåò, ïé ïðïßåò åìöáíßæïíôáé óå äéáöïñåôéêïýò õðïêáôáëüãïõò óôï `/dev/`.

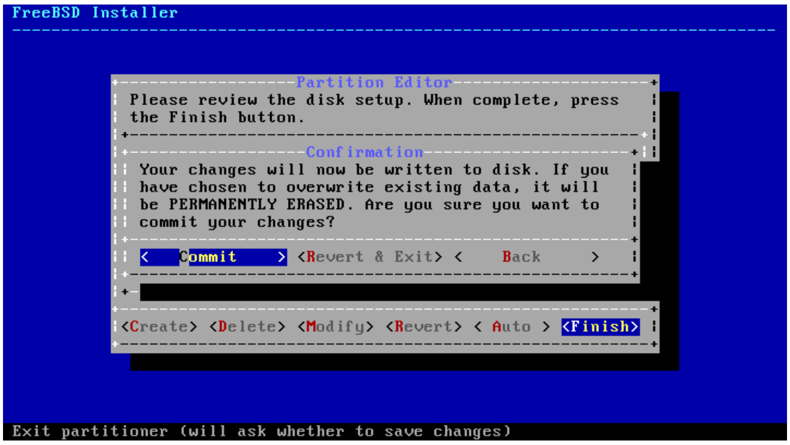
> **Õðüäåéîç:** ×ñçóéìïðïéÞóôå ìïíáäéêÝò åôéêÝôåò óå êÜèå óýóôçìá áñ÷åßùí ãéá íá áðïöýãåôå óõãêñïýóåéò ðïõ ìðïñåß íá ðñïêëçèïýí áðü üìïéá ïíüìáôá. Óå êÜèå åôéêÝôá ìðïñåßôå íá óõìðåñéëÜâåôå ìåñéêÜ ãñÜììáôá áðü ôï üíïìá ôïõ õðïëïãéóôÞ Þ ôçò èÝóç ôïõ, Þ áêüìá êáé ôç ÷ñÞóç ôïõ. Èá ìðïñïýóáôå ãéá ðáñÜäåéãìá íá ïíïìÜóåôå ôïí êåíôñéêü êáôÜëïãï “labroot” Þ “rootfs-lab” óå Ýíá õðïëïãéóôÞ ðïõ áíÞêåé óå Ýíá åñãáóôÞñéï.

ÌåôÜ ôç äçìéïõñãßá ôùí ðñïóáñìïóìÝíùí êáôáôìÞóåùí, åðéëÝîôå [Finish] ãéá íá óõíå÷ßóåôå ìå ôçí åãêáôÜóôáóç.

3.8 Åðéâåâáßùóç ôçò ÅãêáôÜóôáóçò

Óå áõôü ôï óçìåßï Ý÷åôå ôçí ôåëåõôáßá åõêáéñßá íá áêõñþóåôå ôçí åãêáôÜóôáóç ÷ùñßò íá ãßíïõí áëëáãÝò óôïõò óêëçñïýò äßóêïõò.

Ó÷Þìá 3-17. ÔåëéêÞ Åðéâåâáßùóç


```
FreeBSD Installer

Partition Editor
Please review the disk setup. When complete, press
the Finish button.

Confirmation
Your changes will now be written to disk. If you
have chosen to overwrite existing data, it will
be PERMANENTLY ERASED. Are you sure you want to
commit your changes?

<  Commit  > <Revert & Exit> <    Back    >

<Create> <Delete> <Modify> <Revert> < Auto > <Finish>

Exit partitioner (will ask whether to save changes)
```

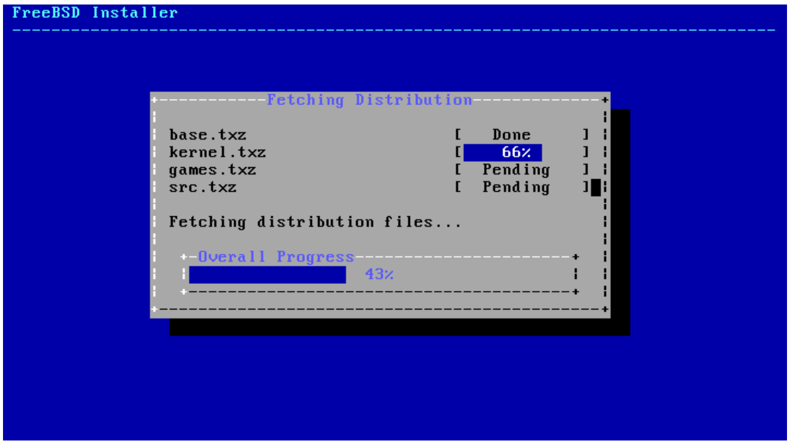
ÅðéëÝîôå [Commit] êáé ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå. Áí ÷ñåéÜæåôáé íá êÜíåôå áëëáãÝò, åðéëÝîôå [Back] ãéá íá åðéóôñÝøåôå óôïí åðåîåñãáóôÞ êáôáôìÞóåùí. Ìå ôï ðëÞêôñï [Revert & Exit] ìðïñåßôå íá åãêáôáëåßøåôå ôï ðñüãñáììá åãêáôÜóôáóçò ÷ùñßò íá ãßíïõí áëëáãÝò óôïõò óêëçñïýò äßóêïõò.

Ï ÷ñüíïò åãêáôÜóôáóçò ðïéêßëëåé áíÜëïãá ìå ôéò äéáíïìÝò êáé ôá óôïé÷åßá åãêáôÜóôáóçò ðïõ Ý÷åôå åðéëÝîåé, ôï ìÝóï åãêáôÜóôáóçò êáé ôçí ôá÷ýôçôá ôïõ õðïëïãéóôÞ. Èá äåßôå ìéá óåéñÜ áðü ìçíýìáôá ó÷åôéêÜ ìå ôçí ðñüïäï ôçò äéáäéêáóßáò.

Áñ÷éêÜ, ôï ðñüãñáììá åãêáôÜóôáóçò èá ãñÜøåé ôéò êáôáôìÞóåéò óôï äßóêï êáé èá åêôåëÝóåé êáôÜëëçëåò åíôïëÝò `newfs` ãéá íá äçìéïõñãÞóåé ôá áíÜëïãá óõóôÞìáôá áñ÷åßùí.

Áí êÜíåôå åãêáôÜóôáóç ìÝóù äéêôýïõ, ôï **bsdinstall** èá ðñï÷ùñÞóåé ìåôáöïñôþíïíôáò ôá áðáñáßôçôá áñ÷åßá.

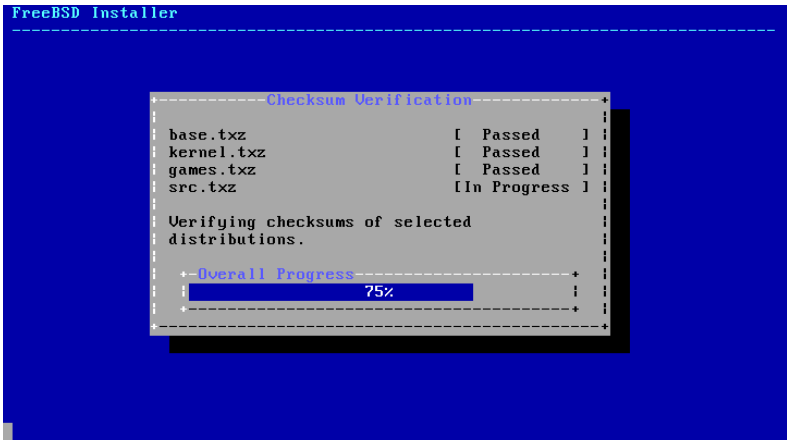
Ó÷Þìá 3-18. Ìåôáöüñôùóç Áñ÷åßùí ÅãêáôÜóôáóçò



```
FreeBSD Installer
--------------------------------------------------------------------------------

               +-----------Fetching Distribution-------------+
               |                                             |
               | base.txz                      [   Done    ] |
               | kernel.txz                    [    66%    ] |
               | games.txz                     [  Pending  ] |
               | src.txz                       [  Pending  ] |
               |                                             |
               | Fetching distribution files...              |
               |                                             |
               |  +-Overall Progress---------------------+   |
               |  |                43%                   |   |
               |  +--------------------------------------+   |
               +---------------------------------------------+
```

Óôç óõíÝ÷åéá, èá ãßíåé Ýëåã÷ïò áêåñáéüôçôáò ôùí áñ÷åßùí åãêáôÜóôáóçò ãéá íá åðéâåâáéùèåß üôé äåí Ý÷ïõí áëëïéùèåß êáôÜ ôç ìåôáöüñôùóç Þ êáôÜ ôçí áíÜãíùóç áðü ôï ìÝóï åãêáôÜóôáóçò.

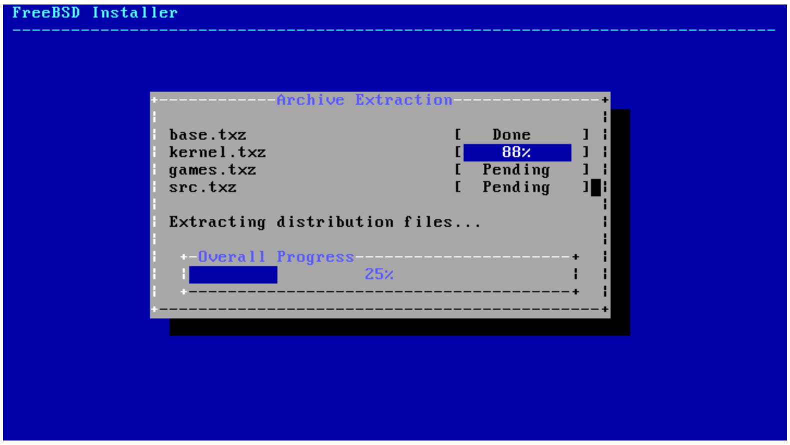
Ó÷Þìá 3-19. ÅðáëÞèåõóç Áñ÷åßùí ÅãêáôÜóôáóçò



```
FreeBSD Installer
--------------------------------------------------------------------------------

               +-----------Checksum Verification-------------+
               |                                             |
               | base.txz                      [  Passed   ] |
               | kernel.txz                    [  Passed   ] |
               | games.txz                     [  Passed   ] |
               | src.txz                       [In Progress ] |
               |                                             |
               | Verifying checksums of selected             |
               | distributions.                              |
               |                                             |
               |  +-Overall Progress---------------------+   |
               |  |                75%                   |   |
               |  +--------------------------------------+   |
               +---------------------------------------------+
```

Óôï ôåëåõôáßï âÞìá, ôá åðéâåâáéùìÝíá áñ÷åßá åãêáôÜóôáóçò èá åîá÷èïýí êáé èá ãñáöïýí óôï óêëçñü äßóêï.

Ó÷Þìá 3-20. ÅîáãùãÞ Áñ÷åßùí ÅãêáôÜóôáóçò



```
FreeBSD Installer
--------------------------------------------------------------------------------

              +------------Archive Extraction--------------+
              |                                            |
              |  base.txz                     [    Done   ]|
              |  kernel.txz                   [    88%    ]|
              |  games.txz                    [  Pending  ]|
              |  src.txz                      [  Pending  ]|
              |                                            |
              |  Extracting distribution files...          |
              |                                            |
              |  +-Overall Progress----------------------+ |
              |  |                  25%                  | |
              |  +---------------------------------------+ |
              +--------------------------------------------+
```

Ìå ôï ôÝëïò ôçò åîáãùãÞò üëùí ôùí áñ÷åßùí åãêáôÜóôáóçò, ôï **bsdinstall** èá åéóÝëèåé óôç äéáäéêáóßá ñõèìßóåùí ìåôÜ ôçí åãêáôÜóôáóç (äåßôå ÔìÞìá 3.9).

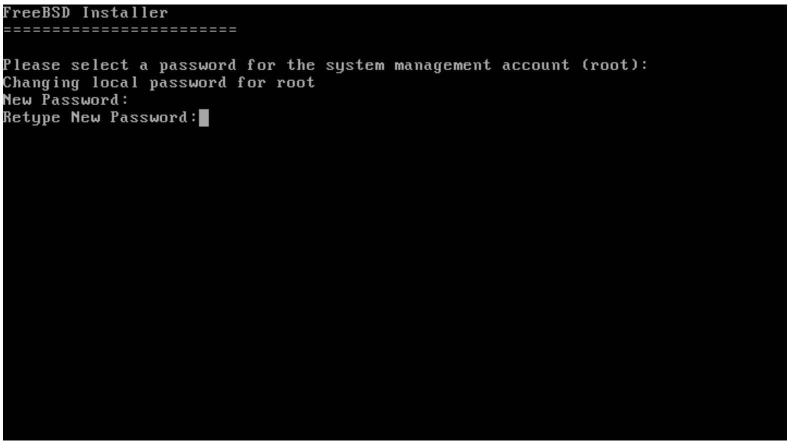
3.9 ÌåôÜ ôçí ÅãêáôÜóôáóç

ÌåôÜ áðü ìéá åðéôõ÷çìÝíç åãêáôÜóôáóç ôïõ FreeBSD, áêïëïõèåß ìéá óåéñÜ ñõèìßóåùí. Ìðïñåßôå íá åðáíáëÜâåôå ïðïéáäÞðïôå ñýèìéóç áí åéóÝëèåôå óôçí áíôßóôïé÷ç åðéëïãÞ óôï ôåëéêü ìåíïý ðñéí åðáíåêêéíÞóåôå óôï íÝï-åãêáôåóôçìÝíï óáò FreeBSD óýóôçìá.

3.9.1 Ñýèìéóç ôïõ Êùäéêïý ôïõ `root`

Èá ðñÝðåé íá ïñßóåôå Ýíá êùäéêü ðñüóâáóçò ãéá ôï ÷ñÞóôç `root`. ÐáñáôçñÞóôå üôé äåí öáßíïíôáé ôá ãñÜììáôá ðïõ ðëçêôñïëïãåßôå êáèþò åéóÜãåôå ôïí êùäéêü. ÌåôÜ ôçí åéóáãùãÞ ôïõ êùäéêïý, èá ðñÝðåé íá ôïí åéóÜãåôå Üëëç ìéá öïñÜ. Ìå ôïí ôñüðï áõôü åîáóöáëßæåôáé üôé äåí Ý÷åé ãßíåé êÜðïéï ëÜèïò êáôÜ ôçí ðëçêôñïëüãçóç.

Ó÷Þìá 3-21. Ñýèìéóç ôïõ Êùäéêïý ôïõ `root`



```
FreeBSD Installer
========================

Please select a password for the system management account (root):
Changing local password for root
New Password:
Retype New Password:
```

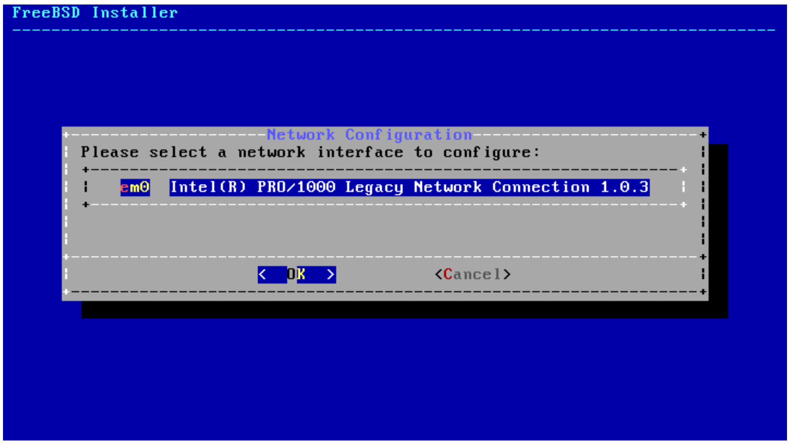
Ç åãêáôÜóôáóç óõíå÷ßæåôáé ìåôÜ ôçí åðéôõ÷Þ åéóáãùãÞ ôïõ êùäéêïý.

3.9.2 Ñýèìéóç Êáñôþí Äéêôýïõ

> **Óçìåßùóç:** Ç ñýèìéóç ôïõ äéêôýïõ ðáñáëåßðåôáé áí Ý÷åé Þäç ðñáãìáôïðïéçèåß óôá ðëáßóéá ìéáò åãêáôÜóôáóçò *bootonly*.

Èá äåßôå ìéá ëßóôá ìå üëåò ôéò äéåðáöÝò äéêôýïõ ðïõ áíé÷íåýèçêáí óôïí õðïëïãéóôÞ óáò. ÅðéëÝîôå áõôÞ ðïõ åðéèõìåßôå íá ñõèìßóåôå.

Ó÷Þìá 3-22. ÅðéëïãÞ ìéáò ÄéåðáöÞò Äéêôýïõ



```
FreeBSD Installer
Network Configuration
Please select a network interface to configure:
em0  Intel(R) PRO/1000 Legacy Network Connection 1.0.3
```

3.9.2.1 Ñýèìéóç Áóýñìáôçò ÊÜñôáò Äéêôýïõ

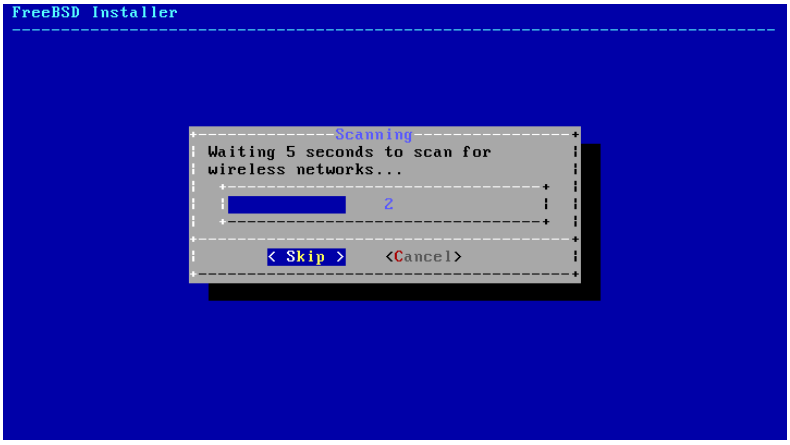
Áí åðéëÝîåôå íá ñõèìßóåôå ìéá áóýñìáôç äéåðáöÞ äéêôýïõ, èá ðñÝðåé íá ñõèìßóåôå ôéò ðáñáìÝôñïõò áíáãíþñéóçò êáé áóöÜëåéáò ãéá íá óõíäåèåßôå óôï äßêôõï.

Ôá áóýñìáôá äßêôõá áíáãíùñßæïíôáé áðü ôï Áíáãíùñéóôéêü Õðçñåóßáò Þ Service Set Identifier (SSID). Ôï SSID åßíáé Ýíá óýíôïìï üíïìá ðïõ áðïäßäåôáé óå êÜèå áóýñìáôï äßêôõï.

Ôá ðåñéóóüôåñá áóýñìáôá äßêôõá êñõðôïãñáöïýí ôá äåäïìÝíá ðïõ ìåôáäßäïíôáé ãéá íá ðñïóôáôåýóïõí ôéò ðëçñïöïñßåò áðü ìç åîïõóéïäïôçìÝíç ÷ñÞóç. Óõíßóôáôáé íá ÷ñçóéìïðïéÞóåôå êñõðôïãñÜöçóç WPA2. Ðáëáéüôåñåò ìÝèïäïé êñõðôïãñÜöçóçò üðùò ôï WEP ðñïóöÝñïõí åëÜ÷éóôç áóöÜëåéá.

Ôï ðñþôï âÞìá ãéá íá óõíäåèåßôå óå Ýíá áóýñìáôï äßêôõï åßíáé íá óáñþóåôå ãéá Óçìåßá Áóýñìáôçò Ðñüóâáóçò (Access Points).

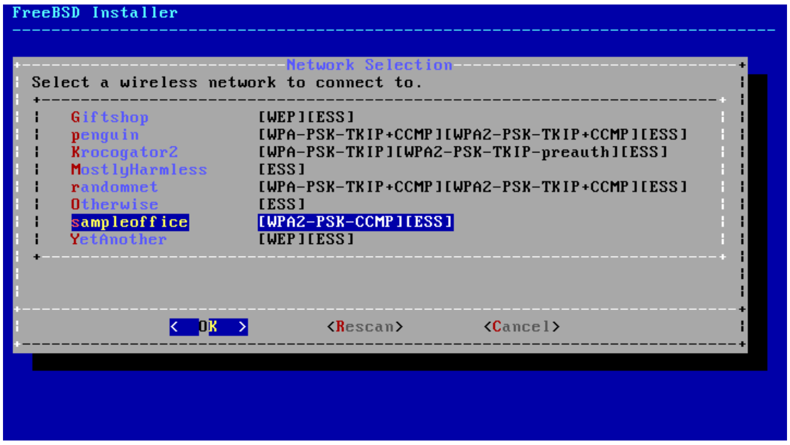
Ó÷Þìá 3-23. ÓÜñùóç ãéá Access Points



```
FreeBSD Installer

Scanning
Waiting 5 seconds to scan for
wireless networks...

2

< Skip >      <Cancel>
```

Ôá SSIDs ðïõ èá âñåßôå êáôÜ ôç äéÜñêåéá ôçò óÜñùóçò óõíïäåýïíôáé áðü ôá åßäç êñõðôïãñÜöçóçò ðïõ äéáôßèåíôáé ãéá êÜèå äßêôõï. Áí äåí âëÝðåôå ôï SSID ðïõ åðéèõìåßôå óôç ëßóôá, åðéëÝîôå [Rescan] ãéá íá åêôåëÝóåôå ôç óÜñùóç îáíÜ. Áí åîáêïëïõèåßôå íá ìç âëÝðåôå ôï åðéèõìçôü äßêôõï, åëÝãîôå ôçí êåñáßá ãéá ôõ÷üí ðñïâëÞìáôá Þ ìåôáêéíÞóôå ôïí õðïëïãéóôÞ ðéï êïíôÜ óôï óçìåßï ðñüóâáóçò. Íá åêôåëÝóåôå íÝá óÜñùóç ìåôÜ áðü êÜèå áëëáãÞ.

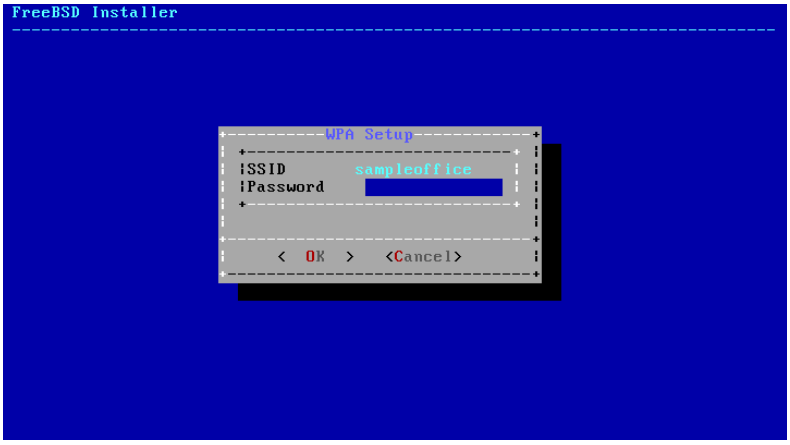
Ó÷Þìá 3-24. ÅðéëïãÞ Áóýñìáôïõ Äéêôýïõ



```
FreeBSD Installer

Network Selection
Select a wireless network to connect to.

  Giftshop              [WEP][ESS]
  penguin               [WPA-PSK-TKIP+CCMP][WPA2-PSK-TKIP+CCMP][ESS]
  Krocogator2           [WPA-PSK-TKIP][WPA2-PSK-TKIP-preauth][ESS]
  MostlyHarmless        [ESS]
  randomnet             [WPA-PSK-TKIP+CCMP][WPA2-PSK-TKIP+CCMP][ESS]
  Otherwise             [ESS]
  sampleoffice          [WPA2-PSK-CCMP][ESS]
  YetAnother            [WEP][ESS]

<  OK  >        <Rescan>        <Cancel>
```

ÌåôÜ ôçí åðéëïãÞ ôïõ áóýñìáôïõ äéêôýïõ, èá ðñÝðåé íá åéóÜãåôå ôéò ðëçñïöïñßåò ðïõ ó÷åôßæïíôáé ìå ôçí êñõðôïãñÜöçóç. Óå äßêôõá WPA2 ÷ñåéÜæåôáé íá äþóåôå ìüíï Ýíá êùäéêü ðñüóâáóçò (ãíùóôü ùò Pre-Shared Key Þ PSK). Ãéá ëüãïõò áóöáëåßáò, ïé ÷áñáêôÞñåò ðïõ ðëçêôñïëïãåßôå óôï ðåäßï åìöáíßæïíôáé ùò áóôåñßóêïé.

Ó÷Þìá 3-25. Ñýèìéóç WPA2

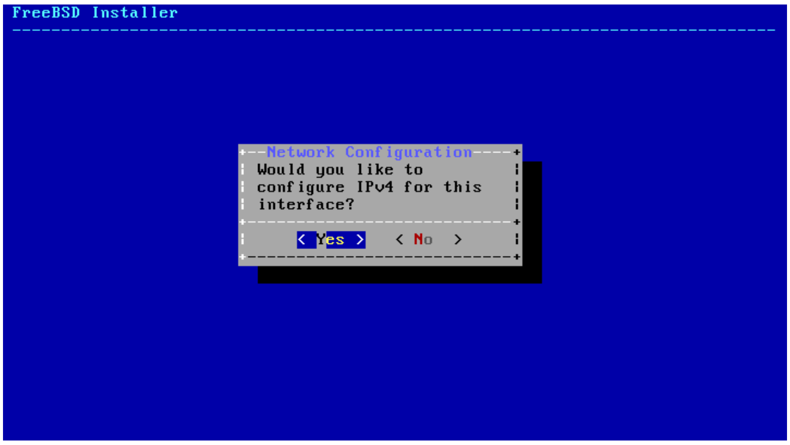

FreeBSD Installer
WPA Setup
SSID
sampleoffice
Password
< OK >
<Cancel>

ÌåôÜ ôçí åðéëïãÞ ôïõ áóýñìáôïõ äéêôýïõ êáé ôçí åéóáãùãÞ ôùí ðéóôïðïéçôéêþí óýíäåóçò, ç åãêáôÜóôáóç óõíå÷ßæåôáé ìå ôç ñýèìéóç ôùí õðüëïéðùí ðáñáìÝôñùí ôïõ äéêôýïõ.

3.9.2.2 Ñýèìéóç Äéêôýïõ IPv4

ÅðéëÝîôå áí èá ÷ñçóéìïðïéçèåß äéêôýùóç IPv4. Ðñüêåéôáé ãéá ôï ðéï óõíçèéóìÝíï åßäïò óýíäåóçò.

Ó÷Þìá 3-26. ÅðéëïãÞ Äéêôýùóçò IPv4


FreeBSD Installer
Network Configuration

Would you like to configure IPv4 for this interface?

< Yes >
< No >

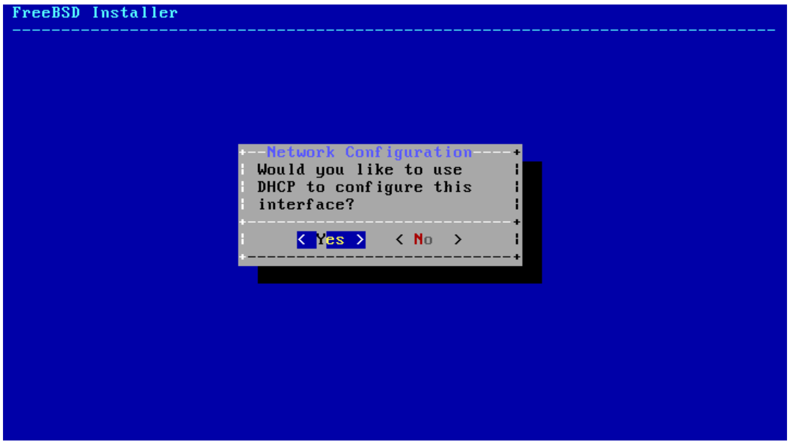
ÕðÜñ÷ïõí äýï ìÝèïäïé ñýèìéóçò ôïõ IPv4. ÌÝóù ôïõ *DHCP* ç ñýèìéóç ôçò äéåðáöÞò ãßíåôáé áõôüìáôá. Áõôü åßíáé êáé ç óõíéóôþìåíç ìÝèïäïò. Ç ñýèìéóç *Static* áðáéôåß ÷åéñïêßíçôç åéóáãùãÞ ðëçñïöïñéþí äéêôýïõ.

> **Óçìåßùóç:** Ìç âÜëåôå ôõ÷áßåò ñõèìßóåéò äéêôýïõ, êáèþò äåí èá ëåéôïõñãÞóïõí. Èá ðñÝðåé íá ëÜâåôå ôéò ðëçñïöïñßåò ðïõ áíáöÝñïíôáé óôï ÔìÞìá 3.3.3 áðü ôïí äéá÷åéñéóôÞ Þ ôïí ðÜñï÷ï ôïõ äéêôýïõ óáò.

3.9.2.2.1 Ñýèìéóç Äéêôýïõ IPv4 ìÝóù DHCP

Áí äéáèÝôåôå åîõðçñåôçôÞ DHCP, åðéëÝîôå [Yes] ãéá íá ñõèìßóåôå áõôüìáôá ôçí äéåðáöÞ äéêôýïõ.

Ó÷Þìá 3-27. ÅðéëÝîôå Ñýèìéóç IPv4 ìÝóù DHCP

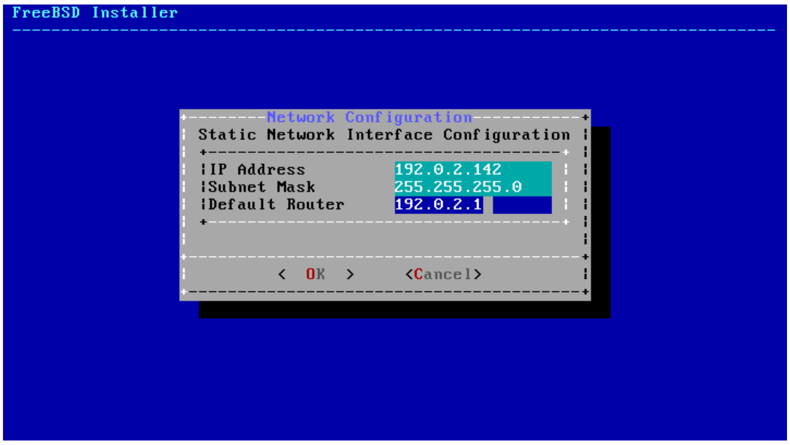


```
FreeBSD Installer

Network Configuration
Would you like to use
DHCP to configure this
interface?

< Yes >    < No  >
```

3.9.2.2.2 ÓôáôéêÞ Ñýèìéóç Äéêôýïõ IPv4

Ç óôáôéêÞ ñýèìéóç ôçò äéåðáöÞò äéêôýïõ, áðáéôåß íá åéóÜãåôå êÜðïéåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï IPv4.

Ó÷Þìá 3-28. ÓôáôéêÞ Ñýèìéóç IPv4



```
FreeBSD Installer

Static Network Configuration
Static Network Interface Configuration
 IP Address        192.0.2.142
 Subnet Mask       255.255.255.0
 Default Router    192.0.2.1

      <  OK  >       <Cancel>
```

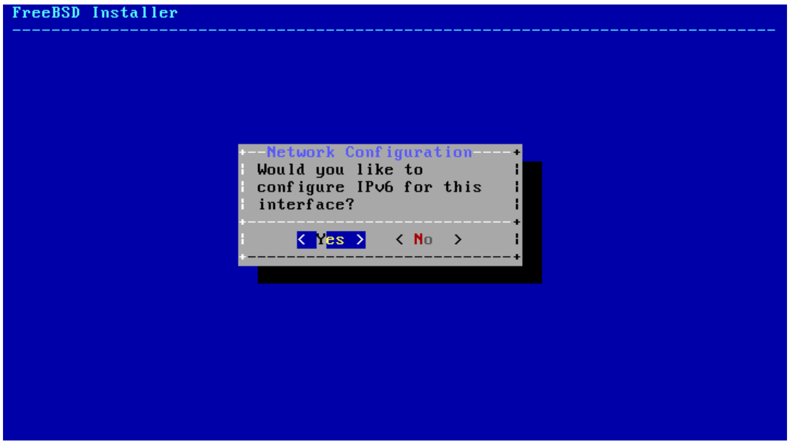
- `IP Address` - Ç äéåýèõíóç IP ðïõ èá åéóÜãåôå ÷åéñïêßíçôá óå áõôü ôïí õðïëïãéóôÞ. Ç äéåýèõíóç áõôÞ ðñÝðåé íá åßíáé ìïíáäéêÞ êáé íá ìçí ÷ñçóéìïðïéåßôáé áðü ïðïéïäÞðïôå Üëëï ìç÷Üíçìá óôï ôïðéêü óáò äßêôõï.
- `Subnet Mask` - Ç ìÜóêá õðïäéêôýïõ ðïõ ÷ñçóéìïðïéåß ôï ôïðéêü óáò äßêôõï. ÔõðéêÜ áõôÞ åßíáé `255.255.255.0`.

- `Default Router` - Ç äéåýèõíóç IP ôïõ ðñïåðéëåãìÝíïõ äñïìïëïãçôÞ ôïõ äéêôýïõ óáò. ÓõíÞèùò åßíáé ç äéåýèõíóç ôïõ äñïìïëïãçôÞ Þ Üëëïõ äéêôõáêïý åîïðëéóìïý ðïõ óõíäÝåé ôï ôïðéêü óáò äßêôõï ìå ôï Internet. Èá ôç äåßôå åðßóçò íá áíáöÝñåôå ùò *default gateway (ðñïåðéëåãìÝíç ðýëç)*.

3.9.2.3 Ñýèìéóç Äéêôýïõ IPv6

Ôï IPv6 åßíáé ìéá íÝá ìÝèïäïò ñýèìéóçò äéêôýïõ. Áí ôï äßêôõï óáò äéáèÝôåé IPv6 êáé åðéèõìåßôå íá ôï ñõèìßóåôå, ðéÝóôå [Yes] ãéá íá ôï åðéëÝîåôå.

Ó÷Þìá 3-29. ÅðéëïãÞ Äéêôýùóçò IPv6


FreeBSD Installer

Network Configuration

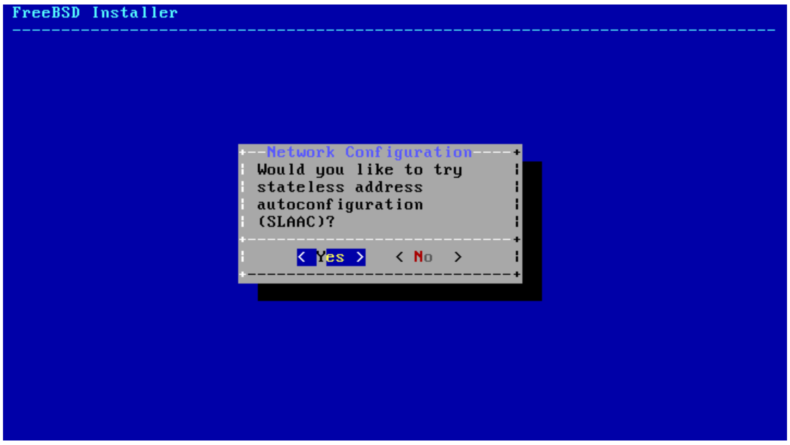
Would you like to configure IPv6 for this interface?

Ôï IPv6 äéáèÝôåé åðßóçò äýï ìåèüäïõò ñýèìéóçò. Ôï *SLAAC* , Þ *StateLess Address AutoConfiguration*, ñõèìßæåé áõôüìáôá ôéò ðáñáìÝôñïõò ôïõ äéêôýïõ óáò. Ç ñýèìéóç *Static* áðáéôåß íá êÜíåôå ôéò áíôßóôïé÷åò ñõèìßóåéò ÷åéñïêßíçôá.

3.9.2.3.1 IPv6 Stateless Address Autoconfiguration

Ôï SLAAC åðéôñÝðåé óå ìéá óõóêåõÞ åíüò äéêôýïõ IPv6 íá æçôÞóåé ðëçñïöïñßåò áõôüìáôçò ñýèìéóçò áðü Ýíá ôïðéêü äñïìïëïãçôÞ. Äåßôå ôï RFC4862 (http://tools.ietf.org/html/rfc4862) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ó÷Þìá 3-30. ÅðéëÝîôå Ñýèìéóç IPv6 SLAAC

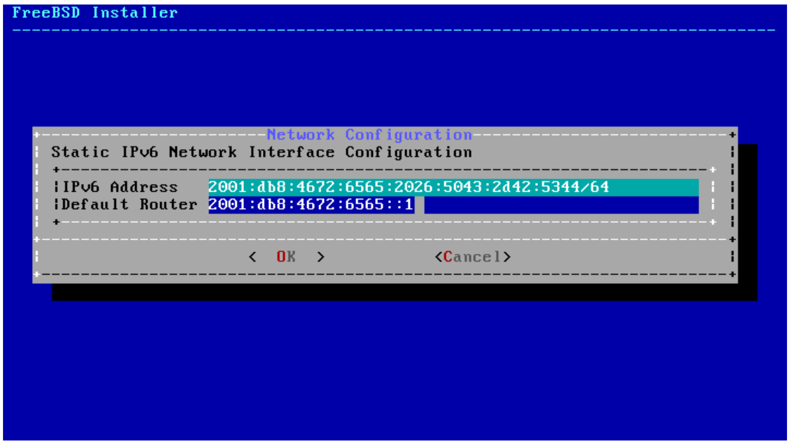


```
FreeBSD Installer
--------------------------------------------------------------------------------

+--Network Configuration----+
| Would you like to try     |
| stateless address         |
| autoconfiguration         |
| (SLAAC)?                  |
+---------------------------+
|   < Yes >    < No  >      |
+---------------------------+
```

3.9.2.3.2 ÓôáôéêÞ Ñýèìéóç Äéêôýïõ IPv6

Ç óôáôéêÞ ñýèìéóç ôçò äéåðáöÞò äéêôýïõ ôïõ IPv6, áðáéôåß ôçí ÷åéñïêßíçôç åéóáãùãÞ êÜðïéùí ñõèìßóåùí.

Ó÷Þìá 3-31. ÓôáôéêÞ Ñýèìéóç IPv6



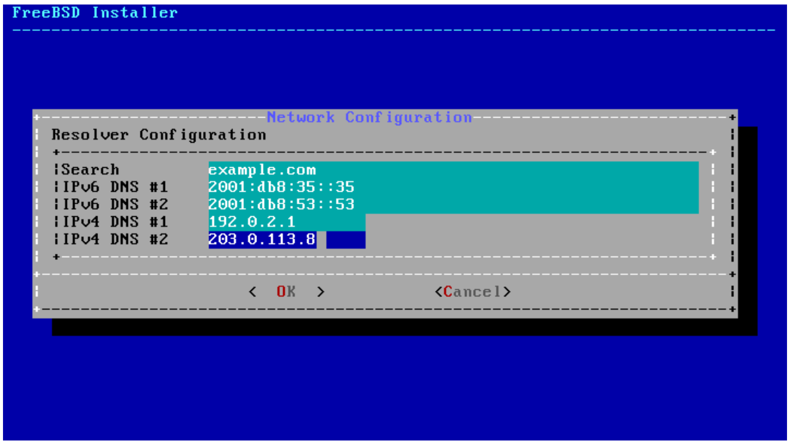
```
FreeBSD Installer
--------------------------------------------------------------------------------

+--------------------------Network Configuration----------------------------+
| Static IPv6 Network Interface Configuration                               |
| +---------------------------------------------------------------------+   |
| |IPv6 Address    2001:db8:4672:6565:2026:5043:2d42:5344/64             |   |
| |Default Router  2001:db8:4672:6565::1                                 |   |
| +---------------------------------------------------------------------+   |
+---------------------------------------------------------------------------+
|                 <  OK  >                  <Cancel>                        |
+---------------------------------------------------------------------------+
```

- `IPv6 Address` - Ç äéåýèõíóç IP ðïõ èá åéóÜãåôå ÷åéñïêßíçôá óå áõôü ôïí õðïëïãéóôÞ. Ç äéåýèõíóç áõôÞ ðñÝðåé íá åßíáé ìïíáäéêÞ êáé íá ìçí ÷ñçóéìïðïéåßôáé áðü êáíÝíá Üëëï ìç÷Üíçìá óôï ôïðéêü óáò äßêôõï.
- `Default Router` - Ç IPv6 äéåýèõíóç ôïõ ðñïåðéëåãìÝíïõ äñïìïëïãçôÞ ãéá ôï äßêôõï óáò. Óõíçèùò åßíáé ç äéåýèõíóç ôïõ äñïìïëïãçôÞ Þ Üëëïõ äéêôõáêïý åîïðëéóìïý ðïõ óõíäÝåé ôï ôïðéêü óáò äßêôõï ìå ôï Internet. Èá ôç äåßôå åðßóçò íá áíáöÝñåôáé ùò *default gateway (ðñïåðéëåãìÝíç ðýëç)*.

3.9.2.4 Ñýèìéóç ôïõ DNS

Ôï *Domain Name System (Óýóôçìá ÏíïìÜôùí ÔïìÝá)* Þ *DNS* ìåôáôñÝðåé ïíüìáôá õðïëïãéóôþí óå äéåõèýíóåéò äéêôýïõ êáé ôï áíôßèåôï. Áí ÷ñçóéìïðïéÞóáôå DHCP Þ SLAAC ãéá íá ñõèìßóåôå áõôüìáôá ôç äéåðáöÞ äéêôýïõ, ïé áíôßóôïé÷åò ñõèìßóåéò ðéèáíüí íá Ý÷ïõí ãßíåé Þäç. Óôçí áíôßèåôç ðåñßðôùóç, âÜëôå ôï üíïìá ôïìÝá ôïõ ôïðéêïý äéêôýïõ óôï ðåäßï Search. Ôá ðåäßá DNS #1 êáé DNS #2 åßíáé ïé äéåõèýíóåéò IP ôùí ôïðéêþí åîõðçñåôçôþí DNS. ×ñåéÜæåôáé íá åéóÜãåôå ôïõëÜ÷éóôïí Ýíá åîõðçñåôçôÞ DNS.

Ó÷Þìá 3-32. Ñýèìéóç DNS



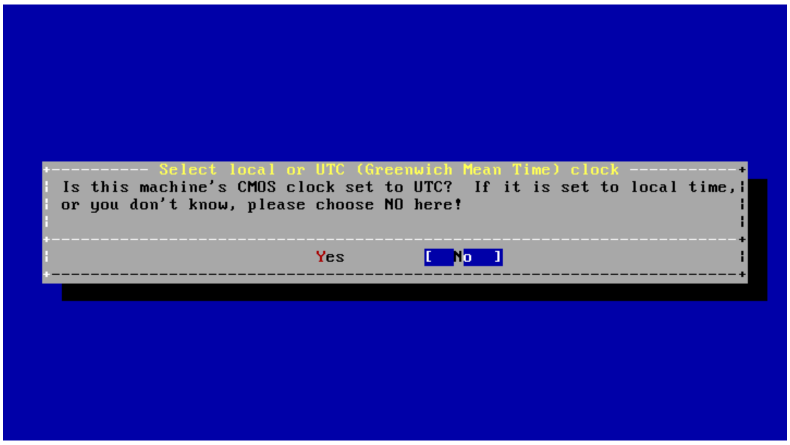
```
FreeBSD Installer

Network Configuration
Resolver Configuration

Search          example.com
IPv6 DNS #1     2001:db8:35::35
IPv6 DNS #2     2001:db8:53::53
IPv4 DNS #1     192.0.2.1
IPv4 DNS #2     203.0.113.8

          <  OK  >           <Cancel>
```

3.9.3 Ñýèìéóç ôçò Æþíçò ¿ñáò

Ç ñýèìéóç ôçò óùóôÞò æþíçò þñáò óôï ìç÷Üíçìá óáò, åîáóöáëßæåé ôçí áõôüìáôç áëëáãÞ ôçò áðü ÷åéìåñéíÞ óå åáñéíÞ êáé ôï áíôßóôñïöï. ÅðéôñÝðåé åðßóçò ôç óùóôÞ ëåéôïõñãßá üëùí ôùí õðçñåóéþí ðïõ ó÷åôßæïíôáé ìå ôçí ôÞñçóç ÷ñüíïõ.

Ôï ðáñÜäåéãìá ìáò áíáöÝñåôáé óå Ýíá ìç÷Üíçìá ðïõ âñßóêåôáé óôçí ÁíáôïëéêÞ æþíç þñáò ôùí ÇíùìÝíùí Ðïëéôåéþí. Ç äéêÞ óáò åðéëïãÞ èá åßíáé äéáöïñåôéêÞ áíÜëïãá ìå ôç ãåùãñáöéêÞ óáò èÝóç.

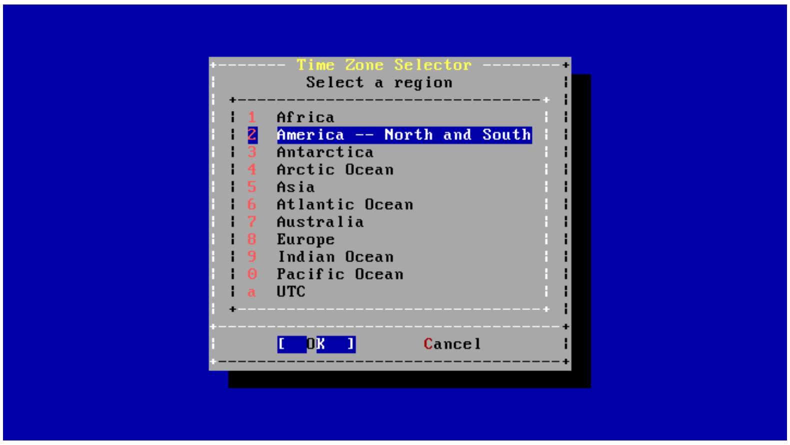
Ó÷Þìá 3-33. ÅðéëïãÞ Ôïðéêïý Þ UTC Ñïëïãéïý



```
+---------- Select local or UTC (Greenwich Mean Time) clock -----------+
| Is this machine's CMOS clock set to UTC?  If it is set to local time,|
| or you don't know, please choose NO here!                            |
|                                                                      |
+----------------------------------------------------------------------+
|                         Yes          [  No  ]                        |
+----------------------------------------------------------------------+
```

ÅðéëÝîôå [Yes] Þ [No] áíÜëïãá ìå ôï ðùò åßíáé ñõèìéóìÝíï ôï ñïëüé ôïõ ìç÷áíÞìáôïò êáé ðéÝóôå **Enter**. Áí äåí ãíùñßæåôå áí ôï óýóôçìá óáò ÷ñçóéìïðïéåß þñá UTC Þ ôïðéêÞ, åðéëÝîôå [No] ãéá íá åðéëÝîåôå ôçí ôïðéêÞ þñá ðïõ åßíáé êáé ç ðéï óõíçèéóìÝíç.

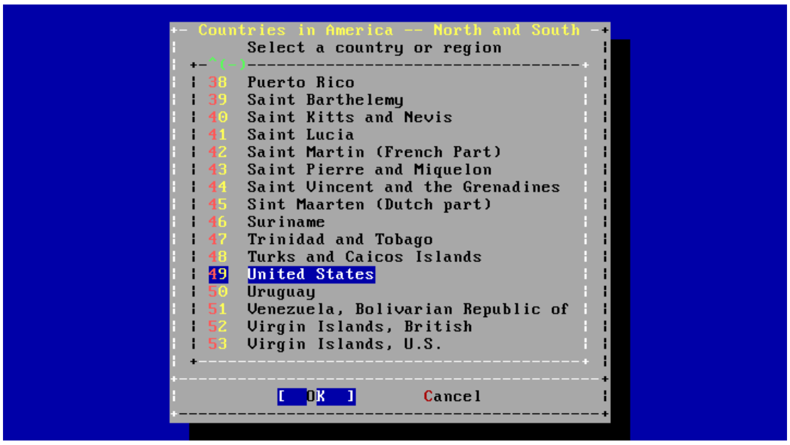
Ó÷Þìá 3-34. ÅðéëÝîôå ìéá Ðåñéï÷Þ



```
+------- Time Zone Selector --------+
|          Select a region          |
| +-------------------------------+ |
| | 1  Africa                     | |
| | 2  America -- North and South | |
| | 3  Antarctica                 | |
| | 4  Arctic Ocean               | |
| | 5  Asia                       | |
| | 6  Atlantic Ocean             | |
| | 7  Australia                  | |
| | 8  Europe                     | |
| | 9  Indian Ocean               | |
| | 0  Pacific Ocean              | |
| | a  UTC                        | |
| +-------------------------------+ |
+-----------------------------------+
|      [  OK  ]         Cancel      |
+-----------------------------------+
```

ÅðéëÝîôå ôçí óùóôÞ ðåñéï÷Þ ÷ñçóéìïðïéþíôáò ôá âåëÜêéá êáé ðéÝóôå **Enter**.

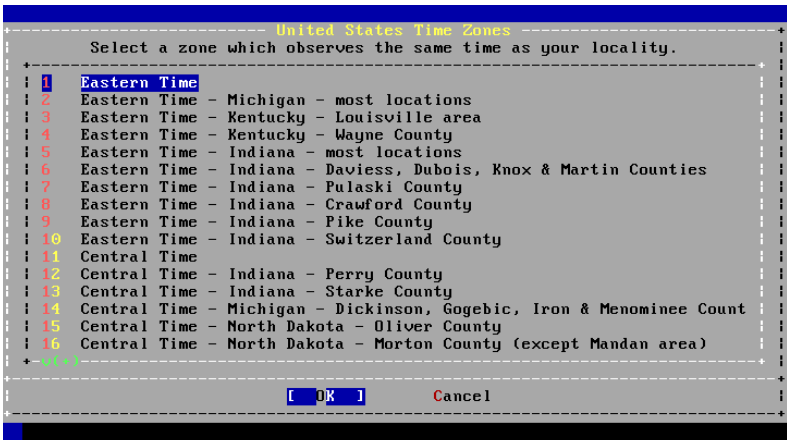
Ó÷Þìá 3-35. ÅðéëïãÞ ×þñáò



```
 Countries in America -- North and South
        Select a country or region
  38  Puerto Rico
  39  Saint Barthelemy
  40  Saint Kitts and Nevis
  41  Saint Lucia
  42  Saint Martin (French Part)
  43  Saint Pierre and Miquelon
  44  Saint Vincent and the Grenadines
  45  Sint Maarten (Dutch part)
  46  Suriname
  47  Trinidad and Tobago
  48  Turks and Caicos Islands
  49  United States
  50  Uruguay
  51  Venezuela, Bolivarian Republic of
  52  Virgin Islands, British
  53  Virgin Islands, U.S.

           [  OK  ]        Cancel
```

ÅðéëÝîôå ôç óùóôÞ ÷þñá ÷ñçóéìïðïéþíôáò ôá âåëÜêéá êáé ðéÝóôå **Enter**.

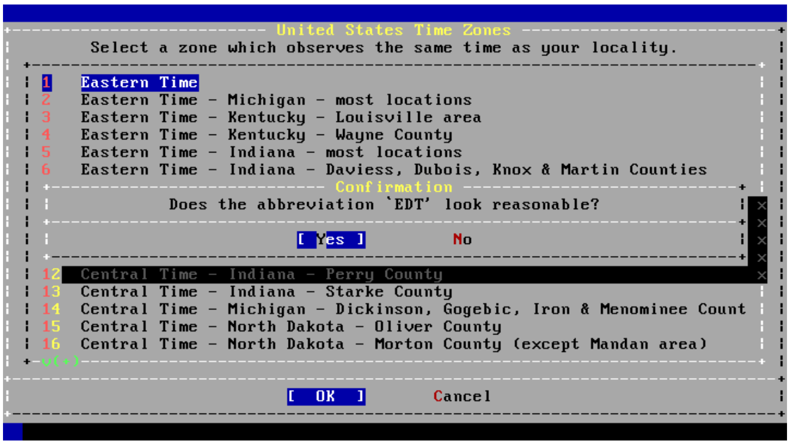
Ó÷Þìá 3-36. ÅðéëïãÞ Æþíçò ¿ñáò



```
 United States Time Zones
     Select a zone which observes the same time as your locality.
  1   Eastern Time
  2   Eastern Time - Michigan - most locations
  3   Eastern Time - Kentucky - Louisville area
  4   Eastern Time - Kentucky - Wayne County
  5   Eastern Time - Indiana - most locations
  6   Eastern Time - Indiana - Daviess, Dubois, Knox & Martin Counties
  7   Eastern Time - Indiana - Pulaski County
  8   Eastern Time - Indiana - Crawford County
  9   Eastern Time - Indiana - Pike County
  10  Eastern Time - Indiana - Switzerland County
  11  Central Time
  12  Central Time - Indiana - Perry County
  13  Central Time - Indiana - Starke County
  14  Central Time - Michigan - Dickinson, Gogebic, Iron & Menominee Count
  15  Central Time - North Dakota - Oliver County
  16  Central Time - North Dakota - Morton County (except Mandan area)

                   [  OK  ]        Cancel
```

ÅðéëÝîôå ôç óùóôÞ æþíç þñáò ÷ñçóéìïðïéþíôáò ôá âåëÜêéá êáé ðéÝóôå **Enter**.

Ó÷Þìá 3-37. Åðéâåâáßùóç Æþíçò ¿ñáò



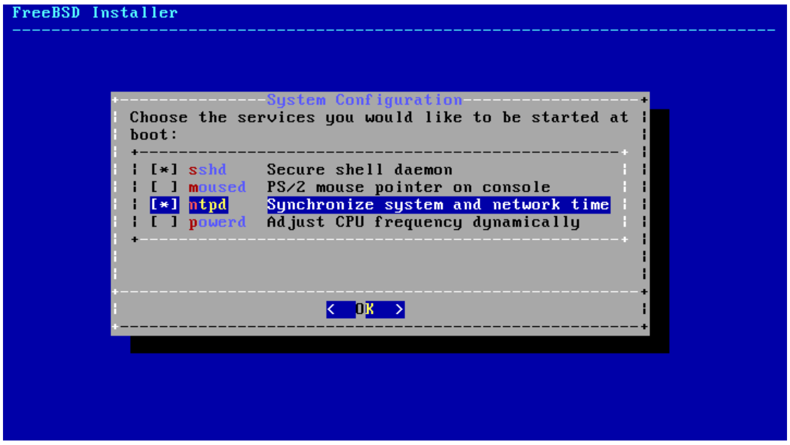
```
United States Time Zones
Select a zone which observes the same time as your locality.

1   Eastern Time
2   Eastern Time - Michigan - most locations
3   Eastern Time - Kentucky - Louisville area
4   Eastern Time - Kentucky - Wayne County
5   Eastern Time - Indiana - most locations
6   Eastern Time - Indiana - Daviess, Dubois, Knox & Martin Counties
                        Confirmation
        Does the abbreviation `EDT' look reasonable?

                  [ Yes ]          No

12  Central Time - Indiana - Perry County
13  Central Time - Indiana - Starke County
14  Central Time - Michigan - Dickinson, Gogebic, Iron & Menominee Count
15  Central Time - North Dakota - Oliver County
16  Central Time - North Dakota - Morton County (except Mandan area)
v(+)

                 [  OK  ]          Cancel
```

Åðéâåâáéþóôå üôé ç óõíôïìïãñáößá ãéá ôçí åðéëåãìÝíç æþíç þñáò åßíáé ç óùóôÞ. ¸ðåéôá ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ìå ôéò õðüëïéðåò ñõèìßóåéò.

3.9.4 ÅðéëïãÞ Õðçñåóéþí ðïõ èá Åíåñãïðïéçèïýí

Ìðïñåßôå íá åðéëÝîåôå ðïéåò áðü ôéò ðñüóèåôåò õðçñåóßåò èá åíåñãïðïéçèïýí óôçí åêêßíçóç. ¼ëåò ïé ðáñáêÜôù õðçñåóßåò åßíáé ðñïáéñåôéêÝò.

Ó÷Þìá 3-38. ÅðéëïãÞ Ðñüóèåôùí Õðçñåóéþí ðñïò Åíåñãïðïßçóç



```
FreeBSD Installer

              System Configuration
  Choose the services you would like to be started at
  boot:

   [*] sshd     Secure shell daemon
   [ ] moused   PS/2 mouse pointer on console
   [*] ntpd     Synchronize system and network time
   [ ] powerd   Adjust CPU frequency dynamically

                  <  OK  >
```

Ðñüóèåôåò Õðçñåóßåò

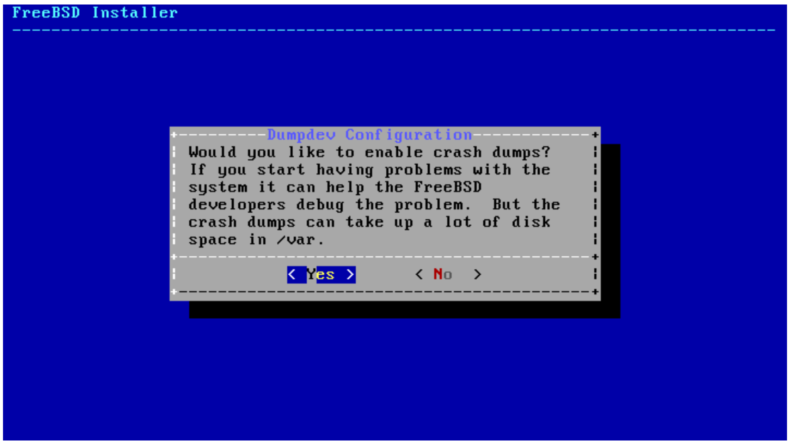
- `sshd` - Secure Shell (ÁóöáëÝò ÊÝëõöïò) (SSH) Ï äáßìïíáò ãéá áóöáëÞ áðïìáêñõóìÝíç ðñüóâáóç.
- `moused` - ÐáñÝ÷åé äõíáôüôçôá ÷ñÞóçò ôïõ ðïíôéêéïý áðü ôçí êïíóüëá ôïõ óõóôÞìáôïò.
- `ntpd` - Network Time Protocol, ðñùôüêïëëï ãéá ñýèìéóç ôçò þñáò ìÝóù äéêôýïõ (NTP). Ï äáßìïíáò ÷ñçóéìïðïéåßôáé ãéá ôçí áõôüìáôç ñýèìéóç ôïõ ñïëïãéïý.

- `powerd` - Âïçèçôéêü ðñüãñáììá ãéá Ýëåã÷ï éó÷ýïò êáé äéá÷åßñéóç åíÝñãåéáò.

3.9.5 Åíåñãïðïßçóç Crash Dumps

Ôï **bsdinstall** èá óáò ñùôÞóåé áí èÝëåôå íá åíåñãïðïéÞóåôå ôá crash dumps óôï óýóôçìá óáò. Ç åíåñãïðïßçóç ôùí crash dumps ìðïñåß íá åßíáé ðïëý ÷ñÞóéìç óôïí åíôïðéóìü ðñïâëçìÜôùí ôïõ óõóôÞìáôïò êáé ãéá ôï ëüãï áõôü óõíéóôÜôáé íá ôá åíåñãïðïéÞóåôå üôáí åßíáé äõíáôüí. ÅðéëÝîôå [Yes] ãéá íá ôá åíåñãïðïéÞóåôå, Þ [No] ãéá íá óõíå÷ßóåôå ÷ùñßò crash dumps.

Ó÷Þìá 3-39. Åíåñãïðïßçóç Crash Dumps



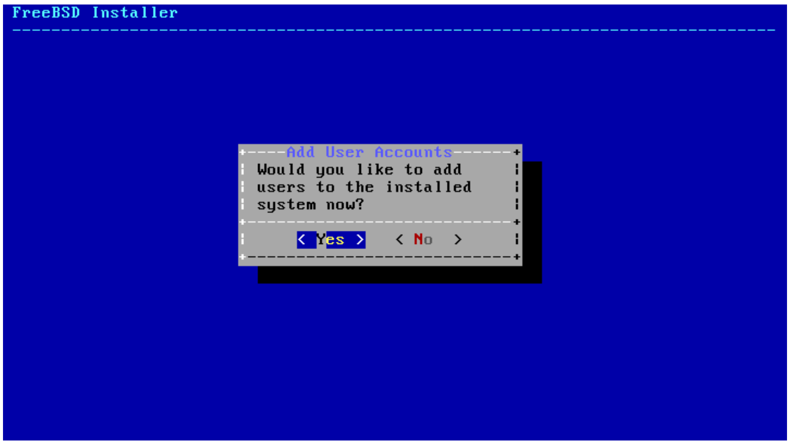
Would you like to enable crash dumps? If you start having problems with the system it can help the FreeBSD developers debug the problem. But the crash dumps can take up a lot of disk space in /var.

3.9.6 ÐñïóèÞêç ×ñçóôþí

Ç ðñïóèÞêç ôïõëÜ÷éóôïí åíüò ÷ñÞóôç êáôÜ ôçí åãêáôÜóôáóç, óáò åðéôñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï óýóôçìá ÷ùñßò íá åéóÝñ÷åóôå ùò `root`. ¼ôáí åéóÝñ÷åóôå ùò `root`, äåí õðÜñ÷ïõí ðñáêôéêÜ üñéá Þ êÜðïéï åßäïò ðñïóôáóßáò ó÷åôéêÜ ìå ôï ôé ìðïñåßôå íá êÜíåôå. ¼ôáí åéóÝñ÷åóôå ùò êáíïíéêüò ÷ñÞóôçò, ìðïñåßôå íá ÷åéñéóôåßôå ôï óýóôçìá óáò ìå ðåñéóóüôåñç áóöÜëåéá.

ÅðéëÝîôå [Yes] ãéá íá ðñïóèÝóåôå íÝïõò ÷ñÞóôåò.

Ó÷Þìá 3-40. ÐñïóèÞêç Ëïãáñéáóìþí ×ñçóôþí



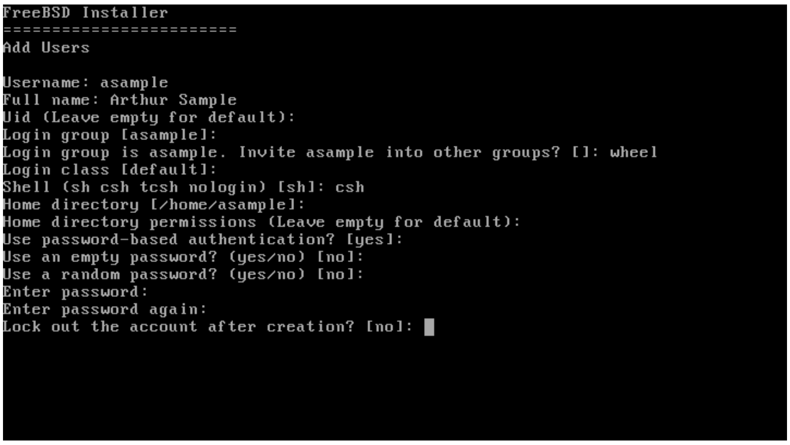
FreeBSD Installer

Add User Accounts

Would you like to add users to the installed system now?

ÅéóÜãåôå ôéò ðëçñïöïñßåò ãéá ôï ÷ñÞóôç ðïõ èá ðñïóôåèåß.

Ó÷Þìá 3-41. ÅéóáãùãÞ Ðëçñïöïñéþí ×ñÞóôç



```
FreeBSD Installer
========================
Add Users

Username: asample
Full name: Arthur Sample
Uid (Leave empty for default):
Login group [asample]:
Login group is asample. Invite asample into other groups? []: wheel
Login class [default]:
Shell (sh csh tcsh nologin) [sh]: csh
Home directory [/home/asample]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
Enter password again:
Lock out the account after creation? [no]:
```

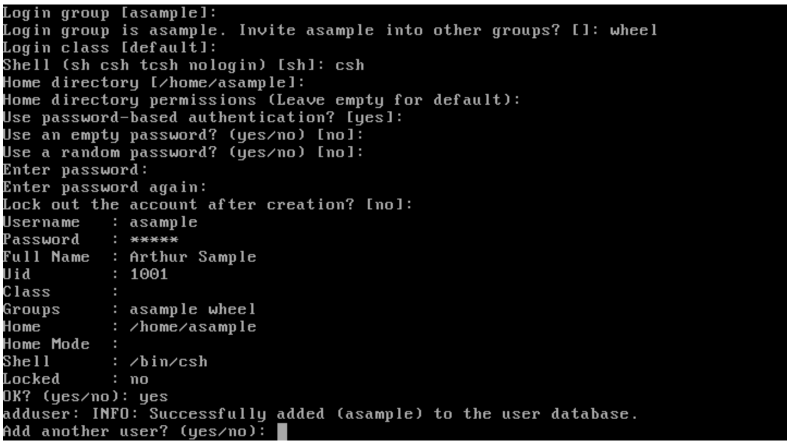
Ðëçñïöïñßåò ×ñÞóôç

- `Username` - Ôï üíïìá ðïõ èá ÷ñçóéìïðïéåß ï ÷ñÞóôçò ãéá íá åéóÝëèåé óôï óýóôçìá. ÔõðéêÜ ôï ðñþôï ãñÜììá ôïõ ìéêñïý ïíüìáôïò óå óõíäõáóìü ìå ôï åðßèåôï.
- `Full name` - Ôï ðëÞñåò üíïìá ôïõ ÷ñÞóôç.
- `Uid` - User ID. Ï áíáãíùñéóôéêüò áñéèìüò ÷ñÞóôç. ÓõíÞèùò äåí óõìðëçñþíïõìå áõôü ôï ðåäßï, þóôå íá åðéëåãåß áõôüìáôá Ýíáò áñéèìüò áðü ôï óýóôçìá.
- `Login group` - Ç ïìÜäá óôçí ïðïßá áíÞêåé ï ÷ñÞóôçò. ÓõíÞèùò ôï áöÞíïõìå êåíü þóôå íá ãßíåé áðïäåêôÞ ç ðñïåðéëåãìÝíç ôéìÞ.
- `Invite` *`user`* `into other groups?` - Åðéðñüóèåôåò ïìÜäåò ÷ñçóôþí óôéò ïðïßåò èÝëïõìå íá áíÞêåé ï ÷ñÞóôçò.
- `Login class` - ÓõíÞèùò äåí óõìðëçñþíïõìå áõôü ôï ðåäßï, þóôå íá ãßíåé áðïäåêôÞ ç ðñïåðéëåãìÝíç ôéìÞ.

- `Shell` - Ôï êÝëõöïò ðïõ èá ÷ñçóéìïðïéåß ï óõãêåêñéìÝíïò ÷ñÞóôçò. Óôï ðáñÜäåéãìá ìáò åðéëÝîáìå ôï csh(1).
- `Home directory` - Ï ðñïóùðéêüò êáôÜëïãïò ôïõ ÷ñÞóôç. Ç ðñïåðéëåãìÝíç ôéìÞ åßíáé óõíÞèùò ç óùóôÞ.
- `Home directory permissions` - Ôá äéêáéþìáôá óôïí êáôÜëïãï ôïõ ÷ñÞóôç. Ôá ðñïåðéëåãìÝíá åßíáé óõíÞèùò óùóôÜ.
- `Use password-based authentication?` - H ôõðéêÞ áðÜíôçóç åßíáé "yes".
- `Use an empty password?` - Ç ôõðéêÞ áðÜíôçóç åßíáé "no".
- `Use a random password?` - Ç ôõðéêÞ áðÜíôçóç åßíáé "no".
- `Enter password` - Ï êùäéêüò ðñüóâáóçò ãéá ôï óõãêåêñéìÝíï ÷ñÞóôç. Äåí öáßíåôáé óôçí ïèüíç êáèþò ôïí ðëçêôñïëïãïýìå.
- `Enter password again` - Ï êùäéêüò ðñÝðåé íá åéóá÷èåß Üëëç ìéá öïñÜ ãéá åðéâåâáßùóç.
- `Lock out the account after creation?` - Ç ôõðéêÞ áðÜíôçóç åßíáé "no".

Áöïý åéóÜãåôå üëåò ôéò ðëçñïöïñßåò, èá äåßôå ìéá ðåñßëçøç ôïõò êáé ôï óýóôçìá èá óáò ñùôÞóåé ãéá ôçí ïñèüôçôá ôïõò. Áí êÜíáôå êÜðïéï ëÜèïò êáôÜ ôç äéÜñêåéá ôçò åéóáãùãÞò, ãñÜøôå `no` êáé îáíáðñïóðáèÞóôå. Áí üëá åßíáé óùóôÜ, ãñÜøôå `yes` ãéá íá äçìéïõñãÞóåôå ôï íÝï ÷ñÞóôç.

Ó÷Þìá 3-42. ¸îïäïò áðü ôç Äéá÷åßñéóç ×ñçóôþí êáé ÏìÜäùí



```
Login group [asample]:
Login group is asample. Invite asample into other groups? []: wheel
Login class [default]:
Shell (sh csh tcsh nologin) [sh]: csh
Home directory [/home/asample]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
Enter password again:
Lock out the account after creation? [no]:
Username   : asample
Password   : *****
Full Name  : Arthur Sample
Uid        : 1001
Class      :
Groups     : asample wheel
Home       : /home/asample
Home Mode  :
Shell      : /bin/csh
Locked     : no
OK? (yes/no): yes
adduser: INFO: Successfully added (asample) to the user database.
Add another user? (yes/no):
```

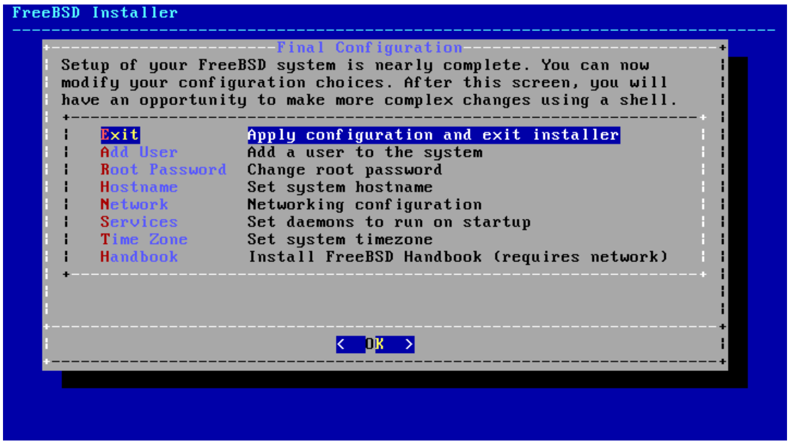
Áí èÝëåôå íá ðñïóèÝóåôå ðåñéóóüôåñïõò ÷ñÞóôåò, áðáíôÞóôå óôçí åñþôçóç "Add another user?" ìå `yes`. ÁðáíôÞóôå `no` ãéá íá ôåëåéþóåôå ìå ôçí ðñïóèÞêç ÷ñçóôþí êáé íá óõíå÷ßóåôå ôçí åãêáôÜóôáóç.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ðñïóèÞêç êáé äéá÷åßñéóç ÷ñçóôþí, äåßôå ôï ÊåöÜëáéï 14.

3.9.7 ÔåëéêÝò Ñõèìßóåéò

ÌåôÜ ôï ôÝëïò ôçò åãêáôÜóôáóçò êáé ôùí áñ÷éêþí ñõèìßóåùí, Ý÷åôå ìéá ôåëåõôáßá åõêáéñßá íá áëëÜîåôå ôéò ñõèìßóåéò ðñéí ôçí Ýîïäï áðü ôï ðñüãñáììá åãêáôÜóôáóçò.

Ó÷Þìá 3-43. ÔåëéêÝò Ñõèìßóåéò



```
FreeBSD Installer
------------------------------------------------------------------------------
 +-----------------------Final Configuration------------------------+
 | Setup of your FreeBSD system is nearly complete. You can now     |
 | modify your configuration choices. After this screen, you will   |
 | have an opportunity to make more complex changes using a shell.  |
 | +--------------------------------------------------------------+ |
 | |   Exit           Apply configuration and exit installer      | |
 | |   Add User       Add a user to the system                    | |
 | |   Root Password  Change root password                        | |
 | |   Hostname       Set system hostname                         | |
 | |   Network        Networking configuration                    | |
 | |   Services       Set daemons to run on startup               | |
 | |   Time Zone      Set system timezone                         | |
 | |   Handbook       Install FreeBSD Handbook (requires network) | |
 | +--------------------------------------------------------------+ |
 |                                                                  |
 |                                                                  |
 +------------------------------------------------------------------+
 |                            <  OK  >                              |
 +------------------------------------------------------------------+
```

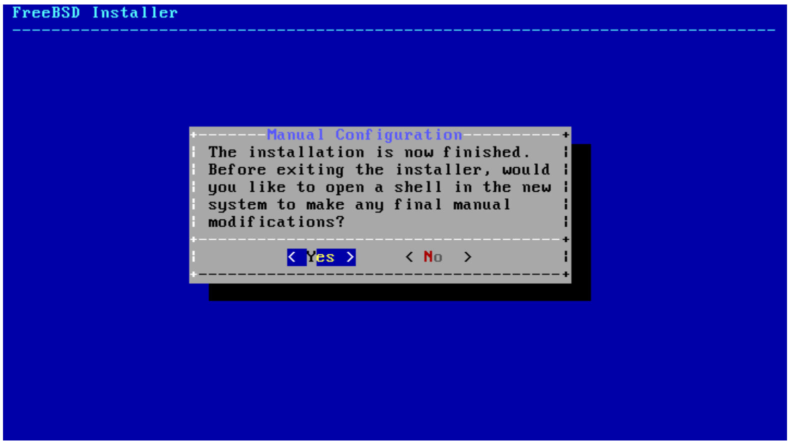
×ñçóéìïðïéÞóôå áõôü ôï ìåíïý ãéá íá êÜíåôå ïðïéåóäÞðïôå áëëáãÝò Þ ðñüóèåôåò ñõèìßóåéò èÝëåôå ðñéí ôçí ïëïêëÞñùóç ôçò åãêáôÜóôáóçò.

ÅðéëïãÝò Ôåëéêþí Ñõèìßóåùí

- `Add User` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.9.6.
- `Root Password` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.9.1.
- `Hostname` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.5.2.
- `Network` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.9.2.
- `Services` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.9.4.
- `Time Zone` - ÐåñéãñÜöåôáé óôï ÔìÞìá 3.9.3.
- `Handbook` - Ìåôáöüñôùóç êáé åãêáôÜóôáóç ôïõ Åã÷åéñéäßïõ ôïõ FreeBSD (ôï ïðïßï äéáâÜæåôå áõôÞ ôç óôéãìÞ).

Ìå ôçí ïëïêëÞñùóç ôùí ôåëéêþí ñõèìßóåùí, åðéëÝîôå Exit ãéá íá êëåßóåôå ôçí åãêáôÜóôáóç.

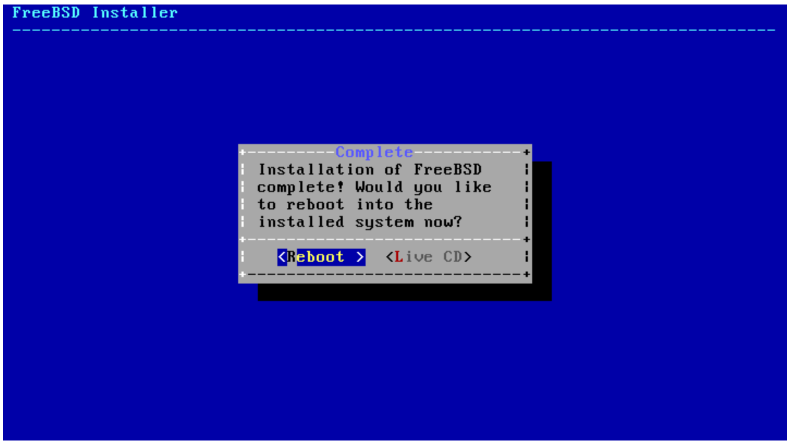
Ó÷Þìá 3-44. ×åéñïêßíçôç Ñýèìéóç



```
FreeBSD Installer
------------------------------------------------------------------------------

               +--------Manual Configuration--------+
               | The installation is now finished.  |
               | Before exiting the installer, would |
               | you like to open a shell in the new |
               | system to make any final manual     |
               | modifications?                      |
               +-------------------------------------+
               |        < Yes >      < No  >         |
               +-------------------------------------+
```

Ôï **bsdinstall** èá óáò ñùôÞóåé ãéá ôõ÷üí åðéðëÝïí ñõèìßóåéò ðïõ ðñÝðåé íá ãßíïõí ðñéí åðáíåêêéíÞóåôå óôï íÝï óýóôçìá. ÅðéëÝîôå [Yes] ãéá íá åêêéíÞóåôå Ýíá êÝëõöïò óôï íÝï óýóôçìá Þ [No] ãéá íá ðñï÷ùñÞóåôå óôï ôåëåõôáßï âÞìá ôçò åãêáôÜóôáóçò.

Ó÷Þìá 3-45. ÏëïêëÞñùóç ôçò ÅãêáôÜóôáóçò



Installation of FreeBSD complete! Would you like to reboot into the installed system now?

Áí ÷ñåéÜæåôáé íá êÜíåôå ðåñéóóüôåñåò Þ åéäéêÝò ñõèìßóåéò, ìðïñåßôå íá åðéëÝîåôå [Live CD]. Ìå ôçí åðéëïãÞ áõôÞ, Èá îåêéíÞóåôå ôï ìÝóï åãêáôÜóôáóçò óå êáôÜóôáóç Live CD.

Ìå ôçí ïëïêëÞñùóç ôçò åãêáôÜóôáóçò, åðéëÝîôå [Reboot] ãéá íá åðáíåêêéíÞóåôå ôïí õðïëïãéóôÞ óáò êáé íá îåêéíÞóåôå ôï íÝï FreeBSD óýóôçìÜ óáò. Ìç îå÷Üóåôå íá áöáéñÝóåôå ôï ìÝóï åãêáôÜóôáóçò áðü ôïí ïäçãü CD (Þ ôçí USB õðïäï÷Þ), äéáöïñåôéêÜ ôï óýóôçìá óáò ßóùò îåêéíÞóåé îáíÜ áðü áõôü.

3.9.8 Åêêßíçóç êáé Ôåñìáôéóìüò ôïõ FreeBSD

3.9.8.1 FreeBSD/i386 Booting

ÊáôÜ ôçí åêêßíçóç ôïõ FreeBSD åìöáíßæïíôáé ðïëëÜ ðëçñïöïñéáêÜ ìçíýìáôá. Öõóéïëïãéêü, ôá ðåñéóóüôåñá êõëïýí åêôüò ôçò ïèüíçò. ÌåôÜ ôï ôÝëïò ôçò åêêßíçóçò åìöáíßæåôáé ç ðñïôñïðÞ åéóüäïõ óôï óýóôçìá (login). Ìðïñåßôå íá äåßôå ôá ìçíýìáôá ðïõ êýëçóáí åêôüò ïèüíçò ðéÝæïíôáò ôï ðëÞêôñï **Scroll-Lock** ãéá íá íá åíåñãïðïéÞóåôå ôçí *ðñïóùñéíÞ ìíÞìç êýëéóçò*. ×ñçóéìïðïéÞóôå Ýðåéôá ôá ðëÞêôñá **PgUp**, **PgDn** êáé ôá âåëÜêéá ãéá íá äåßôå ôá ðáëéÜ ìçíýìáôá. ÐéÝæïíôáò ôï **Scroll-Lock** îáíÜ, èá åðéóôñÝøåôå óôçí êáíïíéêÞ áðåéêüíéóç.

Óôçí ðñïôñïðÞ `login:` ãñÜøôå ôï üíïìá ðïõ äçìéïõñãÞóáôå êáôÜ ôçí åãêáôÜóôáóç, óôï ðáñÜäåéãìá ìáò `asample`. Íá áðïöåýãåôå íá åéóÝñ÷åóôå ùò `root` üôáí äåí åßíáé áðáñáßôçôï.

Ç äõíáôüôçôá ðñïò ôá ðßóù êýëéóçò ôùí ìçíõìÜôùí ðïõ ðáñÜãïíôáé ðñïçãïõìÝíùò åßíáé ðåñéïñéóìÝíç, åðïìÝíùò äåí èá ìðïñÝóåôå ìå áõôü ôïí ôñüðï íá ôá äåßôå üëá. ÌåôÜ ôçí åßóïäï óáò óôï óýóôçìá, ìðïñåßôå íá äåßôå ôá ìçíýìáôá áðü ôç ãñáììÞ åíôïëþí ãñÜöïíôáò `dmesg | less` óôçí ðñïôñïðÞ. ÐéÝóôå **q** ãéá íá åðéóôñÝøåôå óôç ãñáììÞ åíôïëþí üôáí ôåëåéþóåôå.

ÔõðéêÜ ìçíýìáôá åêêßíçóçò (Ý÷ïõí ðáñáëåéöèåß ïé ðëçñïöïñßåò Ýêäïóçò):

```
Copyright (c) 1992-2011 The FreeBSD Project.
Copyright (c) 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994
        The Regents of the University of California. All rights reserved.
```

```
FreeBSD is a registered trademark of The FreeBSD Foundation.

    root@farrell.cse.buffalo.edu:/usr/obj/usr/src/sys/GENERIC amd64
CPU: Intel(R) Core(TM)2 Duo CPU     E8400  @ 3.00GHz (3007.77-MHz K8-class CPU)
  Origin = "GenuineIntel"  Id = 0x10676  Family = 6  Model = 17  Stepping = 6
  Features=0x783fbff<FPU,VME,DE,PSE,TSC,MSR,PAE,MCE,CX8,APIC,SEP,MTRR,PGE,MCA,CMOV,PAT,PSE36,MMX,
  Features2=0x209<SSE3,MON,SSSE3>
  AMD Features=0x20100800<SYSCALL,NX,LM>
  AMD Features2=0x1<LAHF>
real memory  = 536805376 (511 MB)
avail memory = 491819008 (469 MB)
Event timer "LAPIC" quality 400
ACPI APIC Table: <VBOX   VBOXAPIC>
ioapic0: Changing APIC ID to 1
ioapic0 <Version 1.1> irqs 0-23 on motherboard
kbd1 at kbdmux0
acpi0: <VBOX VBOXXSDT> on motherboard
acpi0: Power Button (fixed)
acpi0: Sleep Button (fixed)
Timecounter "ACPI-fast" frequency 3579545 Hz quality 900
acpi_timer0: <32-bit timer at 3.579545MHz> port 0x4008-0x400b on acpi0
cpu0: <ACPI CPU> on acpi0
pcib0: <ACPI Host-PCI bridge> port 0xcf8-0xcff on acpi0
pci0: <ACPI PCI bus> on pcib0
isab0: <PCI-ISA bridge> at device 1.0 on pci0
isa0: <ISA bus> on isab0
atapci0: <Intel PIIX4 UDMA33 controller> port 0x1f0-0x1f7,0x3f6,0x170-0x177,0x376,0xd000-0xd00f a
ata0: <ATA channel 0> on atapci0
ata1: <ATA channel 1> on atapci0
vgapci0: <VGA-compatible display> mem 0xe0000000-0xe0ffffff irq 18 at device 2.0 on pci0
em0: <Intel(R) PRO/1000 Legacy Network Connection 1.0.3> port 0xd010-0xd017 mem 0xf0000000-0xf001
em0: Ethernet address: 08:00:27:9f:e0:92
pci0: <base peripheral> at device 4.0 (no driver attached)
pcm0: <Intel ICH (82801AA)> port 0xd100-0xd1ff,0xd200-0xd23f irq 21 at device 5.0 on pci0
pcm0: <SigmaTel STAC9700/83/84 AC97 Codec>
ohci0: <OHCI (generic) USB controller> mem 0xf0804000-0xf0804fff irq 22 at device 6.0 on pci0
usbus0: <OHCI (generic) USB controller> on ohci0
pci0: <bridge> at device 7.0 (no driver attached)
acpi_acad0: <AC Adapter> on acpi0
atkbdc0: <Keyboard controller (i8042)> port 0x60,0x64 irq 1 on acpi0
atkbd0: <AT Keyboard> irq 1 on atkbdc0
kbd0 at atkbd0
atkbd0: [GIANT-LOCKED]
psm0: <PS/2 Mouse> irq 12 on atkbdc0
psm0: [GIANT-LOCKED]
psm0: model IntelliMouse Explorer, device ID 4
attimer0: <AT timer> port 0x40-0x43,0x50-0x53 on acpi0
Timecounter "i8254" frequency 1193182 Hz quality 0
Event timer "i8254" frequency 1193182 Hz quality 100
sc0: <System console> at flags 0x100 on isa0
sc0: VGA <16 virtual consoles, flags=0x300>
vga0: <Generic ISA VGA> at port 0x3c0-0x3df iomem 0xa0000-0xbffff on isa0
atrtc0: <AT realtime clock> at port 0x70 irq 8 on isa0
```

```
Event timer "RTC" frequency 32768 Hz quality 0
ppc0: cannot reserve I/O port range
Timecounters tick every 10.000 msec
pcm0: measured ac97 link rate at 485193 Hz
em0: link state changed to UP
usbus0: 12Mbps Full Speed USB v1.0
ugen0.1: <Apple> at usbus0
uhub0: <Apple OHCI root HUB, class 9/0, rev 1.00/1.00, addr 1> on usbus0
cd0 at ata1 bus 0 scbus1 target 0 lun 0
cd0: <VBOX CD-ROM 1.0> Removable CD-ROM SCSI-0 device
cd0: 33.300MB/s transfers (UDMA2, ATAPI 12bytes, PIO 65534bytes)
cd0: Attempt to query device size failed: NOT READY, Medium not present
ada0 at ata0 bus 0 scbus0 target 0 lun 0
ada0: <VBOX HARDDISK 1.0> ATA-6 device
ada0: 33.300MB/s transfers (UDMA2, PIO 65536bytes)
ada0: 12546MB (25694208 512 byte sectors: 16H 63S/T 16383C)
ada0: Previously was known as ad0
Timecounter "TSC" frequency 3007772192 Hz quality 800
Root mount waiting for: usbus0
uhub0: 8 ports with 8 removable, self powered
Trying to mount root from ufs:/dev/ada0p2 [rw]...
Setting hostuuid: 1848d7bf-e6a4-4ed4-b782-bd3f1685d551.
Setting hostid: 0xa03479b2.
Entropy harvesting: interrupts ethernet point_to_point kickstart.
Starting file system checks:
/dev/ada0p2: FILE SYSTEM CLEAN; SKIPPING CHECKS
/dev/ada0p2: clean, 2620402 free (714 frags, 327461 blocks, 0.0% fragmentation)
Mounting local file systems:.
vboxguest0 port 0xd020-0xd03f mem 0xf0400000-0xf07fffff,0xf0800000-0xf0803fff irq 20 at device 4.
vboxguest: loaded successfully
Setting hostname: machine3.example.com.
Starting Network: lo0 em0.
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> metric 0 mtu 16384
        options=3<RXCSUM,TXCSUM>
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x3
        inet 127.0.0.1 netmask 0xff000000
        nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
em0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500
        options=9b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING,VLAN_HWCSUM>
        ether 08:00:27:9f:e0:92
        nd6 options=29<PERFORMNUD,IFDISABLED,AUTO_LINKLOCAL>
        media: Ethernet autoselect (1000baseT <full-duplex>)
        status: active
Starting devd.
Starting Network: usbus0.
DHCPREQUEST on em0 to 255.255.255.255 port 67
DHCPACK from 10.0.2.2
bound to 192.168.1.142 -- renewal in 43200 seconds.
add net ::ffff:0.0.0.0: gateway ::1
add net ::0.0.0.0: gateway ::1
add net fe80::: gateway ::1
add net ff02::: gateway ::1
```

```
ELF ldconfig path: /lib /usr/lib /usr/lib/compat /usr/local/lib
32-bit compatibility ldconfig path: /usr/lib32
Creating and/or trimming log files.
Starting syslogd.
No core dumps found.
Clearing /tmp (X related).
Updating motd:.
Configuring syscons: blanktime.
Generating public/private rsa1 key pair.
Your identification has been saved in /etc/ssh/ssh_host_key.
Your public key has been saved in /etc/ssh/ssh_host_key.pub.
The key fingerprint is:
10:a0:f5:af:93:ae:a3:1a:b2:bb:3c:35:d9:5a:b3:f3 root@machine3.example.com
The key’s randomart image is:
+--[RSA1 1024]----+
|    o..          |
|   o . .         |
|  .   o          |
|       o         |
|    o   S        |
|   + + o         |
|o . + *          |
|o+ ..+ .         |
|==o..o+E         |
+-----------------+
Generating public/private dsa key pair.
Your identification has been saved in /etc/ssh/ssh_host_dsa_key.
Your public key has been saved in /etc/ssh/ssh_host_dsa_key.pub.
The key fingerprint is:
7e:1c:ce:dc:8a:3a:18:13:5b:34:b5:cf:d9:d1:47:b2 root@machine3.example.com
The key’s randomart image is:
+--[ DSA 1024]----+
|       ..     . .|
|      o  .   . + |
|     . ..   . E .|
|    . .  o o . . |
|     +  S = .    |
|    +  . = o     |
|     +  . * .    |
|    . .  o .     |
|      .o. .      |
+-----------------+
Starting sshd.
Starting cron.
Starting background file system checks in 60 seconds.

Thu Oct  6 19:15:31 MDT 2011

FreeBSD/amd64 (machine3.example.com) (ttyv0)

login:
```

Ç äçìéïõñãßá ôùí êëåéäéþí RSA êáé DSA ìðïñåß íá ðÜñåé êÜðïéï ÷ñüíï óå áñãÜ ìç÷áíÞìáôá. Ãßíåôáé üìùò ìüíï óôçí ðñþôç åêêßíçóç êáé ìüíï áí Ý÷åé ñõèìéóôåß ôï **sshd** ãéá áõôüìáôç åêêßíçóç. Ïé åðüìåíåò åêêéíÞóåéò èá åßíáé ôá÷ýôåñåò.

Ôï FreeBSD äåí åãêáèéóôÜ êÜðïéï ãñáöéêü ðåñéâÜëëïí áðü ðñïåðéëïãÞ, áëëÜ õðÜñ÷ïõí áñêåôÜ äéáèÝóéìá ðñïò åãêáôÜóôáóç. Äåßôå ôï ÊåöÜëáéï 6 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

3.9.9 Ôåñìáôéóìüò ôïõ FreeBSD

Ï óùóôüò ôåñìáôéóìüò ôïõ FreeBSD åîáóöáëßæåé ôá äåäïìÝíá êáé ôï õëéêü ôïõ õðïëïãéóôÞ óáò áðü æçìéÜ. Äåí ðñÝðåé áðëþò íá äéáêüøåôå ôçí ôñïöïäïóßá. Áí ï ÷ñÞóôçò óáò åßíáé ìÝëïò ôçò ïìÜäáò `wheel`, ìðïñåßôå íá ãßíåôå õðåñ÷ñÞóôçò ìå ôçí åíôïëÞ `su` êáé ôçí åéóáãùãÞ ôïõ êùäéêïý ôïõ `root`. ÄéáöïñåôéêÜ, óõíäåèåßôå ùò `root` êáé ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `shutdown -p now`. Ôï óýóôçìá èá ôåñìáôßóåé ìå ôï óùóôü ôñüðï êáé èá äéáêïðåß êáé ç ðáñï÷Þ ñåýìáôïò.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï óõíäõáóìü ðëÞêôñùí **Ctrl**+**Alt**+**Del** ãéá íá åðáíåêêéíÞóåôå ôï óýóôçìá, áëëÜ áõôü äåí óõíßóôáôáé êáôÜ ôç äéÜñêåéá ôçò êáíïíéêÞò ëåéôïõñãßáò.

3.10 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Ç åíüôçôá ðïõ áêïëïõèåß êáëýðôåé ôçí áíôéìåôþðéóç âáóéêþí ðñïâëçìÜôùí åãêáôÜóôáóçò — ãéá ðáñÜäåéãìá êïéíÜ ðñïâëÞìáôá ðïõ Ý÷ïõí áíáöåñèåß áðü ðïëëïýò ÷ñÞóôåò. ÕðÜñ÷ïõí åðßóçò êÜðïéåò åñùôÞóåéò êáé áðáíôÞóåéò ãéá üóïõò åðéèõìïýí íá Ý÷ïõí ôï FreeBSD ùò dual boot ìå MS-DOS Þ Windows.

3.10.1 Ôé íá ÊÜíåôå áí ÊÜôé ÐÜåé ÓôñáâÜ

Ëüãù ôùí äéÜöïñùí ðåñéïñéóìþí óôçí áñ÷éôåêôïíéêÞ ôïõ PC, äåí åßíáé äõíáôüí ç áíß÷íåõóç óõóêåõþí íá åßíáé 100% áîéüðéóôç. ÕðÜñ÷ïõí üìùò êÜðïéá ðñÜãìáôá ðïõ ìðïñåßôå íá êÜíåôå áí ç áíß÷íåõóç äåí åßíáé åðéôõ÷Þò.

ÅëÝãîôå ôéò Óçìåéþóåéò Õëéêïý (http://www.FreeBSD.org/releases/index.html) ãéá ôçí Ýêäïóç ôïõ FreeBSD ðïõ ÷ñçóéìïðïéåßôå, ãéá íá âåâáéùèåßôå üôé ôï õëéêü óáò õðïóôçñßæåôáé.

Áí ôï õëéêü óáò õðïóôçñßæåôáé êáé åîáêïëïõèåßôå íá Ý÷åôå êïëëÞìáôá Þ Üëëá ðñïâëÞìáôá, èá ðñÝðåé íá äçìéïõñãÞóåôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá. Áõôü èá óáò åðéôñÝøåé íá ðñïóèÝóåôå õðïóôÞñéîç ãéá óõóêåõÝò ïé ïðïßåò äåí õðÜñ÷ïõí óôïí ðõñÞíá `GENERIC`. Ï ðõñÞíáò óôï ìÝóï åãêáôÜóôáóçò Ý÷åé äçìéïõñãçèåß ìå ôçí õðüèåóç üôé ïé ðåñéóóüôåñåò óõóêåõÝò âñßóêïíôáé óôéò ðñïåðéëåãìÝíåò ñõèìßóåéò ôïõò üóï áöïñÜ ôá IRQs, ôéò äéåõèýíóåéò IO êáé ôá êáíÜëéá DMA. Áí Ý÷åôå áëëÜîåé áõôÝò ôéò ñõèìßóåéò ßóùò ÷ñåéáóôåß íá áëëÜîåôå ôéò ñõèìßóåéò ôïõ ðõñÞíá êáé íá ôïí åðáíáìåôáãëùôôßóåôå ãéá íá ìðïñÝóåé ôï FreeBSD íá åíôïðßóåé ôéò óõóêåõÝò óáò.

Åßíáé åðßóçò ðéèáíü ç äéáäéêáóßá áíß÷íåõóçò ãéá ìéá óõóêåõÞ ðïõ äåí åßíáé åãêáôåóôçìÝíç íá ðñïêáëÝóåé ðñüâëçìá óôçí áíß÷íåõóç ìéáò Üëëçò õðáñêôÞò óõóêåõÞò. Óôçí ðåñßðôùóç áõôÞ, èá ðñÝðåé íá áöáéñÝóåôå ôçí áíß÷íåõóç ãéá ôç óõóêåõÞ ðïõ äçìéïõñãåß ôï ðñüâëçìá.

> **Óçìåßùóç:** ÊÜðïéá ðñïâëÞìáôá åãêáôÜóôáóçò ìðïñïýí íá áðïöåõ÷èïýí Þ íá ìåéùèïýí ìå ôçí áíáâÜèìéóç firmware äéÜöïñùí óõóêåõþí õëéêïý êáé åéäéêüôåñá ôçò ìçôñéêÞò. Ôï firmware ôçò ìçôñéêÞò åßíáé óõ÷íÜ ãíùóôü ìå ôïí üñï BIOS. Ïé ðåñéóóüôåñïé êáôáóêåõáóôÝò ìçôñéêþí äéáèÝôïõí ìéá äéêôõáêÞ ôïðïèåóßá áðü üðïõ ìðïñåßôå íá êáôåâÜóåôå áíáâáèìéóìÝíåò åêäüóåéò êáé áíÜëïãåò ðëçñïöïñßåò.

> Ïé êáôáóêåõáóôÝò óõíÞèùò óõíéóôïýí íá ìçí áíáâáèìßæåôå ôï BIOS ôçò ìçôñéêÞò áí äåí õðÜñ÷åé êáëüò ëüãïò, üðùò ãéá ðáñÜäåéãìá ìéá êñßóéìç åíçìÝñùóç. Ç åíçìÝñùóç *åíäÝ÷åôáé íá áðïôý÷åé* áöÞíïíôáò ôï BIOS óå ìéá åíäéÜìåóç êáôÜóôáóç êáé ôïí õðïëïãéóôÞ åêôüò ëåéôïõñãßáò.

3.10.2 ÅñùôÞóåéò êáé ÁðáíôÞóåéò óôçí Áíôéìåôþðéóç ÐñïâëçìÜôùí

1. Ôï óýóôçìá ìïõ óôáìáôÜ íá áíôáðïêñßíåôáé êáôÜ ôçí áíß÷íåõóç õðóêåõþí óôçí åêêßíçóç Þ óõìðåñéöÝñåôáé ðåñßåñãá êáôÜ ôçí åãêáôÜóôáóç.

Ôï FreeBSD êÜíåé åêôåôáìÝíç ÷ñÞóç ôùí õðçñåóéþí ACPI (åöüóïí õðÜñ÷åé) óôéò áñ÷éôåêôïíéêÝò i386, amd64 êáé ia64 þóôå íá ñõèìßóåé óùóôÜ ôéò óõóêåõÝò êáôÜ ôçí åêêßíçóç. Äõóôõ÷þò õðÜñ÷ïõí áêüìá êÜðïéá ðñïâëÞìáôá ôüóï óôï ACPI üóï êáé óôï BIOS firmware áñêåôþí ìçôñéêþí. Ìðïñåßôå íá áðåíåñãïðïéÞóåôå ôï ACPI èÝôïíôáò `hint.acpi.0.disabled` óôï ôñßôï óôÜäéï ôïõ öïñôùôÞ åêêßíçóçò:

```
set hint.acpi.0.disabled="1"
```

Êáèþò ç ñýèìéóç áõôÞ ÷Üíåôáé óå êÜèå åêêßíçóç, åßíáé áðáñáßôçôï íá ðñïóèÝóåôå ôçí ïäçãßá `hint.acpi.0.disabled="1"` óôï áñ÷åßï `/boot/loader.conf`. Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï öïñôùôÞ åêêßíçóçò óôï ÔìÞìá 13.1.

ÊåöÜëáéï 4 ÂáóéêÝò ¸ííïéåò óôï UNIX®

ÁíáèåùñçìÝíï áðü ôïí Chris Shumway.

4.1 Óýíïøç

Ôï áêüëïõèï êåöÜëáéï èá êáëýøåé ôéò âáóéêÝò åíôïëÝò êáé ëåéôïõñãßåò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò FreeBSD. Ôï ìåãáëýôåñï ìÝñïò áõôÞò ôçò ýëçò ó÷åôßæåôáé ìå üëá ôá Ë.Ó. ðïõ åßíáé âáóéóìÝíá óôï UNIX. ÅÜí ç ýëç óáò öáßíåôáé ïéêåßá ìðïñåßôå íá äéáôñÝîåôå ãñÞãïñá áõôü ôï êåöÜëáéï. ÅÜí - áíôßèåôá - åßóôå íÝïò óôï FreeBSD ôüôå ïðùóäÞðïôå èá ðñÝðåé íá äéáâÜóåôå ðñïóåêôéêÜ ïëüêëçñï ôï êåöÜëáéï.

ÌåôÜ ôçí áíÜãíùóç ôïõ êåöáëáßïõ, èá ãíùñßæåôå:

- Ðùò íá ÷ñçóéìïðïéåßôå ôéò “åéêïíéêÝò êïíóüëåò” ôïõ FreeBSD.
- Ðùò ëåéôïõñãïýí ïé Üäåéåò áñ÷åßùí óôï UNIX êáé èá êáôáëÜâåôå ôçí ÷ñÞóç ôùí file flags óôï FreeBSD.
- Ôçí ðñïåðéëåãìÝíç äéÜôáîç ôïõ óõóôÞìáôïò áñ÷åßùí ôïõ FreeBSD.
- Ôçí ïñãÜíùóç ôùí äßóêùí óôï FreeBSD.
- Ôé åßíáé êáé ðþò ëåéôïõñãåß ç ðñïóÜñôçóç (mount) êáé áðïðñïóÜñôçóç (unmount) óõóôçìÜôùí áñ÷åßùí.
- Ôé åßíáé ïé äéåñãáóßåò (processes), ôá óÞìáôá (signals) êáé ïé äáßìïíåò (daemons).
- Ôé åßíáé ôï êÝëõöïò (shell) êáé ðùò íá áëëÜæåôå ôï ðñïåðéëåãìÝíï ðåñéâÜëëïí åñãáóßáò.
- Ðùò íá ÷ñçóéìïðïéåßôå âáóéêÜ ðñïãñÜììáôá åðåîåñãáóßáò êåéìÝíïõ (editors).
- Ôé åßíáé ïé óõóêåõÝò (devices) êáé ôá áñ÷åßá óõóêåõÞò (device nodes).
- Ðïéá Ýêäïóç åêôåëÝóéìùí ÷ñçóéìïðïéåßôáé óôï FreeBSD.
- Ðùò íá äéáâÜæåôå ôéò óåëßäåò âïçèåßáò (manual pages) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

4.2 ÅéêïíéêÝò Êïíóüëåò êáé ÔåñìáôéêÜ

Ìðïñåßôå íá ÷åéñéóôåßôå ôï FreeBSD ìå äéÜöïñïõò ôñüðïõò. ¸íáò áðü áõôïýò, åßíáé ðëçêôñïëïãþíôáò åíôïëÝò êåéìÝíïõ óå Ýíá ôåñìáôéêü. Ìå áõôü ôïí ôñüðï Ý÷åôå óôá ÷Ýñéá óáò Ýíá åõÝëéêôï êáé äõíáôü ëåéôïõñãéêü óýóôçìá UNIX. ÁõôÞ ç åíüôçôá ðåñéãñÜöåé ôé åßíáé ôá “ôåñìáôéêÜ” êáé ïé “êïíóüëåò” êáé ðùò ìðïñïýí íá ÷ñçóéìïðïéçèïýí óôï FreeBSD.

4.2.1 Ç Êïíóüëá

ÅÜí äåí Ý÷åôå ñõèìßóåé ôï FreeBSD íá îåêéíÜ áõôüìáôá êÜðïéï ãñáöéêü ðåñéâÜëëïí åñãáóßáò, ôüôå áìÝóùò ìåôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò êáé ôçí ïëïêëÞñùóç ôùí óåíáñßùí åêêßíçóçò (startup scripts) èá åìöáíéóôåß ç ðñïôñïðÞ óýíäåóçò (login prompt). Èá äåßôå êÜôé ðáñüìïéï óôçí ïèüíç óáò:

```
Additional ABI support:.
Local package initialization:.
Additional TCP options:.
```

```
Fri Sep 20 13:01:06 EEST 2002

FreeBSD/i386 (pc3.example.org) (ttyv0)

login:
```

Ôï ìÞíõìá ìðïñåß íá åßíáé ëßãï äéáöïñåôéêü óôï óýóôçìá óáò, áëëÜ äåí ðñÝðåé íá äéáöÝñåé êáôÜ ðïëý. Èá áóôéÜóïõìå ôçí ðñïóï÷Þ ìáò óôéò ôåëåõôáßåò äýï ãñáììÝò. Ç ðñïôåëåõôáßá ãñáììÞ áíáöÝñåé:

```
FreeBSD/i386 (pc3.example.org) (ttyv0)
```

ÁõôÞ ç ãñáììÞ ðåñéÝ÷åé ìåñéêÝò ðëçñïöïñßåò ãéá ôï óýóôçìá ðïõ ìüëéò åêêéíÞóáôå. ¸÷åôå ìðñïóôÜ óáò ìéá êïíóüëá “FreeBSD”, ðïõ ôñÝ÷åé óå åðåîåñãáóôÞ áñ÷éôåêôïíéêÞò x86 ôçò Intel Þ Üëëïõ óõìâáôïý[1]. Ôï üíïìá áõôÞò ôçò ìç÷áíÞò (üëåò ïé ìç÷áíÝò UNIX Ý÷ïõí êÜðïéï üíïìá) åßíáé `pc3.example.org`, êáé Ý÷åôå áíïéêôü ìðñïóôÜ óáò ôï ôåñìáôéêü `ttyv0` — êïíóüëá ôïõ óõóôÞìáôïò.

Ïëïêëçñþíïíôáò, ç ôåëåõôáßá ãñáììÞ åßíáé ðÜíôá:

```
login:
```

Óå áõôü ôï ìÝñïò èá ðñÝðåé íá ðëçêôñïëïãÞóåôå ôï “üíïìá ÷ñÞóôç” (username) ãéá íá óõíäåèåßôå óôï FreeBSD. Óôçí åðüìåíç åíüôçôá èá ðåñéãñÜøïõìå áêñéâþò áõôÞí ôçí äéáäéêáóßá.

4.2.2 ÅéóáãùãÞ ×ñÞóôç óôï Óýóôçìá FreeBSD

Ôï FreeBSD åßíáé Ýíá óýóôçìá ðïëõ÷ñçóôéêü (multiuser) êáé ðïëõåðåîåñãáóôéêü (multiprocessing). Áõôü åßíáé ï áêáäçìáúêüò ïñéóìüò ðïõ äßíåôáé óõíÞèùò óå Ýíá óýóôçìá ðïõ ìðïñåß íá ÷ñçóéìïðïéåßôáé áðü ðïëëïýò äéáöïñåôéêïýò áíèñþðïõò, åíþ ôáõôü÷ñïíá ôñÝ÷ïõí äéáöïñåôéêÜ ðñïãñÜììáôá óôçí ßäéá ìç÷áíÞ.

ÊÜèå óýóôçìá multiuser ÷ñåéÜæåôáé êÜðïéïõ ôñüðïõ þóôå íá îå÷ùñßæåé êÜèå “÷ñÞóôç” áðü ôïõò õðïëïßðïõò. Óôï FreeBSD (üðùò êáé óå üëá ôá Ë.Ó. ðïõ âáóßæïíôáé óôï UNIX), áõôü åðéôõã÷Üíåôáé áðáéôþíôáò êÜèå ÷ñÞóôçò íá “åßíáé óõíäåäåìÝíïò (log in)” ðñéí íá ìðïñåß íá ôñÝîåé ðñïãñÜììáôá. ÊÜèå ÷ñÞóôçò Ý÷åé îå÷ùñéóôü üíïìá (ôï “üíïìá ÷ñÞóôç Þ username”) êáé ìßá ðñïóùðéêÞ äéêëåßäá áóöáëåßáò, (ôïí “êùäéêü ðñüóâáóçò Þ password”). ÁõôÜ èá æçôçèïýí áðü ôï FreeBSD óå êÜèå ÷ñÞóôç ðñéí íá ôïõ åðéôñáðåß íá ôñÝîåé ïðïéáäÞðïôå åöáñìïãÞ.

ÁìÝóùò ìåôÜ ôçí ïëïêëÞñùóç ôùí äéåñãáóéþí åêêßíçóçò ôïõ FreeBSD êáé ôùí óåíáñßùí åêêßíçóçò (startup scripts)[2], èá åìöáíéóôåß ôï óýìâïëï ôçò ðñïôñïðÞò (prompt) êáé èá óáò æçôçèåß Ýíá Ýãêõñï üíïìá ÷ñÞóôç:

```
login:
```

Ãéá ðáñÜäåéãìá, áò õðïèÝóïõìå ðùò ôï üíïìá ÷ñÞóôç óáò åßíáé `john`. ÐëçêôñïëïãÞóôå `john` óôçí ðñïôñïðÞ êáé ðáôÞóôå **Enter**. Èá áêïëïõèÞóåé ìéá íÝá ðñïôñïðÞ ãéá íá äþóåôå ôïí “êùäéêü ðñüóâáóçò (password)”:

```
login: john
Password:
```

ÐëçêôñïëïãÞóôå ôþñá ôïí êùäéêü ðñüóâáóçò ôïõ `john`, êáé ðáôÞóôå **Enter**. Ï êùäéêüò ðñüóâáóçò *äåí åßíáé ïñáôüò!* Äåí ÷ñåéÜæåôáé íá áíçóõ÷åßôå ãéá áõôü. Åßíáé åðáñêÝò íá ðïýìå ðùò áõôü óõìâáßíåé ãéá ëüãïõò áóöáëåßáò.

Áí Ý÷åôå ðëçêôñïëïãÞóåé óùóôÜ ôïí êùäéêü ðñüóâáóçò, ôüôå Ý÷åôå óõíäåèåß óôï FreeBSD êáé åßóôå Ýôïéìïé íá äïêéìÜóåôå üëåò ôéò äéáèÝóéìåò åíôïëÝò UNIX.

ÐñÝðåé íá äåßôå ôï MOTD Þ áëëéþò ôï çìåñÞóéï ìÞíõìá êáé óôç óõíÝ÷åéá ôçí ðñïôñïðÞ åíôïëÞò (Ýíá ÷áñáêôÞñá #, $, Þ %). Áõôü óçìáßíåé ðùò Ý÷åôå óõíäåèåß åðéôõ÷þò óôï FreeBSD.

4.2.3 ÐïëëáðëÝò Êïíóüëåò

Ç åêôÝëåóç åíôïëþí UNIX óå ìßá ìüíï êïíóüëá ìðïñåß íá åßíáé éêáíïðïéçôéêÞ, áëëÜ ôï FreeBSD ìðïñåß íá ôñÝ÷åé ôáõôü÷ñïíá ðïëëÜ ðñïãñÜììáôá. Ç ýðáñîç ìßáò ìüíï êïíóüëáò ãéá ðëçêôñïëüãçóç åíôïëþí èá Þôáí ðñáãìáôéêÜ åëëéðÞò ãéá Ýíá Ë.Ó. üðùò ôï FreeBSD ðïõ ìðïñåß íá ôñÝ÷åé ôáõôü÷ñïíá äåêÜäåò ðñïãñÜììáôá. Åäþ åßíáé ðïõ ÷ñåéÜæïíôáé ïé “åéêïíéêÝò êïíóüëåò”.

Ôï FreeBSD ìðïñåß íá ñõèìéóôåß êáôÜëëçëá þóôå íá ðáñïõóéÜæåôáé ìå äéÜöïñåò åéêïíéêÝò êïíóüëåò. Ç åíáëëáãÞ áðü ìßá åéêïíéêÞ êïíóüëá óå ïðïéáäÞðïôå Üëëç ìðïñåß íá ãßíåé ðáôþíôáò ìåñéêÜ ðëÞêôñá óôï ðëçêôñïëüãéï. Ç êÜèå êïíóüëá Ý÷åé ôï äéêü ôçò êáíÜëé åîüäïõ, êáé êáèþò åíáëëÜóóåôå åéêïíéêÝò êïíóüëåò ôï FreeBSD áðïèçêåýåé êáé åðáíáöÝñåé ðñïóåêôéêÜ ôï áíôßóôïé÷ï ðëçêôñïëüãéï êáé ïèüíç ãéá êÜèå êïíóüëá óáí íá õðÞñ÷å ðñáãìáôéêÞ åíáëëáãÞ.

Óõíäõáóìïß åéäéêþí ðëÞêôñùí ÷ñçóéìïðïéïýíôáé áðü ôï FreeBSD ãéá ôçí åíáëëáãÞ êïíóïëþí [3]. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå **Alt-F1**, **Alt-F2**,Ýùò **Alt-F8** ãéá íá ìåôáâåßôå óôéò äéÜöïñåò åéêïíéêÝò êïíóüëåò ôïõ FreeBSD.

Êáèþò åíáëëÜóóåôå áðü ôç ìßá êïíóüëá óôçí Üëëç, ôï FreeBSD áðïèçêåýåé êáé åðáíáöÝñåé ðñïóåêôéêÜ ôçí áíôßóôïé÷ç ïèüíç. Ôï áðïôÝëåóìá åßíáé Ýíá “ïðôéêü ôñéêü” óáí íá åß÷áìå ðïëëáðëÝò “åéêïíéêÝò” ïèüíåò êáé ðëçêôñïëüãéá ðïõ èá ìðïñïýóáìå íá ÷ñçóéìïðïéÞóïõìå ãéá íá ôñÝ÷ïõìå åíôïëÝò óôï FreeBSD. Ôá ðñïãñÜììáôá ðïõ ôñÝ÷åôå áðü ìéá êïíóüëá äåí óôáìáôïýí íá ëåéôïõñãïýí üôáí ç êïíóüëá äåí åßíáé ïñáôÞ. Óõíå÷ßæïõí íá ôñÝ÷ïõí êé üôáí âñßóêåóôå óå äéáöïñåôéêÞ êïíóüëá.

4.2.4 Ôï Áñ÷åßï `/etc/ttys`

Ç åî’ ïñéóìïý ñýèìéóç ôïõ FreeBSD èá îåêéíÞóåé ìå ïêôþ åéêïíéêÝò êïíóüëåò. Äåí ðñüêåéôáé ãéá ìéá ðïëýðëïêç ñýèìéóç êáé ìðïñåßôå åýêïëá íá ôçí áëëÜîåôå þóôå íá öïñôþíïíôáé ðåñéóóüôåñåò Þ ëéãüôåñåò åéêïíéêÝò êïíóüëåò êáôÜ ôçí åêêßíçóç. Ôï ðëÞèïò êáé ç ðáñáìåôñïðïßçóç ôùí åéêïíéêþí êïíóïëþí ñõèìßæåôáé óôï áñ÷åßï `/etc/ttys`.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï áñ÷åßï `/etc/ttys` ãéá íá ñõèìßóåôå ôéò åéêïíéêÝò êïíóüëåò óôï FreeBSD. ÊÜèå ãñáììÞ ôïõ áñ÷åßïõ ðïõ äåí åßíáé ó÷üëéï (ïé ãñáììÝò ðïõ äåí îåêéíïýí ìå ôïí ÷áñáêôÞñá #) ðåñéÝ÷ïõí ñõèìßóåéò ãéá Ýíá ôåñìáôéêü Þ ãéá ìéá åéêïíéêÞ êïíóüëá. Ç ðñïêáèïñéóìÝíç Ýêäïóç ôïõ áñ÷åßïõ, ç ïðïßá ðåñéÝ÷åôáé óôçí äéáíïìÞ FreeBSD, ðåñéÝ÷åé åííÝá åéêïíéêÝò êïíóüëåò, åê ôùí ïðïßùí ïé ïêôþ åßíáé åíåñãïðïéçìÝíåò. Åßíáé ïé ãñáììÝò ðïõ îåêéíïýí ìå `ttyv`:

```
# name  getty                           type    status          comments
#
ttyv0   "/usr/libexec/getty Pc"         cons25  on  secure
# Virtual terminals
ttyv1   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv2   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv3   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv4   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv5   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv6   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv7   "/usr/libexec/getty Pc"         cons25  on  secure
ttyv8   "/usr/X11R6/bin/xdm -nodaemon"  xterm   off secure
```

Ãéá ìéá ëåðôïìåñÞ ðåñéãñáöÞ êÜèå óôÞëçò ôïõ áñ÷åßïõ êáé üëùí ôùí ñõèìßóåùí ðïõ ìðïñïýí íá åöáñìüóôïýí ãéá ôéò åéêïíéêÝò êïíóüëåò óõìâïõëåõôåßôå ôçí óåëßäá âïçèåßáò ttys(5).

4.2.5 Êïíóüëá óå ÊáôÜóôáóç Åíüò ×ñÞóôç

Ìðïñåßôå íá âñåßôå ìéá ëåðôïìåñÞ ðåñéãñáöÞ ãéá ôï ôé åßíáé “êáôÜóôáóç åíüò ÷ñÞóôç” óôçí åíüôçôá ÔìÞìá 13.6.2. Áîßæåé íá áíáöÝñïõìå ðùò õðÜñ÷åé åíåñãÞ ìüíï ìßá êïíóüëá üôáí ôñÝ÷åôå ôï FreeBSD óå êáôÜóôáóç åíüò ÷ñÞóôç. Äåí õðÜñ÷ïõí äéáèÝóéìåò åéêïíéêÝò êïíóüëåò. Óôï áñ÷åßï `/etc/ttys` ìðïñåßôå íá âñåßôå ôéò ñõèìßóåéò óå êáôÜóôáóç åíüò ÷ñÞóôç. ÁíáæçôÞóôå ôçí ãñáììÞ ðïõ îåêéíÜ ìå `console`:

```
# name  getty                           type    status          comments
#
# If console is marked "insecure", then init will ask for the root password
# when going to single-user mode.
console none                            unknown off secure
```

> **Óçìåßùóç:** ¼ðùò áíáöÝñïõí ôá ó÷üëéá ðÜíù áðü ôï `console`, ìðïñåßôå íá åðåîåñãáóôåßôå áõôÞí ôç ãñáììÞ êáé íá áíôéêáôáóôÞóåôå ôçí ëÝîç `secure` ìå `insecure`. Óå áõôÞ ôçí ðåñßðôùóç êáôÜ ôçí åêêßíçóç ôïõ FreeBSD óå êáôÜóôáóç åíüò ÷ñÞóôç, èá óáò æçôçèåß ï êùäéêüò ðñüóâáóçò ôïõ ÷ñÞóôç `root`.
>
> *ÐñïóÝ÷åôå üôáí êÜíåôå ôçí ìåôáôñïðÞ óå `insecure`.* ÅÜí ôý÷åé íá îå÷Üóåôå ôïí êùäéêü ðñüóâáóçò ôïõ `root`, ç ðñüóâáóç óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç ìðïñåß íá ãßíåé äýóâáôç. ÕðÜñ÷åé áêüìç ôñüðïò íá êÜíåôå åêêßíçóç, áëëÜ ßóùò íá åßíáé äýóêïëï ãéá êÜðïéïí ðïõ äåí ãíùñßæåé ðïëëÜ ãéá ôéò äéåñãáóßåò êáé ôá ðñïãñÜììáôá åêêßíçóçò ôïõ FreeBSD.

4.2.6 ÁëëÜæïíôáò ôçí ÁíÜëõóç (video mode) ôçò Êïíóüëáò

Ç ðñïåðéëåãìÝíç áðåéêüíéóç ôçò êïíóüëáò óôï FreeBSD ìðïñåß íá ñõèìéóôåß óå áíÜëõóç 1024x768, 1280x1024, Þ óå ïðïéïäÞðïôå Üëëï ìÝãåèïò õðïóôçñßæåôáé áðü ôçí êÜñôá ãñáöéêþí êáé ôçí ïèüíç óáò. Ãéá íá ÷ñçóéìïðïéÞóåôå äéáöïñåôéêÞ áíÜëõóç, èá ðñÝðåé ðñþôá áðü üëá íá åðáíáìåôáãëùôôßóåôå ôïí ðõñÞíá óáò, êáé íá óõìðåñéëÜâåôå ôéò ðáñáêÜôù äýï åðéëïãÝò:

```
options VESA
options SC_PIXEL_MODE
```

ÌåôÜ ôç ìåôáãëþôôéóç ôïõ ðõñÞíá ìå ôéò ðáñáðÜíù äýï åðéëïãÝò, ìðïñåßôå íá âñåßôå ðïéåò áíáëýóåéò õðïóôçñßæïíôáé áðü ôï õëéêü óáò, ÷ñçóéìïðïéþíôáò ôï âïçèçôéêü ðñüãñáììá vidcontrol(1). Ãéá íá äåßôå ìéá ëßóôá áðü ôéò õðïóôçñéæüìåíåò áíáëýóåéò, äþóôå ôçí áêüëïõèç åíôïëÞ:

```
# vidcontrol -i mode
```

Ç Ýîïäïò ôçò åíôïëÞò áõôÞò, åßíáé ìéá ëßóôá áðü áíáëýóåéò ïèüíçò ðïõ õðïóôçñßæïíôáé áðü ôï õëéêü óáò. Ìðïñåßôå Ýðåéôá íá åðéëÝîåôå ìéá íÝá áíÜëõóç, äßíïíôáò ôçí ùò üñéóìá óôçí vidcontrol(1) óå ìéá êïíóüëá ðïõ Ý÷åôå óõíäåèåß ùò `root`:

```
# vidcontrol MODE_279
```

Áí ç íÝá áíÜëõóç ãßíåé äåêôÞ, ìðïñåßôå íá ôçí ïñßóåôå ùò ðñïåðéëåãìÝíç ãéá êÜèå åêêßíçóç, ìå ôçí êáôÜëëçëç ñýèìéóç óôï áñ÷åßï `/etc/rc.conf`:

```
allscreens_flags="MODE_279"
```

4.3 ¶äåéåò (Permissions)

Ôï FreeBSD åßíáé áðüãïíïò ôïõ BSD UNIX, êáé ãéá áõôü ôï ëüãï âáóßæåôáé óå ìåñéêÝò Ýííïéåò êëåéäéÜ ôïõ UNIX. Ç ðñþôç êáé ðéï óçìáíôéêÞ åßíáé ðùò ôï FreeBSD åßíáé Ýíá ðïëõ÷ñçóôéêü (multiuser) ëåéôïõñãéêü óýóôçìá. Ôï óýóôçìá ìðïñåß íá åîõðçñåôÞóåé ðïëëïýò ÷ñÞóôåò ðïõ åñãÜæïíôáé ôáõôü÷ñïíá êáé óå åíôåëþò áíåîÜñôçôåò åöáñìïãÝò. Ôï óýóôçìá åßíáé õðåýèõíï ãéá ôïí óùóôü äéáìïéñáóìü êáé ôéò áíÜãêåò äéá÷åßñéóçò óõóêåõþí hardware, ðåñéöåñåéáêþí, ìíÞìçò, êáé ôçí óùóôÞ êáôáíïìÞ ôùí ðüñùí ôçò CPU ãéá êÜèå ÷ñÞóôç.

ÅðåéäÞ ôï óýóôçìá Ý÷åé ôçí éêáíüôçôá íá åîõðçñåôåß ðïëëïýò ÷ñÞóôåò, óå ïôéäÞðïôå äéá÷åéñßæåôáé, õðÜñ÷åé ìéá ïìÜäá áäåéþí ðïõ ïñßæåé ðïéïò ìðïñåß íá äéáâÜóåé, íá ãñÜøåé êáé íá åêôåëÝóåé áõôïýò ôïõò ðüñïõò. Ïé Üäåéåò áðïèçêåýïíôáé óå ïêôÜäåò äéá÷ùñéóìÝíåò óå ôñßá ìÝñç, Ýíá ãéá ôïí éäéïêôÞôç ôïõ áñ÷åßïõ, Ýíá ãéá ôçí ïìÜäá óôçí ïðïßá áíÞêåé ôï áñ÷åßï, êáé Ýíá ìÝñïò ãéá üëïõò ôïõò Üëëïõò. Óôç óõíÝ÷åéá ðáñïõóéÜæåôáé ðßíáêáò ìå ôéò áíôéóôïé÷ßåò ìåôáîý ôùí ïìÜäùí áäåéþí êáé ôùí áñéèìçôéêþí ôïõò ôéìþí.

ÔéìÞ	¶äåéá	ÅìöÜíéóç óå ðåñéå÷üìåíá êáôáëüãùí
0	ÁíÜãíùóç:ü÷é, ÅããñáöÞ:ü÷é, ÅêôÝëåóç:ü÷é	`---`
1	ÁíÜãíùóç:ü÷é, ÅããñáöÞ:ü÷é, ÅêôÝëåóç:íáé	`--x`
2	ÁíÜãíùóç:ü÷é, ÅããñáöÞ:íáé, ÅêôÝëåóç:ü÷é	`-w-`
3	ÁíÜãíùóç:ü÷é, ÅããñáöÞ:íáé, ÅêôÝëåóç:íáé	`-wx`
4	ÁíÜãíùóç:íáé, ÅããñáöÞ:ü÷é, ÅêôÝëåóç:ü÷é	`r--`
5	ÁíÜãíùóç:íáé, ÅããñáöÞ:ü÷é, ÅêôÝëåóç:íáé	`r-x`
6	ÁíÜãíùóç:íáé, ÅããñáöÞ:íáé, ÅêôÝëåóç:ü÷é	`rw-`
7	ÁíÜãíùóç:íáé, ÅããñáöÞ:íáé, ÅêôÝëåóç:íáé	`rwx`

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ ls(1) ìå ðñüèåìá `-l` óôçí ãñáììÞ åíôïëþí ãéá íá äåßôå ôá ðåñéå÷üìåíá êáôáëüãïõ êáé ðáñáôçñÞóôå ðùò ðåñéÝ÷åôáé ìéá óôÞëç ìå ôéò Üäåéåò ôùí áñ÷åßùí ãéá ôïí éäéïêôÞôç, ôçí ïìÜäá, êáé ãéá üëïõò ôïõò Üëëïõò. Ãéá ðáñÜäåéãìá, áí äþóïõìå `ls -l` óå Ýíá ôõ÷áßï êáôÜëïãï:

```
% ls -l
total 530
-rw-r--r--  1 root  wheel     512 Sep  5 12:31 myfile
-rw-r--r--  1 root  wheel     512 Sep  5 12:31 otherfile
-rw-r--r--  1 root  wheel    7680 Sep  5 12:31 email.txt
...
```

Ç ðñþôç óôÞëç ðïõ ðáßñíïõìå ìå ôçí åíôïëÞ `ls -l` äéá÷ùñßæåôáé ùò åîÞò:

```
-rw-r--r--
```

Ï ðñþôïò ÷áñáêôÞñáò (áðü ôá áñéóôåñÜ) ìáò åíçìåñþíåé áí ðñüêåéôáé ãéá Ýíá êáíïíéêü áñ÷åßï, êáôÜëïãï, åéäéêÞ óõóêåõÞ ÷áñáêôÞñùí, õðïäï÷Ýá (socket), Þ ïðïéáäÞðïôå Üëëï áñ÷åßï øåõäï-óõóêåõÞò. Óôçí ðåñßðôùóç ìáò, ôï `-` õðïäçëþíåé Ýíá êáíïíéêü áñ÷åßï. Ïé áêüëïõèïé ôñåéò ÷áñáêôÞñåò, óôï ðáñÜäåéãìá ìáò, `rw-`, ïñßæïõí ôéò Üäåéåò ãéá ôïí éäéïêôÞôç ôïõ áñ÷åßïõ. Ïé ôñåéò åðüìåíïé ÷áñáêôÞñåò, `r--`, ïñßæïõí ôéò Üäåéåò ãéá ôçí ïìÜäá óôçí ïðïßá áíÞêåé ôï áñ÷åßï. Ïé ôåëåõôáßïé ôñåéò ÷áñáêôÞñåò, `r--`, ïñßæïõí ôéò Üäåéåò ãéá ôïí õðüëïéðï êüóìï. Ç ðáýëá óçìáßíåé ðùò ç Üäåéá åßíáé áðåíåñãïðïéçìÝíç. Óôçí ðåñßðôùóç ôïõ áñ÷åßïõ ìáò, ïé Üäåéåò Ý÷ïõí ïñéóôåß þóôå ï éäéïêôÞôçò íá ìðïñåß íá äéáâÜæåé êáé íá ãñÜöåé óôï áñ÷åßï, ç ïìÜäá íá ìðïñåß íá äéáâÜóåé ôï áñ÷åßï, êáé ï õðüëïéðïò êüóìïò íá ìðïñåß ìüíï íá äéáâÜóåé ôï áñ÷åßï. Óýìöùíá ìå ôïí ðáñáðÜíù ðßíáêá, ïé Üäåéåò ãéá áõôü ôï áñ÷åßï åßíáé `644`, üðïõ êáèÝíá áðü ôá ôñßá øçößá ðáñïõóéÜæåé ôï áíôßóôïé÷ï ìÝñïò áäåéþí ôïõ áñ÷åßïõ.

ÌÝ÷ñé åäþ åßíáé üëá êáëÜ, áëëÜ ðùò ôï óýóôçìá åëÝã÷åé ôéò Üäåéåò óõóêåõþí; Ôï FreeBSD ìåôá÷åéñßæåôáé ôéò ðåñéóóüôåñåò óõóêåõÝò óáí Ýíá áñ÷åßï ôï ïðïßï ôá ðñïãñÜììáôá ìðïñïýí íá áíïßîïõí, íá äéáâÜóïõí êáé íá ãñÜøïõí óå áõôü óáí íá Þôáí Ýíá ïðïéïäÞðïôå áñ÷åßï. ÁõôÜ ôá åéäéêÜ áñ÷åßá óõóêåõþí áðïèçêåýïíôáé óôïí êáôÜëïãï `/dev`.

Ôï óýóôçìá ìåôá÷åéñßæåôáé åðßóçò êáé ôïõò êáôáëüãïõò ùò áñ÷åßá. ¸÷ïõí Üäåéåò áíÜãíùóçò, åããñáöÞò êáé åêôÝëåóçò. Ôï bit ðïõ ïñßæåé ôçí åêôÝëåóç óôïõò êáôáëüãïõò Ý÷åé åëáöñþò äéáöïñåôéêü íüçìá áðü üôé óôá áñ÷åßá. ¼ôáí Ýíáò êáôÜëïãïò Ý÷åé ïñéóôåß åêôåëÝóéìïò, óçìáßíåé ðùò åßíáé ðñïóðåëÜóéìïò, äçëáäÞ åßíáé åðéôñåðôü íá ðåñÜóïõìå óå Ýíá õðïêáôÜëïãï ôïõ (íá êÜíïõìå “cd”). Áõôü åðßóçò óçìáßíåé ðùò åðéôñÝðåôáé ç ðñüóâáóç óå üëá ôá ãíùóôÜ (áõôü Ý÷åé íá êÜíåé ìå ôéò Üäåéåò ôùí ßäéùí ôùí áñ÷åßùí) áñ÷åßá.

Åéäéêüôåñá, ãéá íá åìöáíßæïíôáé ôá ðåñéå÷üìåíá êáôáëüãïõ ðñÝðåé íá Ý÷åé ôåèåß Üäåéá áíÜãíùóçò (read) óôïí êáôÜëïãï, åíþ ãéá íá äéáãñáöåß Ýíá áñ÷åßï ôïõ ïðïßïõ ãíùñßæåôå ôï üíïìá åßíáé áíáãêáßï íá Ý÷ïõí äïèåß ïé Üäåéåò åããñáöÞò (write) *êáé* åêôÝëåóçò (execute) óôïí êáôÜëïãï ðïõ ðåñéÝ÷åé ôï áñ÷åßï.

ÕðÜñ÷ïõí êé Üëëá bit áäåéþí, áëëÜ ÷ñçóéìïðïéïýíôáé êõñßùò óå åéäéêÝò ðåñéðôþóåéò üðùò óå setuid binaries êáé sticky directories. Áí èÝëåôå ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôéò Üäåéåò áñ÷åßùí êáé ðùò íá ôéò ïñßæåôå, óõìâïõëåõôåßôå ïðùóäÞðïôå ôçí óåëßäá manual chmod(1).

4.3.1 ÓõìâïëéêÝò ¶äåéåò

ÓõíåéóöïñÜ ôïõ Tom Rhodes.

Ïé óõìâïëéêÝò Üäåéåò, ìåñéêÝò öïñÝò áíáöÝñïíôáé êáé ùò óõìâïëéêÝò åêöñÜóåéò, ÷ñçóéìïðïéïýí ÷áñáêôÞñåò óôçí èÝóç ôùí ïêôþ ôéìþí ãéá íá èÝóïõí Üäåéåò óå áñ÷åßá Þ êáôáëüãïõò. Ïé óõìâïëéêÝò åêöñÜóåéò ÷ñçóéìïðïéïýí ôçí óýíôáîç (ðïéïò) (åíÝñãåéá) (Üäåéåò), üðïõ åßíáé äéáèÝóéìåò ïé áêüëïõèåò ôéìÝò:

ÅðéëïãÞ	**ÃñÜììá**	**Óçìáßíåé**
(ðïéïò)	u	User (×ñÞóôçò)
(ðïéïò)	g	Group owner (ÏìÜäá ðïõ áíÞêåé)
(ðïéïò)	o	Other (Õðüëïéðïé ÷ñÞóôåò)
(ðïéïò)	a	All (üëïé, “world”)
(åíÝñãåéá)	+	Ðñüóèåóç áäåéþí
(åíÝñãåéá)	-	Áöáßñåóç áäåéþí
(åíÝñãåéá)	=	¶ìåóïò ïñéóìüò áäåéþí
(Üäåéåò)	r	Read (ÁíÜãíùóç)
(Üäåéåò)	w	Write (ÅããñáöÞ)
(Üäåéåò)	x	Execute (ÅêôÝëåóç)
(Üäåéåò)	t	Sticky bit
(Üäåéåò)	s	Set UID Þ GID

Ïé ôéìÝò åéóÜãïíôáé ìå ôçí åíôïëÞ chmod(1) üðùò ðñéí, áëëÜ ìå ãñÜììáôá. Ãéá ðáñÜäåéãìá, èá ìðïñïýóáôå íá ÷ñçóéìïðïéÞóåôå ôçí áêüëïõèç åíôïëÞ ãéá íá áðáãïñåýóåôå óå Üëëïõò ÷ñÞóôåò ôçí ðñüóâáóç óôï *`FILE`*:

```
% chmod go= FILE
```

Ìðïñïýí íá ãßíïõí ðÜíù áðü ìßá áëëáãÝò óôéò Üäåéåò åíüò áñ÷åßïõ ôáõôü÷ñïíá äéá÷ùñßæïíôáò ôéò áëëáãÝò ìå êüììá. Ãéá ðáñÜäåéãìá, ç áêüëïõèç åíôïëÞ èá áöáéñÝóåé óôçí ïìÜäá êáé óôïõ "õðüëïéðïõ êüóìïõ" ôçí Üäåéá åããñáöÞò, êáé óôç óõíÝ÷åéá èá ðñïóèÝóåé Üäåéá åêôÝëåóçò óå üëïõò.

```
% chmod go-w,a+x FILE
```

4.3.2 FreeBSD File Flags

ÓõíåéóöïñÜ ôïõ Tom Rhodes.

ÐÝñá áðü ôéò Üäåéåò áñ÷åßùí ðïõ óõæçôÞèçêáí ðñéí áðü ëßãï, ôï FreeBSD õðïóôçñßæåé ôçí ÷ñÞóç ôùí "file flags." ÁõôÜ ôá flags ðñïóèÝôïõí Ýíá åðéðñüóèåôï åðßðåäï áóöáëåßáò êáé åëÝã÷ïõ óå áñ÷åßá, áëëÜ ü÷é óå êáôáëüãïõò.

ÁõôÜ ôá flags ðñïóèÝôïõí Ýíá ðñüóèåôï åðßðåäï åëÝã÷ïõ óå áñ÷åßá, äéáóöáëßæïíôáò ìáò ðùò óå êÜðïéåò ðåñéðôþóåéò áêüìç êé ï `root` íá ìçí ìðïñåß íá äéáãñÜøåé Þ íá ìåôáôñÝøåé áñ÷åßá.

Ç ìåôáôñïðÞ ôùí file flags ãßíåôáé ìå ôçí chflags(1), ÷ñçóéìïðïéþíôáò ìéá áðëÞ äéåðáöÞ. Ãéá ðáñÜäåéãìá, ãéá íá åíåñãïðïéÞóïõìå ôï flag ôïõ óõóôÞìáôïò ìç äéáãñáöÞò áñ÷åßïõ óôï áñ÷åßï `file1`, äßíïõìå ôçí áêüëïõèç åíôïëÞ:

```
# chflags sunlink file1
```

Êáé ãéá íá áðåíåñãïðïéÞóïõìå ôï flag ôïõ óõóôÞìáôïò ìç äéáãñáöÞò áñ÷åßïõ, áðëÜ äßíïõìå ôçí ðñïçãïýìåíç åíôïëÞ ìå "no" ìðñïóôÜ áðü ôï `sunlink`. ÐáñáôçñÞóôå:

```
# chflags nosunlink file1
```

Ãéá íá äåßôå ôá flags åíüò áñ÷åßïõ, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ ls(1) ìå ôï ðñüèåìá `-lo`:

```
# ls -lo file1
```

Óôçí Ýîïäï èá ðñÝðåé íá äåßôå êÜôé ðáñüìïéï ìå ôï áêüëïõèï:

```
-rw-r--r--  1 trhodes  trhodes  sunlnk 0 Mar  1 05:54 file1
```

ÌåñéêÜ flags ìðïñïýí íá ðñïóôåèïýí Þ íá áöáéñåèïýí ìüíï áðü ôïí ÷ñÞóôç `root`. Óôéò õðüëïéðåò ðåñéðôþóåéò, ï éäéïêôÞôçò ôïõ áñ÷åßïõ ìðïñåß íá èÝóåé áõôÜ ôá flags. Ðñïôåßíïõìå óôïõò äéá÷åéñéóôÝò íá äéáâÜóïõí ôéò óåëßäåò âïçèåßáò chflags(1) êáé chflags(2) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

4.3.3 Ïé ¶äåéåò setuid, setgid êáé sticky

ÓõíåéóöïñÜ áðü ôïí Tom Rhodes.

Åêôüò áðü ôéò Üäåéåò ðïõ Ý÷ïõìå óõæçôÞóåé Þäç, õðÜñ÷ïõí ôñåéò áêüìá ôéò ïðïßåò êÜèå äéá÷åéñéóôÞò ðñÝðåé íá ãíùñßæåé. Ðñüêåéôáé ãéá ôéò Üäåéåò `setuid`, `setgid` êáé `sticky`.

Ïé ðáñáðÜíù åßíáé óçìáíôéêÝò ãéá êÜðïéåò ëåéôïõñãßåò óôï UNIX, êáèþò ðáñÝ÷ïõí ëåéôïõñãßåò ðïõ äåí åßíáé öõóéïëïãéêÜ äéáèÝóéìåò óôïõò êïéíïýò ÷ñÞóôåò. Ãéá íá ôéò êáôáíïÞóåôå, èá ðñÝðåé ðñþôá íá êáôáëÜâåôå ôçí äéáöïñÜ ìåôáîý ôïõ ðñáãìáôéêïý áíáãíùñéóôéêïý ÷ñÞóôç (real user ID) êáé ôïõ åíåñãïý áíáãíùñéóôéêïý ÷ñÞóôç (effective user ID).

Ôï ðñáãìáôéêü ID ôïõ ÷ñÞóôç, åßíáé ôï UID óôï ïðïßï áíÞêåé, Þ ìå ôï ïðïßï îåêéíÜ, ìéá äéåñãáóßá. Ôï åíåñãü UID, åßíáé ôï áíáãíùñéóôéêü ÷ñÞóôç ôï ïðïßï åêôåëåß ôçí äéåñãáóßá. Ãéá ðáñÜäåéãìá, ôï âïçèçôéêü ðñüãñáììá passwd(1) åêôåëåßôáé ìå ôï ðñáãìáôéêü ID ôïõ ÷ñÞóôç ðïõ áëëÜæåé ôïí êùäéêü ôïõ. Ùóôüóï, ãéá íá ìðïñåß íá äéá÷åéñéóôåß ôçí âÜóç äåäïìÝíùí ìå ôïõò êùäéêïýò ôïõ óõóôÞìáôïò, ôï ðñüãñáììá áõôü ÷ñçóéìïðïéåß ùò åíåñãü ID áõôü ôïõ ÷ñÞóôç `root`. Ìå áõôü ôïí ôñüðï, åðéôñÝðåôáé óôïõò áðëïýò ÷ñÞóôåò íá áëëÜæïõí ôïõò êùäéêïýò ÷ùñßò íá ðáßñíïõí ôï ìÞíõìá ëÜèïõò `Permission Denied` (áðáãüñåõóç ðñüóâáóçò).

> **Óçìåßùóç:** Ç åðéëïãÞ `nosuid` óôçí åíôïëÞ mount(8) èá ðñïêáëÝóåé áðïôõ÷ßá åêôÝëåóçò áõôþí ôùí åíôïëþí, êáé ìÜëéóôá ÷ùñßò êÜðïéï ìÞíõìá ëÜèïõò. Ìå ëßãá ëüãéá, ç åêôÝëåóç ôïõò èá áðïôý÷åé, êáé ï ÷ñÞóôçò äåí èá åíçìåñùèåß ãéá áõôü. Ç åðéëïãÞ áõôÞ äåí åßíáé åðßóçò áðüëõôá áóöáëÞò, êáèþò (óýìöùíá ìå ôç óåëßäá manual mount(8)) õðÜñ÷åé ôñüðïò íá ðáñáêáìöèåß ìÝóù êÜðïéïõ åíäéÜìåóïõ `nosuid` ðñïãñÜììáôïò (wrapper).

Ìðïñåßôå íá êáèïñßóåôå ôçí Üäåéá setuid, ôïðïèåôþíôáò ôïí áñéèìü ôÝóóåñá (4) ìðñïóôÜ áðü ôï ãåíéêü óåô ôùí áäåéþí, üðùò öáßíåôáé óôï áêüëïõèï ðáñÜäåéãìá:

```
# chmod 4755 suidexample.sh
```

Ïé Üäåéåò óôï áñ÷åßï *`suidexample.sh`* èá öáßíïíôáé ôþñá üðùò ðáñáêÜôù:

```
-rwsr-xr-x   1 trhodes  trhodes    63 Aug 29 06:36 suidexample.sh
```

ÐáñáôçñÞóôå óôï ðáñÜäåéãìá, üôé ôï `s` åßíáé ðëÝïí ìÝëïò ôïõ óõíüëïõ áäåéþí ðïõ Ý÷ïõí êáèïñéóôåß ãéá ôïí éäéïêôÞôç ôïõ áñ÷åßïõ, êáé Ý÷åé áíôéêáôáóôÞóåé ôçí áíôßóôïé÷ç Üäåéá åêôÝëåóçò. Ìå ôïí ôñüðï áõôü ëåéôïõñãïýí ðñïãñÜììáôá ðïõ ÷ñåéÜæïíôáé áõîçìÝíá äéêáéþìáôá, üðùò ãéá ðáñÜäåéãìá ç åíôïëÞ `passwd`.

Ãéá íá ðáñáôçñÞóåôå áõôÞ ôç ëåéôïõñãßá ôçí þñá ðïõ óõìâáßíåé, áíïßîôå äýï ôåñìáôéêÜ. Óôï ðñþôï, îåêéíÞóôå ôçí åíôïëÞ `passwd` ùò êáíïíéêüò ÷ñÞóôçò. Êáèþò ç åíôïëÞ åêôåëåßôáé êáé ðåñéìÝíåé ãéá ôçí åéóáãùãÞ ôïõ íÝïõ êùäéêïý, åëÝãîôå ôïí ðßíáêá äéåñãáóéþí êáé áíáæçôÞóôå ôéò ðëçñïöïñßåò ôïõ ÷ñÞóôç ðïõ åêôåëåß ôçí åíôïëÞ `passwd`.

Óôï ôåñìáôéêü Á:

```
Changing local password for trhodes
Old Password:
```

Óôï ôåñìáôéêü Â:

```
# ps aux | grep passwd
```

```
trhodes  5232  0.0  0.2  3420  1608   0  R+    2:10AM   0:00.00 grep passwd
root     5211  0.0  0.2  3620  1724   2  I+    2:09AM   0:00.01 passwd
```

¼ðùò åßðáìå ðáñáðÜíù, ç åíôïëÞ `passwd` åêôåëåßôáé áðü Ýíá êáíïíéêü ÷ñÞóôç, áëëÜ ÷ñçóéìïðïéåß ôï åíåñãü UID ôïõ ÷ñÞóôç `root`.

Ç Üäåéá `setgid` åêôåëåß ôçí ßäéá ëåéôïõñãßá üðùò êáé ç `setuid`, áëëÜ åðéäñÜ óôéò Üäåéåò ôçò ïìÜäáò (group). ¼ôáí åêôåëÝóåôå ìéá åöáñìïãÞ Þ âïçèçôéêü ðñüãñáììá, èá ÷ñçóéìïðïéåß ôéò Üäåéåò ôçò ïìÜäáò óôçí ïðïßá áíÞêåé ôï áñ÷åßï, êáé ü÷é ôïõ ÷ñÞóôç ðïõ ôçí îåêßíçóå.

Ãéá íá èÝóåôå ôçí Üäåéá `setgid` óå Ýíá áñ÷åßï, èá ðñÝðåé íá ôïðïèåôÞóåôå ôïí áñéèìü äýï (2) ìðñïóôÜ áðü ôï óýíïëï áäåéþí, óôçí åíôïëÞ `chmod`. Äåßôå ôï ðáñáêÜôù ðáñÜäåéãìá:

```
# chmod 2755 sgidexample.sh
```

¼ðùò êáé ðñéí, èá ðáñáôçñÞóåôå ôç íÝá Üäåéá `s`, áëëÜ áõôÞ ôç öïñÜ óôï óåô ôùí áäåéþí ôçò ïìÜäáò:

```
-rwxr-sr-x   1 trhodes  trhodes    44 Aug 31 01:49 sgidexample.sh
```

> **Óçìåßùóç:** Óôá ðáñáäåßãìáôá ìáò, áí êáé ôï áñ÷åßï åßíáé Ýíá åêôåëÝóéìï script ãéá êÝëõöïò, äåí èá åêôåëåóôåß ìå äéáöïñåôéêü åíåñãü ID (EUID). Áõôü óõìâáßíåé ãéáôß óå áõôÜ ôá scripts äåí åðéôñÝðåôáé ç ðñüóâáóç óôéò êëÞóåéò setuid(2) ôïõ óõóôÞìáôïò.

Ïé äýï ðñþôåò åéäéêÝò Üäåéåò ðïõ áíáöÝñáìå, ïé `setuid` êáé `setgid`, åíäå÷ïìÝíùò íá ìåéþóïõí ôçí áóöÜëåéá ôïõ óõóôÞìáôïò, áöïý åðéôñÝðïõí óå ðñïãñÜììáôá íá åêôåëïýíôáé ìå áõîçìÝíá äéêáéþìáôá. ÕðÜñ÷åé ùóôüóï ìéá ôñßôç åéäéêÞ Üäåéá, ç ïðïßá ìðïñåß íá áõîÞóåé ôçí áóöÜëåéá ôïõ óõóôÞìáôïò: ôï `sticky bit`.

¼ôáí èÝóåôå ôï `sticky bit` óå Ýíá êáôÜëïãï, åðéôñÝðåôáé ç äéáãñáöÞ åíüò áñ÷åßïõ ìüíï áðü ôïí éäéïêôÞôç ôïõ. Ç Üäåéá áõôÞ åßíáé ÷ñÞóéìç ãéá íá áðïöýãåôå ç äéáãñáöÞ åíüò áñ÷åßïõ áðü êïéíü÷ñçóôïõò êáôáëüãïõò, üðùò ãéá ðáñÜäåéãìá ï `/tmp`, áðü êÜðïéï ÷ñÞóôç ðïõ äåí åßíáé ï éäéïêôÞôçò ôïõ. Ãéá íá èÝóåôå áõôÞ ôçí Üäåéá, ôïðïèåôÞóôå ôïí áñéèìü Ýíá (1) óôçí áñ÷Þ ôïõ óåô áäåéþí:

```
# chmod 1777 /tmp
```

Ìðïñåßôå ôþñá íá äåßôå ôï áðïôÝëåóìá, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `ls`:

```
# ls -al / | grep tmp
```

```
drwxrwxrwt  10 root  wheel         512 Aug 31 01:49 tmp
```

Ç Üäåéá `sticky bit` öáßíåôáé ùò `t` óôï ôÝëïò ôïõ óõíüëïõ ôùí áäåéþí.

4.4 ÄïìÞ Êáôáëüãïõ

Ç éåñáñ÷éêÞ äïìÞ ôïõ FreeBSD åßíáé Ýíá âáóéêü óôïé÷åßï ðïõ ðñÝðåé íá ãíùñßæåôå áí èÝëåôå íá Ý÷åôå ìéá ïëïêëçñùìÝíç åéêüíá ôïõ óõóôÞìáôïò. Ç ðéï óçìáíôéêÞ Ýííïéá åßíáé áõôÞ ôïõ ñéæéêïý (root) êáôáëüãïõ, “/”. Áõôüò ï êáôÜëïãïò ðñïóáñôÜôáé (mount) ðñþôïò êáôÜ ôçí åêêßíçóç êáé ðåñéÝ÷åé ôï âáóéêü óýóôçìá éêáíü íá åôïéìÜóåé ôï Ë.Ó. ãéá ëåéôïõñãßá multi-user. Ï root êáôÜëïãïò ðåñéÝ÷åé åðßóçò óçìåßá ðñïóÜñôçóçò ãéá Üëëá óõóôÞìáôá áñ÷åßùí ðïõ ðñïóáñôþíôáé êáôÜ ôçí ìåôÜâáóç óå êáôÜóôáóç ëåéôïõñãßáò multi-user.

Óçìåßï ðñïóÜñôçóçò (mount point) åßíáé Ýíáò êáôÜëïãïò óôïí ïðïßï ìðïñïýí íá áíáðôõ÷èïýí ðñüóèåôá óõóôÞìáôá áñ÷åßùí óå Ýíá ãïíéêü óýóôçìá áñ÷åßùí (óõíÞèùò óôï root óýóôçìá áñ÷åßùí). Áõôü ðåñéãñÜöåôáé áíáëõôéêÜ óôçí åíüôçôá ÔìÞìá 4.5. Óôá óôÜíôáñô óçìåßá ðñïóÜñôçóçò ðåñéëáìâÜíïíôáé: ïé `/usr`, `/var`, `/tmp`, `/mnt`, êáé `/cdrom`. Áõôïß ïé êáôÜëïãïé óõíÞèùò åßíáé êáôá÷ùñçìÝíïé óôï áñ÷åßï `/etc/fstab`. Ôï `/etc/fstab` åßíáé Ýíáò ðßíáêáò äéáöüñùí óõóôçìÜôùí áñ÷åßùí êáé óçìåßùí ðñïóÜñôçóçò ãéá áíáöïñÜ óôï óýóôçìá. Ôá ðåñéóóüôåñá óõóôÞìáôá ðïõ áíáöÝñïíôáé óôï `/etc/fstab` ðñïóáñôþíôáé áõôüìáôá êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò áðü ôï script rc(8) åêôüò áí ðåñéÝ÷åôáé ç åðéëïãÞ `noauto`. ËåðôïìÝñåéåò ìðïñåßôå íá âñåßôå óôï ÔìÞìá 4.6.1.

Ìéá ðëÞñçò ðåñéãñáöÞ ôçò éåñáñ÷ßáò ôïõ óõóôÞìáôïò áñ÷åßùí åßíáé äéáèÝóéìç óôï hier(7). Áêïëïõèåß ìéá óýíôïìç áíáóêüðçóç ìå ôïõò ðéï óõíÞèåéò êáôáëüãïõò.

ÊáôÜëïãïò	**ÐåñéãñáöÞ**
`/`	Ñéæéêüò (root) êáôÜëïãïò ôïõ óõóôÞìáôïò áñ÷åßùí.
`/bin/`	×ñÞóéìá åñãáëåßá ãéá ðåñéâÜëëïí åíüò Þ ðïëëáðëþí ÷ñçóôþí.
`/boot/`	ÐñïãñÜììáôá êáé áñ÷åßá ñõèìßóåùí ðïõ ÷ñçóéìïðïéïýíôáé êáôÜ ôçí åêêßíçóç ôïõ ëåéôïõñãéêïý óõóôÞìáôïò.
`/boot/defaults/`	ÐñïêáèïñéóìÝíá áñ÷åßá ñõèìßóåùí åêêßíçóçò, äåßôå loader.conf(5).
`/dev/`	Áñ÷åßá óõóêåõþí, äåßôå intro(4).
`/etc/`	Áñ÷åßá ñõèìßóåùí óõóôÞìáôïò êáé óåíÜñéá åêêßíçóçò.
`/etc/defaults/`	ÐñïêáèïñéóìÝíá áñ÷åßá ñõèìßóåùí óõóôÞìáôïò, äåßôå ôçí rc(8).
`/etc/mail/`	Áñ÷åßá ñõèìßóåùí ãéá ðñÜêôïñåò ìåôáöïñÜò çëåêôñ. ôá÷õäñïìåßïõ (ÌÔÁ) üðùò ôï sendmail(8).
`/etc/namedb/`	Áñ÷åßá ñõèìßóåùí `named`, äåßôå named(8).
`/etc/periodic/`	ÓåíÜñéá ëåéôïõñãéþí ðïõ ôñÝ÷ïõí óå çìåñÞóéá, åâäïìáäéáßá, êáé ìçíéáßá âÜóç, cron(8); äåßôå periodic(8).
`/etc/ppp/`	Áñ÷åßá ñõèìßóåùí `ppp`, äåßôå ôéò ppp(8).
`/mnt/`	Êåíüò êáôÜëïãïò ðïõ óõíÞèùò ÷ñçóéìïðïéåßôáé áðü ôïõò äéá÷åéñéóôÝò óõóôçìÜôùí ùò ðñïóùñéíü óçìåßï ðñïóÜñôçóçò.
`/proc/`	Óýóôçìá áñ÷åßùí äéåñãáóéþí, äåßôå ôéò procfs(5), mount_procfs(8).
`/rescue/`	ÐñïãñÜììáôá ìå óôáôéêÞ óýíäåóç (static link) ãéá áóöáëÞ åðáíáöïñÜ óõóôÞìáôïò, äåßôå ôçí rescue(8).
`/root/`	Ðñïóùðéêüò êáôÜëïãïò ôïõ ÷ñÞóôç `root`.
`/sbin/`	ÐñïãñÜììáôá óõóôÞìáôïò êáé ÷ñÞóéìá åñãáëåßá äéá÷åßñéóçò ãéá ðåñéâÜëëïí åíüò Þ ðïëëáðëþí ÷ñçóôþí.
`/tmp/`	ÐñïóùñéíÜ áñ÷åßá. Ôá ðåñéå÷üìåíá ôïõ `/tmp` óõíÞèùò äåí äéáôçñïýíôáé ìåôÜ áðü åðáíåêêßíçóç ôïõ óõóôÞìáôïò. Óôï `/tmp` óõíÞèùò ðñïóáñôÜôáé Ýíá óýóôçìá áñ÷åßùí ìíÞìçò. Áõôü ìðïñåß íá åðéôåõ÷èåß áõôïìÜôùò ÷ñçóéìïðïéþíôáò ôéò ó÷åôéêÝò ìåôáâëçôÝò tmpmfs ôïõ rc.conf(5) (Þ ìå ìéá êáôá÷þñçóç óôïí `/etc/fstab`, äåßôå ôçí mdmfs(8)).
`/usr/`	ÐåñéÝ÷ïíôáé ó÷åäüí üëá ôá âïçèçôéêÜ ðñïãñÜììáôá êáé ïé åöáñìïãÝò ÷ñçóôþí.
`/usr/bin/`	Êïéíü÷ñçóôá âïçèçôéêÜ ðñïãñÜììáôá, åñãáëåßá ðñïãñáììáôéóìïý, êáé åöáñìïãÝò.

ÊáôÜëïãïò	**ÐåñéãñáöÞ**
`/usr/include/`	ÓôÜíôáñ áñ÷åßá óõìðåñßëçøçò C (include files).
`/usr/lib/`	Áñ÷åßá âéâëéïèçêþí.
`/usr/libdata/`	ÄéÜöïñá áñ÷åßá äåäïìÝíùí âïçèçôéêþí ðñïãñáììÜôùí.
`/usr/libexec/`	Äáßìïíåò óõóôÞìáôïò & âïçèçôéêÜ ðñïãñÜììáôá óõóôÞìáôïò (åêôåëïýíôáé áðü Üëëá ðñïãñÜììáôá).
`/usr/local/`	ÔïðéêÜ åêôåëÝóéìá, âéâëéïèÞêåò, êôë. Åðßóçò åßíáé êáé ï ðñïêáèïñéóìÝíïò ðñïïñéóìüò ãéá ðñïãñÜììáôá ðïõ åãêáèßóôáíôáé áðü ôá ports ôïõ FreeBSD. ÌÝóá óôïí `/usr/local`, ÷ñçóéìïðïéåßôáé ãåíéêÜ ç äéÜôáîç ôïõ `/usr` ðïõ ðåñéãñÜöåôáé óôï hier(7). Åîáéñïýíôáé ïé êáôÜëïãïé óåëßäùí âïçèåßáò man, ðïõ âñßóêåôáé Üìåóá êÜôù áðü ôïí `/usr/local` êáé ü÷é êÜôù áðü ôïí `/usr/local/share`, êáèþò êáé ç ôåêìçñßùóç êÜèå port ðïõ âñßóêåôáé óôïí `share/doc/`*`port`* .
`/usr/obj/`	ÄÝíôñï ðñïïñéóìïý ðïõ åîáñôÜôáé áðü ôçí áñ÷éôåêôïíéêÞ ôïõ ìç÷áíÞìáôïò êáé ðáñÜãåôáé ìåôáãëùôôßæïíôáò ôï äÝíôñï `/usr/src`.
`/usr/ports/`	Ç ÓõëëïãÞ Ports ôïõ FreeBSD (ðñïáéñåôéêü).
`/usr/sbin/`	Äáßìïíåò óõóôÞìáôïò & âïçèçôéêÜ ðñïãñÜììáôá óõóôÞìáôïò (åêôåëïýíôáé áðü ÷ñÞóôåò).
`/usr/share/`	Áñ÷åßá áíåîÜñôçôá áðü ôçí Áñ÷éôåêôïíéêÞ ôïõ ìç÷áíÞìáôïò.
`/usr/src/`	Áñ÷åßá BSD êáé/Þ ôïðéêÜ áñ÷åßá ðçãáßïõ êþäéêá.
`/usr/X11R6/`	ÅêôåëÝóéìá, âéâëéïèÞêåò, êôë. ãéá ôçí äéáíïìÞ X11R6 (ðñïáéñåôéêü).
`/var/`	Áñ÷åßá áíáöïñÜò (log) äéáöüñùí ÷ñÞóåùí, temporary, transient, êáé spool. ÌåñéêÝò öïñÝò ðñïóáñôÜôáé óôïí `/var` Ýíá óýóôçìá áñ÷åßùí ìíÞìçò. Áõôü ìðïñåß íá åðéôåõ÷èåß áõôüìáôá ÷ñçóéìïðïéþíôáò ôéò ó÷åôéêÝò ìåôáâëçôÝò varmfs ôïõ rc.conf(5) (Þ ìå ìßá êáôá÷þñçóç óôï `/etc/fstab`, äåßôå ôéò mdmfs(8)).
`/var/log/`	ÄéÜöïñá áñ÷åßá óõìâÜíôùí ôïõ óõóôÞìáôïò.
`/var/mail/`	Áñ÷åßá ãñáììáôïêéâùôßïõ (mailbox) ÷ñçóôþí.
`/var/spool/`	ÄéÜöïñïé êáôÜëïãïé ðáñï÷Ýôåõóçò (spool) åêôõðùôþí êáé çëåêôñïíéêÞò áëëçëïãñáößáò ôïõ óõóôÞìáôïò.
`/var/tmp/`	ÐñïóùñéíÜ (temporary) áñ÷åßá. Ôá áñ÷åßá áõôÜ óõíÞèùò äéáôçñïýíôáé êáôÜ ôçí äéÜñêåéá åðáíåêêéíÞóåùí ôïõ óõóôÞìáôïò, åêôüò áí ï `/var` åßíáé Ýíá óýóôçìá áñ÷åßùí ìíÞìçò.
`/var/yp/`	Áðåéêïíßóåéò (maps) NIS.

4.5 ÏñãÜíùóç Äßóêïõ

Ç ìéêñüôåñç ìïíÜäá ïñãÜíùóçò ðïõ ÷ñçóéìïðïéåß ôï FreeBSD ãéá íá âñåé áñ÷åßá åßíáé ôï üíïìá áñ÷åßïõ. Ôá ïíüìáôá áñ÷åßùí åßíáé åõáßóèçôá óôá êåöáëáßá- ìéêñÜ, ôï ïðïßï óçìáßíåé üôé ôï `readme.txt` êáé ôï `README.TXT` åßíáé äýï äéáöïñåôéêÜ áñ÷åßá. Ôï FreeBSD äåí ÷ñçóéìïðïéåß ôçí åðÝêôáóç `.txt` áñ÷åßïõ ãéá íá ðñïóäéïñßóåé áí Ýíá áñ÷åßï åßíáé ðñüãñáììá, Þ Ýããñáöï, Þ Üëëïò ôýðïò äåäïìÝíùí.

Ôá áñ÷åßá áðïèçêåýïíôáé óå êáôáëüãïõò. ¸íáò êáôÜëïãïò ìðïñåß íá ìçí ðåñéÝ÷åé áñ÷åßá, Þ ìðïñåß íá ðåñéÝ÷åé åêáôïíôÜäåò áñ÷åßá. ¸íáò êáôÜëïãïò ìðïñåß åðßóçò íá ðåñéÝ÷åé Üëëïõò êáôáëüãïõò, åðéôñÝðïíôáò óáò íá êáôáóêåõÜóåôå ìéá éåñáñ÷éêÞ äïìÞ êáôáëüãùí üðïõ êáôÜëïãïé åóùêëåßïõí Üëëïõò êáôáëüãïõò. Áõôü ìáò åðéôñÝðåé íá ïñãáíþóïõìå ôá äåäïìÝíá ìáò ðïëý åõêïëüôåñá.

Ç áíáöïñÜ óå áñ÷åßá êáé êáôáëüãïõò ãßíåôáé äßíïíôáò ôï üíïìá áñ÷åßïõ Þ ôï üíïìá êáôáëüãïõ, áêïëïõèåß ìßá áñéóôåñüóôñïöç êÜèåôïò, `/` êáé Ýðåéôá ïðïéïäÞðïôå Üëëï êáôÜëïçëï üíïìá êáôáëüãïõ. ÅÜí Ý÷åôå ôïí êáôÜëïãï `foo`, ï ïðïßïò ðåñéÝ÷åé ôïí êáôÜëïãï `bar`, ï ïðïßïò ðåñéÝ÷åé ôï áñ÷åßï `readme.txt`, ôüôå ôï ïëïêëçñùìÝíï üíïìá, *äéáäñïìÞ (path)* óôï áñ÷åßï åßíáé `foo/bar/readme.txt`.

ÊáôÜëïãïé êáé áñ÷åßá áðïèçêåýïíôáé óå Ýíá óýóôçìá áñ÷åßùí. ÊÜèå óýóôçìá áñ÷åßùí ðåñéÝ÷åé Ýíá êáôÜëïãï óôï áíþôåñï åðßðåäï, ðïõ ïíïìÜæåôáé *root (ñéæéêüò) êáôÜëïãïò* ãéá ôï óõãêåêñéìÝíï óýóôçìá áñ÷åßùí. Ï root êáôÜëïãïò ìðïñåß íá ðåñéÝ÷åé Üëëïõò êáôáëüãïõò.

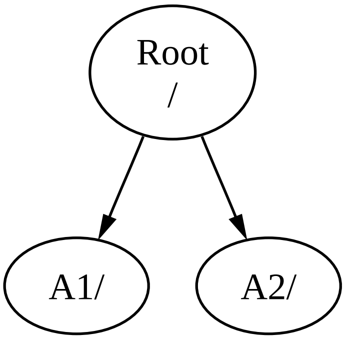
Áõôü ðéèáíþò åßíáé ðáñüìïéï ìå ïðïéïäÞðïôå Üëëï ëåéôïõñãéêü óýóôçìá Ý÷åôå ÷ñçóéìïðïéÞóåé. Ùóôüóï õðÜñ÷ïõí ìåñéêÝò äéáöïñÝò. Ãéá ðáñÜäåéãìá, ôï MS-DOS ÷ñçóéìïðïéåß `\` ãéá íá äéá÷ùñßæåé ïíüìáôá êáôáëüãùí êáé áñ÷åßùí, åíþ ôï Mac OS® ÷ñçóéìïðïéåß `:`.

Ôï FreeBSD äåí ÷ñçóéìïðïéåß ãñÜììáôá ïäçãþí Þ ïíüìáôá ïäçãþí óôç äéáäñïìÞ. ÅðïìÝíùò äåí èá ðñÝðåé íá ãñÜöåôå `c:/foo/bar/readme.txt` óôï FreeBSD.

ÁíôéèÝôùò, Ýíá óýóôçìá áñ÷åßùí êáèïñßæåôáé ùò root óýóôçìá áñ÷åßùí. Ï ñéæéêüò êáôÜëïãïò ôïõ root óõóôÞìáôïò áñ÷åßùí áíáöÝñåôáé ùò `/`. ÊÜèå Üëëï óýóôçìá áñ÷åßùí *ðñïóáñôÜôáé* êÜôù áðü ôï root óýóôçìá áñ÷åßùí Äåí Ý÷åé óçìáóßá ðüóïõò äßóêïõò Ý÷åôå óôï FreeBSD óýóôçìá óáò, êÜèå êáôÜëïãïò åìöáíßæåôáé íá åßíáé ìÝñïò ôïõ ßäéïõ äßóêïõ.

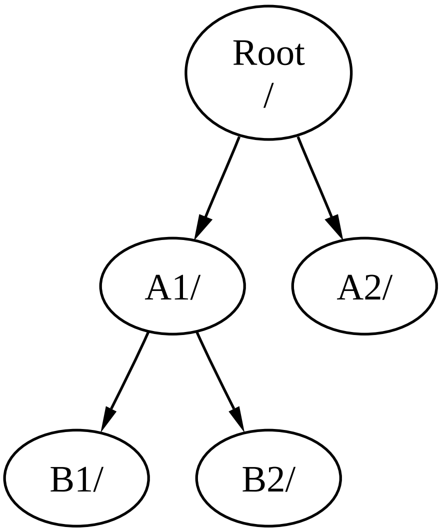
Áò õðïèÝóïõìå ðùò Ý÷åôå ôñßá óõóôÞìáôá áñ÷åßùí, ôá ïíïìÜæïõìå `A`, `B` êáé `C`. ÊÜèå óýóôçìá áñ÷åßïõ Ý÷åé Ýíáí ñéæéêü êáôÜëïãï, ï ïðïßïò ðåñéÝ÷åé äýï Üëëïõò êáôáëüãïõò, ðïõ ôïõò ïíïìÜæïõìå `A1`, `A2` (êáé ðáñïìïßùò `B1`, `B2` êáé `C1`, `C2`).

Áò èåùñÞóïõìå üôé ôï `A` åßíáé ôï root óýóôçìá áñ÷åßùí. Áí ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `ls` ãéá íá äåßôå ôá ðåñéå÷üìåíá áõôïý ôïõ êáôáëüãïõ, èá äåßôå äýï õðïêáôáëüãïõò, `A1` êáé `A2`. Ôï äÝíôñï ôïõ êáôáëüãïõ ìïéÜæåé óáí áõôü:



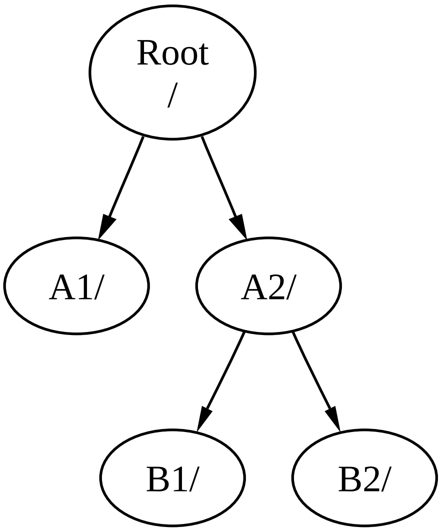
ÊÜèå óýóôçìá áñ÷åßùí ðñÝðåé íá ðñïóáñôÜôáé óå Ýíá êáôÜëïãï äéáöïñåôéêïý óõóôÞìáôïò áñ÷åßùí. Áò õðïèÝóïõìå ðùò èÝëåôå íá ðñïóáñôÞóåôå ôï óýóôçìá áñ÷åßïõ `B` óôïí `êáôÜëïãï  A1`. Ï ñéæéêüò êáôÜëïãïò ôïõ `B` áíôéêáèéóôÜ ôïí

`A1`, êáé ïé êáôÜëïãïé ôïõ `B` åìöáíßæïíôáé áíáëüãùò:



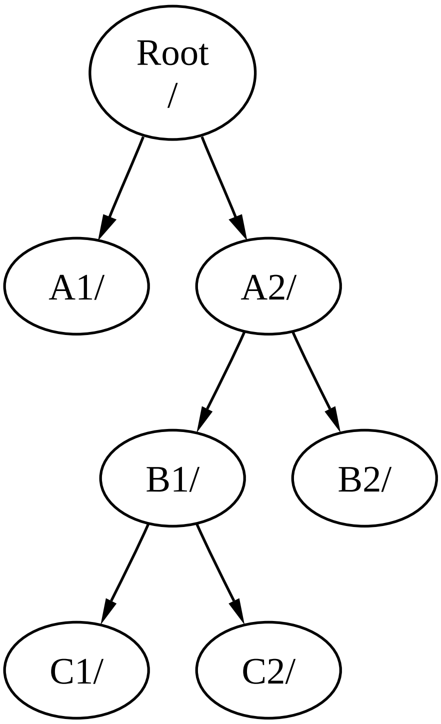
¼ëá ôá áñ÷åßá ðïõ ðåñéÝ÷ïíôáé óôïõò êáôáëüãïõò `B1` êáé `B2` ôá âñßóêïõìå ìå ôç äéáäñïìÞ `/A1/B1` Þ ìå `/A1/B2` áíôßóôïé÷á. ¼ëá ôá áñ÷åßá ðïõ âñßóêïíôáí óôï `/A1` åßíáé ðñïóùñéíÜ êñõììÝíá. Èá åðáíåìöáíéóôïýí üôáí ï `B` èá *áðïðñïóáñôçèåß* áðü ôïí A.

Áí ï `B` åß÷å ðñïóáñôçèåß óôïí `A2` ôüôå ôï äéÜãñáììá èá Ýäåé÷íå êÜðùò Ýôóé:

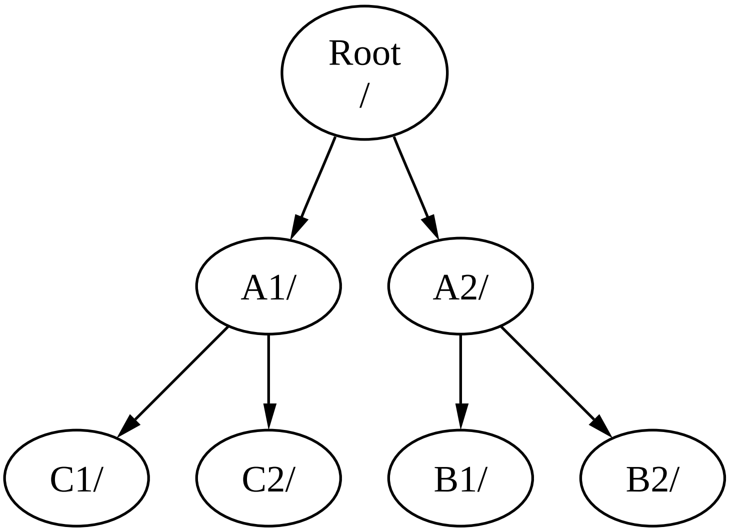


êáé ïé äéáäñïìÝò èá Þôáí `/A2/B1` êáé `/A2/B2` áíôßóôïé÷á.

Ôá óõóôÞìáôá áñ÷åßùí ìðïñïýí íá ðñïóáñôþíôáé óôçí êïñõöÞ Üëëùí óõóôçìÜôùí. Óõíå÷ßæïíôáò ôï ôåëåõôáßï ðáñÜäåéãìá, ôï óýóôçìá áñ÷åßïõ `C` èá ìðïñïýóå íá ðñïóáñôçèåß óôçí êïñõöÞ ôïõ êáôáëüãïõ `B1` óôï óýóôçìá áñ÷åßïõ `B`, ïäçãþíôáò óå áõôÞí ôçí êáôáíïìÞ:



[1] áêüìç ôï `C` èá ìðïñïýóå íá ðñïóáñôçèåß Üìåóá óôï óýóôçìá áñ÷åßïõ `A`, êÜôù áðü ôïí êáôÜëïãï `A1`:



Áí ãíùñßæåôå ôï óýóôçìá MS-DOS, åßíáé ðáñüìïéï, áëëÜ ü÷é áêñéâþò ôï ßäéï, ìå ôçí åíôïëÞ `join`.

Áõôü óõíÞèùò äåí åßíáé êÜôé ðïõ ðñÝðåé íá ãíùñßæåôå Üìåóá. ÔõðéêÜ, åóåßò äçìéïõñãåßôå óõóôÞìáôá áñ÷åßùí üôáí åãêáèéóôÜôå ôï FreeBSD êáé áðïöáóßæåôå ôï óçìåßï ðñïóÜñôçóçò áõôþí, êáé Ýðåéôá äåí ÷ñåéÜæåôáé íá ôá áëëÜîåôå åêôüò áí ðñüêåéôáé íá ðñïóèÝóåôå Ýíá êáéíïýñãéï äßóêï.

Åßíáé áðüëõôá äõíáôüí íá Ý÷åôå Ýíá ìåãÜëï root óýóôçìá áñ÷åßùí, êáé íá ìçí ÷ñåéÜæåôáé íá äçìéïõñãÞóåôå Üëëá.

Ìå áõôÞ ôçí ôáêôéêÞ õðÜñ÷ïõí ìåñéêÜ ìåéïíåêôÞìáôá êáé Ýíá ðëåïíÝêôçìá.

ÐñïôåñÞìáôá Ðïëëáðëþí ÓõóôçìÜôùí Áñ÷åßùí

- Äéáöïñåôéêü óõóôÞìáôá áñ÷åßùí ìðïñïýí íá Ý÷ïõí äéáöïñåôéêÝò *åðéëïãÝò ðñïóÜñôçóçò*. Ãéá ðáñÜäåéãìá, ìå ðñïóåêôéêü ó÷åäéáóìü, ôï root óýóôçìá áñ÷åßùí ìðïñåß íá ðñïóáñôçèåß ìüíï ãéá áíÜãíùóç, þóôå íá åßíáé áäýíáôç ç äéáãñáöÞ Þ ç ìåôáôñïðÞ êÜðïéïõ óçìáíôéêïý áñ÷åßïõ. Äéá÷ùñßæïíôáò óõóôÞìáôá áñ÷åßùí ìå äõíáôüôçôá åããñáöÞò áðü ôïí ÷ñÞóôç, üðùò ï `/home`, åðéôñÝðåé åðßóçò ôçí ðñïóÜñôçóç ôïõò ùò *nosuid*. ÁõôÞ ç åðéëïãÞ ðåñéïñßæåé ôçí ÷ñÞóç åêôåëÝóéìùí ðïõ åßíáé áðïèçêåõìÝíá óôï óýóôçìá áñ÷åßùí, ìå åíåñãïðïéçìÝíá ôá bits *suid*/*guid*, âåëôéþíïíôáò ðéèáíþò ôçí áóöÜëåéá.
- ÁíÜëïãá ìå ôï ðùò èá ÷ñçóéìïðïéçèåß ôï óýóôçìá áñ÷åßùí, ôï FreeBSD ñõèìßæåé ìå ôïí êáëýôåñï ôñüðï ôçí äéÜôáîç ôùí áñ÷åßùí óôï óýóôçìá. ÅðïìÝíùò Ýíá óýóôçìá ðïõ ðåñéÝ÷åé ðïëëÜ ìéêñÜ áñ÷åßá ðïõ ìåôáâÜëëïíôáé óõ÷íÜ, èá Ý÷åé äéáöïñåôéêÞ äéÜôáîç áðü Ýíá Üëëï ðïõ ðåñéÝ÷åé ëéãüôåñá óå áñéèìü, áëëÜ ðéï ìåãÜëá áñ÷åßá. ÅÜí Ý÷åôå Ýíá ìïíáäéêü óýóôçìá áñ÷åßùí, ôüôå ÷Üíåôå áõôÞ ôç äõíáôüôçôá.
- Ôá óõóôÞìáôá áñ÷åßùí ôïõ FreeBSD åßíáé ðïëý éó÷õñÜ. Ùóôüóï, ìéá áäõíáìßá óå êÜðïéï óçìáíôéêü óçìåßï ìðïñåß áêüìç íá ïäçãÞóåé óå êáôÜññåõóç ôçò äïìÞò ôïõ óõóôÞìáôïò áñ÷åßùí. Ï äéá÷ùñéóìüò ôùí äåäïìÝíùí óáò óå ðïëëáðëÜ óõóôÞìáôá áñ÷åßùí êÜíåé ðéï åýêïëç ìéá ðéèáíÞ åðáíáöïñÜ áðü backup, üôáí áõôü åßíáé áíáãêáßï.

ÐñïôåñÞìáôá åíüò Ìïíïêüììáôïõ ÓõóôÞìáôïò Áñ÷åßïõ

- Ôá óõóôÞìáôá áñ÷åßùí åßíáé óõãêåêñéìÝíïõ óôáèåñïý ìåãÝèïõò. Áí äçìéïõñãÞóåôå Ýíá óýóôçìá áñ÷åßùí êáôÜ ôçí åãêáôÜóôáóç ôïõ FreeBSD êáé ôïõ äþóåôå Ýíá ïñéóìÝíï ìÝãåèïò, ìðïñåß áñãüôåñá íá áíáêáëýøåôå ðùò ÷ñåéÜæåóôå íá ôï êÜíåôå ìåãáëýôåñï. Áõôü äåí åßíáé åýêïëá ðñáãìáôïðïéÞóéìï ÷ùñßò backup, áíáäçìéïõñãßá ôïõ óõóôÞìáôïò áñ÷åßïõ ìå ôï íÝï ìÝãåèïò, êáé åðáíáöïñÜ ôùí áðïèçêåõìÝíùí äåäïìÝíùí.

> **Óçìáíôéêü:** Óôï FreeBSD ðåñéÝ÷åôáé ç åíôïëÞ growfs(8), ç ïðïßá åðéôñÝðåé íá áõîÞóïõìå ôï ìÝãåèïò åíüò óõóôÞìáôïò áñ÷åßùí êáôÜ ôç ëåéôïõñãßá ôïõ, áöáéñþíôáò áõôüí ôïí ðåñéïñéóìü.

Ôá óõóôÞìáôá áñ÷åßùí ðåñéÝ÷ïíôáé óå êáôáôìÞóåéò (partitions). Áõôü äåí Ý÷åé ôçí ßäéá Ýííïéá ìå ôçí êïéíÞ ÷ñÞóç ôïõ üñïõ êáôÜôìçóç (üðùò ãéá ðáñÜäåéãìá, ç êáôÜôìçóç ôïõ MS-DOS), ëüãù ôçò êëçñïíïìéÜò ðïõ öÝñåé ôï FreeBSD áðü ôï UNIX. ÊÜèå êáôÜôìçóç áíáãíùñßæåôáé áðü Ýíá ëáôéíéêü ÷áñáêôÞñá îåêéíþíôáò áðü a Ýùò ôï h. ÊÜèå êáôÜôìçóç ìðïñåß íá ðåñéÝ÷åé ìüíï Ýíá óýóôçìá áñ÷åßùí, ôï ïðïßï óçìáßíåé ðùò ç áíáöïñÜ óôá óõóôÞìáôá áñ÷åßùí ãßíåôáé åßôå áðü ôï ôõðéêü óçìåßï ðñïóÜñôçóçò óôçí éåñáñ÷ßá ôïõ óõóôÞìáôïò áñ÷åßùí, åßôå áðü ôï ëáôéíéêü ÷áñáêôÞñá ôçò êáôÜôìçóçò.

Åðßóçò ôï FreeBSD ÷ñçóéìïðïéåß ìÝñïò áðü ôï äßóêï ãéá *÷þñï swap* . Ï ÷þñïò Swap ðáñÝ÷åé óôï FreeBSD *åéêïíéêÞ ìíÞìç (virtual memory)*. Áõôü åðéôñÝðåé óôïí õðïëïãéóôÞ óáò íá óõìðåñéöÝñåôáé óáí íá åß÷å ðïëý ðåñéóóüôåñç ìíÞìç áðü üóï ðñáãìáôéêÜ Ý÷åé. ¼ôáí ôï FreeBSD äåí Ý÷åé äéáèÝóéìç ìíÞìç ìåôáöÝñåé ìåñéêÜ áðü ôá äåäïìÝíá ðïõ äåí ÷ñçóéìïðïéïýíôáé, ôçí ðñïêåéìÝíç óôéãìÞ, óôïí ÷þñï swap, êáé üôáí ôá ÷ñåéáóôåß ôá åðáíáöÝñåé (åíþ ìåôáöÝñåé êÜðïéá Üëëá äåäïìÝíá óôïí ÷þñï swap).

ÕðÜñ÷ïõí êÜðïéåò óõìâÜóåéò ó÷åôéêÜ ìå ôéò êáôáôìÞóåéò

ÊáôÜôìçóç	Óýìâáóç
a	ÓõíÞèùò ðåñéëáìâÜíåé ôï root óýóôçìá áñ÷åßùí
b	ÓõíÞèùò ðåñéëáìâÜíåé ôïí ÷þñï swap

ÊáôÜôìçóç	Óýìâáóç
c	ÓõíÞèùò éäßïõ ìåãÝèïõò ìå ôçí ðåñéëáìâáíüìåíç öÝôá (slice). Áõôü åðéôñÝðåé óå âïçèçôéêÜ ðñïãñÜììáôá ðïõ ðñÝðåé íá äïõëÝøïõí óå ïëüêëçñï ôï êïììÜôé (ãéá ðáñÜäåéãìá, Ýíáò áíé÷íåõôÞò êáôåóôñáììÝíùí ìðëïê) íá ëåéôïõñãïýí óôçí c êáôÜôìçóç. ÊáíïíéêÜ äåí èá ðñÝðåé íá äçìéïõñãåßôå óýóôçìá áñ÷åßùí óå áõôÞ ôçí êáôÜôìçóç.
d	Ç êáôÜôìçóç d åß÷å óôï ðáñåëèüí ìéá åéäéêÞ áíôéóôïé÷ßá, êÜôé ðïõ äåí éó÷ýåé ðëÝïí óÞìåñá, åðïìÝíùò ç d ìðïñåß íá ÷ñçóéìïðïéåßôáé óáí ìéá êáíïíéêÞ êáôÜôìçóç.

ÊÜèå êáôÜôìçóç ðïõ ðåñéÝ÷åé Ýíá óýóôçìá áñ÷åßùí áðïèçêåýåôáé óôï FreeBSD óå ìéá ôïðïèåóßá ðïõ ïíïìÜæåôáé *öÝôá (slice)*. Ç öÝôá åßíáé Ýíáò üñïò ôïõ FreeBSD ãéá áõôü ðïõ êïéíþò áðïêáëåßôáé êáôÜôìçóç, êáé áõôü åðßóçò ïöåßëåôáé óôçí êáôáãùãÞ ôïõ FreeBSD áðü ôï UNIX. Ïé öÝôåò áñéèìïýíôáé áñ÷ßæïíôáò áðü ôï 1 Ýùò ôï 4.

Ï áñéèìüò ôçò öÝôáò áêïëïõèåß ôï üíïìá óõóêåõÞò ìåôÜ ôï ðñüèåìá s îåêéíþíôáò áðü ôï 1. ÅðïìÝíùò, “da0*s1*” åßíáé ç ðñþôç öÝôá ôïõ ðñþôïõ ïäçãïý SCSI. Ìðïñïýí íá õðÜñ÷ïõí ìÝ÷ñé ôÝóóåñéò öÝôåò óå êÜèå äßóêï, áëëÜ ìðïñåßôå íá äçìéïõñãÞóåôå ëïãéêÝò öÝôåò ìÝóá óå êáôÜëëçëïõ ôýðïõ öõóéêÝò öÝôåò. Óå áõôÝò ôéò åêôåôáìÝíåò öÝôåò ç áñßèìçóç îåêéíÜåé áðü ôï 5, åðïìÝíùò “ad0*s5*” åßíáé ç ðñþôç åêôåôáìÝíç öÝôá óôïí ðñþôï äßóêï IDE. ÁõôÝò ïé óõóêåõÝò ÷ñçóéìïðïéïýíôáé áðü óõóôÞìáôá áñ÷åßùí ðïõ ðñÝðåé íá êáôáëáìâÜíïõí ìéá ïëüêëçñç öÝôá.

Ïé öÝôåò, ïé “åðéêßíäõíá áöïóéùìÝíïé (dangerously dedicated) ” öõóéêïß ïäçãïß êáèþò êáé Üëëïé ïäçãïß, ðåñéÝ÷ïõí *êáôáôìÞóåéò*, ïé ïðïßåò ðáñïõóéÜæïíôáé ìå ëáôéíéêïýò ÷áñáêôÞñåò áðü ôï a Ýùò ôï h. Áõôüò ï ÷áñáêôÞñáò áíáöÝñåôáé óôï üíïìá óõóêåõÞò, åðïìÝíùò “da0*a*” åßíáé ç a êáôÜôìçóç óôïí ðñþôï ïäçãü da, ï ïðïßïò åßíáé “åðéêßíäõíá áöïóéùìÝíïò”. Ç “ad1s3*e*” åßíáé ç ðÝìðôç êáôÜôìçóç óôçí ôñßôç öÝôá ôïõ äåýôåñïõ ïäçãïý äßóêïõ IDE.

Ôåëéêþò, êÜèå äßóêïò óôï óýóôçìá åßíáé ìïíáäéêÜ ïíïìáóìÝíïò. ÊÜèå üíïìá äßóêïõ îåêéíÜ ìå Ýíá êùäéêü ðïõ õðïäåéêíýåé ôïí ôýðï ôïõ äßóêïõ, êáé Ýíá áñéèìü ðïõ õðïäçëþíåé ðïéïò äßóêïò åßíáé. Áíôßèåôá ìå ôéò öÝôåò, ïé äßóêïé áñéèìïýíôáé îåêéíþíôáò áðü ôï 0. Ïé ðéï óõíÞèåéò êùäéêïß ðïõ èá óõíáíôÞóåôå áíáöÝñïíôáé óôçí Ðßíáêáò 4-1.

¼ôáí ãßíåôáé áíáöïñÜ óå ìéá êáôÜôìçóç, ôï FreeBSD æçôÜ íá äçëùèåß åðßóçò ç ïíïìáóßá ôçò öÝôáò êáé ôïõ äßóêïõ ðïõ ðåñéÝ÷åé ôçí êáôÜôìçóç, åíþ óôçí ðåñßðôùóç ðïõ áíáöÝñåóôå óå ìéá öÝôá èá ðñÝðåé íá äçëþóåôå ôï üíïìá ôïõ äßóêïõ. ÅðïìÝíùò, üôáí áíáöÝñåóôå óå ìéá êáôÜôìçóç ÷ñåéÜæåôáé íá äçëþíåôå ôï üíïìá ôïõ äßóêïõ, s, ôïí áñéèìü ôçò öÝôáò, êáé ôïí ÷áñáêôÞñá ôçò êáôÜôìçóçò. Ðáñáäåßãìáôá ìðïñåßôå íá âñåßôå óôçí ÐáñÜäåéãìá 4-1.

Ç ÐáñÜäåéãìá 4-2 ðáñïõóéÜæåé Ýíá åííïéïëïãéêü ìïíôÝëï ãéá ôç äïìÞ ôïõ äßóêïõ ðïõ èá óáò âïçèÞóåé íá êáôáëÜâåôå êáëýôåñá êÜðïéá ðñÜãìáôá.

Ãéá íá åãêáôáóôÞóåôå ôï FreeBSD ðñÝðåé ðñþôá íá ñõèìßóåôå ôéò öÝôåò ôïõ äßóêïõ, íá äçìéïõñãÞóåôå ôéò êáôáôìÞóåéò ìÝóá óôéò öÝôåò ðïõ èá ÷ñçóéìïðïéÞóåôå ãéá ôï FreeBSD, Ýðåéôá íá äçìéïõñãÞóåôå Ýíá óýóôçìá áñ÷åßùí (Þ ÷þñï swap) óå êÜèå êáôÜôìçóç, êáé ôÝëïò íá áðïöáóßóåôå óå ðïéï óçìåßï èá ðñïóáñôçèåß ôï óýóôçìá áñ÷åßùí.

Ðßíáêáò 4-1. Êùäéêïß Óõóêåõþí Äßóêùí

Êþäéêáò	Óçìáóßá
`ad`	Äßóêïò ATAPI (IDE)
`da`	Äßóêïò SCSI Üìåóçò ðñüóâáóçò
`acd`	ATAPI (IDE) CDROM
`cd`	SCSI CDROM
`fd`	ÌïíÜäá ÄéóêÝôáò (Floppy)

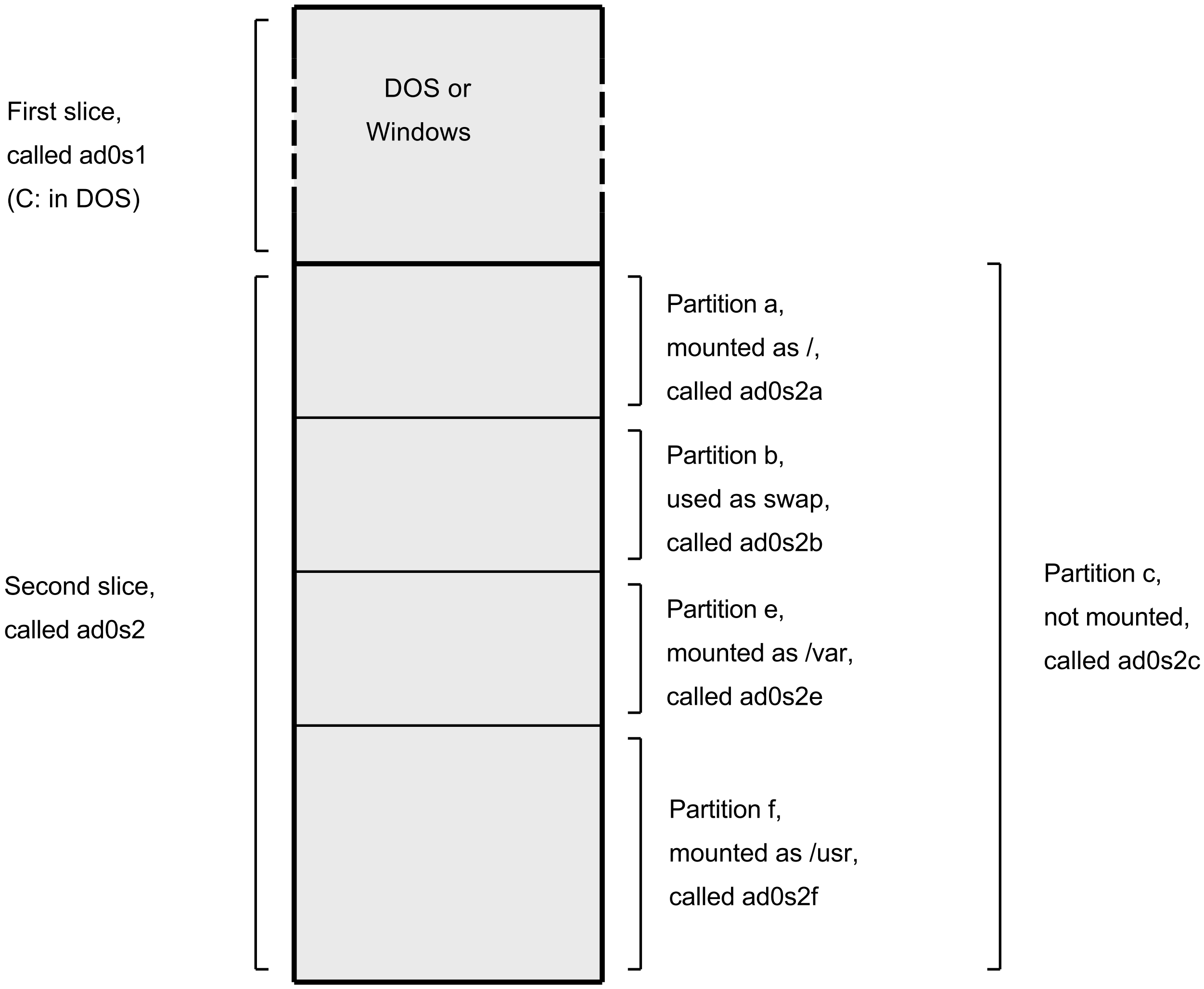
ÐáñÜäåéãìá 4-1. Õðïäåßãìáôá ÏíïìÜôùí Äßóêïõ, ÖÝôáò, ÊáôÜôìçóçò

Ïíïìáóßá	Óçìáóßáé
`ad0s1a`	Ç ðñþôç êáôÜôìçóç (`a`) óôçí ðñþôç öÝôá (`s1`) ôïõ ðñþôïõ äßóêïõ IDE (`ad0`).
`da1s2e`	Ç ðÝìðôç êáôÜôìçóç (`e`) óôçí äåýôåñç öÝôá (`s2`) ôïõ äåýôåñïõ äßóêïõ SCSI (`da1`).

ÐáñÜäåéãìá 4-2. Åííïéïëïãéêü ÌïíôÝëï åíüò Äßóêïõ

Ôï äéÜãñáììá ðáñïõóéÜæåé ìéá åéêüíá ôïõ ðñþôïõ äßóêïõ IDE ðïõ åßíáé ðñïóáñôçìÝíïò óôï óýóôçìá. Áò õðïèÝóïõìå ðùò ï äßóêïò Ý÷åé ìÝãåèïò 4 GB, êáé ðåñéÝ÷åé äýï öÝôåò ôùí 2 GB (êáôáôìÞóåéò MS-DOS). Ç ðñþôç öÝôá ðåñéÝ÷åé Ýíá äßóêï MS-DOS, `C:`, êáé ç äåýôåñç öÝôá ìßá åãêáôÜóôáóç FreeBSD. Óå áõôü ôï ðáñÜäåéãìá, ç åãêáôÜóôáóç FreeBSD Ý÷åé ôñåéò êáôáôìÞóåéò äåäïìÝíùí êáé ìßá êáôÜôìçóç swap.

Êáèåìßá áðü ôéò ôñåéò êáôáôìÞóåéò èá ðåñéÝ÷åé Ýíá óýóôçìá áñ÷åßùí. Ç êáôÜôìçóç `a` èá ÷ñçóéìïðïéçèåß ãéá ôï root óýóôçìá áñ÷åßùí, ç `e` ãéá ôç äïìÞ êáôÜëïãïõ `/var`, êáé ç `f` ãéá ôç äïìÞ êáôáëüãïõ `/usr`.


First slice,
called ad0s1
(C: in DOS)
DOS or
Windows
Second slice,
called ad0s2
Partition a,
mounted as /,
called ad0s2a
Partition b,
used as swap,
called ad0s2b
Partition e,
mounted as /var,
called ad0s2e
Partition f,
mounted as /usr,
called ad0s2f
Partition c,
not mounted,
called ad0s2c

(not to scale)

4.6 ÐñïóÜñôçóç êáé ÁðïðñïóÜñôçóç ÓõóôçìÜôùí Áñ÷åßùí

¸íá óýóôçìá áñ÷åßùí áíáðáñéóôÜôáé êáëýôåñá óå ìïñöÞ äÝíôñïõ, ìå ôéò ñßæåò ôïõ óôï `/`. Ïé êáôÜëïãïé `/dev`, `/usr`, êáé Üëëïé åßíáé êëáäéÜ ôïõ êáôáëüãïõ root, êáé ìðïñåß íá Ý÷ïõí ìå ôç óåéñÜ ôïõò, ôá äéêÜ ôïõò êëáäéÜ, üðùò ôïí `/usr/local`, êáé ïýôù êáèåîÞò.

ÕðÜñ÷ïõí äéÜöïñïé ëüãïé ãéá ôïõò ïðïßïõò èá Ýðñåðå íá ôïðïèåôÞóïõìå êÜðïéïõò áðü áõôïýò ôïõò êáôáëüãïõò óå äéáöïñåôéêÜ óõóôÞìáôá áñ÷åßùí. Ï êáôÜëïãïò `/var` ðåñéÝ÷åé ôïõò êáôáëüãïõò `log/`, `spool/`, êáé äéÜöïñïõò

Üëëïõò ôýðïõò ðñïóùñéíþí áñ÷åßùí, êáé ãéá ôï ëüãï áõôü ìðïñåß íá ãåìßóåé. Äåí èá Þôáí êáëÞ éäÝá íá ãåìßóåé ôï root óýóôçìá áñ÷åßùí, åðïìÝíùò ï äéá÷ùñéóìüò ôïõ `/var` áðü ôïí `/` åßíáé óõ÷íÜ åðéèõìçôüò.

¸íáò Üëëïò óõíçèéóìÝíïò ëüãïò íá Ý÷ïõìå äéÜöïñïõò êáôáëüãïõò óå äéáöïñåôéêÜ óõóôÞìáôá áñ÷åßùí åßíáé üôáí ðñüêåéôáé íá öéëïîåíçèïýí óå äéáöïñåôéêïýò öõóéêïýò äßóêïõò, Þ åßíáé îå÷ùñéóôïß åéêïíéêïß äßóêïé, üðùò óõìâáßíåé ìå ôï Äéêôõáêü Óýóôçìá Áñ÷åßùí (Network File System), êáé ôïõò ïäçãïýò CDROM.

4.6.1 Ôï Áñ÷åßï `fstab`

ÊáôÜ ôç äéáäéêáóßá åêêßíçóçò, ôá óõóôÞìáôá áñ÷åßùí ðïõ áíáöÝñïíôáé óôï `/etc/fstab` ðñïóáñôþíôáé áõôüìáôá (åêôüò áí áíáöÝñïíôáé ìå ôçí åðéëïãÞ `noauto`).

Ôï áñ÷åßï `/etc/fstab` ðåñéÝ÷åé ìéá óåéñÜ áðü ãñáììÝò ìå äéÜôáîç üðùò ç áêüëïõèç:

```
device          /mount-point  fstype      options        dumpfreq      passno
```

`device`

¼íïìá óõóêåõÞò (ç ïðïßá èá ðñÝðåé íá õðÜñ÷åé), üðùò åîçãåßôáé óôçí ÔìÞìá 19.2.

`mount-point`

ÊáôÜëïãïò (èá ðñÝðåé íá õðÜñ÷åé) óôïí ïðïßï ðñïóáñôÜôáé ôï óýóôçìá áñ÷åßùí.

`fstype`

Ï ôýðïò ôïõ óõóôÞìáôïò áñ÷åßùí ðïõ èá äïèåß óôçí mount(8). Ôï ðñïêáèïñéóìÝíï óýóôçìá áñ÷åßùí ôïõ FreeBSD åßíáé ôï `ufs`.

`options`

Ôï `rw` ãéá óõóôÞìáôá áñ÷åßùí áíÜãíùóçò- åããñáöÞò (read- write), Þ `ro` ãéá óõóôÞìáôá áñ÷åßùí ìüíï áíÜãíùóçò (read-only), óõìðëçñùìÝíï ìå üðïéá Üëëç åðéëïãÞ ìðïñåß íá ÷ñåéÜæåóôå. Ìßá óõíÞèçò åðéëïãÞ åßíáé ç `noauto` ãéá óõóôÞìáôá áñ÷åßùí ðïõ äåí ðñïóáñôþíôáé áõôüìáôá êáôÜ ôéò äéåñãáóßåò åêêßíçóçò ôïõ óõóôÞìáôïò. ¶ëëåò åðéëïãÝò áíáöÝñïíôáé óôçí óåëßäá âïÞèåéáò mount(8).

`dumpfreq`

Áõôü ôï ðåäßï ÷ñçóéìïðïéåßôáé áðü ôï dump(8) ãéá íá ïñßóåé ðïéá óõóôÞìáôá áñ÷åßùí ÷ñåéÜæïíôáé dumping. Áí ôï ðåäßï áðïõóéÜæåé, ôüôå ç ðñïêáèïñéóìÝíç ôéìÞ ôïõ åßíáé ìçäÝí.

`passno`

Áõôü ïñßæåé ôçí óåéñÜ ìå ôçí ïðïßá èá åëÝã÷ïíôáé ôá óõóôÞìáôá áñ÷åßùí. ÓõóôÞìáôá áñ÷åßùí ðïõ äåí åðéèõìïýìå íá åëåã÷èïýí èá ðñÝðåé íá Ý÷ïõí óôï ðåäßï `passno` ôéìÞ ìçäÝí. Ôï root óýóôçìá áñ÷åßùí (ôï ïðïßï ðñÝðåé íá åëåã÷èåß ðñéí áðü üëá ôá Üëëá) èá Ý÷åé óôï ðåäßï `passno` ôçí ôéìÞ Ýíá êáé üëá ôá Üëëá óõóôÞìáôá áñ÷åßùí èá Ý÷ïõí óôï ðåäßï `passno` ôéìÝò ìåãáëýôåñåò áðü Ýíá. Áí ðåñéóóüôåñá áðü Ýíá óõóôÞìáôá áñ÷åßùí Ý÷ïõí ôçí ßäéá ôéìÞ `passno` ôüôå ôï fsck(8) èá åðé÷åéñÞóåé íá åëÝãîåé ðáñÜëëçëá ôá óõóôÞìáôá áñ÷åßùí, áí áõôü åßíáé åöéêôü.

Óõìâïõëåõôåßôå ôçí óåëßäá âïçèåßáò fstab(5) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôçí ìïñöÞ ôïõ áñ÷åßïõ `/etc/fstab` êáé ãéá ôéò åðéëïãÝò ðïõ ìðïñåß íá ðåñéÝ÷åé.

4.6.2 Ç ÅíôïëÞ `mount`

Ç åíôïëÞ mount(8) åßíáé áõôü áêñéâþò ðïõ ÷ñåéÜæåóôå ãéá ôçí ðñïóÜñôçóç óõóôçìÜôùí áñ÷åßùí.

Ç âáóéêÞ ìïñöÞ ôçò åßíáé:

```
# mount device mountpoint
```

ÕðÜñ÷åé ðëçèþñá åðéëïãþí, üðùò áíáöÝñåôáé óôçí óåëßäá âïçèåßáò mount(8), áëëÜ ïé ðéï óõíÞèåéò åßíáé:

ÅðéëïãÝò åíôïëÞò mount

`-a`

ÐñïóÜñôçóç üëùí ôùí óõóôçìÜôùí áñ÷åßùí ðïõ áíáöÝñïíôáé óôï `/etc/fstab`, åêôüò áõôþí ðïõ öÝñïõí ôçí åðéëïãÞ “noauto”, åîáéñïýíôáé ìÝóù ôçò åðéëïãÞò `-t`, Þ áõôþí ðïõ Þäç Ý÷ïõí ðñïóáñôçèåß.

`-d`

ÊÜíåé ôá ðÜíôá åêôüò áðü ôçí ðñáãìáôéêÞ ðñïóÜñôçóç ôïõ óõóôÞìáôïò. ÁõôÞ ç åðéëïãÞ åßíáé ÷ñÞóéìç óå óõíäõáóìü ìå ôï ðñüèåìá `-v` ãéá íá ðñïóäéïñéóôåß ôé áêñéâþò ðñïóðáèåß íá êÜíåé ç mount(8) ôçí óõãêåêñéìÝíç óôéãìÞ.

`-f`

ÁíáãêÜæåé ôçí ðñïóÜñôçóç åíüò ìç-êáèáñïý óõóôÞìáôïò áñ÷åßùí (åðéêßíäõíï), Þ åîáíáãêÜæåé ôçí áíÜêëçóç ðñüóâáóçò åããñáöÞò üôáí õðïâéâÜæåôáé ç ðñïóÜñôçóç åíüò óõóôÞìáôïò áñ÷åßùí áíÜãíùóçò-åããñáöÞò (read-write) óå ìüíï-áíÜãíùóçò.

`-r`

ÐñïóáñôÜ ôï óýóôçìá áñ÷åßùí óå êáôÜóôáóç ìüíï-áíÜãíùóçò. Åßíáé áêñéâþò ôï ßäéï ìå ôç ÷ñÞóç ôïõ ðñïèÝìáôïò `ro` ìå ôçí åðéëïãÞ `-o`.

`-t` *`fstype`*

ÐñïóáñôÜ ôï õðÜñ÷ïí óýóôçìá áñ÷åßùí, ÷ñçóéìïðïéþíôáò ôïí ôýðï óõóôÞìáôïò áñ÷åßùí ðïõ äßíåôáé, Þ ðñïóáñôÜ ìüíï óõóôÞìáôá áñ÷åßùí ôïõ óõãêåêñéìÝíïõ ôýðïõ, åÜí äïèåß ìáæß ìå ôçí åðéëïãÞ `-a`.

Ôï “ufs” åßíáé ï ðñïåðéëåãìÝíïò ôýðïò óõóôÞìáôïò áñ÷åßùí.

`-u`

Áíáíåþíåé ôéò åðéëïãÝò ðñïóÜñôçóçò óôï óýóôçìá áñ÷åßùí.

`-v`

ÓõìðåñéëáìâÜíåé áíáëõôéêÞ áíáöïñÜ.

`-w`

ÐñïóáñôÜ ôï óýóôçìá áñ÷åßùí ãéá áíÜãíùóç-åããñáöÞ (read-write).

Ç åðéëïãÞ `-o` äÝ÷åôáé ìßá óåéñÜ áðü åðéëïãÝò ÷ùñéóìÝíåò ìå êüììá, ðåñéëáìâÜíïíôáò ôéò áêüëïõèåò:

noexec

Äåí åðéôñÝðåôáé ç ëåéôïõñãßá åêôåëÝóéìùí óå áõôü ôï óýóôçìá áñ÷åßùí. Áõôü åßíáé åðßóçò ìéá åðéëïãÞ áóöáëåßáò.

nosuid

Äåí ëáìâÜíïíôáé õð’ üøéí setuid Þ setgid flags óôï óýóôçìá áñ÷åßùí.

4.6.3 Ç ÅíôïëÞ `umount`

Ç åíôïëÞ umount(8) ðáßñíåé, ùò ðáñÜìåôñï, Ýíá åê ôùí óçìåßùí ðñïóÜñôçóçò, ôï üíïìá ìéáò óõóêåõÞò, Þ ôéò åðéëïãÝò `-a` Þ `-A`.

¼ëïé ïé ôýðïé äÝ÷ïíôáé ôçí `-f` ãéá íá åîáíáãêÜóïõí óå áðïðñïóÜñôçóç, êáé ôçí `-v` ãéá áíáëõôéêÞ áíáöïñÜ. Óáò ðñïåéäïðïéïýìå üôé ç åðéëïãÞ `-f` ãåíéêÜ äåí åßíáé êáëÞ éäÝá. Ç åî’ áíáãêáóìïý áðïðñïóÜñôçóç ìðïñåß íá ïäçãÞóåé óå êáôÜññåõóç ôïõ õðïëïãéóôÞ Þ íá êáôáóôñÝøåé äåäïìÝíá óôï óýóôçìá áñ÷åßùí.

Ïé `-a` êáé `-A` ÷ñçóéìïðïéïýíôáé ãéá íá áðïðñïóáñôÞóïõí üëá ôá ðñïóáñôçìÝíá óõóôÞìáôá áñ÷åßùí, óýìöùíá êáé ìå ôéò åðéëïãÝò ðïõ äßíïíôáé áðü ôï `-t`, áí õðÜñ÷åé. Ôï `-A`, ùóôüóï, äåí èá åðé÷åéñÞóåé íá áðïðñïóáñôÞóåé ôï root óýóôçìá áñ÷åßùí.

4.7 Äéåñãáóßåò

To FreeBSD åßíáé Ýíá ëåéôïõñãéêü óýóôçìá multi-tasking. Áõôü óçìáßíåé ðùò êÜèå óôéãìÞ ìðïñïýí íá ôñÝ÷ïõí ðáñáðÜíù áðü Ýíá ðñïãñÜììáôá. ÊÜèå ðñüãñáììá ðïõ ôñÝ÷åé ïðïéáäÞðïôå óôéãìÞ ïíïìÜæåôáé *äéåñãáóßá* (process). ÊÜèå åíôïëÞ ðïõ ôñÝ÷åôå îåêéíÜåé ôïõëÜ÷éóôïí ìßá íÝá äéåñãáóßá, êáé õðÜñ÷ïõí êÜðïéåò äéåñãáóßåò ôïõ óõóôÞìáôïò ðïõ ôñÝ÷ïõí óõíÝ÷åéá ãéá íá êñáôïýí ôï óýóôçìá óå ëåéôïõñãßá.

ÊÜèå äéåñãáóßá ÷áñáêôçñßæåôáé áðü Ýíá ìïíáäéêü áñéèìü ðïõ ïíïìÜæåôáé *ID äéåñãáóßáò* Þ *PID*, êáé üðùò áêñéâþò óõìâáßíåé ìå ôá áñ÷åßá, êÜèå äéåñãáóßá Ý÷åé Ýíáí éäéïêôÞôç êáé Ýíá ãêñïõð. Ïé ðëçñïöïñßåò ôïõ éäéïêôÞôç êáé ôïõ ãêñïõð ÷ñçóéìïðïéïýíôáé ãéá íá ðñïóäéïñßæåôáé ðïéá áñ÷åßá êáé óõóêåõÝò ìðïñåß íá áíïßîåé ç óõãêåêñéìÝíç äéåñãáóßá, ÷ñçóéìïðïéþíôáò ôéò Üäåéåò áñ÷åßùí ðïõ óõæçôÞóáìå íùñßôåñá. Ïé ðåñéóóüôåñåò äéåñãáóßåò Ý÷ïõí åðßóçò ìßá ãïíéêÞ äéåñãáóßá. Ç ãïíéêÞ äéåñãáóßá åßíáé åêåßíç ç äéåñãáóßá ðïõ ôéò îåêßíçóå. Ãéá ðáñÜäåéãìá, åÜí ðëçêôñïëïãåßôå åíôïëÝò óôï êÝëõöïò, ôüôå ôï êÝëõöïò åßíáé ìßá äéåñãáóßá, êáé êÜèå åíôïëÞ ðïõ ôñÝ÷åôå åßíáé åðßóçò ìßá äéåñãáóßá. ÅðïìÝíùò êÜèå äéåñãáóßá ðïõ ôñÝ÷åôå ìå áõôüí ôïí ôñüðï èá Ý÷åé ãïíéêÞ äéåñãáóßá ôï êÝëõöïò óáò. Ç ìüíç åîáßñåóç åßíáé ìßá äéåñãáóßá ðïõ ïíïìÜæåôáé init(8). Ç `init` åßíáé ðÜíôá ç ðñþôç äéåñãáóßá, êáé åðïìÝíùò ôï PID ôçò åßíáé ðÜíôá 1. Ç `init` îåêéíÜ áõôüìáôá áðü ôïí ðõñÞíá êáôÜ ôçí åêêßíçóç ôïõ FreeBSD.

Äýï éäéáßôåñá ÷ñÞóéìåò åíôïëÝò ãéá íá ðáñáôçñåßôå ôéò äéåñãáóßåò óôï óýóôçìá, åßíáé ïé ps(1) êáé top(1). Ç åíôïëÞ `ps` ÷ñçóéìïðïéåßôáé ãéá ôçí ðñïâïëÞ ìéáò óôáôéêÞò ëßóôáò ôùí ôñÝ÷ïõóùí äéåñãáóéþí, êáé ìðïñåß íá åìöáíßæåé ôï PID ôïõò, ðüóç ìíÞìç ÷ñçóéìïðïéïýí, ôçí åíôïëÞ ìå ôçí ïðïßá îåêßíçóáí, êáé Üëëåò ðëçñïöïñßåò. Ç åíôïëÞ `top` åìöáíßæåé üëåò ôéò ôñÝ÷ïõóåò äéåñãáóßåò, êáé áíáíåþíåé ôçí ïèüíç óáò áíÜ ëßãá äåõôåñüëåðôá, åðïìÝíùò ìðïñåßôå íá ðáñáôçñåßôå ôé áêñéâþò êÜíåé ï õðïëïãéóôÞò óáò ôç äåäïìÝíç óôéãìÞ.

Ç `ps`, áðü ðñïåðéëïãÞ, åìöáíßæåé ìüíï ôéò åíôïëÝò ðïõ ôñÝ÷ïõí êáé áíÞêïõí óå åóÜò. Ãéá ðáñÜäåéãìá:

```
% ps
  PID  TT  STAT      TIME COMMAND
  298  p0  Ss     0:01.10 tcsh
 7078  p0  S      2:40.88 xemacs mdoc.xsl (xemacs-21.1.14)
```

```
37393  p0  I      0:03.11 xemacs freebsd.dsl (xemacs-21.1.14)
48630  p0  S      2:50.89 /usr/local/lib/netscape-linux/navigator-linux-4.77.bi
48730  p0  IW     0:00.00 (dns helper) (navigator-linux-)
72210  p0  R+     0:00.00 ps
  390  p1  Is     0:01.14 tcsh
 7059  p2  Is+    1:36.18 /usr/local/bin/mutt -y
 6688  p3  IWs    0:00.00 tcsh
10735  p4  IWs    0:00.00 tcsh
20256  p5  IWs    0:00.00 tcsh
  262  v0  IWs    0:00.00 -tcsh (tcsh)
  270  v0  IW+    0:00.00 /bin/sh /usr/X11R6/bin/startx -- -bpp 16
  280  v0  IW+    0:00.00 xinit /home/nik/.xinitrc -- -bpp 16
  284  v0  IW     0:00.00 /bin/sh /home/nik/.xinitrc
  285  v0  S      0:38.45 /usr/X11R6/bin/sawfish
```

¼ðùò ìðïñåßôå íá äåßôå óå áõôü ôï ðáñÜäåéãìá, ç Ýîïäïò áðü ôçí ps ðñïâÜëëåôáé óå óôÞëåò. `PID` åßíáé ôï PID ôçò äéåñãáóßáò üðùò áíáöÝñèçêå íùñßôåñá. Ôá PID äéáíÝìïíôáé áðü 1, Ýùò 99999, êáé üôáí îåðåñáóôïýí ôï 99999 îåêéíïýí áðü ôçí áñ÷Þ (Ýíá PID äåí ìðïñåß íá áðïäïèåß îáíÜ áí åßíáé Þäç óå ÷ñÞóç). Ç óôÞëç `TT` äåß÷íåé ôï ôåñìáôéêü (tty) ôïõ ðñïãñÜììáôïò ðïõ åêôåëåßôáé, êáé ìðïñåß íá áãíïçèåß áõôÞ ôç óôéãìÞ äß÷ùò ðñüâëçìá. Ç `STAT` õðïäåéêíýåé ôçí êáôÜóôáóç ôïõ ðñïãñÜììáôïò, êáé ðÜëé ìðïñåß íá áãíïçèåß. Ç `TIME` åßíáé ç ÷ñïíéêÞ äéÜñêåéá ðïõ ôï ðñüãñáììá áðáó÷ïëåß ôçí CPU, áõôü óõíÞèùò äåí åßíáé ï ÷ñüíïò åêôÝëåóçò áöïý ôá ðåñéóóüôåñá ðñïãñÜììáôá êáèõóôåñïýí ìå Üëëåò åñãáóßåò ðñéí áðáó÷ïëÞóïõí ôçí CPU. Ç ôåëåõôáßá óôÞëç, ç `COMMAND` åßíáé ç ãñáììÞ åíôïëÞò ðïõ äüèçêå ãéá íá ôñÝîåé ôï ðñüãñáììá.

Ç ps(1) õðïóôçñßæåé äéÜöïñåò åðéëïãÝò ãéá íá áëëÜîåé ôçí ãêÜìá ôùí ðëçñïöïñéþí ðïõ åìöáíßæïíôáé. Ìßá áðü ôéò ðéï ÷ñÞóéìåò åðéëïãÝò åßíáé ç `auxww`. Ç `a` åìöáíßæåé ðëçñïöïñßåò ãéá üëåò ôéò ôñÝ÷ïõóåò äéåñãáóßåò, ü÷é ìüíï ôéò äéêÝò óáò. Ç `u` åìöáíßæåé ôï üíïìá ÷ñÞóôç ôïõ éäéïêôÞôç ôçò äéåñãáóßáò, üðùò êáé ôç ÷ñÞóç ôçò ìíÞìçò. Ç `x` åìöáíßæåé ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò äéåñãáóßåò ôùí äáéìüíùí êáé ç `ww` áíáãêÜæåé ôçí ps(1) íá åìöáíßóåé ïëüêëçñç ôçí åíôïëÞ ãñáììÞò ãéá êÜèå äéåñãáóßá, áöïý óõíÞèùò åìöáíßæåôáé êïììÝíç ëüãù ôïõ ìÞêïõò ôçò ðïõ äåí ÷ùñÜ íá åìöáíéóôåß óôçí ïèüíç.

Ç Ýîïäïò ôçò top(1) åßíáé ðáñüìïéá. ¸íá äåßãìá åñãáóßáò ôçò ìïéÜæåé óáí áõôÞ:

```
% top
last pid: 72257;  load averages:  0.13,  0.09,  0.03    up 0+13:38:33  22:39:10
47 processes:  1 running, 46 sleeping
CPU states: 12.6% user,  0.0% nice,  7.8% system,  0.0% interrupt, 79.7% idle
Mem: 36M Active, 5256K Inact, 13M Wired, 6312K Cache, 15M Buf, 408K Free
Swap: 256M Total, 38M Used, 217M Free, 15% Inuse

  PID USERNAME PRI NICE  SIZE    RES STATE    TIME   WCPU    CPU COMMAND
72257 nik       28   0  1960K  1044K RUN      0:00 14.86%  1.42% top
 7078 nik        2   0 15280K 10960K select   2:54  0.88%  0.88% xemacs-21.1.14
  281 nik        2   0 18636K  7112K select   5:36  0.73%  0.73% XF86_SVGA
  296 nik        2   0  3240K  1644K select   0:12  0.05%  0.05% xterm
48630 nik        2   0 29816K  9148K select   3:18  0.00%  0.00% navigator-linu
  175 root       2   0   924K   252K select   1:41  0.00%  0.00% syslogd
 7059 nik        2   0  7260K  4644K poll     1:38  0.00%  0.00% mutt
...
```

Ç Ýîïäïò åßíáé ÷ùñéóìÝíç óå äýï ôìÞìáôá. Ç êåöáëßäá (ïé ðÝíôå ðñþôåò ãñáììÝò) åìöáíßæïõí ôï PID ôçò ôåëåõôáßáò äéåñãáóßáò ðïõ Ýôñåîå, ôçí ìÝóç ôéìÞ öïñôßïõ (åßíáé ìéá ìÝôñçóç ðïõ äåß÷íåé ðüóï áðáó÷ïëçìÝíï åßíáé ôï óýóôçìá), ï ÷ñüíïò ëåéôïõñãßáò (uptime) ôïõ óõóôÞìáôïò (áðü ôçí ôåëåõôáßá åðáíåêêßíçóç) êáé ôçí ôñÝ÷ïõóá þñá. Ôá Üëëá óôïé÷åßá óôçí êåöáëßäá ó÷åôßæïíôáé ìå ôï íïýìåñï ôùí äéåñãáóéþí ðïõ ôñÝ÷ïõí (47 óå áõôÞ ôç ðåñßðôùóç), ðüóç ìíÞìç êáé ÷þñï swap êáôÝ÷ïõí êáé ðüóï ÷ñüíï îïäåýåé ôï óýóôçìá óå äéÜöïñåò êáôáóôÜóåéò ëåéôïõñãßáò ôçò CPU.

Ðéï êÜôù áêïëïõèåß ìéá óåéñÜ áðü óôÞëåò, ðïõ ðåñéÝ÷ïõí ðáñüìïéåò ðëçñïöïñßåò ìå ôçí Ýîïäï ôçò ps. ¼ðùò êáé íùñßôåñá ìðïñåßôå íá äåßôå ôï PID, ôï üíïìá ÷ñÞóôç, ôï ðïóïóôü ÷ñÞóçò ôçò CPU, êáé ôçí åíôïëÞ ìå ôçí ïðïßá îåêßíçóå ç äéåñãáóßá. Ç top(1) áðü ðñïåðéëïãÞ, åìöáíßæåé åðßóçò ôï ðïóïóôü ìíÞìçò ðïõ ÷ñçóéìïðïéåßôáé áðü ôç äéåñãáóßá. ÁõôÞ ÷ùñßæåôáé óå äýï óôÞëåò. Ç ìßá åßíáé ãéá ôï óõíïëéêü ìÝãåèïò ìíÞìçò ðïõ ÷ñåéÜóôçêå ç åöáñìïãÞ, åíþ ç Üëëç ãéá ôï ìÝãåèïò ôçò ìíÞìçò ðïõ êáôáíáëþíåé ôçí ðáñïýóá óôéãìÞ. Óå áõôü ôï ðáñÜäåéãìá ìðïñåßôå íá äåßôå üôé ï **Netscape®** ÷ñåéÜóôçêå ó÷åäüí 30 MB RAM, áëëÜ ôçí ðáñïýóá óôéãìÞ ÷ñçóéìïðïéåß ìüíï 9 MB.

Ç top(1) áõôüìáôá áíáíåþíåé ôï ðåñéå÷üìåíï ôçò êÜèå äýï äåõôåñüëåðôá. Áõôü ìðïñåß íá ñõèìéóôåß ìå ôçí åðéëïãÞ `s`.

4.8 Äáßìïíåò, ÓÞìáôá, êáé Ôåñìáôéóìüò Äéåñãáóéþí

¼ôáí ÷ñçóéìïðïéåßôå Ýíá êåéìåíïãñÜöï, åßíáé åýêïëï íá ôïí åëÝã÷åôå, íá öïñôþíåôå áñ÷åßá, êáé ïôéäÞðïôå Üëëï. Áõôü óõìâáßíåé äéüôé ï êåéìåíïãñÜöïò ðáñÝ÷åé áõôÝò ôéò äõíáôüôçôåò, êáé åðßóçò åðåéäÞ åßíáé ðñïóáñôçìÝíïò óå Ýíá *ôåñìáôéêü*. ÌåñéêÜ ðñïãñÜììáôá äåí åßíáé ó÷åäéáóìÝíá íá äïõëåýïõí ìå óõíå÷åßò ÷åéñéóìïýò áðü ôïí ÷ñÞóôç, êáé åðïìÝíùò áðïóõíäÝïíôáé áðü ôï ôåñìáôéêü ìå ôçí ðñþôç åõêáéñßá. Ãéá ðáñÜäåéãìá, Ýíáò åîõðçñåôçôÞò web îïäåýåé üëï ôïõ ôï ÷ñüíï óôï íá áðáíôÜ óå áéôÞìáôá web, åðïìÝíùò äåí ÷ñåéÜæåôáé êáìéÜ åéóáãùãÞ äåäïìÝíùí áðü ôïí ÷ñÞóôç. ¶ëëï ðáñáðëÞóéï ðáñÜäåéãìá åöáñìïãÞò, åßíáé ôá ðñïãñÜììáôá ìåôáöïñÜò çëåêôñïíéêÞò áëëçëïãñáößáò áðü ìéá ôïðïèåóßá óå ìéáí Üëëç.

ÏíïìÜæïõìå áõôÜ ôá ðñïãñÜììáôá *äáßìïíåò (daemons)*. Ïé äáßìïíåò Þôáí ÷áñáêôÞñåò ôçò ÅëëçíéêÞò ìõèïëïãßáò (ïýôå êáëïß - ïýôå êáêïß), Þôáí áðëÜ ìéêñÜ óõíïäåõôéêÜ ðíåýìáôá ðïõ Ýêáíáí ÷ñÞóéìá ðñÜãìáôá ãéá ôçí áíèñùðüôçôá, üðùò áêñéâþò êáé ïé äéáêïìéóôÝò web êáé åîõðçñåôçôÝò çëåêôñïíéêÞò áëëçëïãñáößáò óÞìåñá êÜíïõí ÷ñÞóéìá ðñÜãìáôá. Áõôüò åßíáé êáé ï ëüãïò ãéá ôïí ïðïßï ç ìáóêüô ôïõ BSD åßíáé åäþ êáé ðïëý êáéñü ï ÷áñïýìåíïò äáßìïíáò ìå ðÜíéíá óðïñ ðáðïýôóéá êáé ôçí ôñßáéíá.

Ç ïíïìáóßá ôùí ðñïãñáììÜôùí ðïõ ôñÝ÷ïõí óáí äáßìïíåò óõìâáôéêÜ ôåëåéþíåé ìå “d”. Ôï **BIND** åßíáé ôï Berkeley Internet Name Domain, áëëÜ ôï ðñáãìáôéêü ðñüãñáììá ðïõ ôñÝ÷åé ïíïìÜæåôáé `named`, ôï ðñüãñáììá ôïõ åîõðçñåôçôÞ web **Apache** ëÝãåôáé `httpd`, ï äáßìïíáò åëÝã÷ïõ ôùí åêôõðùôþí ãñáììÞò åßíáé ï `lpd` êáé ïýôù êáèåîÞò. ÁõôÞ åßíáé áðëÜ ìéá óýìâáóç, ü÷é áðüëõôïò êáíüíáò, ãéá ðáñÜäåéãìá, ï êýñéïò äáßìïíáò çëåêôñïíéêÞò áëëçëïãñáößáò ãéá ôçí åöáñìïãÞ **Sendmail** ïíïìÜæåôáé `sendmail`, êáé ü÷é `maild`, üðùò èá Þôáí áíáìåíüìåíï.

ÌåñéêÝò öïñÝò èá ÷ñåéáóôåß íá åðéêïéíùíåßôå ìå ôç äéåñãáóßá åíüò äáßìïíá. ¸íáò ôñüðïò ãéá íá ãßíåé áõôü åßíáé óôÝëíïíôáò (üðùò êáé óå êÜèå åêôåëÝóéìç äéåñãáóßá) *óÞìáôá (signals)*. ÕðÜñ÷ïõí äéÜöïñá óÞìáôá ðïõ ìðïñåßôå íá óôåßëåôå — ìåñéêÜ áðü áõôÜ Ý÷ïõí ìéá óõãêåêñéìÝíç óçìáóßá, åíþ Üëëá åñìçíåýïíôáé ìÝóá áðü ôçí åöáñìïãÞ, êáé åðïìÝíùò ãéá íá îÝñïõìå ðùò åñìçíåýïíôáé ôá óÞìáôá èá ðñÝðåé íá äéáâÜóïõìå ôçí ôåêìçñßùóç ôçò åöáñìïãÞò. Ìðïñåßôå íá óôåßëåôå óÞìá óå ìéá äéåñãáóßá ìüíï áí óáò áíÞêåé. Áí óôåßëåôå óÞìá óå ìéá äéåñãáóßá ðïõ áíÞêåé óå êÜðïéïí Üëëï ìå kill(1) Þ kill(2), äåí èá óáò åðéôñáðåß. Ç ìïíáäéêÞ åîáßñåóç óå áõôü, åßíáé ï ÷ñÞóôçò `root`, ðïõ ìðïñåß íá óôÝëíåé óÞìáôá óôéò äéåñãáóßåò ïðïéïõäÞðïôå Üëëïõ ÷ñÞóôç ôïõ óõóôÞìáôïò.

Ôï FreeBSD óôÝëíåé åðßóçò óÞìáôá óå åöáñìïãÝò óå ìåñéêÝò ðåñéðôþóåéò. Áí ìßá åöáñìïãÞ åßíáé ãñáììÝíç Üó÷çìá, êáé ðñïóðáèåß íá ðñïóðåëÜóåé ìíÞìç ðïõ äåí ôçò áíÞêåé, ôï FreeBSD óôÝëíåé óôç äéåñãáóßá ôï óÞìá *Segmentation Violation* (`SIGSEGV`). Áí ìéá åöáñìïãÞ ÷ñçóéìïðïßçóå ôï óýóôçìá åéäïðïßçóçò alarm(3) ãéá íá åéäïðïéçèåß ìåôÜ ôçí ðÜñïäï ìéáò ÷ñïíéêÞò ðåñéüäïõ ôüôå ôï FreeBSD èá óôåßëåé ôï Alarm signal (`SIGALRM`), êáé ïýôù êáè’åîÞò.

Äýï óÞìáôá ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá íá óôáìáôÞóïõí ìßá äéáäéêáóßá, ôï `SIGTERM` êáé ôï `SIGKILL`. Ôï `SIGTERM` åßíáé ï óùóôüò ôñüðïò ãéá íá óôáìáôÞóïõìå ìéá äéáäéêáóßá. Ç äéåñãáóßá *áíôéëáìâÜíåôáé* ôï óÞìá, åêôåëåß ôï óôáìÜôçìá êëåßíïíôáò üëá ôá áñ÷åßá áíáöïñÜò (log files), ðïõ ðéèáíþò íá åßíáé áíïé÷ôÜ, êáé ãåíéêþò ôåëåéþíåé ïôéäÞðïôå êÜíåé ôçí óõãêåêñéìÝíç ÷ñïíéêÞ óôéãìÞ ðñéí óôáìáôÞóåé. Óå ìåñéêÝò ðåñéðôþóåéò ç äéåñãáóßá ìðïñåß íá áãíïÞóåé ôï `SIGTERM` åÜí âñßóêåôáé óôá ìéóÜ êÜðïéáò åñãáóßáò ðïõ äåí ìðïñåß íá äéáêïðåß.

Ôï óÞìá `SIGKILL` äåí ìðïñåß íá áãíïçèåß áðü ìßá äéåñãáóßá. Åßíáé óáí íá ëÝåé óôç äéåñãáóßá, "Äåí ìå åíäéáöÝñåé ôé êÜíåéò, óôáìÜôá ôþñá áìÝóùò". Áí óôåßëåôå ôï óÞìá `SIGKILL` óå ìéá äéáäéêáóßá ôüôå ôï FreeBSD èá óôáìáôÞóåé ôçí äéáäéêáóßá Üìåóá [4].

¶ëëá óÞìáôá ðïõ ðéèáíþò íá èÝëåôå íá ÷ñçóéìïðïéÞóåôå åßíáé ôá `SIGHUP`, `SIGUSR1`, êáé `SIGUSR2`. ÁõôÜ åßíáé óÞìáôá ãåíéêÞò ÷ñÞóçò, êáé üôáí áðïóôÝëëïíôáé êÜíïõí äéáöïñåôéêÜ ðñÜãìáôá áíÜëïãá ìå ôçí åöáñìïãÞ.

Áò õðïèÝóïõìå ðùò áëëÜîáôå ôï áñ÷åßï ñýèìéóçò ôïõ åîõðçñåôçôÞ äéáäéêôýïõ óáò, êáé ðùò èá èÝëáôå íá ðåßôå óôïí åîõðçñåôçôÞ íá îáíáäéáâÜóåé ôéò ñõèìßóåéò. Èá ìðïñïýóáôå íá óôáìáôÞóåôå êáé íá åðáíåêêéíÞóåôå ôï `httpd`, áëëÜ áõôü èá ïäçãïýóå óå ìéá ÷ñïíéêÞ ðåñßïäï üðïõ ï åîõðçñåôçôÞò èá Ýìåíå åêôüò ëåéôïõñãßáò, êÜôé ôï ïðïßï ìðïñåß íá åßíáé áíåðéèýìçôï. Ïé ðåñéóóüôåñïé äáßìïíåò åßíáé ó÷åäéáóìÝíïé íá áðáíôïýí óå óÞìáôá `SIGHUP` ãéá ôçí åê íÝïõ áíÜãíùóç ôïõ áñ÷åßïõ ñýèìéóçò ôïõò. ÅðïìÝíùò, áíôß íá óôáìáôÞóïõìå êáé íá åðáíåêêéíÞóïõìå ôï `httpd` èá ìðïñïýóáìå íá ôïõ óôåßëïõìå ôï óÞìá `SIGHUP`. ÅðåéäÞ äåí õðÜñ÷åé óõãêåêñéìÝíïò ôñüðïò óôçí áðÜíôçóç áõôþí ôùí óçìÜôùí, êáé äéáöïñåôéêïß äáßìïíåò Ý÷ïõí äéáöïñåôéêÞ óõìðåñéöïñÜ, ðñÝðåé íá äéáâÜóåôå ðñþôá ôçí ôåêìçñßùóç ãéá ôïí óõãêåêñéìÝíï äáßìïíá.

Ôá óÞìáôá óôÝëíïíôáé ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ kill(1), üðùò õðïäåéêíýåé ôï áêüëïõèï ðáñÜäåéãìá.

ÓôÝëíïíôáò ÓÞìá óå ìßá Äéåñãáóßá

Áõôü ôï ðáñÜäåéãìá äåß÷íåé ðùò íá óôåßëåôå óÞìá óôçí inetd(8). Ôï áñ÷åßï ñýèìéóçò ôçò `inetd` åßíáé ôï `/etc/inetd.conf`, êáé ç `inetd` èá îáíá-äéáâÜóåé áõôü ôï áñ÷åßï ñýèìéóçò üôáí èá óôáëåß ôï óÞìá `SIGHUP`.

1. Âñåßôå ôï PID ôçò äéåñãáóßáò, ôçò ïðïßáò åðéèõìåßôå íá óôåßëåôå ôï óÞìá. ÅíåñãÞóôå ÷ñçóéìïðïéþíôáò ôéò åíôïëÝò ps(1) êáé grep(1). Ç åíôïëÞ grep(1) ÷ñçóéìïðïéåßôáé ãéá íá øÜîåé óôçí Ýîïäï ìéáò åíôïëÞò, ãéá ôïõò áëöáñéèìçôéêïýò ÷áñáêôÞñåò ðïõ Ý÷åôå ïñßóåé. Ç åíôïëÞ åêôåëåßôáé áðü Ýíáí áðëü ÷ñÞóôç, åíþ ç inetd(8) åêôåëåßôáé áðü ôïí `root`, åðïìÝíùò èá ðñÝðåé íá ðñïóèÝóåôå ôçí åðéëïãÞ `ax` óôçí ps(1).

   ```
   % ps -ax | grep inetd
     198  ??  IWs    0:00.00 inetd -wW
   ```

   ÅðïìÝíùò ôï PID ôçò inetd(8) åßíáé ôï 198. Óå ìåñéêÝò ðåñéðôþóåéò ìðïñåß íá åìöáíßæåôáé óôçí Ýîïäï ç åíôïëÞ `grep inetd`. Áõôü ïöåßëåôáé óôïí ôñüðï ìå ôïí ïðïßï ç ps(1) øÜ÷íåé ôçí ëßóôá ôùí åíåñãþí äéåñãáóéþí.

2. ×ñçóéìïðïéÞóôå ôçí kill(1) ãéá íá óôåßëåôå ôï óÞìá. ÅðåéäÞ ç inetd(8) ôñÝ÷åé áðü ôïí `root` èá ðñÝðåé ðñþôá íá ÷ñçóéìïðïéÞóåôå su(1) ãéá íá ãßíåôå ðñþôá `root`.

   ```
   % su
   Password:
   # /bin/kill -s HUP 198
   ```

   ¼ðùò êáé ìå ôéò ðåñéóóüôåñåò åíôïëÝò óôï UNIX, ç kill(1) äåí èá ôõðþóåé ôßðïôå óôçí Ýîïäï áí ç åíôïëÞ åß÷å åðéôõ÷ßá. ÅÜí óôåßëåôå Ýíá óÞìá óå ìéá äéåñãáóßá ðïõ äåí óáò áíÞêåé èá äåßôå `kill: PID: Operation not permitted`. Áí ðëçêôñïëïãÞóåôå ëÜèïò ôï PID ôüôå Þ èá óôåßëåôå ôï óÞìá óå ëÜèïò äéåñãáóßá,êÜôé ðïõ ìðïñåß íá åßíáé Üó÷çìï, Þ, áí åßóôå ôõ÷åñüò, èá Ý÷åôå óôåßëåé ôï óÞìá óå Ýíá PID ðïõ äåí ÷ñçóéìïðïéåßôáé ôç óõãêåêñéìÝíç óôéãìÞ, êáé èá äåßôå `kill: PID: No such process`.

   > **Ãéáôß íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `/bin/kill`;:** ÐïëëÜ êåëýöç ðáñÝ÷ïõí ôçí åíôïëÞ `kill` ùò åóùìáôùìÝíç åíôïëÞ. Áõôü óçìáßíåé ðùò ôï êÝëõöïò èá óôåßëåé ôï óÞìá Üìåóá, áíôß íá ôñÝîåé ôï `/bin/kill`. Áõôü ìðïñåß íá åßíáé ðïëý ÷ñÞóéìï, áëëÜ äéáöïñåôéêÜ êåëýöç Ý÷ïõí äéáöïñåôéêÞ óýíôáîç ãéá ôïí êáèïñéóìü ôï üíïìá ôïõ óÞìáôïò ðïõ ðñÝðåé íá áðïóôáëåß. Áíôß ëïéðüí íá ðñÝðåé íá ìÜèïõìå üëåò ôéò ðåñéðôþóåéò ,åßíáé åõêïëüôåñï áðëÜ íá ÷ñçóéìïðïéïýìå ôçí åíôïëÞ `/bin/kill ...` Üìåóá.

Ç áðïóôïëÞ Üëëùí óçìÜôùí ìïéÜæåé ðÜñá ðïëý, áðëÜ áíôéêáôáóôÞóôå ôï `TERM` Þ ôï `KILL` óôç ãñáììÞ åíôïëþí ìå êÜðïéï Üëëï.

> **Óçìáíôéêü:** Ç öüíåõóç ôõ÷áßùí äéåñãáóéþí óôï óýóôçìá ìðïñåß íá åßíáé êáêÞ éäÝá. Éäéáßôåñá, ç init(8), ìå PID 1, åßíáé ðïëý åéäéêÞ. Ç åêôÝëåóç ôçò åíôïëÞò `/bin/kill -s KILL 1` åßíáé Ýíáò ãñÞãïñïò ôñüðïò íá óâÞóåôå ôï óýóôçìá óáò. *ÐÜíôá* íá åëÝã÷åôå äýï öïñÝò ôéò ðáñáìÝôñïõò ðïõ ÷ñçóéìïðïéåßôå ìå ôçí kill(1) *ðñéí* ðéÝóåôå **Return**.

4.9 Êåëýöç

Óôï FreeBSD Ýíá ìåãÜëï ìÝñïò ôçò êáèçìåñéíÞò åñãáóßáò ãßíåôáé óå Ýíá ðåñéâÜëëïí ãñáììÞò åíôïëþí ïíüìáæåôáé êÝëõöïò (shell). Ç êýñéá äïõëåéÜ ôïõ êåëýöïõò åßíáé íá ðáßñíåé åíôïëÝò áðü ôï êáíÜëé åéóüäïõ êáé íá ôéò åêôåëåß. ÌåñéêÜ êåëýöç Ý÷ïõí åíóùìáôùìÝíåò ëåéôïõñãßåò þóôå íá âïçèïýí óôéò êáèçìåñéíÝò ðñïãñáììáôéóôéêÝò åñãáóßåò üðùò äéá÷åßñéóç áñ÷åßùí, file globbing, åðåîåñãáóßá ãñáììÞò åíôïëþí, ìáêñïåíôïëÝò, êáé ìåôáâëçôÝò ðåñéâÜëëïíôïò. Ôï FreeBSD äéáôßèåôáé ìå äéÜöïñá êåëýöç, üðùò ôï `sh`, ôï Bourne Shell êáé ôï `tcsh`, ôï âåëôéùìÝíï C-shell. ÄéÜöïñá Üëëá êåëýöç åßíáé äéáèÝóéìá áðü ôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD, üðùò ôá `zsh` êáé `bash`.

Ðïéï êÝëõöïò íá ÷ñçóéìïðïéÞóåôå; Åßíáé ðñáãìáôéêÜ èÝìá ãïýóôïõ. ÅÜí åßóôå ðñïãñáììáôéóôÞò óå ãëþóóá C èá áéóèáíèåßôå ðåñéóóüôåñï ïéêåßïò ìå ôá êåëýöç ôýðïõ C, üðùò ôï `tcsh`. ÅÜí Ýñ÷åóôå áðü ôï Linux Þ åßóôå íÝïò óå ðåñéâÜëëïí ãñáììÞò åíôïëþí UNIX ìðïñåßôå íá äïêéìÜóåôå ôï `bash`. Ç ïõóßá åßíáé ðùò êÜèå êÝëõöïò Ý÷åé ìïíáäéêÝò éäéüôçôåò ðïõ ìðïñåß íá óõíåñãáóôïýí ìå ôï ðåñéâÜëëïí åñãáóßáò ôçò ðñïôßìçóçò óáò, êáé åðïìÝíùò åßíáé åðéëïãÞ óáò ðïéï êÝëõöïò íá ÷ñçóéìïðïéÞóåôå.

Ìéá êïéíÞ éäéüôçôá üëùí ôùí êåëõöþí åßíáé ç áõôüìáôç óõìðëÞñùóç ïíïìÜôùí áñ÷åßùí. Áöïý Ý÷åôå ðëçêôñïëïãÞóåé ôá ðñþôá ãñÜììáôá ìéáò åíôïëÞò Þ åíüò ïíüìáôïò áñ÷åßïõ áí ðéÝóåôå ôï ðëÞêôñï **Tab** óôï ðëçêôñïëüãéï, ôüôå ôï êÝëõöïò áõôüìáôá èá ïëïêëçñþóåé ôï õðüëïéðï ôçò åíôïëÞò Þ ôïõ ïíüìáôïò áñ÷åßïõ. Áò äþóïõìå Ýíá ðáñÜäåéãìá. Áò õðïèÝóïõìå ðùò Ý÷åôå äýï áñ÷åßá `foobar` êáé `foo.bar`. Áí èÝëåôå íá óâÞóåôå ôï `foo.bar` èá ðñÝðåé íá ðëçêôñïëïãÞóåôå `rm fo[`**`Tab`**`].[`**`Tab`**`]`.

Ôï êÝëõöïò èá ôõðþóåé áõôüìáôá `rm foo[BEEP].bar`.

Ôï [BEEP] åßíáé ôï êïõäïýíé ôçò êïíóüëáò, ôï ïðïßï ìáò ðëçñïöïñåß ðùò äåí Þôáí äõíáôüí íá ïëïêëçñþóåé ôï üíïìá ôïõ áñ÷åßïõ äéüôé õðÜñ÷ïõí ðåñéóóüôåñá áðü Ýíá ïíüìáôá áñ÷åßùí ðïõ ôáéñéÜæïõí. ¼íôùò ôï `foobar` êáé ôï `foo.bar` îåêéíïýí ìå `fo`, êáé ôï êÝëõöïò êáôÜöåñå íá óõìðëçñþóåé ùò ôï `foo`. Áí ðëçêôñïëïãÞóåôå åðéðëÝïí `.`, êáé ìåôÜ ðÜëé **Tab**, ôï êÝëõöïò èá êáôáöÝñåé íá óõìðëçñþóåé ôï õðüëïéðï ôïõ ïíüìáôïò áñ÷åßïõ ãéá óáò.

¶ëëï éäéáßôåñï ÷áñáêôçñéóôéêü ôïõ êåëýöïõò åßíáé ç ÷ñÞóç ôùí ìåôáâëçôþí ðåñéâÜëëïíôïò. Ïé ìåôáâëçôÝò ðåñéâÜëëïíôïò åßíáé Ýíá æåýãïò ìåôáâëçôþí/êëåéäéþí áðïèçêåõìÝíá óôïí ðåñéâÜëëïíôá ÷þñï ôïõ êåëýöïõò Áõôüò ï ÷þñïò ìðïñåß íá äéáâáóôåß áðü ïðïéïäÞðïôå ðñüãñáììá ðïõ êáëåßôáé áðü ôï êÝëõöïò, êáé Ýôóé ðåñéÝ÷åé ðëÞèïò ñõèìßóåùí ðñïãñáììÜôùí. Áêïëïõèåß ìßá ëßóôá ìå óõíÞèåéò ìåôáâëçôÝò ðåñéâÜëëïíôïò êáé ôç óçìáóßá ôïõò:

ÌåôáâëçôÞ	ÐåñéãñáöÞ
`USER`	¼íïìá ôïõ ôñÝ÷ïíôá ÷ñÞóôç.

ÌåôáâëçôÞ	**ÐåñéãñáöÞ**
`PATH`	Ëßóôá êáôáëüãùí ãéá ôçí áíáæÞôçóç åêôåëÝóéìùí ÷ùñéóìÝíç ìå Üíù-êÜôù ôåëåßåò.
`DISPLAY`	¼íïìá äéêôýïõ ôçò ïèüíçò X11 ðïõ åßíáé äéáèÝóéìç ãéá óýíäåóç, áí õðÜñ÷åé.
`SHELL`	Ôï åíåñãü êÝëõöïò.
`TERM`	Ôï üíïìá ôïõ ôýðïõ ôïõ ôåñìáôéêïý ÷ñÞóôç. Ïñßæåé ôéò äõíáôüôçôåò ôïõ ôåñìáôéêïý.
`TERMCAP`	ÅããñáöÞ óôç âÜóç äåäïìÝíùí êùäéêþí escape ãéá äéÜöïñåò ëåéôïõñãßåò ôåñìáôéêþí.
`OSTYPE`	Ï ôýðïò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò ð.÷., FreeBSD.
`MACHTYPE`	Ç áñ÷éôåêôïíéêÞ CPU óôçí ïðïßá äïõëåýåé ôï óýóôçìá.
`EDITOR`	Ï ðñïåðéëåãìÝíïò êåéìåíïãñÜöïò ôïõ ÷ñÞóôç.
`PAGER`	Ôï ðñïåðéëåãìÝíï ðñüãñáììá óåëéäïðïßçóçò ôïõ ÷ñÞóôç.
`MANPATH`	Ëßóôá êáôáëüãùí ãéá ôçí áíáæÞôçóç ôùí óåëßäùí âïçèåßáò (man pages) ÷ùñéóìÝíç ìå Üíù-êÜôù ôåëåßåò.

Ï ïñéóìüò ìéáò ìåôáâëçôÞò ðåñéâÜëëïíôïò äéáöÝñåé êÜðùò áðü êÝëõöïò óå êÝëõöïò. Ãéá ðáñÜäåéãìá óôá êåëýöç ôýðïõ-C, üðùò ôá `tcsh` êáé `csh`, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí `setenv` ãéá íá ïñßóåôå ìåôáâëçôÝò ðåñéâÜëëïíôïò. Óå êåëýöç Bourne üðùò ôá `sh` êáé `bash`, èá ðñÝðåé íá ÷ñçóéìïðïéåßóôå ôçí `export` ãéá íá èÝóåôå ôéò ôñÝ÷ïõóåò ìåôáâëçôÝò ðåñéâÜëëïíôïò. Ãéá ðáñÜäåéãìá, ãéá íá ïñßóåôå Þ íá ìåôáôñÝøåôå ôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `EDITOR`, óå `csh` Þ `tcsh` èá ðñÝðåé íá äþóåôå ìéá åíôïëÞ ðïõ íá èÝôåé ôç ìåôáâëçôÞ `EDITOR` óôï `/usr/local/bin/emacs`:

```
% setenv EDITOR /usr/local/bin/emacs
```

Ãéá êåëýöç Bourne:

```
% export EDITOR="/usr/local/bin/emacs"
```

Ìðïñåßôå åðßóçò óôá ðåñéóóüôåñá êåëýöç íá áíáðôýóóåôå ôéò ìåôáâëçôÝò ðåñéâÜëëïíôïò ôïðïèåôþíôáò ìðñïóôÜ ôïõò ôïí ÷áñáêôÞñá `$`. Ãéá ðáñÜäåéãìá, ç `echo $TERM` èá ôõðþóåé ôçí ôéìÞ ðïõ Ý÷ïõìå èÝóåé óôçí ìåôáâëçôÞ, äéüôé ôï êÝëõöïò áíáðôýóóåé ôçí `$TERM` êáé ðåñíÜ ôçí ôéìÞ ôçò óôçí `echo`.

Ôá êåëýöç ÷ñçóéìïðïéïýí ìåñéêïýò åéäéêïýò ÷áñáêôÞñåò, ðïõ ïíïìÜæïíôáé meta-÷áñáêôÞñåò ãéá åìöáíßóåéò éäéáßôåñùí äåäïìÝíùí. Ï ðéï êïéíüò åî’ áõôþí åßíáé ï ÷áñáêôÞñáò `*`, ï ïðïßïò áíôéðñïóùðåýåé ïðïéïäÞðïôå áëöáñéèìçôéêü ÷áñáêôÞñá óå Ýíá üíïìá áñ÷åßïõ. Áõôïß ïé åéäéêïß meta-÷áñáêôÞñåò ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá íá êÜíïõí filename globbing. Ãéá ðáñÜäåéãìá, áí ðëçêôñïëïãÞóåôå `echo *` åßíáé ó÷åäüí ôï ßäéï ìå ôï íá äþóåôå `ls` äéüôé ôï êÝëõöïò ðáßñíåé üëá ôá áñ÷åßá ðïõ ôáéñéÜæïõí ìå `*` êáé ôá ðñïùèåß óôçí ãñáììÞ åíôïëþí ãéá ôçí `echo`.

Ãéá íá åìðïäßóåôå ôï êÝëõöïò íá åðåîåñãáóôåß áõôïýò ôïõò åéäéêïýò ÷áñáêôÞñåò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï óýìâïëï äéáöõãÞò (escape) ôïðïèåôþíôáò ìðñïóôÜ ôïõò ìéá áíÜðïäç êÜèåôï (`\`). Ç `echo $TERM` ôõðþíåé ôïí ôýðï ôïõ ôåñìáôéêïý óáò, åíþ ç `echo \$TERM` ôõðþíåé áðëÜ `$TERM`.

4.9.1 ÁëëÜæïíôáò ôï ÊÝëõöïò óáò

Ï åõêïëüôåñïò ôñüðïò ãéá íá áëëÜîåôå ôï êÝëõöïò óáò åßíáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `chsh`. ÔñÝ÷ïíôáò ôçí `chsh` èá ïäçãçèåßôå óôïí êåéìåíïãñÜöï ðïõ Ý÷åôå èÝóåé óôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `EDITOR`, åíþ áí äåí Ý÷åôå èÝóåé, èá ïäçãçèåßôå óôïí `vi`. ÁëëÜîôå êáôÜëëçëá ôç ãñáììÞ “Shell:”

Ìðïñåßôå åðßóçò íá äþóåôå óôçí `chsh` ôçí åðéëïãÞ `-s`, áõôÞ èá èÝóåé ôï êÝëõöïò ãéá óáò, ÷ùñßò íá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå ôïí åðåîåñãáóôÞ. Ãéá ðáñÜäåéãìá, áí èÝëåôå íá áëëÜîåôå ôï êÝëõöïò óáò óå `bash`, ç áêüëïõèç åíôïëÞ åßíáé áêñéâþò áõôü ðïõ ÷ñåéÜæåóôå:

```
% chsh -s /usr/local/bin/bash
```

> **Óçìåßùóç:** Ôï êÝëõöïò óôï ïðïßï åðéèõìåßôå íá ìåôáâåßôå *ðñÝðåé* íá åßíáé êáôá÷ùñçìÝíï óôï áñ÷åßï `/etc/shells`. Áí Ý÷åôå åãêáôáóôÞóåé Ýíá êÝëõöïò áðü ôç óõëëïãÞ ôùí ports, ôüôå áõôü èá ðñÝðåé íá Ý÷åé Þäç ãßíåé. Áí åãêáôáóôÞóáôå ôï êÝëõöïò ìüíïé óáò, ôüôå èá ðñÝðåé íá åêôåëÝóåôå ôç äéáäéêáóßá ðïõ áêïëïõèåß.
>
> Áí ãéá ðáñÜäåéãìá, åãêáôáóôÞóáôå ôï `bash` ìüíïé óáò êáé ôï ôïðïèåôÞóáôå óôïí `/usr/local/bin`, ôüôå èá ðñÝðåé íá äþóåôå:
>
> ```
> # echo "/usr/local/bin/bash" >> /etc/shells
> ```
>
> Êáé ìåôÜ îáíáôñÝîôå ôçí `chsh`.

4.10 ÊåéìåíïãñÜöïé

ÁñêåôÝò ñõèìßóåéò óôï FreeBSD ãßíïíôáé ìå åðåîåñãáóßá áñ÷åßùí êåéìÝíïõ. Ãéá áõôü ôï ëüãï, èá Þôáí êáëÞ éäÝá íá åîïéêåéùèåßôå ìå Ýíá êåéìåíïãñÜöï. Áñêåôïß ðáñÝ÷ïíôáé óôï âáóéêü óýóôçìá ôïõ FreeBSD êáé ðïëëïß ðåñéóóüôåñïé åßíáé äéáèÝóéìïé óôç ÓõëëïãÞ ôùí Ports (Ports Collection).

Ï åõêïëüôåñïò êáé áðëïýóôåñïò êåéìåíïãñÜöïò ãéá íá ìÜèåôå ïíïìÜæåôáé **ee**, ðïõ óçìáßíåé easy editor (åýêïëïò êåéìåíïãñÜöïò). Ãéá íá îåêéíÞóåôå ôïí **ee**, ðñÝðåé íá ðëçêôñïëïãÞóåôå óôç ãñáììÞ åíôïëþí `ee` *`filename`* üðïõ *`filename`* åßíáé ôï üíïìá ôïõ áñ÷åßïõ ðïõ èÝëåôå íá åðåîåñãáóôåßôå. Ãéá ðáñÜäåéãìá, ãéá íá åðåîåñãáóôåßôå ôï `/etc/rc.conf`, ðëçêôñïëïãåßóôå `ee /etc/rc.conf`. Ìüëéò âñåèåßôå óôï `ee`, üëåò ïé åíôïëÝò ãéá íá ÷åéñéóôåßôå ôéò ëåéôïõñãßåò ôïõ êåéìåíïãñÜöïõ áíáöÝñïíôáé óôï ðÜíù ìÝñïò ôçò ïèüíçò. Ï ÷áñáêôÞñáò êáðÝëï `^` óçìáßíåé ôï ðëÞêôñï **Ctrl**, åðïìÝíùò `^e` óçìáßíåé ðùò ðñÝðåé íá ðëçêôñïëïãÞóåôå ôïí óõíäõáóìü ðëÞêôñùí **Ctrl**+**e**. Ãéá íá âãåßôå áðü ôïí **ee**, ðéÝóôå ôï ðëÞêôñï **Esc**, êáé åðéëÝîôå leave editor. Ï êåéìåíïãñÜöïò èá óáò ñùôÞóåé íá óþóåôå ôéò áëëáãÝò, áí Ý÷åôå åðåîåñãáóôåß ôï áñ÷åßï.

Ôï FreeBSD ðåñéÝ÷åôáé åðßóçò ìå ðéï éó÷õñïýò êåéìåíïãñÜöïõò üðùò ôï åíóùìáôùìÝíï óôï âáóéêü óýóôçìá **vi**. Ôï **Emacs** êáé ôï **vim**, åßíáé ìÝñïò ôçò ÓõëëïãÞò ôùí Ports ôïõ FreeBSD (`editors/emacs` êáé `editors/vim`). Áõôïß ïé êåéìåíïãñÜöïé ðñïóöÝñïõí ðïëëÝò ðåñéóóüôåñåò ëåéôïõñãßåò êáé äõíáôüôçôåò, ìå êüóôïò áõîçìÝíçò ðïëõðëïêüôçôá êáé äõóêïëßá åêìÜèçóçò. Ùóôüóï áí ó÷åäéÜæåôå íá åðåîåñãÜæåóôå áñêåôÜ êåßìåíá, ç åêìÜèçóç åíüò éó÷õñïý êåéìåíïãñÜöïõ üðùò ôï **vim** Þ ôï **Emacs** èá óáò ãëéôþóåé ðïëý ðåñéóóüôåñï ÷ñüíï åðåîåñãáóßáò óôï ìÝëëïí.

ÐïëëÝò åöáñìïãÝò ðïõ ÷ñåéÜæïíôáé íá áëëÜîïõí êÜðïéï áñ÷åßï Þ áðáéôïýí áðü ôï ÷ñÞóôç íá ðëçêôñïëïãÞóåé êÜðïéï êåßìåíï, èá áíïßîïõí áõôüìáôá êÜðïéï êåéìåíïãñÜöï. Ãéá íá áëëÜîåôå ôïí ðñïåðéëåãìÝíï êåéìåíïãñÜöï, èá ðñÝðåé íá èÝóåôå êáôÜëëçëç ôéìÞ óôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `EDITOR`. Äåßôå ôçí åíüôçôá Êåëýöç ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

4.11 ÓõóêåõÝò êáé Áñ÷åßá óõóêåõþí

ÓõóêåõÞ åßíáé Ýíáò üñïò ðïõ áíáöÝñåôáé óå ó÷Ýóç ìå ëåéôïõñãßåò hardware åíüò óõóôÞìáôïò, ðåñéëáìâÜíïíôáò äßóêïõò, åêôõðùôÝò, êÜñôåò ãñáöéêþí êáé ðëçêôñïëüãéá. ÊáôÜ ôçí åêêßíçóç ôïõ FreeBSD ïé ðåñéóóüôåñåò ðëçñïöïñßåò ðïõ áíáãñÜöïíôáé óôçí ïèüíç åßíáé óõóêåõÝò ðïõ áíáãíùñßæïíôáé áðü ôï óýóôçìá. Ìðïñåßôå íá îáíáäåßôå ôá ìçíýìáôá åêêßíçóçò, äéáâÜæïíôáò ôï `/var/run/dmesg.boot`.

Ãéá ðáñÜäåéãìá, `acd0` åßíáé ï ðñþôïò ïäçãüò IDE CDROM, åíþ ôï `kbd0` áíôéðñïóùðåýåé ôï ðëçêôñïëüãéï.

Óôéò ðåñéóóüôåñåò áðü áõôÝò ôéò óõóêåõÝò óå Ýíá ëåéôïõñãéêü óýóôçìá UNIX ç ðñüóâáóç ðñÝðåé íá ãßíåôáé äéáìÝóïõ åéäéêþí áñ÷åßùí ðïõ ïíïìÜæïíôáé áñ÷åßá óõóêåõþí, êáé åßíáé ôïðïèåôçìÝíá óôïí êáôÜëïãï `/dev`.

4.11.1 Äçìéïõñãþíôáò Áñ÷åßá Óõóêåõþí

¼ôáí ðñïóèÝôåôå ìéá íÝá óõóêåõÞ óôï óýóôçìá óáò, Þ ìåôáãëùôôßæåôå ðçãáßï êþäéêá ãéá õðïóôÞñéîç íÝùí ïäçãþí, ðñÝðåé íá äçìéïõñãïýíôáé íÝá áñ÷åßá óõóêåõþí.

4.11.1.1 `DEVFS` (DEVice File System)

Ôï óýóôçìá áñ÷åßùí óõóêåõþí Þ, `DEVFS`, ðáñÝ÷åé ðñüóâáóç óôï ÷þñï ïíïìÜôùí óõóêåõþí ôïõ ðõñÞíá (device namespace) óôï global óýóôçìá áñ÷åßùí ôïõ óõóôÞìáôïò. Áíôß íá äçìéïõñãåßôå êáé íá ìåôáôñÝðåôå áñ÷åßá óõóêåõþí, ôï `DEVFS` óõíôçñåß ãéá óáò áõôü ôï éäéáßôåñï óýóôçìá áñ÷åßùí.

Äåßôå ôçí óåëßäá âïçèåßáò devfs(5) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

4.12 Ôýðïé ÅêôåëÝóéìùí

Ãéá íá êáôáëÜâåôå ãéáôß ôï FreeBSD ÷ñçóéìïðïéåß ôïí ôýðï elf(5) èá ðñÝðåé ðñþôá íá ãíùñßæåôå ìåñéêÜ ðñÜãìáôá ãéá ôïõò ôñåéò “êõñßáñ÷ïõò” ôýðïõò åêôåëÝóéìùí ãéá ôï UNIX

- a.out(5)

  Ï ðáëáéüôåñïò êáé ðéï “êëáóóéêüò” ôýðïò áíôéêåéìÝíùí ôïõ UNIX. ×ñçóéìïðïéåß ìéá ìéêñÞ êáé óõìðáãÞ êåöáëßäá ìå Ýíá ìáãéêü íïýìåñï óôçí áñ÷Þ ðïõ ó÷íÜ ÷ñçóéìïðïéåßôáé ãéá íá ÷áñáêôçñßæåé ôïí ôýðï (äåßôå ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ôçí a.out(5)). ÐåñéÝ÷åé ôñßá öïñôùìÝíá ôìÞìáôá: .text, .data êáé .bss êáé åðéðëÝïí Ýíá ðßíáêá óõìâüëùí êáé Ýíá ðßíáêá áëöáñéèìçôéêþí ÷áñáêôÞñùí.

- COFF

  Ï ôýðïò áíôéêåéìÝíïõ SVR3. Ç êåöáëßäá ôþñá áðïôåëåßôáé áðü Ýíá ðßíáêá ôìÞìáôïò, þóôå íá ìðïñïýìå íá Ý÷ïõìå êÜôé ðáñáðÜíù áðü áðëÜ .text, .data êáé .bss.

- elf(5)

  Ï äéÜäï÷ïò ôïõ COFF, ðåñéëáìâÜíåé ðïëëáðëÜ ôìÞìáôá êáé äÝ÷åôáé ôéìÝò 32 Þ 64 bit. Ôï âáóéêü ìåéïíÝêôçìá: Ï ELF ó÷åäéÜóôçêå ìå ôçí ðñïûðüèåóç ðùò èá õðÞñ÷å ìüíï Ýíá ABI ãéá êÜèå áñ÷éôåêôïíéêÞ óõóôÞìáôïò. ÁõôÞ ç õðüèåóç åßíáé üìùò åóöáëìÝíç ôþñá, áöïý áêüìç êáé óôïí åìðïñéêü êüóìï ôïõ SYSV (üðïõ õðÜñ÷ïõí ôïõëÜ÷éóôïí ôñßá ABI: SRV4, Solaris, SCO) äåí éó÷ýåé.

Ôï FreeBSD ðñïóðáèåß íá îåðåñÜóåé áõôü ôï ðñüâëçìá ðáñÝ÷ïíôáò Ýíá âïçèçôéêü ðñüãñáììá ìå ôï ïðïßï ìðïñïýìå íá *åíóùìáôþóïõìå (branding)* óå Ýíá åêôåëÝóéìï ELF ôéò ðëçñïöïñßåò ãéá ôï ABI ðïõ åßíáé óõìâáôü ìå áõôü. Äåßôå ôçí óåëßäá manual ôïõ brandelf(1) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ôï FreeBSD ðñïÝñ÷åôáé áðü ôïí “êëáóóéêü” ÷þñï êáé ìÝ÷ñé ôçí áñ÷Þ ôçò óåéñÜò 3.X, ÷ñçóéìïðïéïýóå ôïí ôýðï a.out(5), ìéá ôå÷íïëïãßá äïêéìáóìÝíç êáé áðïäåäåéãìÝíç óå ðïëëÝò ãåíéÝò åêäüóåùí ôïõ BSD. Áí êáé ç ìåôáãëþôôéóç êáé åêôÝëåóç åããåíþí åêôåëÝóéìùí (êáé ðõñÞíùí) ôýðïõ ELF Þôáí äõíáôÞ óôá FreeBSD óõóôÞìáôá Þäç áðü ðïëý êáéñü ðñéí, ôï FreeBSD áñ÷éêÜ áíôéóôÜèçêå óôçí “þèçóç” ãéá êáèéÝñùóç ôïõ ELF ùò ðñïêáèïñéóìÝíïõ ôýðïõ. Ãéáôß; ¼ôáí ï êüóìïò ôïõ Ëßíïõî Ýêáíå ôçí ïäõíçñÞ ìåôÜâáóç ðñïò ôï ELF, äåí Þôáí ôüóï ãéá íá îåöýãåé áðü ôïí ôýðï åêôåëÝóéìùí `a.out` üóï ãéá íá áíôéìåôùðßóåé ôï äýóêáìðôï äéêü ôïõò ìç÷áíéóìü êïéíü÷ñçóôùí âéâëéïèçêþí, ï ïðïßïò âáóßæïíôáí óå jump-tables êáé ðñïêáëïýóå ìåãÜëç äõó÷Ýñåéá óôçí êáôáóêåõÞ ôïõò, ôüóï óôïõò ðñïãñáììáôéóôÝò üóï êáé óôïõò ìåôáðùëçôÝò. Áðü ôç óôéãìÞ ðïõ ôá äéáèÝóéìá åñãáëåßá ôïõ ELF ðñïóÝöåñáí ëýóç óôï ðñüâëçìá ôùí êïéíþí âéâëéïèçêþí êáé Ýãéíå ãåíéêþò áðïäåêôü ùò Þôáí “ï äñüìïò ðñïò ôá åìðñüò”, Ýãéíå áðïäåêôü ôï áíáãêáßï êüóôïò ôçò ìåôáöïñÜò êáé åðéôåý÷èçêå ç ìåôáêßíçóç. Ï ìç÷áíéóìüò êïéíü÷ñçóôùí âéâëéïèçêþí ôïõ FreeBSD âáóßæåôáé óå ìåãÜëï âáèìü óôïí áíôßóôïé÷ï ìç÷áíéóìü ôïõ SunOS™ ôçò Sun êáé åßíáé ðïëý åýêïëïò óôç ÷ñÞóç.

Ôüôå, ãéáôß õðÜñ÷ïõí ôüóïé äéáöïñåôéêïß ôýðïé;

Ðßóù óôï óêïôåéíü ðáñåëèüí, õðÞñ÷å áðëü hardware. Áõôü ôï áðëü hardware õðïóôÞñéæå Ýíá áðëü, ìéêñü óýóôçìá. Ôï `a.out` Þôáí áðüëõôá êáôÜëëçëï ãéá ôçí áíáðáñÜóôáóç åêôåëÝóéìùí óå áõôü ôï áðëü óýóôçìá (Ýíá PDP-11). ¼ôáí ï êüóìïò Üñ÷éóå íá ìåôáöÝñåé ôï UNIX áðü áõôü ôï áðëü óýóôçìá, äéáôçñÞèçêå ï ôýðïò `a.out` ãéáôß Þôáí éêáíïðïéçôéêüò ãéá ôá ðñþôá ports ôïõ UNIX óå áñ÷éôåêôïíéêÝò üðùò ç Motorola 68k, VAXen, êôë.

ÌåôÝðåéôá êÜðïéïò ëáìðñüò ìç÷áíéêüò hardware áðïöÜóéóå ðùò áöïý ìðïñïýóå íá åîáíáãêÜæåé ôï ëïãéóìéêü íá êÜíåé ôüóá ðñü÷åéñá êüëðá, èá ìðïñïýóå åðßóçò íá ðáñáëåßøåé ìåñéêÝò ðýëåò áðü ôï ó÷åäéáóìü þóôå íá åðéôñÝøåé óôïí ðõñÞíá ôçò CPU íá ôñÝ÷åé ãñçãïñüôåñá. Áí êáé äéáóêåõÜóèçêå þóôå íá äïõëåýåé ìå áõôü ôï íÝï åßäïò hardware (ãíùóôü óÞìåñá ùò RISC), ï ôýðïò `a.out` Þôáí ôåëéêÜ áêáôÜëëçëïò ãéá áõôü, êáé Ýôóé ó÷åäéÜóôçêáí ðïëëïß íÝïé ôýðïé ãéá íá åðéôåõ÷èåß êáëýôåñç áðüäïóç áðü ôï hardware áðü üôé Þôáí äõíáôüí ìå ôïí áðëü êáé ðåñéïñéóôéêü ôýðï `a.out`. ÅöåõñÝèçêáí äéÜöïñïé ôýðïé üðùò ïé COFF, ECOFF, êáé ìåñéêïß Üëëïé ëéãüôåñï ãíùóôïß, êáé åñåõíÞèçêáí ïé ðåñéïñéóìïß ôïõò þóðïõ ôá ðñÜãìáôá óôáèåñïðïéÞèçêáí óôï ELF.

ÅðéðëÝïí, ôï ìÝãåèïò ôùí ðñïãñáììÜôùí ãéíüôáí üëï êáé ìåãáëýôåñï êáé ïé äßóêïé (êáé ç öõóéêÞ ìíÞìç) Þôáí áêüìç ó÷åôéêÜ ìéêñïß êáé êÜðùò Ýôóé ãåííÞèçêå ç éäÝá ôçò êïéíÞò âéâëéïèÞêçò. Ôï óýóôçìá VM Ýãéíå åðßóçò ðåñéóóüôåñï ðåñßðëïêï. ÊÜèå ìßá áðü ôéò âåëôéþóåéò ãéíüôáí ìå âÜóç ôïí ôýðï `a.out`, ðïõ üìùò ãéíüôáí üëï êáé ðéï äýó÷ñçóôïò ìå êÜèå íÝá ðñïóèÞêç. Åðéðñüóèåôá, ï êüóìïò Þèåëå íá öïñôþíåé ôìÞìáôá äõíáìéêÜ åíþ ôï óýóôçìá Þôáí óå öÜóç åêôÝëåóçò, Þ íá åîáëåßöåé ìÝñç ðñïãñáììÜôùí áöïý åß÷å åêôåëåóôåß ï êþäéêáò áñ÷éêïðïßçóçò (init) þóôå íá åîïéêïíïìçèåß öõóéêÞ ìíÞìç êáé ÷þñïò swap. Ïé ãëþóóåò ðñïãñáììáôéóìïý ãéíüíôïõóáí áêüìá ðéï ðåñßðëïêåò êáé ï êüóìïò Þèåëå áõôüìáôç öüñôùóç êáé åêôÝëåóç êþäéêá ðñéí ôçí êëÞóç ôçò main. ¸ãéíáí ðñü÷åéñåò äéïñèþóåéò (hacks) óôïí ôýðï `a.out` þóôå íá óõìâáßíåé ìå üëåò áõôÝò ôéò áëëáãÝò, êáé ðñÜãìáôé, ãéá ìéá ðåñßïäï Ýäåé÷íå íá ëåéôïõñãåß. Ìå ôïí êáéñü üìùò, öÜíçêå üôé ï ôýðïò `a.out` äåí èá ìðïñïýóå íá áíôåðåîÝëèåé óå üëá áõôÜ ôá ðñïâëÞìáôá, ÷ùñßò èá Ýðñåðå íá áíáðôýóóåôáé óõíå÷þò êáé ìå ðåñßðëïêï ôñüðï. Áí êáé ôï ELF Ýëõíå ðïëëÜ áðü áõôÜ ôá ðñïâëÞìáôá, ç ìåôÜâáóç óå áõôü åíüò óõóôÞìáôïò ðïõ âáóéêÜ ëåéôïõñãïýóå, èá ïäçãïýóå óå ïäõíçñÝò êáôáóôÜóåéò. ¸ôóé ï ôýðïò ELF Ýðñåðå íá ðåñéìÝíåé ìÝ÷ñé ôç óôéãìÞ üðïõ ç ðáñáìïíÞ óôï `a.out` èá äçìéïõñãïýóå ðåñéóóüôåñá ðñïâëÞìáôá áðü üôé ç ìåôÜâáóç óôï ELF.

Ùóôüóï, üóï ï êáéñüò ðåñíïýóå, êáé ôá åñãáëåßá ìåôáãëþôôéóçò áðü ôá ïðïßá ðñïÝñ÷ïíôáé ôá áíôßóôïé÷á åñãáëåßá ôïõ FreeBSD (åéäéêüôåñá ï assembler êáé ï loader), áíáðôý÷èçêáí ðáñÜëëçëá óå äýï äÝíôñá. Ôï äÝíôñï ôïõ FreeBSD ðñüóèåóå êïéíÝò âéâëéïèÞêåò êáé äéüñèùóå êÜðïéá óöÜëìáôá. Ç ïìÜäá ôïõ GNU ðïõ åß÷å áñ÷éêÜ ãñÜøåé áõôÜ ôá ðñïãñÜììáôá, ôá Ýãñáøå îáíÜ êáé ðñüóèåóå åõêïëüôåñç õðïóôÞñéîç ãéá êáôáóêåõÞ cross compilers, ôçí åíóùìÜôùóç äéáöïñåôéêþí ôýðùí êáôÜ âïýëçóç, êëð. Áí êáé ðïëëïß æçôïýóáí íá êáôáóêåõáóôïýí cross compilers ãéá FreeBSD, Þôáí Üôõ÷ïé, áöïý ï ðáëéüò ðçãáßïò êþäéêáò ôïõ FreeBSD ãéá ôá **as** êáé **ld** ôá Ýêáíå áêáôÜëëçëá. Ç íÝá áëõóßäá åñãáëåßùí ôïõ GNU (**binutils**) õðïóôçñßæåé cross compiling, ELF, êïéíÝò âéâëéïèÞêåò, ðñïåêôÜóåéò C++, êôë. ÅðéðëÝïí, ðïëëïß ôñßôïé êáôáóêåõáóôÝò ðñïóöÝñïõí åêôåëÝóéìá ELF, êáé åßíáé ðïëý êáëü íá ìðïñïýí íá åêôåëïýíôáé óôï FreeBSD.

Ï ELF åßíáé ðéï åêöñáóôéêüò áðü ôïí `a.out` êáé ðåñéóóüôåñï åðåêôÜóéìïò óôï âáóéêü óýóôçìá. Ôá åñãáëåßá ELF åßíáé åõêïëüôåñá óôçí óõíôÞñçóç êáé ðñïóöÝñïõí õðïóôÞñéîç ãéá cross compilers, êÜôé ðïõ åßíáé ðïëý óçìáíôéêü ãéá ìåñéêïýò áíèñþðïõò. Ìðïñåß ï ELF íá åßíáé ëßãï ðéï áñãüò áðü ôïí `a.out`, áëëÜ ç äéáöïñÜ äåí åßíáé áéóèçôÞ. ÕðÜñ÷ïõí åðßóçò ðïëëÝò Üëëåò äéáöïñÝò ìåôáîý ôïõò, óå ëåðôïìÝñåéåò üðùò ôïí ôñüðï ðïõ áíôéóôïé÷ßæïõí óåëßäåò, ðïõ ÷åéñßæïíôáé ôïí êþäéêá init, êëð. ÊáìéÜ áðü áõôÝò äåí åßíáé ðïëý óçìáíôéêÞ, áëëÜ ùóôüóï äåí ðáýïõí íá åßíáé äéáöïñÝò. Ìå ôïí êáéñü ç õðïóôÞñéîç ãéá ôï `a.out` èá áðïìáêñõíèåß áðü ôïí ðõñÞíá GENERIC, êáé ôåëéêÜ èá áöáéñåèåß åíôåëþò áðü ôïí ðõñÞíá üôáí åêëåßøåé ïëïêëçñùôéêÜ ç áíÜãêç åêôÝëåóçò ðáëáéþí ðñïãñáììÜôùí ôýðïõ `a.out`.

4.13 Ãéá Ðåñéóóüôåñåò Ðëçñïöïñßåò

4.13.1 Óåëßäåò Âïçèåßáò

Ç ðéï êáôáíïçôÞ ôåêìçñßùóç óôï FreeBSD ðñïóöÝñåôáé ìå ôç ìïñöÞ ôùí óåëßäùí âïçèåßáò (manual pages). Ó÷åäüí ãéá êÜèå ðñüãñáììá ôïõ óõóôÞìáôïò äßíåôáé ìéá óýíôïìç áíáöïñÜ ðïõ åîçãåß ôéò âáóéêÝò ëåéôïõñãßåò êáé äéÜöïñá Üëëá èÝìáôá. ÁõôÝò ïé óåëßäåò ðñïâÜëëïíôáé ìå ôçí åíôïëÞ `man`. Ç ÷ñÞóç ôçò åíôïëÞò `man` åßíáé áðëÞ:

```
% man command
```

üðïõ `command` åßíáé ôï üíïìá ôçò åíôïëÞò ãéá ôçí ïðïßá åðéèõìåßôå íá ìÜèåôå ðåñéóóüôåñåò ðëçñïöïñßåò. Ãéá ðáñÜäåéãìá, ãéá íá ìÜèåôå ðåñéóóüôåñá ãéá ôçí åíôïëÞ `ls` ðëçêôñïëïãÞóôå:

```
% man ls
```

Ôï online manual ÷ùñßæåôáé óå ôÝóóåñéò áñéèìçìÝíåò åíüôçôåò:

1. ÅíôïëÝò ÷ñÞóôç.
2. ÊëÞóåéò óõóôÞìáôïò êáé áñéèìïß óöáëìÜôùí.
3. ÓõíáñôÞóåéò ôùí âéâëéïèçêþí ôçò C.
4. Ïäçãïß óõóêåõþí.
5. Ôýðïé áñ÷åßùí.
6. Ðáé÷íßäéá êáé Üëëåò åöáñìïãÝò äéáóêÝäáóçò.
7. ÄéÜöïñåò ðëçñïöïñßåò.
8. ÓõíôÞñçóç óõóôÞìáôïò êáé åíôïëÝò ëåéôïõñãßáò.
9. ÁíÜðôõîç ðõñÞíá.

Óå ìåñéêÝò ðåñéðôþóåéò, ôï ßäéï èÝìá ìðïñåß íá åìöáíßæåôáé óå ðåñéóóüôåñåò åíüôçôåò ôùí óåëßäùí âïçèåßáò. Ãéá ðáñÜäåéãìá, õðÜñ÷åé ç åíôïëÞ ÷ñÞóôç `chmod` êáé ç êëÞóç óõóôÞìáôïò `chmod()`. Óå áõôÞ ôç ðåñßðôùóç, ìðïñåßôå íá ðåßôå óôçí åíôïëÞ `man` ðïéá áêñéâþò èÝëåôå åðéëÝãïíôáò ôçí åíüôçôá:

```
% man 1 chmod
```

Ìå áõôüí ôïí ôñüðï èá åìöáíéóôåß ç óåëßäá âïçèåßáò ãéá ôçí åíôïëÞ ÷ñÞóôç `chmod`. Ïé áíáöïñÝò óå ìéá åéäéêÞ åíüôçôá ôùí óåëßäùí âïçèåßáò ôïðïèåôïýíôáé ðáñáäïóéáêÜ ìÝóá óå ðáñÝíèåóç óôçí ôõðùìÝíç ôåêìçñßùóç, åðïìÝíùò ôï chmod(1) áíáöÝñåôáé óôçí åíôïëÞ ÷ñÞóôç `chmod` êáé ôï chmod(2) áíáöÝñåôáé óôçí êëÞóç óõóôÞìáôïò.

Áõôü åßíáé ÷ñÞóéìï üôáí ãíùñßæïõìå ôï üíïìá ôçò åíôïëÞò êáé áðëÜ åðéèõìïýìå íá ìÜèïõìå ðùò íá ôçí ÷ñçóéìïðïéÞóïõìå, áëëÜ ôé ãßíåôáé áí äåí ãíùñßæïõìå ôï üíïìá ôçò; Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï `man` ãéá íá áíáæçôÞóåôå ëÝîåéò êëåéäéÜ áðü ôéò ðåñéãñáöÝò ôùí åíôïëþí ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `-k`:

```
% man -k mail
```

Ìå ôçí åíôïëÞ áõôÞ èá åìöáíéóôåß ìßá ëßóôá áðü åíôïëÝò ðïõ ðåñéÝ÷ïõí ôçí ëÝîç êëåéäß “mail” óôçí ðåñéãñáöÞ ôïõò. Áõôü åßíáé áíôßóôïé÷ï ìå ôï íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `apropos`.

ÅðïìÝíùò, âëÝðåôå üëåò áõôÝò ôéò ãïõóôüæéêåò åíôïëÝò óôïí `/usr/bin` áëëÜ äåí Ý÷åôå ôçí ðáñáìéêñÞ éäÝá ôïõ ôé ðñáãìáôéêÜ êÜíïõí; ÁðëÜ äþóôå:

```
% cd /usr/bin
% man -f *
```

Þ

```
% cd /usr/bin
% whatis *
```

ôï ïðïßï êÜíåé áêñéâþò ôï ßäéï ðñÜãìá.

4.13.2 GNU Info Files

Ôï FreeBSD ðåñéëáìâÜíåé ðïëëÝò åöáñìïãÝò êáé âïçèçôéêÜ ðñïãñÜììáôá ðïõ Ý÷ïõí äçìéïõñãçèåß áðü ôçí Free Software Foundation (FSF). ÐÝñá áðü ôéò óåëßäåò âïçèåßáò, ôá ðñïãñÜììáôá áõôÜ ðáñÝ÷ïíôáé ìå ôåêìçñßùóç ìïñöÞò hypertext óå áñ÷åßá ðïõ ïíïìÜæïíôáé `info` êáé ôá ïðïßá ìðïñåßôå íá ðñïâÜëëåôå ìå ôçí åíôïëÞ `info` Þ, áí Ý÷åôå åãêáôáóôÞóåé ôï **emacs**, ìÝóù ôçò êáôÜóôáóçò ëåéôïõñãßáò info mode ôïõ **emacs**.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ info(1), áðëÜ ðëçêôñïëïãÞóôå:

```
% info
```

Ãéá ìéá óýíôïìç åéóáãùãÞ, ðëçêôñïëïãÞóôå `h`. Ãéá ìéá ãñÞãïñç áíáöïñÜ åíôïëÞò, ðëçêôñïëïãÞóôå `?`.

Óçìåéþóåéò

1. Áõôü áêñéâþò óçìáßíåé ôï `i386`. Áêüìç êáé áí äåí ÷ñçóéìïðïéåßôå åðåîåñãáóôÞ Intel 386 CPU óôï FreeBSD óýóôçìá óáò, èá åìöáíßæåôáé ôï `i386`. ÁõôÞ åßíáé ç “áñ÷éôåêôïíéêÞ”, êáôáóêåõÞò ôïõ åðåîåñãáóôÞ êáé ü÷é ôï ìïíôÝëï ôïõ åðåîåñãáóôÞ.
2. Ôá óåíÜñéá åêêßíçóçò (startup scripts) åßíáé ðñïãñÜììáôá ðïõ ôñÝ÷ïõí áõôüìáôá êáôÜ ôçí åêêßíçóç ôïõ FreeBSD. Ç êýñéá ëåéôïõñãßá ôïõò åßíáé íá âïçèïýí óôçí óùóôÞ ëåéôïõñãßá üëùí ôùí õðüëïéðùí ôïõ óõóôÞìáôïò, êáé íá îåêéíïýí üëåò ôéò õðçñåóßåò ðïõ Ý÷åôå ñõèìßóåé íá ôñÝ÷ïõí óôï ðáñáóêÞíéï.
3. Ãéá üëåò ôéò ôå÷íéêÝò ëåðôïìÝñåéåò êáé áêñéâåßò ðåñéãñáöÝò ôùí ïäçãþí (drivers) ðïõ ÷ñçóéìïðïéïýíôáé óôï FreeBSD ãéá êïíóüëåò êáé ðëçêôñïëüãéá ìðïñåßôå íá âñåßôå óôéò óåëßäåò syscons(4), atkbd(4), vidcontrol(1)

êáé kbdcontrol(1) ôùí óåëßäùí âïÞèåéáò (manual pages). Äåí èá óõíå÷ßóïõìå ðåñáéôÝñù, áëëÜ ï åíäéáöåñüìåíïò áíáãíþóôçò ìðïñåß íá óõìâïõëåýåôáé ðÜíôá ôéò óåëßäåò âïçèåßáò ãéá ðåñéóóüôåñï ëåðôïìåñÞ êáé ïëïêëçñùìÝíç åðåîÞãçóç ôùí ëåéôïõñãéþí.

4. Áõôü äåí åßíáé áðüëõôá áëçèÝò — ÕðÜñ÷ïõí ìåñéêÜ ðñÜãìáôá ðïõ äåí ìðïñïýí íá äéáêïðïýí. Ãéá ðáñÜäåéãìá, åÜí ç äéåñãáóßá ðñïóðáèåß íá äéáâÜóåé Ýíá áñ÷åßï áðü Üëëïí õðïëïãéóôÞ óôï äßêôõï êáé îáöíéêÜ áõôüò ï Üëëïò õðïëïãéóôÞò äéáêüøåé ãéá êÜðïéï ëüãï (ëüãù êëåéóßìáôïò ôïõ pc Þ ëüãù âëÜâçò óôï äßêôõï), ôüôå ç äéåñãáóßá ïíïìÜæåôáé ìç “äéáêüøéìç”. Ðéèáíþò ç äéåñãáóßá íá êÜíåé time out, óõíÞèùò ìåôÜ áðü äýï ëåðôÜ. Ìüëéò óõìâåß áõôü, èá ôåñìáôéóôåß Üìåóá.

ÊåöÜëáéï 5 ÅãêáôÜóôáóç Åöáñìïãþí: ÐáêÝôá êáé Ports

5.1 Óýíïøç

Ôï FreeBSD óõíïäåýåôáé áðü ìßá ðëïýóéá óõëëïãÞ áðü ðñïãñÜììáôá óáí ìÝñïò ôïõ âáóéêïý óõóôÞìáôïò. ¼ìùò, ëßãá ìðïñåß íá êÜíåé êÜðïéïò ðñéí âñåèåß óôçí áíÜãêç íá åãêáôáóôÞóåé ìéá ðñüóèåôç åöáñìïãÞ ãéá íá õëïðïéÞóåé ìéá ðñáãìáôéêÞ åñãáóßá. Ôï FreeBSD ðáñÝ÷åé äõï óõìðëçñùìáôéêÝò ôå÷íïëïãßåò ãéá íá åãêáôáóôÞóåôå ðñüóèåôåò åöáñìïãÝò óôï óýóôçìá óáò: ôç ÓõëëïãÞ ôùí Ports (Ports Collection, ãéá åãêáôÜóôáóç áðü ôïí ðçãáßï êþäéêá), êáé ôá ðáêÝôá (packages, ãéá åãêáôÜóôáóç áðü ðñï-ìåôáãëùôôéóìÝíá åêôåëÝóéìá ðáêÝôá). ÊÜèå ìßá áðü ôéò äõï ìåèüäïõò ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá åãêáôáóôÞóåôå ôéò íåüôåñåò åêäüóåéò áðü ôéò áãáðçìÝíåò óáò åöáñìïãÝò, áðü ôïðéêÜ áðïèçêåõôéêÜ ìÝóá Þ áðåõèåßáò áðü ôï äßêôõï.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá åãêáèéóôÜôå ðñï-ìåôáãëùôôéóìÝíá ðáêÝôá ëïãéóìéêïý.
- Ðùò íá ìåôáãëùôôßæåôå ðñüóèåôï ëïãéóìéêü áðü ôïí ðçãáßï êþäéêá ÷ñçóéìïðïéþíôáò ôçí ÓõëëïãÞ ôùí Ports.
- Ðùò íá êÜíåôå áðåãêáôÜóôáóç åãêáôáóôçìÝíùí ðáêÝôùí Þ ports.
- Ðùò íá áëëÜæåôå ôéò ðñïêáèïñéóìÝíåò ñõèìßóåéò ðïõ ÷ñçóéìïðïéåß ç ÓõëëïãÞ ôùí Ports.
- Ðùò íá âñßóêåôå ôá êáôÜëëçëá ðáêÝôá ëïãéóìéêïý.
- Ðùò íá áíáâáèìßæåôå ôéò åöáñìïãÝò óáò.

5.2 ÅðéóêüðçóÞ ôçò åãêáôÜóôáóçò ëïãéóìéêïý

Áí Ý÷åôå ÷ñçóéìïðïéÞóåé Ýíá UNIX óýóôçìá óôï ðáñåëèüí, èá ãíùñßæåôå üôé ç óõíçèéóìÝíç äéáäéêáóßá ãéá ôçí åãêáôÜóôáóç ðñüóèåôïõ ëïãéóìéêïý åßíáé ðåñßðïõ ç ðáñáêÜôù:

1. “ÊáôÝâáóìá” ôïõ ëïãéóìéêïý, ðïõ ìðïñåß íá äéáíÝìåôáé óå ìïñöÞ ðçãáßïõ êþäéêá, Þ óáí åêôåëÝóéìï.
2. Áðïóõìðßåóç ôïõ ëïãéóìéêïý áðü ôçí ìïñöÞ ôçò äéáíïìÞò ôïõ (óõíÞèùò Ýíá tarball óõìðéåóìÝíï ìå ôï compress(1), gzip(1), Þ bzip2(1)).
3. Åíôïðéóìüò ôçò ôåêìçñßùóçò (ðéèáíþò Ýíá áñ÷åßï `INSTALL` Þ `README` Þ ìåñéêÜ áñ÷åßá ìÝóá óå Ýíá õðïêáôÜëïãï `doc/`) êáé áíÜãíùóÞ ôïõò ãéá ôï ðùò èá åãêáôáóôáèåß ôï ëïãéóìéêü.
4. Áí ôï ëïãéóìéêü äéáíÝìåôáé ìå ôç ìïñöÞ ðçãáßïõ êþäéêá, ìåôáãëþôôéóç ôïõ. Áõôü ìðïñåß íá ðåñéëáìâÜíåé ôçí åðåîåñãáóßá åíüò `Makefile`, Þ ôçí åêôÝëåóç åíüò `configure` script, êáé Üëëåò åñãáóßåò.
5. ÄïêéìÞ êáé åãêáôÜóôáóç ôïõ ëïãéóìéêïý.

Êáé áõôÜ ìüíï áí üëá ðÜíå êáëÜ. Áí åãêáèéóôÜôå Ýíá ëïãéóìéêü ðïõ äåí Ý÷åé ìåôáöåñèåß óôï FreeBSD ßóùò íá ðñÝðåé íá ôñïðïðïéÞóåôå ôïí ðçãáßï êþäéêá ãéá íá äïõëÝøåé óùóôÜ.

Áí ôï èÝëåôå, ìðïñåßôå íá óõíå÷ßóåôå íá åãêáèéóôÜôå ëïãéóìéêü ìå ôïí “ðáñáäïóéáêü” ôñüðï óôï FreeBSD. ¼ìùò, ôï FreeBSD ðáñÝ÷åé äõï ôå÷íïëïãßåò ðïõ ìðïñïýí íá óáò ãëéôþóïõí áðü ðïëý êüðï: ôá ðáêÝôá êáé ôá ports. Ôçí óôéãìÞ ðïõ ãñÜöôçêå áõôü ôï êåßìåíï, äéáôßèåíôáí ìå áõôüí ôïí ôñüðï ðÜíù áðü 23,000 ðñüóèåôåò åöáñìïãÝò.

Ãéá ïðïéáäÞðïôå åöáñìïãÞ, ôï áíôßóôïé÷ï FreeBSD ðáêÝôï ôçò åßíáé Ýíá ìïíáäéêü áñ÷åßï ðïõ ðñÝðåé íá óáò “êáôåâÜóåôå”. Ôï ðáêÝôï ðåñéÝ÷åé ðñï-ìåôáãëùôôéóìÝíá áíôßãñáöá üëùí ôùí åíôïëþí ôçò åöáñìïãÞò, üðùò åðßóçò êáé áñ÷åßá ðáñáìåôñïðïßçóçò Þ ôåêìçñßùóçò. ¸íá ôÝôïéï ðáêÝôï óå ìïñöÞ áñ÷åßïõ, ìðïñåßôå íá ôï ÷åéñéóôåßôå ìå ôéò åíôïëÝò äéá÷åßñéóçò ðáêÝôùí ôïõ FreeBSD, üðùò ïé pkg_add(1), pkg_delete(1), pkg_info(1), êáé ðÜåé ëÝãïíôáò. Ç åãêáôÜóôáóç ìéáò íÝáò åöáñìïãÞò ìðïñåß íá ãßíåé ìå ìßá ìüíï åíôïëÞ.

¸íá FreeBSD port ãéá ìßá åöáñìïãÞ åßíáé ìéá óõëëïãÞ áðü áñ÷åßá ó÷åäéáóìÝíá ãéá íá áõôïìáôïðïéÞóïõí ôçí äéáäéêáóßá ìåôáãëþôôéóçò ôçò åöáñìïãÞò áðü ôïí ðçãáßï êþäéêá.

Èõìçèåßôå üôé õðÜñ÷ïõí ìåñéêÜ âÞìáôá ðïõ èá ðñÝðåé ëïãéêÜ íá êÜíåôå áí ìåôáãëùôôßóåôå Ýíá ðñüãñáììá ìüíïò óáò (“êáôÝâáóìá”, áðïóõìðßåóç, ðñïóáñìïãÞ (patching), ìåôáãëþôôéóç, åãêáôÜóôáóç). Ôá áñ÷åßá ðïõ áðïôåëïýí Ýíá port ðåñéÝ÷ïõí üëåò ôéò áðáñáßôçôåò ðëçñïöïñßåò ãéá íá åðéôñÝøïõí óôï óýóôçìá íá êÜíåé üëá áõôÜ ãéá åóÜò. Åóåßò åêôåëåßôå ìåñéêÝò áðëÝò åíôïëÝò, êáé ï ðçãáßïò êþäéêáò ãéá ôçí åöáñìïãÞ áõôüìáôá “êáôåâáßíåé”, áðïóõìðéÝæåôáé, ðñïóáñìüæåôáé, ìåôáãëùôôßæåôáé, êáé åãêáèßóôáôáé ãéá åóÜò.

Óôçí ðñáãìáôéêüôçôá, ôï óýóôçìá ports ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ãéá íá äçìéïõñãçèïýí ðáêÝôá ðïõ ìðïñåßôå áñãüôåñá íá äéá÷åéñéóôåßôå ìå ôçí `pkg_add` êáé ôéò Üëëåò åíôïëÝò äéá÷åßñéóçò ðáêÝôùí ðïõ èá áíáöåñèïýí óå ëßãï.

Ôüóï ôá ðáêÝôá, üóï êáé ôá ports êáôáíïïýí ôéò *åîáñôÞóåéò (dependencies)*. Áò õðïèÝóïõìå üôé èÝëåôå íá åãêáôáóôÞóåôå ìßá åöáñìïãÞ ðïõ åîáñôÜôáé áðü ìßá óõãêåêñéìÝíç âéâëéïèÞêç ãéá íá ëåéôïõñãÞóåé. Ôüóï ç åöáñìïãÞ, üóï êáé ç âéâëéïèÞêç äéáôßèåíôáé ùò ðáêÝôá êáé ports ôïõ FreeBSD. Áí ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `pkg_add` Þ ôï óýóôçìá ôùí ports ãéá íá åãêáôáóôÞóåôå ôçí åöáñìïãÞ, áìöüôåñá èá ðáñáôçñÞóïõí üôé ç âéâëéïèÞêç äåí åßíáé åãêáôåóôçìÝíç, êáé áõôüìáôá èá ôçí åãêáôáóôÞóïõí ðñéí áðü ôï ðñüãñáììá.

¸÷ïíôáò áíáöÝñåé üôé ïé äýï ôå÷íïëïãßåò åßíáé áñêåôÜ üìïéåò, ßóùò íá áíáñùôéÝóôå ãéáôß ôï FreeBSD ðñïóöÝñåé êáé ôéò äýï. Ôá ðáêÝôá êáé ôá ports áìöüôåñá Ý÷ïõí ôá äéêÜ ôïõò ðëåïíåêôÞìáôá, êáé ôï ôé èá ÷ñçóéìïðïéÞóåôå åîáñôÜôáé áðü ôçí äéêÞ óáò ðñïôßìçóç.

ÐëåïíåêôÞìáôá ôùí ÐáêÝôùí

- ¸íá óõìðéåóìÝíï tarball ðáêÝôïõ åßíáé óõíÞèùò ìéêñüôåñï áðü ôï óõìðéåóìÝíï tarball ðïõ ðåñéÝ÷åé ôïí ðçãáßï êþäéêá ãéá ôçí åöáñìïãÞ.
- Ôá ðáêÝôá äåí ÷ñåéÜæïíôáé ìåôáãëþôôéóç. Ãéá ìåãÜëåò åöáñìïãÝò, üðùò åßíáé ï **Mozilla**, ôï **KDE**, Þ ôï **GNOME** áõôü ìðïñåß íá åßíáé óçìáíôéêü, éäéáßôåñá áí âñßóêåóôå óå Ýíá áñãü ìç÷Üíçìá.
- Ôá ðáêÝôá äåí áðáéôïýí íá êáôáíïÞóåôå ôçí äéáäéêáóßá ðïõ ó÷åôßæåôáé ìå ôçí ìåôáãëþôôéóç ëïãéóìéêïý óôï FreeBSD.

ÐëåïíåêôÞìáôá ôùí Ports

- Ôá ðáêÝôá óõíÞèùò åßíáé ìåôáãëùôôéóìÝíá ìå óõíôçñçôéêÝò åðéëïãÝò, åðåéäÞ ðñÝðåé íá ëåéôïõñãïýí óôïí ìÝãéóôï áñéèìü óõóôçìÜôùí. Ìå åãêáôÜóôáóç áðü ôï port, ìðïñåßôå íá ñõèìßóåôå ôéò åðéëïãÝò ìåôáãëþôôéóçò (ãéá ðáñÜäåéãìá) íá äçìéïõñãÞóïõí êþäéêá ðïõ íá åêìåôáëëåýåôáé ôéò éäéáéôåñüôçôåò åíüò Pentium 4 Þ Athlon åðåîåñãáóôÞ.
- ÌåñéêÝò åöáñìïãÝò Ý÷ïõí åðéëïãÝò ìåôáãëþôôéóçò ðïõ ó÷åôßæïíôáé ìå ôï ôé ìðïñïýí íá êÜíïõí êáé ôé ü÷é. Ãéá ðáñÜäåéãìá, ï **Apache** ìðïñåß íá ìåôáãëùôôéóôåß ìå Ýíá åõñý öÜóìá áðü åðéëïãÝò. Ìåôáãëùôôßæïíôáò ôïí áðü ôï port, äåí åßíáé áíÜãêç íá äå÷ôåßôå ôéò ðñïåðéëåãìÝíåò åðéëïãÝò, ìðïñåßôå íá êÜíåôå ôéò äéêÝò óáò.

Óå ìåñéêÝò ðåñéðôþóåéò, ìðïñåß íá õðÜñ÷ïõí ðïëëáðëÜ ðáêÝôá ãéá ôçí ßäéá åöáñìïãÞ, ìå äéáöïñåôéêÝò ñõèìßóåéò. Ãéá ðáñÜäåéãìá, ôï **Ghostscript** äéáôßèåôáé ùò Ýíá ðáêÝôï `ghostscript` êáé Ýíá ðáêÝôï `ghostscript-nox11`, áíáëüãùò áí èá åãêáôáóôÞóåôå Þ ü÷é Ýíáí X11 server. Áõôïý ôïõ ôýðïõ ïé ñõèìßóåéò åßíáé äõíáôÝò ìå ôá ðáêÝôá, áëëÜ ãñÞãïñá ãßíïíôáé áäýíáôåò áí ìßá åöáñìïãÞ Ý÷åé ðåñéóóüôåñåò áðü ìßá Þ äýï äéáöïñåôéêÝò ñõèìßóåéò ìåôáãëþôôéóçò.

- Ïé óõíèÞêåò ôùí áäåéþí äéáíïìÞò áðü ìåñéêÝò äéáíïìÝò ëïãéóìéêïý, áðáãïñåýïõí ôçí äéáíïìÞ åêôåëÝóéìïõ êþäéêá. ÐñÝðåé íá äéáíåìçèïýí ìå ôçí ìïñöÞ ðçãáßïõ êþäéêá.
- ÌåñéêÜ Üôïìá äåí åìðéóôåýïíôáé ôá Ýôïéìá åêôåëÝóéìá. ÔïõëÜ÷éóôïí ìå ôïí ðçãáßï êþäéêá, ìðïñåßôå (èåùñçôéêÜ) íá ôïí äéáâÜóåôå êáé íá øÜîåôå ãéá ðéèáíÜ ðñïâëÞìáôá ìüíïò óáò.
- Áí Ý÷åôå ôïðéêÜ, äéêÜ óáò patches, èá ÷ñåéáóôåßôå ôïí ðçãáßï êþäéêá ãéá íá ôá åöáñìüóåôå.
- ÌåñéêÜ Üôïìá ãïõóôÜñïõí íá Ý÷ïõí ôïí ðçãáßï êþäéêá, þóôå íá ôïí äéáâÜóïõí áí âáñåèïýíå, íá ôïí áëëÜîïõí (hack), íá äáíåéóôïýí áðü áõôüí (áí âÝâáéá ôï åðéôñÝðåé ç Üäåéá), ê.ë.ð.

Ãéá íá åßóôå åíÞìåñïò ãéá ôá áíáíåùìÝíá ports, åããñáöåßôå óôçí çëåêôñïíéêÞ ëßóôá ôùí FreeBSD ports (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports) êáé óôçí çëåêôñïíéêÞ ëßóôá áíáöïñþí ðñïâëçìÜôùí ôùí FreeBSD ports (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports-bugs).

> **Ðñïåéäïðïßçóç:** Ðñéí åãêáôáóôÞóåôå ïðïéïäÞðïôå åöáñìïãÞ, ðñÝðåé íá åëÝã÷åôå ôï http://vuxml.freebsd.org/ ãéá èÝìáôá áóöáëåßáò ðïõ ó÷åôßæïíôáé ìå ôçí åöáñìïãÞ óáò.
>
> Ìðïñåßôå åðßóçò íá åãêáôáóôÞóåôå ôï `ports-mgmt/portaudit` ôï ïðïßï áõôüìáôá èá åëÝã÷åé üëåò ôéò åãêáôáóôçìÝíåò åöáñìïãÝò ãéá ãíùóôÜ ôñùôÜ óçìåßá. ¸ëåã÷ïò åðßóçò èá ðñáãìáôïðïéåßôáé ðñéí ôç ìåôáãëþôôéóç ïðïéïõäÞðïôå port. Óôï ìåôáîý, ìðïñåßôå íá ÷ñçóéìïðïéåßôå ôçí åíôïëÞ `portaudit -F -a` áöüôïõ Ý÷åôå ðñþôá åãêáôáóôÞóåé ìåñéêÜ ðáêÝôá.

Ôï õðüëïéðï áõôïý ôïõ êåöáëáßïõ åîçãåß ðùò íá ÷ñçóéìïðïéÞóåôå ôá ðáêÝôá êáé ôá ports ãéá íá åãêáôáóôÞóåôå êáé íá äéá÷åéñéóôåßôå ðñüóèåôï ëïãéóìéêü óôï FreeBSD.

5.3 Âñßóêïíôáò ôçí ÅöáñìïãÞ óáò

Ðñéí åãêáôáóôÞóåôå ïðïéáäÞðïôå åöáñìïãÞ ðñÝðåé íá ãíùñßæåôå ôé èÝëåôå íá êÜíåé, êáé ðùò ïíïìÜæåôáé ç åöáñìïãÞ.

Ç ëßóôá ôùí äéáèÝóéìùí åöáñìïãþí óôï FreeBSD ìåãáëþíåé óõíå÷þò. Åõôõ÷þò, õðÜñ÷ïõí ðïëëïß ôñüðïé íá âñåßôå áõôü ðïõ èÝëåôå:

- Óôç äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD èá âñåßôå ìéá ëßóôá áðü üëåò ôéò äéáèÝóéìåò åöáñìïãÝò, óôï http://www.FreeBSD.org/ports/ (http://www.FreeBSD.org/ports/index.html). Ç ëßóôá áõôÞ áíáíåþíåôáé óõ÷íÜ, åíþ õðÜñ÷åé êáé äõíáôüôçôá áíáæÞôçóçò. Ôá ports åßíáé ÷ùñéóìÝíá óå êáôçãïñßåò, êáé ìðïñåßôå íá áíáæçôÞóåôå ìßá åöáñìïãÞ åßôå ìå ôï üíïìá (áí ôï îÝñåôå), Þ íá äåßôå üëåò ôéò åöáñìïãÝò ðïõ åßíáé äéáèÝóéìåò óå ìéá êáôçãïñßá.
- Ï Dan Langille äéáôçñåß ôï FreshPorts, óôï http://www.FreshPorts.org/. Ôï FreshPorts êáôáãñÜöåé ôéò áëëáãÝò ôùí åöáñìïãþí óôï äÝíôñï ôùí ports êáèþò óõìâáßíïõí, åðéôñÝðïíôÜò óáò íá “ðáñáêïëïõèåßôå” Ýíá Þ ðåñéóóüôåñá ports, êáé ìðïñåß íá óáò óôåßëåé email üôáí áõôÜ áíáíåþíïíôáé.
- Áí äåí ãíùñßæåôå ôï üíïìá ôçò åöáñìïãÞò ðïõ èÝëåôå, äïêéìÜóôå íá ÷ñçóéìïðïéÞóåôå Ýíá site óáí ôï FreshMeat (http://www.freshmeat.net/) ãéá íá âñåßôå ìßá åöáñìïãÞ, êáé ìåôÜ ìðïñåßôå íá åëÝãîåôå îáíÜ ôï site ôïõ FreeBSD ãéá íá äåßôå áí ç åöáñìïãÞ Ý÷åé ãßíåé port.

- Áí îÝñåôå ôï áêñéâÝò üíïìá ôïõ port, êáé èÝëåôå ìüíï íá âñåßôå óå ðïéá êáôçãïñßá åßíáé, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ whereis(1). ÁðëÜ ãñÜøôå `whereis` *áñ÷åßï*, üðïõ *áñ÷åßï* åßíáé ôï ðñüãñáììá ðïõ èÝëåôå íá åãêáôáóôÞóåôå. Áí áõôü âñßóêåôáé óôï óýóôçìá óáò, ç åíôïëÞ èá óáò ðåé ðïõ åßíáé, üðùò ðáñáêÜôù:

  ```
  # whereis lsof
  lsof: /usr/ports/sysutils/lsof
  ```

  Áõôü ìáò ëÝåé üôé ôï `lsof` (Ýíá åñãáëåßï óõóôÞìáôïò) ìðïñåß íá âñåèåß óôïí êáôÜëïãï `/usr/ports/sysutils/lsof`.

- Åðéðñüóèåôá, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ìéá áðëÞ åíôïëÞ echo(1) ãéá íá åíôïðßóåôå ôçí ôïðïèåóßá êÜðïéïõ ðñïãñÜììáôïò ìÝóá óôá ports. Ãéá ðáñÜäåéãìá:

  ```
  # echo /usr/ports/*/*lsof*
  /usr/ports/sysutils/lsof
  ```

  Óçìåéþóôå üôé ôï ðáñáðÜíù èá äåßîåé åðßóçò êáé ïðïéáäÞðïôå áñ÷åßá Ý÷ïõí êáôÝâåé óôïí êáôÜëïãï `/usr/ports/distfiles` åöüóïí ôáéñéÜæïõí óôçí áíáæÞôçóç.

- Áêüìç Ýíáò ôñüðïò íá âñåßôå Ýíá óõãêåêñéìÝíï port, åßíáé ÷ñçóéìïðïéþíôáò ôïí åóùôåñéêü ìç÷áíéóìü áíáæÞôçóçò ôçò ÓõëëïãÞò ôùí Ports. Ãéá íá ÷ñçóéìïðïéÞóåôå áõôü ôïí ôñüðï áíáæÞôçóçò, èá ÷ñåéáóôåß íá âñßóêåóôå óôïí êáôÜëïãï `/usr/ports`. ¼ôáí âñåèåßôå óå áõôüí ôïí êáôÜëïãï, åêôåëÝóôå ôï `make search name=`*üíïìá--ðñïãñÜììáôïò* üðïõ *üíïìá--ðñïãñÜììáôïò* åßíáé ôï üíïìá ôïõ ðñïãñÜììáôïò ðïõ èÝëåôå íá âñåßôå. Ãéá ðáñÜäåéãìá, áí áíáæçôÜôå ôï `lsof`:

  ```
  # cd /usr/ports
  # make search name=lsof
  Port:   lsof-4.56.4
  Path:   /usr/ports/sysutils/lsof
  Info:   Lists information about open files (similar to fstat(1))
  Maint:  obrien@FreeBSD.org
  Index:  sysutils
  B-deps:
  R-deps:
  ```

  Ôï ôìÞìá ôçò åîüäïõ ðïõ ðñÝðåé íá ðñïóÝîåôå éäéáßôåñá åßíáé ç ãñáììÞ “Path:”, áöïý áõôÞ óáò ëÝåé ðïõ íá âñåßôå ôï port. Ïé õðüëïéðåò ðëçñïöïñßåò ðïõ ðáñÝ÷ïíôáé äåí ÷ñåéÜæïíôáé ãéá íá åãêáôáóôáèåß ôï port, ãéá áõôü äåí èá áíáëõèïýí åäþ.

  Ãéá ðéï ëåðôïìåñÞ áíáæÞôçóç ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå åðßóçò `make search key=`*öñÜóç* üðïõ *öñÜóç* åßíáé êÜðïéï êåßìåíï ðñïò áíáæÞôçóç. Áõôü áíáæçôÜ ïíüìáôá port, ó÷üëéá, ðåñéãñáöÝò êáé åîáñôÞóåéò, êáé ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá âñåèïýí ports ðïõ ó÷åôßæïíôáé ìå Ýíá óõãêåêñéìÝíï èÝìá, åÜí äåí ãíùñßæåôå ôï üíïìá ôïõ ðñïãñÜììáôïò ðïõ áíáæçôÜôå.

  Óå üëåò ôéò ðáñáðÜíù ðåñéðôþóåéò, ç öñÜóç ðñïò áíáæÞôçóç åßíáé case-insensitive (äåí ëáìâÜíåé õðüøç ôéò äéáöïñÝò êåöáëáßùí-ìéêñþí). Ç áíáæÞôçóç ãéá ôï “LSOF”, èá äþóåé ôá ßäéá áðïôåëÝóìáôá ìå ôçí áíáæÞôçóç ãéá ôï “lsof”.

5.4 ×ñçóéìïðïéþíôáò ôï Óýóôçìá ôùí ÐáêÝôùí

ÓõíåéóöïñÜ ôïõ Chern Lee.

ÕðÜñ÷ïõí äéÜöïñá åñãáëåßá ìå ôá ïðïßá ìðïñåßôå íá äéá÷åéñéóôåßôå ôá ðáêÝôá óôï FreeBSD:

- Óå Ýíá óýóôçìá ðïõ âñßóêåôáé Þäç óå ëåéôïõñãßá, ìðïñåßôå íá åêôåëÝóåôå ôï **sysinstall** ãéá íá åãêáôáóôÞóåôå, íá äéáãñÜøåôå, êáé íá äåßôå ôéò åãêáôåóôçìÝíåò êáé ôéò äéáèÝóéìåò åöáñìïãÝò. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôï ÔìÞìá 2.10.11.
- Ôá äéÜöïñá åñãáëåßá äéá÷åßñéóçò ìÝóù ôçò ãñáììÞò åíôïëþí, ðïõ áðïôåëïýí êáé ôï áíôéêåßìåíï óõæÞôçóçò áõôÞò ôçò åíüôçôáò.

5.4.1 Åãêáèéóôþíôáò Ýíá ÐáêÝôï

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï åñãáëåßï pkg_add(1) ãéá íá åãêáôáóôÞóåôå Ýíá ðáêÝôï ëïãéóìéêïý ôïõ FreeBSD áðü Ýíá ôïðéêÜ áðïèçêåõìÝíï áñ÷åßï Þ áðü Ýíáí äéáêïìéóôÞ óôï äßêôõï.

ÐáñÜäåéãìá 5-1. “ÊáôÝâáóìá” åíüò ðáêÝôïõ ÷åéñïêßíçôá êáé åãêáôÜóôáóç ôïõ ôïðéêÜ

```
# ftp -a ftp2.FreeBSD.org
Connected to ftp2.FreeBSD.org.
220 ftp2.FreeBSD.org FTP server (Version 6.00LS) ready.
331 Guest login ok, send your email address as password.
230-
230-     This machine is in Vienna, VA, USA, hosted by Verio.
230-         Questions? E-mail freebsd@vienna.verio.net.
230-
230-
230 Guest login ok, access restrictions apply.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> cd /pub/FreeBSD/ports/packages/sysutils/
250 CWD command successful.
ftp> get lsof-4.56.4.tgz
local: lsof-4.56.4.tgz remote: lsof-4.56.4.tgz
200 PORT command successful.
150 Opening BINARY mode data connection for ’lsof-4.56.4.tgz’ (92375 bytes).
100% |**************************************************| 92375       00:00 ETA
226 Transfer complete.
92375 bytes received in 5.60 seconds (16.11 KB/s)
ftp> exit
# pkg_add lsof-4.56.4.tgz
```

ÅÜí äåí Ý÷åôå ìéá ôïðéêÞ ðçãÞ ðáêÝôùí (üðùò åßíáé Ýíá FreeBSD CD-ROM set) ôüôå ßóùò åßíáé åõêïëüôåñï íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-r` ãéá ôï pkg_add(1). ÁõôÞ èá êÜíåé ôï åñãáëåßï íá êáèïñßóåé áõôüìáôá ôç óùóôÞ ìïñöÞ êáé Ýêäïóç êáé Ýðåéôá íá áíáêôÞóåé êáé íá åãêáôáóôÞóåé ôï ðáêÝôï áðü Ýíá FTP site.

```
# pkg_add -r lsof
```

Ôï ðáñáðÜíù ðáñÜäåéãìá èá “êáôåâÜóåé” êáé èá åãêáôáóôÞóåé ôï óùóôü ðáêÝôï ÷ùñßò ðåñáéôÝñù åðÝìâáóç ôïõ ÷ñÞóôç. Áí äåí èÝëåôå íá ÷ñçóéìïðïéÞóåôå ôï êýñéï site äéáíïìÞò ðáêÝôùí, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå êÜðïéï mirror. Ãéá ôï óêïðü áõôü, èá ðñÝðåé íá ñõèìßóåôå óùóôÜ ôçí ôéìÞ ôçò `PACKAGESITE`, þóôå íá ðáñáêÜìøåôå ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò. Ôï pkg_add(1) ÷ñçóéìïðïéåß ôï fetch(3) ãéá íá “êáôåâÜóåé” ôá áñ÷åßá, êáé áõôü ìå ôç óåéñÜ ôïõ ÷ñçóéìïðïéåß äéÜöïñåò ìåôáâëçôÝò ðåñéâÜëëïíôïò, ðåñéëáìâáíïìÝíùí ôùí `FTP_PASSIVE_MODE`, `FTP_PROXY`, êáé `FTP_PASSWORD`. ºóùò ÷ñåéáóôåß íá ñõèìßóåôå ìßá Þ ðåñéóóüôåñåò áðü áõôÝò áí âñßóêåóôå ðßóù áðü Ýíá firewall, Þ ßóùò íá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå Ýíáí FTP/HTTP proxy. Äåßôå ôï fetch(3) ãéá ôçí ðëÞñç ëßóôá ôùí ìåôáâëçôþí. ÐñïóÝîôå üôé óôï ðáñáðÜíù ðáñÜäåéãìá ÷ñçóéìïðïéåßôáé ôï `lsof` áíôß ôïõ `lsof-4.56.4`. ¼ôáí ãßíåôáé áðïìáêñõóìÝíç ëÞøç, ðñÝðåé íá áöáéñåèåß ï áñéèìüò Ýêäïóçò ôïõ ðáêÝôïõ. Ôï pkg_add(1) èá “êáôåâÜóåé” áõôüìáôá ôçí ôåëåõôáßá Ýêäïóç ôçò åöáñìïãÞò.

> **Óçìåßùóç:** Ôï pkg_add(1) èá “êáôåâÜóåé” ôçí ôåëåõôáßá Ýêäïóç ôçò åöáñìïãÞò áí ÷ñçóéìïðïéåßôå FreeBSD-CURRENT Þ FreeBSD-STABLE. Áí ôñÝ÷åôå ìéá -RELEASE Ýêäïóç, èá “êáôåâÜóåé” ôçí Ýêäïóç ôïõ ðáêÝôïõ ðïõ Ý÷åé ìåôáãëùôôéóôåß ìå ôçí Ýêäïóç óáò. Åßíáé äõíáôü íá ôï áëëÜîåôå áõôü, áëëÜæïíôáò ôçí `PACKAGESITE`. Ãéá ðáñÜäåéãìá, áí ôñÝ÷åôå Ýíá óýóôçìá FreeBSD 8.1-RELEASE, ôï pkg_add(1), áðü ðñïåðéëïãÞ, èá ðñïóðáèÞóåé íá “êáôåâÜóåé” ðáêÝôá áðü ôï `ftp://ftp.freebsd.org/pub/FreeBSD/ports/i386/packages-8.1-release/Latest/`. Áí èÝëåôå íá áíáãêÜóåôå ôï pkg_add(1) íá “êáôåâÜóåé” ðáêÝôá ôïõ FreeBSD 8-STABLE, èÝóôå ôçí `PACKAGESITE` ùò `ftp://ftp.freebsd.org/pub/FreeBSD/ports/i386/packages-8-stable/Latest/`.

Ôá áñ÷åßá ôùí ðáêÝôùí äéáíÝìïíôáé óå ìïñöÝò `.tgz` êáé `.tbz`. Ìðïñåßôå íá ôá âñåßôå óôï ftp://ftp.FreeBSD.org/pub/FreeBSD/ports/packages/, Þ óôá CD-ROM ôçò äéáíïìÞò ôïõ FreeBSD. ÊÜèå CD óôï FreeBSD 4-CD set (êáé óôï PowerPak, êëð.) ðåñéÝ÷åé ðáêÝôá óôïí êáôÜëïãï `/packages`. Ç êáôçãïñéïðïßçóç ôùí ðáêÝôùí áêïëïõèåß ôçí äïìÞ ôïõ äÝíôñïõ `/usr/ports`. ÊÜèå êáôçãïñßá Ý÷åé ôï äéêü ôçò êáôÜëïãï, êáé êÜèå ðáêÝôï ìðïñåß íá âñåèåß óôïí êáôÜëïãï `All`.

Ç äïìÞ ôùí êáôáëüãùí ôïõ óõóôÞìáôïò ðáêÝôùí ôáéñéÜæåé ìå ôçí áíôßóôïé÷ç ôùí ports. Ôá äýï óõóôÞìáôá óõíåñãÜæïíôáé ìåôáîý ôïõò ãéá íá äçìéïõñãÞóïõí ôï óõíïëéêü óýóôçìá ðáêÝôùí/ports.

5.4.2 Äéá÷åßñéóç ôùí ÐáêÝôùí

Ôï pkg_info(1) åßíáé Ýíá åñãáëåßï ðïõ ðáñáèÝôåé êáé ðåñéãñÜöåé ôá äéÜöïñá ðáêÝôá ðïõ åßíáé åãêáôáóôçìÝíá.

```
# pkg_info
cvsup-16.1          A general network file distribution system optimized for CV
docbook-1.2         Meta-port for the different versions of the DocBook DTD
...
```

Ôï pkg_version(1) åßíáé Ýíá åñãáëåßï ðïõ óõíïøßæåé ôéò åêäüóåéò üëùí ôùí åãêáôåóôçìÝíùí ðáêÝôùí. Óõãêñßíåé ôçí Ýêäïóç êÜèå ðáêÝôïõ, ìå ôçí ôñÝ÷ïõóá Ýêäïóç ðïõ âñßóêåôáé óôï äÝíôñï ôùí ports.

```
# pkg_version
cvsup                         =
docbook                       =
...
```

Ôá óýìâïëá óôçí äåýôåñç óôÞëç äçëþíïõí ôçí ó÷åôéêÞ çëéêßá ìåôáîý ôùí åãêáôåóôçìÝíùí åêäüóåùí êáé ôùí åêäüóåùí ðïõ åßíáé äéáèÝóéìåò óôï ôïðéêü äÝíôñï ôùí ports.

Óýìâïëï	Óçìáóßá
=	Ç Ýêäïóç ôïõ åãêáôåóôçìÝíïõ ðáêÝôïõ ôáéñéÜæåé ìå áõôÞ ðïõ åßíáé äéáèÝóéìç óôï ôïðéêü äÝíôñï ôùí ports.
<	Ç åãêáôåóôçìÝíç Ýêäïóç åßíáé ðáëáéüôåñç áðü áõôÞ ðïõ åßíáé äéáèÝóéìç óôï äÝíôñï ôùí ports.

Óýìâïëï	Óçìáóßá
>	Ç åãêáôåóôçìÝíç Ýêäïóç åßíáé íåüôåñç áðü áõôÞ ðïõ åßíáé äéáèÝóéìç óôï ôïðéêü äÝíôñï ôùí ports. (Ôï ôïðéêü äÝíôñï ôùí ports åßíáé ðéèáíüôáôá áðáñ÷áéùìÝíï.)
?	Ôï åãêáôåóôçìÝíï ðáêÝôï äåí âñßóêåôáé óôá ðåñéå÷üìåíá ôùí ports. (Áõôü ìðïñåß íá óõìâåß, ãéá ðáñÜäåéãìá, áí Ýíá åãêáôåóôçìÝíï port Ý÷åé áöáéñåèåß áðü ôçí ÓõëëïãÞ ôùí Ports, Þ Ý÷åé ìåôïíïìáóôåß.)
*	ÕðÜñ÷ïõí ðïëëáðëÝò åêäüóåéò ôïõ ðáêÝôïõ.
!	Ôï åãêáôåóôçìÝíï ðáêÝôï õðÜñ÷åé óôï index, áëëÜ ãéá êÜðïéï ëüãï ôï `pkg_version` äåí êáôÜöåñå íá óõãêñßíåé ôçí Ýêäïóç ôïõ åãêáôåóôçìÝíïõ ðáêÝôïõ ìå ôçí áíôßóôïé÷ç êáôá÷þñçóç óôï index.

5.4.3 Áöáéñþíôáò Ýíá ÐáêÝôï

Ãéá íá áöáéñÝóåôå Ýíá åãêáôåóôçìÝíï ðáêÝôï ëïãéóìéêïý, ÷ñçóéìïðïéÞóôå ôï åñãáëåßï pkg_delete(1).

```
# pkg_delete xchat-1.7.1
```

Óçìåéþóôå üôé ôï pkg_delete(1) áðáéôåß ôï ðëÞñåò üíïìá êáé áñéèìü Ýêäïóçò ôïõ ðáêÝôïõ. Ç ðáñáðÜíù åíôïëÞ äåí èá ëåéôïõñãÞóåé áí äþóåôå áðëþò *`xchat`* áíôß ãéá *`xchat-1.7.1`*. Åßíáé ùóôüóï åýêïëï íá ÷ñçóéìïðïéÞóåôå ôçí pkg_version(1) ãéá íá âñåßôå ôçí Ýêäïóç ôïõ åãêáôåóôçìÝíïõ ðáêÝôïõ. Áíôß ãéá áõôü, ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå Ýíá ìðáëáíôÝñ:

```
# pkg_delete xchat\*
```

Óôçí ðåñßðôùóç áõôÞ, èá äéáãñáöïýí üëá ôá ðáêÝôá ðïõ ôá ïíüìáôá ôïõò áñ÷ßæïõí ìå `xchat`.

5.4.4 ÄéÜöïñá

¼ëåò ïé ðëçñïöïñßåò ãéá ôá ðáêÝôá åßíáé áðïèçêåõìÝíåò óôïí êáôÜëïãï `/var/db/pkg`. Óôá áñ÷åßá áõôïý ôïõ êáôáëüãïõ, èá âñåßôå ôç ðåñéãñáöÞ êÜèå ðáêÝôïõ, êáèþò êáé ôç ëßóôá ôùí áñ÷åßùí ðïõ åãêáèéóôÜ.

5.5 ×ñçóéìïðïéþíôáò ôçí ÓõëëïãÞ ôùí Ports

Ôá ðáñáêÜôù ôìÞìáôá äßíïõí âáóéêÝò ïäçãßåò ÷ñÞóçò ôçò ÓõëëïãÞò ôùí Ports ãéá åãêáôÜóôáóç Þ áöáßñåóç ðñïãñáììÜôùí óôï óýóôçìá óáò. Ìðïñåßôå íá âñåßôå ëåðôïìåñÞ ðåñéãñáöÞ ôùí äéáèÝóéìùí åðéëïãþí ôïõ `make` êáé ôùí ìåôáâëçôþí ðåñéâÜëëïíôïò óôï ports(7).

5.5.1 Áíáêôþíôáò ôçí ÓõëëïãÞ ôùí Ports

Ðñéí ìðïñÝóåôå íá åãêáôáóôÞóåôå ðñïãñÜììáôá ìÝóù ôùí ports, ðñÝðåé ðñþôá íá áíáêôÞóåôå ôçí ÓõëëïãÞ ôùí Ports. Ðñüêåéôáé ïõóéáóôéêÜ ãéá ìéá óõëëïãÞ áðü `Makefiles`, patches, êáé áñ÷åßá ðåñéãñáöÞò ðïõ ôïðïèåôïýíôáé óôï `/usr/ports`.

¼ôáí åãêáôáóôÞóáôå ôï FreeBSD óýóôçìá óáò, ôï **sysinstall** óáò ñþôçóå áí èÝëáôå íá åãêáôáóôÞóåôå ôçí ÓõëëïãÞ ôùí Ports. Áí åðéëÝîáôå ü÷é, ìðïñåßôå íá áêïëïõèÞóåôå áõôÝò ôéò ïäçãßåò ãéá íá áíáêôÞóåôå ôçí ÓõëëïãÞ ôùí Ports:

ÌÝèïäïò CVSup

ÁõôÞ åßíáé ìéá ãñÞãïñç ìÝèïäïò ãéá íá áíáêôÞóåôå êáé íá äéáôçñÞóåôå Ýíá åíçìåñùìÝíï áíôßãñáöï ôçò ÓõëëïãÞò ôùí Ports, ÷ñçóéìïðïéþíôáò ôï ðñùôüêïëëï **CVSup**. Áí èÝëåôå íá ìÜèåôå ðåñéóóüôåñá ãéá ôï **CVSup**, äåßôå ôï ×ñçóéìïðïéþíôáò ôï CVSup.

> **Óçìåßùóç:** Ç õëïðïßçóç ôïõ **CVSup** ðïõ ðåñéëáìâÜíåôáé óå Ýíá óýóôçìá FreeBSD, ïíïìÜæåôáé **csup**.

Óéãïõñåõèåßôå üôé ôï `/usr/ports` åßíáé Üäåéï ðñéí åêôåëÝóåôå ôï **csup** ãéá ðñþôç öïñÜ! ÅÜí Ý÷åôå Þäç áíáêôÞóåé ôç ÓõëëïãÞ ôùí Ports ìÝóù êÜðïéáò Üëëçò ðçãÞò, ôï **csup** äåí èá äéáãñÜøåé patches ðïõ Ý÷ïõí áöáéñåèåß óôï ìåôáîý.

1. ÅêôåëÝóôå ôï `csup`:

   ```
   # csup -L 2 -h cvsup.FreeBSD.org /usr/share/examples/cvsup/ports-supfile
   ```

   ÁëëÜîôå ôï *`cvsup.FreeBSD.org`* ìå Ýíáí êïíôéíü óáò äéáêïìéóôÞ **CVSup**. Äåßôå ôï CVSup Mirrors (ÔìÞìá A.6.7) ãéá ôçí ðëÞñç ëßóôá ôùí mirror sites.

   > **Óçìåßùóç:** Áí èÝëåôå, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï äéêü óáò `ports-supfile`, þóôå íá áðïöýãåôå (ãéá ðáñÜäåéãìá) íá äçëþóåôå ôïí äéáêïìéóôÞ **CVSup** óôçí ãñáììÞ åíôïëþí.
   >
   > 1. Óå áõôÞ ôçí ðåñßðôùóç, ùò `root`, áíôéãñÜøôå ôï `/usr/share/examples/cvsup/ports-supfile` óå ìßá íÝá ôïðïèåóßá, üðùò ôï `/root` Þ ôïí äéêü óáò home êáôÜëïãï.
   > 2. ÔñïðïðïéÞóôå ôï `ports-supfile`.
   > 3. ÁëëÜîôå ôï *`CHANGE_THIS.FreeBSD.org`* ìå Ýíáí êïíôéíü óáò äéáêïìéóôÞ **CVSup**.Äåßôå ôï CVSup Mirrors (ÔìÞìá A.6.7) ãéá ôçí ðëÞñç ëßóôá ôùí mirror sites.
   > 4. ÅêôåëÝóôå ôþñá ôï `csup`, ìå ôïí áêüëïõèï ôñüðï:
   >
   >    ```
   >    # csup -L 2 /root/ports-supfile
   >    ```

2. Åêôåëþíôáò ôçí åíôïëÞ csup(1) áñãüôåñá, èá “êáôåâÜóåé” êáé èá åöáñìüóåé üëåò ôéò ðñüóöáôåò áëëáãÝò óôçí ÓõëëïãÞ ôùí Ports, åêôüò áðü ôï íá åðáíá-ìåôáãëùôôßóåé ôá ports ãéá ôï óýóôçìá óáò.

ÌÝèïäïò Portsnap

Ôï **Portsnap** åßíáé Ýíá åíáëëáêôéêü óýóôçìá ãéá ôçí äéáíïìÞ ôçò ÓõëëïãÞò ôùí Ports. Ðáñáêáëþ åëÝãîôå ôï ×ñçóéìïðïéþíôáò ôï Portsnap ãéá ìéá ëåðôïìåñÞ ðåñéãñáöÞ üëùí ôùí ÷áñáêôçñéóôéêþí ôçò åöáñìïãÞò.

1. “ÊáôåâÜóôå” Ýíá óõìðéåóìÝíï snapshot ôçò ÓõëëïãÞò ôùí Ports `/var/db/portsnap`. Áí èÝëåôå, ìðïñåßôå íá áðïóõíäåèåßôå áðü ôï Äéáäßêôõï ìåôÜ áðü áõôü ôï âÞìá.

   ```
   # portsnap fetch
   ```

2. Áí åêôåëåßôå ôï **Portsnap** ãéá ðñþôç öïñÜ, êÜíôå åîáãùãÞ ôïõ snapshot ìÝóá óôï `/usr/ports`:

   ```
   # portsnap extract
   ```

ÅÜí Þäç Ý÷åôå Ýíá ãåìÜôï `/usr/ports` êáé áðëþò ôï áíáíåþíåôå, åêôåëÝóôå ôçí áêüëïõèç åíôïëÞ:

```
# portsnap update
```

ÌÝèïäïò Sysinstall

ÁõôÞ ç ìÝèïäïò ÷ñçóéìïðïéåß ôï **sysinstall** ãéá ôçí åãêáôÜóôáóç ôçò ÓõëëïãÞò ôùí Ports áðü ôï ìÝóï åãêáôÜóôáóçò. Óçìåéþóôå üôé ìå áõôü ôïí ôñüðï èá åãêáôáóôáèåß ôï ðáëéü áíôßãñáöï ôçò ÓõëëïãÞò ôùí Ports, ðïõ áíôéóôïé÷åß óôçí çìåñïìçíßá ôçò Ýêäïóçò ôïõ FreeBSD ðïõ ÷ñçóéìïðïéåßôå. ÅÜí Ý÷åôå ðñüóâáóç óôï Äéáäßêôõï, ðñÝðåé ðÜíôá íá ÷ñçóéìïðïéåßôå ìßá áðü ôéò ìåèüäïõò ðïõ áíáöÝñèçêáí ðéï ðÜíù.

1. Ùò `root`, åêôåëÝóôå ôï `sysinstall` üðùò öáßíåôáé ðáñáêÜôù:

   ```
   # sysinstall
   ```

2. ÅðéëÝîôå ôï Configure, êáé ðéÝóôå **Enter**.
3. ÅðéëÝîôå ôï Distributions, êáé ðéÝóôå **Enter**.
4. Ìåôáêéíçèåßôå óôï ports, êáé ðéÝóôå **Space**.
5. Ìåôáêéíçèåßôå óôï Exit, êáé ðéÝóôå **Enter**.
6. ÅðéëÝîôå ôï ìÝóï åãêáôÜóôáóçò ôçò åðéèõìßáò óáò, üðùò CDROM, FTP, êáé ðÜåé ëÝãïíôáò.
7. Ìåôáêéíçèåßôå óôï Exit êáé ðéÝóôå **Enter**.
8. ÐéÝóôå **X** ãéá íá âãåßôå áðü ôï **sysinstall**.

5.5.2 Åãêáèéóôþíôáò Ports

Ôï ðñþôï ðñÜãìá ðïõ ðñÝðåé íá äéåõêñéíéóôåß ó÷åôéêÜ ìå ôçí ÓõëëïãÞ ôùí Ports åßíáé ç Ýííïéá ôïõ üñïõ “skeleton (óêåëåôüò)”. Ìå ëßãá ëüãéá, Ýíá port skeleton åßíáé ç åëÜ÷éóôç óõëëïãÞ áñ÷åßùí ðïõ ÷ñåéÜæïíôáé Ýíá óýóôçìá FreeBSD þóôå íá ìåôáãëùôôßóåé êáé íá åãêáôáóôÞóåé óùóôÜ Ýíá ðñüãñáììá. ÊÜèå port skeleton ðåñéÝ÷åé:

- ¸íá `Makefile`. Ôï `Makefile` ðåñéÝ÷åé äéÜöïñåò äçëþóåéò ðïõ ïñßæïõí ðùò ðñÝðåé íá ìåôáãëùôôéóôåß ç åöáñìïãÞ êáé ðïõ ðñÝðåé íá åãêáôáóôáèåß óôï óýóôçìÜ óáò.
- ¸íá áñ÷åßï `distinfo`. Áõôü ôï áñ÷åßï ðåñéÝ÷åé ðëçñïöïñßåò ãéá ôá áñ÷åßá ðïõ ðñÝðåé íá “êáôÝâïõí” ãéá ôçí ìåôáãëþôôéóç ôïõ port, êáé ôá checksums ôïõò (÷ñçóéìïðïéþíôáò ôï sha256(1)), ãéá íá åðéâåâáéùèåß üôé ôá áñ÷åßá äåí Ý÷ïõí áëëïéùèåß êáôÜ ôçí äéÜñêåéá ôçò ìåôáöïñÜò ôïõò.
- ¸íáí êáôÜëïãï `files`. Áõôüò ï êáôÜëïãïò ðåñéÝ÷åé ôá patches ðïõ åðéôñÝðïõí óôï ðñüãñáììá íá ìåôáãëùôôéóôåß êáé åãêáôáóôáèåß óôï FreeBSD óýóôçìÜ óáò. Ôá patches åßíáé ìéêñÜ áñ÷åßá ðïõ ïñßæïõí áëëáãÝò óå óõãêåêñéìÝíá áñ÷åßá. Åßíáé óå ìïñöÞ êåéìÝíïõ, êáé âáóéêÜ ëÝíå “Áöáßñåóå ôçí ãñáììÞ 10” Þ “ÌåôÝôñåøå ôç ãñáììÞ 26 óå áõôü ...”. Ôá patches åßíáé åðßóçò ãíùóôÜ ùò “diffs” åðåéäÞ äçìéïõñãïýíôáé ìå ôï ðñüãñáììá diff(1).

  Áõôüò ï êáôÜëïãïò ìðïñåß íá ðåñéÝ÷åé êáé Üëëá áñ÷åßá ðïõ ÷ñçóéìïðïéïýíôáé ãéá íá ìåôáãëùôôéóôåß ôï port.
- ¸íá áñ÷åßï `pkg-descr`. Áõôü åßíáé ìéá ðéï ëåðôïìåñÞò, óõ÷íÜ ðïëëþí ãñáììþí, ðåñéãñáöÞ ôïõ ðñïãñÜììáôïò.
- ¸íá áñ÷åßï `pkg-plist`. Áõôü ðåñéÝ÷åé ìéá ëßóôá üëùí ôùí áñ÷åßùí ðïõ èá åãêáôáóôáèïýí áðü ôï port. Åðßóçò êáèïäçãåß ôï óýóôçìá ôùí ports ôé áñ÷åßá íá áöáéñÝóåé êáôÜ ôçí áðåãêáôÜóôáóç.

ÌåñéêÜ ports Ý÷ïõí êáé Üëëá áñ÷åßá, üðùò ôï `pkg-message`. Ôï óýóôçìá ôùí ports ÷ñçóéìïðïéåß áõôÜ ôá áñ÷åßá ãéá íá ÷åéñéóôåß åéäéêÝò ðåñéóôÜóåéò. Áí èÝëåôå ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå áõôÜ ôá áñ÷åßá, êáé ôá ports ãåíéêüôåñá, äåßôå ôï FreeBSD Porter’s Handbook (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/porters-handbook/index.html).

Ôï port ðåñéÝ÷åé ïäçãßåò ãéá ôï ðùò íá ìåôáãëùôôéóôåß ï ðçãáßïò êþäéêáò, áëëÜ äåí ðåñéÝ÷åé ôïí ðçãáßï êþäéêá. Ìðïñåßôå íá ðñïìçèåõôåßôå ôïí ðçãáßï êþäéêá áðü Ýíá CD-ROM Þ áðü ôï Äéáäßêôõï. Ï ðçãáßïò êþäéêáò äéáíÝìåôáé ìå ïðïéïäÞðïôå ôñüðï åðéèõìåß ï äçìéïõñãüò ôïõ. Óõ÷íÜ åßíáé Ýíá tarred êáé gzipped áñ÷åßï, áëëÜ ìðïñåß íá åßíáé óõìðéåóìÝíïò ìå êÜðïéï Üëëï åñãáëåßï Þ íá åßíáé áêüìá êáé áóõìðßåóôïò. Ï ðçãáßïò êþäéêáò ôïõ ðñïãñÜììáôïò, óå ïðïéáäÞðïôå ìïñöÞ êé áí äéáôßèåôáé, ëÝãåôáé “distfile”. Ïé äýï ìÝèïäïé ãéá íá åãêáôáóôÞóåôå Ýíá FreeBSD port ðåñéãñÜöïíôáé ðáñáêÜôù.

> **Óçìåßùóç:** ÐñÝðåé íá óõíäåèåßôå ùò `root` ãéá íá åãêáôáóôÞóåôå ports.

> **Ðñïåéäïðïßçóç:** Ðñéí åãêáôáóôÞóåôå ïðïéáäÞðïôå port, ðñÝðåé íá óéãïõñåõôåßôå üôé Ý÷åôå ìßá áíáíåùìÝíç Óõëëïãþ ôùí Ports, êáé ðñÝðåé íá åëÝãîåôå ôï http://vuxml.freebsd.org/ ãéá èÝìáôá áóöáëåßáò ó÷åôéêÜ ìå ôï port ðïõ åíäéáöÝñåóôå.
>
> Áí èÝëåôå íá åëÝã÷åôå áõôüìáôá ãéá ôõ÷üí ðñïâëÞìáôá áóöáëåßáò ðñéí áðü êÜèå åãêáôÜóôáóç íÝáò åöáñìïãÞò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï **portaudit**. Èá âñåßôå áõôü ôï åñãáëåßï óôçí Óõëëïãþ ôùí Ports (`ports-mgmt/portaudit`). Åßíáé êáëÞ éäÝá íá åêôåëÝóåôå ôï `portaudit -F` ðñéí åãêáôáóôÞóåôå Ýíá íÝï port, ãéá íá áíáêôÞóåôå ôçí ôñÝ÷ïõóá âÜóç äåäïìÝíùí ðñïâëçìÜôùí áóöáëåßáò. Áíôßóôïé÷ïò Ýëåã÷ïò êáé áíáíÝùóç ôçò âÜóçò äåäïìÝíùí åêôåëåßôáé åðßóçò áõôüìáôá êáôÜ ôïí êáèçìåñéíü Ýëåã÷ï áóöáëåßáò ôïõ óõóôÞìáôïò. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò äéáâÜóôå ôéò óåëßäåò manual portaudit(1) êáé periodic(8).

Ç Óõëëïãþ ôùí Ports ðñïûðïèÝôåé üôé Ý÷åôå ëåéôïõñãéêÞ óýíäåóç ìå ôï Äéáäßêôõï. ÅÜí äåí Ý÷åôå, èá ÷ñåéáóôåß íá âÜëåôå ìüíïò óáò Ýíá áíôßãñáöï ôïõ distfile ìÝóá óôï `/usr/ports/distfiles`.

Áñ÷éêÜ, ìåôáêéíçèåßôå óôïí êáôÜëïãï ôïõ port ðïõ èÝëåôå íá åãêáôáóôÞóåôå:

```
# cd /usr/ports/sysutils/lsof
```

Ìüëéò âñåèåßôå óôïí êáôÜëïãï `lsof`, èá äåßôå ôïí port skeleton. Ôï åðüìåíï âÞìá åßíáé íá ìåôáãëùôôßóåôå, Þ íá “êôßóåôå (build)”, ôï port. Áõôü ãßíåôáé áðëÜ ðëçêôñïëïãþíôáò `make` óôçí ãñáììÞ åíôïëþí. ¼ôáí ôï êÜíåôå, èá äåßôå êÜôé üðùò áõôü:

```
# make
>> lsof_4.57D.freebsd.tar.gz doesn't seem to exist in /usr/ports/distfiles/.
>> Attempting to fetch from ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/.
===>  Extracting for lsof-4.57
...
[extraction output snipped]
...
>> Checksum OK for lsof_4.57D.freebsd.tar.gz.
===>  Patching for lsof-4.57
===>  Applying FreeBSD patches for lsof-4.57
===>  Configuring for lsof-4.57
...
[configure output snipped]
...
===>  Building for lsof-4.57
...
```

```
[compilation output snipped]
...
#
```

ÐñïóÝîôå üôé ìüëéò ç ìåôáãëþôôéóç ïëïêëçñùèåß èá åðéóôñÝøåôå óôçí ãñáììÞ åíôïëþí. Ôï åðüìåíï âÞìá åßíáé íá åãêáôáóôÞóåôå ôï port. Ãéá íá ôï åãêáôáóôÞóåôå, ÷ñåéÜæåôáé áðëþò íá ðñïóèÝóåôå ìéá ëÝîç óôçí åíôïëÞ `make`, êáé áõôÞ ç ëÝîç åßíáé `install`:

```
# make install
===>  Installing for lsof-4.57
...
[installation output snipped]
...
===>   Generating temporary packing list
===>   Compressing manual pages for lsof-4.57
===>   Registering installation for lsof-4.57
===>  SECURITY NOTE:
      This port has installed the following binaries which execute with
      increased privileges.
#
```

Ìüëéò åðéóôñÝøåôå óôçí ãñáììÞ åíôïëþí, èá ðñÝðåé íá ìðïñåßôå íá åêôåëÝóåôå ôçí åöáñìïãÞ ðïõ ìüëéò åãêáôáóôÞóáôå. Èá äåßôå ìéá ðñïåéäïðïßçóç áóöáëåßáò, åðåéäÞ ôï `lsof` åßíáé Ýíá ðñüãñáììá ðïõ ôñÝ÷åé ìå áõîçìÝíá ðñïíüìéá. ÊáôÜ ôçí ìåôáãëþôôéóç êáé åãêáôÜóôáóç ôùí ports, èá ðñÝðåé íá ðñïóÝ÷åôå ïðïéáäÞðïôå ðñïåéäïðïßçóç åìöáíéóôåß.

Ìéá êáëÞ éäÝá, åßíáé íá äéáãñÜøåôå ôïí õðïêáôÜëïãï ðïõ ðåñéÝ÷åé üëá ôá ðñïóùñéíÜ áñ÷åßá ðïõ ÷ñçóéìïðïéÞèçêáí êáôÜ ôçí ìåôáãëþôôéóç. ¼÷é ìüíï êáôáíáëþíïõí ðïëýôéìï ÷þñï, Üëëá ìðïñåß íá ðñïêáëÝóïõí ðñïâëÞìáôá áñãüôåñá üôáí èá èåëÞóåôå íá åãêáôáóôÞóåôå ìéá íåüôåñç Ýêäïóç ôïõ port.

```
# make clean
===>  Cleaning for lsof-4.57
#
```

Óçìåßùóç: Ìðïñåßôå íá ãëéôþóåôå äýï ðñüóèåôá âÞìáôá áðëþò åêôåëþíôáò `make install clean` áíôß ãéá `make`, `make install` êáé `make clean` ùò ôñßá îå÷ùñéóôÜ âÞìáôá.

Óçìåßùóç: ÌåñéêÜ êåëýöç êñáôÜíå ìéá ëßóôá áðü ôéò åíôïëÝò ðïõ âñßóêïíôáé äéáèÝóéìåò óôïõò êáôáëüãïõò ðïõ áíáöÝñïíôáé óôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `PATH`, ãéá íá åðéôá÷ýíïõí ôéò áíáæçôÞóåéò ãéá ôá åêôåëÝóéìá áñ÷åßá áõôþí ôùí åíôïëþí. Áí ÷ñçóéìïðïéåßôå Ýíá áðü áõôÜ ôá êåëýöç, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `rehash` ìåôÜ ôçí åãêáôÜóôáóç åíüò port, ðñéí ìðïñÝóåôå íá ÷ñçóéìïðïéÞóåôå ôéò íÝåò åíôïëÝò. ÁõôÞ ç åíôïëÞ ëåéôïõñãåß óå êåëýöç üðùò ôï `tcsh`. ×ñçóéìïðïéÞóôå ôçí åíôïëÞ `hash -r` ãéá êåëýöç üðùò ôï `sh`. Äåßôå ôçí ôåêìçñßùóç ôïõ êåëýöïõò óáò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

ÌåñéêÜ ðñïúüíôá ôñßôùí êáôáóêåõáóôþí óå DVD-ROM, üðùò ôï FreeBSD Toolkit áðü ôï FreeBSD Mall (http://www.freebsdmall.com/), ðåñéÝ÷ïõí distfiles. ÁõôÜ ìðïñïýí íá ÷ñçóéìïðïéçèïýí ìå ôçí ÓõëëïãÞ ôùí Ports. ÐñïóáñôÞóôå ôï DVD-ROM óôï `/cdrom`. Áí ÷ñçóéìïðïéåßôå êÜðïéï äéáöïñåôéêü óçìåßï ðñïóÜñôçóçò, ñõèìßóôå ôçí ìåôáâëçôÞ `CD_MOUNTPTS` ôïõ make. Ôá áíáãêáßá distfiles èá ÷ñçóéìïðïéçèïýí áõôüìáôá áí õðÜñ÷ïõí óôï äéóêÜêé.

> **Óçìåßùóç:** ÐñÝðåé íá ãíùñßæåôå üôé ïé Üäåéåò ìåñéêþí ports äåí åðéôñÝðïõí ôçí äéáíïìÞ ôïõò óå CD-ROM. Áõôü ìðïñåß íá ïöåßëåôáé ð.÷. óôï üôé ðñÝðåé íá óõìðëçñþóåôå ìéá öüñìá åããñáöÞò ðñéí “êáôåâÜóåôå” ôçí åöáñìïãÞ, Þ óôï üôé äåí åðéôñÝðåôáé ç åðáíáäéáíïìÞ, Þ óå êÜðïéï Üëëï ëüãï. ÅÜí èÝëåôå íá åãêáôáóôÞóåôå Ýíá port ðïõ äåí ðåñéëáìâÜíåôáé óôï CD-ROM, èá ÷ñåéáóôåß íá åßóôå óõíäåäåìÝíïò óôï Äéáäßêôõï ãéá íá ôï åðéôý÷åôå.

Ôï óýóôçìá ôùí ports ÷ñçóéìïðïéåß ôï fetch(3) ãéá íá “êáôåâÜóåé” ôá áñ÷åßá. Ôï fetch(3) ÷ñçóéìïðïéåß äéÜöïñåò ìåôáâëçôÝò ðåñéâÜëëïíôïò, ðåñéëáìâáíïìÝíùí ôùí `FTP_PASSIVE_MODE`, `FTP_PROXY`, êáé `FTP_PASSWORD`. ºóùò ÷ñåéáóôåß íá ñõèìßóåôå ìßá Þ ðåñéóóüôåñåò áí âñßóêåóôå ðßóù áðü Ýíá firewall, Þ ßóùò íá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå Ýíáí FTP/HTTP proxy. Äåßôå ôï fetch(3) ãéá ìéá ðëÞñç ëßóôá ôùí ìåôáâëçôþí áõôþí.

Ãéá ÷ñÞóôåò ðïõ äåí ìðïñïýí íá åßíáé óõíäåäåìÝíïé üëç ôçí þñá, äéáôßèåôáé ç åðéëïãÞ `make fetch`. Áðëþò åêôåëÝóôå ôçí åíôïëÞ óôïí êáôÜëïãï (`/usr/ports`) êáé ôá áðáñáßôçôá áñ÷åßá èá “êáôÝâïõí” ãéá åóÜò. Ç åíôïëÞ áõôÞ èá ëåéôïõñãÞóåé êáé óå õðïêáôáëüãïõò, üðùò ãéá ðáñÜäåéãìá: `/usr/ports/net`. ÐñïóÝîôå üôé áí Ýíá port åîáñôÜôáé áðü âéâëéïèÞêåò Þ Üëëá ports, ç åíôïëÞ áõôÞ *äåí* èá áíáêôÞóåé ôá distfiles ôïõò. ÁíôéêáôáóôÞóôå ôï `fetch` ìå ôï `fetch-recursive` áí èÝëåôå ìáæß ìå ôï port íá áíáêôÞóåôå êáé üëåò ôéò åîáñôÞóåéò ôïõ.

> **Óçìåßùóç:** Ìðïñåßôå íá ìåôáãëùôôßóåôå üëá ôá ports óå ìßá êáôçãïñßá Þ áêüìá êáé óå üëåò, åêôåëþíôáò ôï `make` óôïí áñ÷éêü êáôÜëïãï, üðùò ìå ôçí ðñïáíáöåñèåßóá `make fetch` ìÝèïäï. Áõôü üìùò åßíáé åðéêßíäõíï, ãéáôß ìåñéêÜ ports äåí ìðïñïýí íá óõíõðÜñ÷ïõí. Óå Üëëåò ðåñéðôþóåéò, ìåñéêÜ ports ìðïñåß íá åãêáôáóôÞóïõí äõï äéáöïñåôéêÜ áñ÷åßá ìå ôï ìå ôï ßäéï üíïìá.

Óå ìåñéêÝò óðÜíéåò ðåñéðôþóåéò, ïé ÷ñÞóôåò ìðïñåß íá ÷ñåéÜæåôáé íá áíáêôÞóïõí ôá tarballs áðü Ýíá site äéáöïñåôéêü áðü ôá `MASTER_SITES` (ç ôïðïèåóßá áðü üðïõ “êáôåâáßíïõí” ôá áñ÷åßá). Ìðïñåßôå íá áëëÜîåôå ôçí åðéëïãÞ `MASTER_SITES` ìå ôçí áêüëïõèç åíôïëÞ:

```
# cd /usr/ports/directory
# make MASTER_SITE_OVERRIDE= \
ftp://ftp.FreeBSD.org/pub/FreeBSD/ports/distfiles/ fetch
```

Óå áõôü ôï ðáñÜäåéãìá áëëÜîáìå ôçí åðéëïãÞ `MASTER_SITES` óå `ftp.FreeBSD.org/pub/FreeBSD/ports/distfiles/`.

> **Óçìåßùóç:** ÌåñéêÜ ports åðéôñÝðïõí (Þ áðáéôïýí) íá äþóåôå åðéëïãÝò ìåôáãëþôôéóçò ðïõ ìðïñïýí íá åíåñãïðïéÞóïõí/áðåíåñãïðïéÞóïõí ôìÞìáôá ôçò åöáñìïãÞò ðïõ åßíáé á÷ñåßáóôá, óõãêåêñéìÝíåò åðéëïãÝò áóöáëåßáò, êáé Üëëåò ôñïðïðïéÞóåéò. ÊÜðïéá ðáñáäåßãìáôá ôÝôïéùí ports åßíáé ôá `www/firefox`, `security/gpgme`, êáé ôï `mail/sylpheed-claws`. ¼ôáí õðÜñ÷ïõí äéáèÝóéìåò ôÝôïéåò åðéëïãÝò, èá åìöáíéóôåß óôçí ïèüíç óáò ó÷åôéêü ìÞíõìá.

5.5.2.1 ÐáñáêÜìðôïíôáò ôïõò ÐñïåðéëåãìÝíïõò ÊáôáëüãïõòÔùí Ports

ÌåñéêÝò öïñÝò åßíáé ÷ñÞóéìï (Þ åðéôáêôéêü) íá ÷ñçóéìïðïéÞóåôå Ýíá äéáöïñåôéêü êáôÜëïãï åñãáóßáò êáé åãêáôÜóôáóçò. Ïé ìåôáâëçôÝò `WRKDIRPREFIX` êáé `PREFIX` ìðïñïýí íá ðáñáêÜìøïõí ôïõò ðñïåðéëåãìÝíïõò êáôáëüãïõò. Ãéá ðáñÜäåéãìá, ç åíôïëÞ:

```
# make WRKDIRPREFIX=/usr/home/example/ports install
```

èá ìåôáãëùôôßóåé ôï port óôï `/usr/home/example/ports` êáé èá åãêáôáóôÞóåé ôá ðÜíôá óôï `/usr/local`, åíþ ç åíôïëÞ:

```
# make PREFIX=/usr/home/example/local install
```

èá ìåôáãëùôôßóåé ôï port óôï `/usr/ports` êáé èá ôï åãêáôáóôÞóåé óôï `/usr/home/example/local`.

Êáé öõóéêÜ ç åíôïëÞ:

```
# make WRKDIRPREFIX=../ports PREFIX=../local install
```

èá óõíäõÜóåé êáé ôá äõï (åßíáé ðïëý ìåãÜëç ãéá íá ôçí äåßîïõìå åäþ, Üëëá ðñÝðåé íá ðÞñáôå ôçí ãåíéêÞ éäÝá).

Åíáëëáêôéêþò, áõôÝò ïé ìåôáâëçôÝò ìðïñïýí íá ñõèìéóôïýí ùò ìÝñïò ôïõ ðåñéâÜëëïíôïò óáò. ÄéáâÜóôå ôçí óåëßäá manual ãéá ôï êÝëõöïò óáò, ãéá íá âñåßôå ôéò ó÷åôéêÝò ïäçãßåò.

5.5.2.2 Áíôéìåôùðßæïíôáò ôï `imake`

ÌåñéêÜ ports ðïõ ÷ñçóéìïðïéïýí ôï `imake` (ìÝñïò ôïõ X Window System) äåí óõíåñãÜæïíôáé óùóôÜ ìå ôï `PREFIX`, êáé åðéìÝíïõí íá åãêáôáóôáèïýí óôï `/usr/X11R6`. ¼ìïéá, ìåñéêÜ Perl ports áãíïïýí ôï `PREFIX` êáé åãêáèßóôáíôáé óôï äÝíôñï Perl. Ôï íá êÜíåôå áõôÜ ôá ports íá óÝâïíôáé ôï `PREFIX` åßíáé ìßá äýóêïëç Þ áäýíáôç äïõëåéÜ.

5.5.2.3 Åðáíáñýèìéóç Åðéëïãþí Ports

¼ôáí ìåôáãëùôôßæåôå êÜðïéá ports, ìðïñåß íá åìöáíéóôåß óôçí ïèüíç óáò Ýíá ìåíïý åðéëïãþí (âáóéóìÝíï óå ncurses) ôï ïðïßï íá óáò åðéôñÝðåé íá åðéëÝîåôå äéÜöïñåò åðéëïãÝò ìåôáãëþôôéóçò. Äåí åßíáé óðÜíéï êÜðïéïé ÷ñÞóôåò íá èÝëïõí íá åðéóêåöôïýí îáíÜ áõôü ôï ìåíïý, ãéá íá ðñïóèÝóïõí, íá áöáéñÝóïõí Þ íá áëëÜîïõí êÜðïéåò åðéëïãÝò, ìåôÜ ôçí ìåôáãëþôôéóç ôïõ port. Ìéá åðéëïãÞ åßíáé íá ìåôáêéíçèåßôå óôïí êáôÜëïãï ôïõ port êáé íá ãñÜøåôå `make config`, ìå ôï ïðïßï èá åìöáíéóôåß îáíÜ ôï ìåíïý ìå ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò óáò Þäç åðéëåãìÝíåò. Ìéá Üëëç äõíáôüôçôá, åßíáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `make showconfig`, ìå ôçí ïðïßá èá äåßôå üëåò ôéò åðéëåãìÝíåò ñõèìßóåéò ôïõ port. ÔÝëïò, ìéá áêüìá åðéëïãÞ åßíáé íá åêôåëÝóåôå ôçí åíôïëÞ `make rmconfig` ç ïðïßá èá áöáéñÝóåé üëåò ôéò áðïèçêåõìÝíåò åðéëïãÝò êáé èá óáò åðéôñÝøåé íá îåêéíÞóåôå îáíÜ áðü ôçí áñ÷Þ. ¼ëåò áõôÝò ïé åðéëïãÝò, êáé áêüìá ðåñéóóüôåñåò, åîçãïýíôáé óôç óåëßäá manual ôïõ ports(7).

5.5.3 Áöáéñþíôáò ÅãêáôåóôçìÝíá Ports

Ôþñá ðïõ ãíùñßæåôå ðùò íá åãêáèéóôÜôå ports, ðéèáíþò èá áíáñùôéÝóôå ðùò áöáéñïýíôáé, óôçí ðåñßðôùóç ðïõ åãêáôáóôÞóáôå Ýíá êáé áñãüôåñá áðïöáóßóáôå üôé åãêáôáóôÞóáôå ôï ëÜèïò port. Èá áöáéñÝóïõìå ôï ðñïçãïýìåíï ðáñÜäåéãìá (ðïõ Þôáí ôï `lsof` ãéá üóïõò äåí ôï ðñüóåîáí). Ôá ports áöáéñïýíôáé üðùò êáé ôá ðáêÝôá (ôï áíáëýóáìå óôçí åíüôçôá ×ñçóéìïðïéþíôáò ôï Óýóôçìá ôùí ÐáêÝôùí), ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ pkg_delete(1):

```
# pkg_delete lsof-4.57
```

5.5.4 Áíáâáèìßæïíôáò ôá Ports

Áñ÷éêÜ, äåßôå ôá ðáñù÷çìÝíá ports ãéá ôá ïðïßá õðÜñ÷ïõí äéáèÝóéìåò íåüôåñåò åêäüóåéò óôçí ÓõëëïãÞ ôùí Ports, ìå ôçí åíôïëÞ pkg_version(1):

```
# pkg_version -v
```

5.5.4.1 `/usr/ports/UPDATING`

Ìüëéò áíáíåþóåôå ôçí ÓõëëïãÞ ôùí Ports, ðñÝðåé íá åëÝãîåôå ôï áñ÷åßï `/usr/ports/UPDATING`, ðñéí åðé÷åéñÞóåôå ôçí áíáâÜèìéóç åíüò port. Áõôü ôï áñ÷åßï ðåñéãñÜöåé äéÜöïñá ðéèáíÜ ðñïâëÞìáôá, êáèþò êáé åíäå÷üìåíá ðñüóèåôá âÞìáôá ðïõ ðñÝðåé íá åêôåëÝóåôå üôáí áíáíåþíåôå Ýíá port. Ðáñáäåßãìáôá ôùí ðáñáðÜíù, åßíáé ç áëëáãÞ ìïñöÞò êÜðïéùí áñ÷åßùí, áëëáãÞ óôçí ôïðïèåóßá ôùí áñ÷åßùí ñõèìßóåùí, Þ Üëëåò áóõìâáôüôçôåò ìå ðáëáéüôåñåò åêäüóåéò.

Áí ôï `UPDATING` áíáéñåß êÜôé ðïõ äéáâÜóáôå åäþ, èåùñÞóôå üôé éó÷ýåé ôï `UPDATING`.

5.5.4.2 Áíáâáèìßæïíôáò Ports ìå ôï Portupgrade

Ôï åñãáëåßï **portupgrade** åßíáé ó÷åäéáóìÝíï ãéá íá áíáâáèìßæåé åýêïëá åãêáôåóôçìÝíá ports. Äéáôßèåôáé áðü ôï `ports-mgmt/portupgrade` port. ÅãêáôáóôÞóôå ôï üðùò êÜèå port, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `make install clean`:

```
# cd /usr/ports/ports-mgmt/portupgrade
# make install clean
```

Ç åíôïëÞ `pkgdb -F` èá äéáâÜóåé êáé èá äéïñèþóåé üëåò ôéò áóõíÝðåéåò ðïõ ßóùò õðÜñ÷ïõí óôç ëßóôá ôùí åãêáôåóôçìÝíùí ports. Åßíáé êáëÞ éäÝá åßíáé íá ôçí åêôåëåßôå óõ÷íÜ, åíäå÷ïìÝíùò ðñéí áðü êÜèå áíáâÜèìéóç.

¼ôáí åêôåëåßôå ôï `portupgrade -a`, ôï **portupgrade** èá áñ÷ßóåé íá áíáâáèìßæåé üëá ôá ðáñù÷çìÝíá ports ðïõ åßíáé åãêáôåóôçìÝíá óôï óýóôçìá óáò. ×ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-i` áí èÝëåôå íá óáò ñùôÜ ãéá åðéâåâáßùóç ãéá êÜèå îå÷ùñéóôÞ áíáâÜèìéóç.

```
# portupgrade -ai
```

Áí èÝëåôå íá áíáâáèìßóåôå ìüíï ìßá óõãêåêñéìÝíç åöáñìïãÞ, êáé ü÷é üëá ôá äéáèÝóéìá ports, ÷ñçóéìïðïéÞóôå ôï `portupgrade pkgname`. ÓõìðåñéëÜâåôå ôçí åðéëïãÞ `-R` áí ôï **portupgrade** ðñÝðåé ðñþôá íá áíáâáèìßóåé üëá ôá ports ðïõ áðáéôïýíôáé ãéá ôçí óõãêåêñéìÝíç åöáñìïãÞ.

```
# portupgrade -R firefox
```

Ãéá íá ÷ñçóéìïðïéÞóåôå ðáêÝôá áíôß ãéá ports óôçí åãêáôÜóôáóç, äþóôå ôçí åðéëïãÞ `-P`. Ìå áõôÞ ôçí åðéëïãÞ ôï **portupgrade** áíáæçôÜ ôïõò ôïðéêïýò êáôáëüãïõò ðïõ ïñßæïíôáé óôï `PKG_PATH`, Þ áíáêôÜ ôá ðáêÝôá áðü áðïìáêñõóìÝíá sites åÜí äåí âñåèïýí ôïðéêÜ. Áí ôá ðáêÝôá äåí ìðïñïýí íá áíáêôçèïýí ìå ôïõò ðáñáðÜíù ôñüðïõò, ôï **portupgrade** èá ÷ñçóéìïðïéÞóåé ôá ports. Ãéá íá áðïöýãåôå åíôåëþò ôçí ÷ñÞóç ôùí ports, êáèïñßóôå ôçí åðéëïãÞ `-PP`.

```
# portupgrade -PR gnome2
```

Ãéá íá áíáêôÞóåôå áðëþò ôá distfiles (Þ ôá ðáêÝôá, áí Ý÷åôå ïñßóåé ôçí åðéëïãÞ `-P`) ÷ùñßò íá ìåôáãëùôôßóåôå Þ íá åãêáôáóôÞóåôå ôßðïôá, ÷ñçóéìïðïéÞóôå ôï `-F`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôï portupgrade(1).

5.5.4.3 Áíáâáèìßæïíôáò Ports ìå ôï Portmanager

Ôï **Portmanager** åßíáé Ýíá áêüìá åñãáëåßï ãéá åýêïëç áíáâÜèìéóç åãêáôåóôçìÝíùí ports. Äéáôßèåôáé áðü ôï `ports-mgmt/portmanager` port:

```
# cd /usr/ports/ports-mgmt/portmanager
# make install clean
```

¼ëá ôá åãêáôåóôçìÝíá ports ìðïñïýí íá áíáâáèìéóôïýí ÷ñçóéìïðïéþíôáò áõôÞ ôçí áðëÞ åíôïëÞ:

```
# portmanager -u
```

Ìðïñåßôå íá ðñïóèÝóåôå ôçí åðéëïãÞ `-ui` ãéá íá åñùôçèåßôå íá åðéâåâáéþóåôå êÜèå âÞìá ðïõ èá åêôåëÝóåé ôï **Portmanager**. Ôï **Portmanager** ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ãéá íá åãêáôáóôÞóåôå íÝá ports óôï óýóôçìá. Óå áíôßèåóç ìå ôçí åíôïëÞ `make install clean`, ôï **Portmanager** èá áíáâáèìßóåé üëåò ôéò åîáñôÞóåéò ðñéí ôçí ìåôáãëþôôéóç êáé åãêáôÜóôáóç ôïõ åðéëåãìÝíïõ port.

```
# portmanager x11/gnome2
```

Áí õðÜñ÷ïõí ðñïâëÞìáôá ðïõ ó÷åôßæïíôáé ìå ôéò åîáñôÞóåéò åíüò åðéëåãìÝíïõ port, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï **Portmanager** ãéá íá ôéò åðáíá-ìåôáãëùôôßóåé üëåò ìå ôçí óùóôÞ óåéñÜ. Ìüëéò ôåëåéþóåé ìå ôéò åîáñôÞóåéò, èá åðáíá-ìåôáãëùôôßóåé êáé ôï ðñïâëçìáôéêü port.

```
# portmanager graphics/gimp -f
```

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò äåßôå ôç óåëßäá manual portmanager(1).

5.5.4.4 Áíáâáèìßæïíôáò ôá Ports ìÝóù ôïõ Portmaster

Ôï **Portmaster** åßíáé Ýíá áêüìá åñãáëåßï ãéá ôçí áíáâÜèìéóç ôùí åãêáôåóôçìÝíùí ports. Ôï **Portmaster** ó÷åäéÜóôçêå þóôå íá ÷ñçóéìïðïéåß ôá åñãáëåßá ðïõ ðáñÝ÷åé ôï “âáóéêü” óýóôçìá (äåí åîáñôÜôáé áðü Üëëá ports) êáé ÷ñçóéìïðïéåß ôéò ðëçñïöïñßåò ôïõ `/var/db/pkg` ãéá íá êáèïñßóåé ðïéá ports èá áíáâáèìßóåé. Åßíáé äéáèÝóéìï ìÝóù ôïõ port `ports-mgmt/portmaster`:

```
# cd /usr/ports/ports-mgmt/portmaster
# make install clean
```

Ôï **Portmaster** ïìáäïðïéåß ôá ports óå ôÝóóåñéò êáôçãïñßåò:

- Root ports (äåí åîáñôþíôáé áðü Üëëá, êáé ïýôå Üëëá åîáñôþíôáé áðü áõôÜ)
- Trunk ports (äåí åîáñôþíôáé áðü Üëëá, ùóôüóï êÜðïéá ðáêÝôá åîáñôþíôáé áðü áõôÜ)
- Branch ports (Ý÷ïõí åîáñôÞóåéò êáé ðñïò ôéò äýï êáôåõèýíóåéò)
- Leaf ports (åîáñôþíôáé áðü Üëëá, áëëÜ ü÷é ôï áíôßèåôï)

Ìðïñåßôå íá äåßôå ìéá ëßóôá üëùí ôùí åãêáôåóôçìÝíùí ports êáé íá øÜîåôå ãéá åíçìåñùìÝíåò åêäüóåéò, ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `-L`:

```
# portmaster -L
===>>> Root ports (No dependencies, not depended on)
===>>> ispell-3.2.06_18
===>>> screen-4.0.3
        ===>>> New version available: screen-4.0.3_1
===>>> tcpflow-0.21_1
===>>> 7 root ports
...
===>>> Branch ports (Have dependencies, are depended on)
```

```
===>>> apache-2.2.3
        ===>>> New version available: apache-2.2.8
...
===>>> Leaf ports (Have dependencies, not depended on)
===>>> automake-1.9.6_2
===>>> bash-3.1.17
        ===>>> New version available: bash-3.2.33
...
===>>> 32 leaf ports

===>>> 137 total installed ports
        ===>>> 83 have new versions available
```

Ìðïñåßôå íá áíáâáèìßóåôå üëá ôá åãêáôåóôçìÝíá ports ìå ôçí ðáñáêÜôù áðëÞ åíôïëÞ:

```
# portmaster -a
```

> **Óçìåßùóç:** Áðü ðñïåðéëïãÞ, ôï **Portmaster** èá äçìéïõñãÞóåé áíôßãñáöï áóöáëåßáò ôïõ åãêáôåóôçìÝíïõ ðáêÝôïõ ðñéí ôï äéáãñÜøåé. Áí ç åãêáôÜóôáóç ôçò íÝáò Ýêäïóçò åßíáé åðéôõ÷Þò, ôï **Portmaster** èá óâÞóåé ôï áíôßãñáöï áõôü. Áí ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-b`, ôï **Portmaster** äåí èá óâÞóåé áõôüìáôá ôï áíôßãñáöï. Áí ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-i`, èá èÝóåôå ôï **Portmaster** óå äéáäñáóôéêÞ ëåéôïõñãßá, üðïõ èá óáò æçôÜåé åðéâåâáßùóç ðñéí ôçí áíáâÜèìéóç êÜèå port.

Áí áíôéìåôùðßóåôå ëÜèç êáôÜ ôç äéáäéêáóßá ôçò áíáâÜèìéóçò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-f` ãéá íá áíáâáèìßóåôå êáé íá ìåôáãëùôôßóåôå îáíÜ üëá ôá ports:

```
# portmaster -af
```

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôï **Portmaster** ãéá íá åãêáôáóôÞóåôå íÝá ports óôï óýóôçìá óáò, áíáâáèìßæïíôáò êáé üëåò ôéò åîáñôÞóåéò ôïõò ðñéí ôç ìåôáãëþôôéóç êáé åãêáôÜóôáóç ôïõò:

```
# portmaster shells/bash
```

Ðáñáêáëïýìå äåßôå ôç óåëßäá manual ôïõ portmaster(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

5.5.5 Ports êáé Áðïèçêåõôéêüò ×þñïò

Ç ÓõëëïãÞ ôùí Ports êáôáíáëþíåé äéáèÝóéìï ÷þñï óôï äßóêï ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ. ÌåôÜ ôçí ìåôáãëþôôéóç êáé åãêáôÜóôáóç ëïãéóìéêïý áðü ôá ports, ðñÝðåé ðÜíôá íá èõìÜóôå íá êáèáñßæåôå ôïõò ðñïóùñéíïýò êáôáëüãïõò `work` ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `make clean`. Ìðïñåßôå íá êáèáñßóåôå üëç ôçí ÓõëëïãÞ ôùí Ports ìå ôçí áêüëïõèç åíôïëÞ:

```
# portsclean -C
```

Ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ, èá óõóóùñåõôïýí ðïëëÜ áñ÷åßá äéáíïìÞò ðçãáßïõ êþäéêá óôïí êáôÜëïãï `distfiles`. Ìðïñåßôå íá ôá áöáéñÝóåôå ÷åéñïêßíçôá, Þ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí áêüëïõèç åíôïëÞ ãéá íá äéáãñÜøåôå üëá ôá distfiles ðïõ äåí ó÷åôßæïíôáé ðëÝïí ìå êáíÝíá port:

```
# portsclean -D
```

[1] ãéá íá áöáéñÝóåôå üëá ôá distfiles ðïõ äåí ó÷åôßæïíôáé ìå êáíÝíá port ðïõ âñßóêåôáé åãêáôåóôçìÝíï óôï óýóôçìá óáò:

```
# portsclean -DD
```

> **Óçìåßùóç:** Ôï åñãáëåßï `portsclean` åãêáèßóôáôáé ùò ìÝñïò ôïõ **portupgrade**.

Ìçí îå÷íÜôå íá áöáéñåßôå ôá åãêáôåóôçìÝíá ports üôáí äåí ôá ÷ñåéÜæåóôå ðëÝïí. ¸íá êáëü åñãáëåßï ãéá íá áõôïìáôïðïéçèåß áõôÞ ç åñãáóßá, åßíáé ôï port `ports-mgmt/pkg_cutleaves`.

5.6 ÅíÝñãåéåò ìåôÜ ôçí ÅãêáôÜóôáóç

ÌåôÜ ôçí åãêáôÜóôáóç ìéáò íÝáò åöáñìïãÞò, ëïãéêÜ èá èÝëåôå íá äéáâÜóåôå üôé ôåêìçñßùóç õðÜñ÷åé, íá ôñïðïðïéÞóåôå ôá áñ÷åßá ñõèìßóåùí ðïõ ÷ñåéÜæåôáé, íá âåâáéùèåßôå üôé ç åöáñìïãÞ îåêéíÜåé êáôÜ ôçí åêêßíçóç (áí åßíáé daemon), ê.ë.ð.

Ôá áêñéâÞ âÞìáôá ðïõ èá ÷ñåéáóôïýí ãéá íá ñõèìßóåôå êÜèå åöáñìïãÞ, èá åßíáé ðñïöáíþò äéáöïñåôéêÜ. ¼ìùò, áí ìüëéò åãêáôáóôÞóáôå ìéá íÝá åöáñìïãÞ êáé áíáñùôéÝóôå "Ôþñá ôé;" ïé ðáñáêÜôù óõìâïõëÝò ìðïñåß íá óáò âïçèÞóïõí:

- ×ñçóéìïðïéÞóôå ôï pkg_info(1) ãéá íá äåßôå ôé áñ÷åßá åãêáôáóôÜèçêáí, êáé ðïõ. Ãéá ðáñÜäåéãìá, áí ìüëéò åãêáôáóôÞóáôå ôï FooPackage version 1.0.0, ôüôå ç åíôïëÞ:

  ```
  # pkg_info -L foopackage-1.0.0 | less
  ```

  èá óáò äåßîåé üëá ôá áñ÷åßá ðïõ åãêáôáóôÜèçêáí áðü áõôü ôï ðáêÝôï. ÐñïóÝîôå ôá áñ÷åßá óôïí êáôÜëïãï `man/`, ðïõ èá åßíáé óåëßäåò manual, ôïõò êáôáëüãïõò `etc/`, üðïõ èá åßíáé ôá áñ÷åßá ñõèìßóåùí, êáé ôï `doc/`, üðïõ èá âñßóêåôáé ðéï ðåñéåêôéêÞ ôåêìçñßùóç.

  Áí äåí åßóôå óßãïõñïò ðïéá Ýêäïóç ôçò åöáñìïãÞò åãêáôáóôÞóáôå, ìéá åíôïëÞ üðùò áõôÞ:

  ```
  # pkg_info | grep -i foopackage
  ```

  èá âñåé üëá ôá åãêáôåóôçìÝíá ðáêÝôá ðïõ Ý÷ïõí ôï *`foopackage`* óôï üíïìá ôïõ ðáêÝôïõ. Áíôéêáôáóôáóôå ôï *`foopackage`* óôçí ãñáììÞ åíôïëþí ìå ôï ðáêÝôï ðïõ áíáæçôÜôå.

- Ìüëéò äåßôå ðïõ âñßóêïíôáé ôá manual pages ôçò åöáñìïãÞò, äåßôå ôá ìå ôçí man(1). ¼ìïéá, äåßôå ôá ðáñáäåßãìáôá ôùí áñ÷åßùí ñýèìéóçò, êáé üðïéá Üëëç ðñüóèåôç ôåêìçñßùóç äéáôßèåôáé.

- Áí õðÜñ÷åé web site ãéá ôçí åöáñìïãÞ, åëÝãîôå ôï ãéá ðñüóèåôç ôåêìçñßùóç, óõ÷íÝò åñùôÞóåéò (FAQ), êáé Üëëá. Áí äåí åßóôå óßãïõñïò ãéá ôçí äéåýèõíóÞ ôïõ web site, ßóùò ôï âñåßôå óôçí Ýîïäï ôçò åíôïëÞò:

  ```
  # pkg_info foopackage-1.0.0
  ```

  Áí õðÜñ÷åé ãñáììÞ `WWW:`, èá ðñÝðåé íá Ý÷åé ôï URL ãéá ôï web site ôçò åöáñìïãÞò.

- Ports ðïõ ðñÝðåé íá îåêéíïýí êáôÜ ôçí åêêßíçóç (üðùò äéáêïìéóôÝò Internet) óõíÞèùò åãêáèéóôïýí Ýíá script óôï `/usr/local/etc/rc.d`. ÐñÝðåé íá åëÝãîåôå ôï script ãéá ôçí ïñèüôçôá ôïõ êáé íá ôï ôñïðïðïéÞóåôå Þ íá ôï ìåôïíïìÜóåôå áí ÷ñåéÜæåôáé. Äåßôå ôï Åêêéíþíôáò Õðçñåóßåò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

5.7 Áíôéìåôùðßæïíôáò ×áëáóìÝíá Ports

Áí Ýñèåôå áíôéìÝôùðïò ìå Ýíá port ôï ïðïßï äåí ëåéôïõñãåß, õðÜñ÷ïõí êÜðïéá ðñÜãìáôá ðïõ ìðïñåßôå íá êÜíåôå:

1. Äåßôå áí åêêñåìåß êÜðïéá äéüñèùóç ãéá ôï port óôï Problem Report database (http://www.FreeBSD.org/support.html#gnats). ÅÜí íáé, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôç ðñïôåéíüìåíç äéüñèùóç.
2. ÆçôÞóôå âïÞèåéá áðü ôïí óõíôçñçôÞ ôïõ port. ÐëçêôñïëïãÞóôå `make maintainer` Þ äéáâÜóôå ôï `Makefile` ãéá íá âñåßôå ôçí äéåýèõíóç email ôïõ óõíôçñçôÞ. Óôï ìÞíõìá óáò, èõìçèåßôå íá óõìðåñéëÜâåôå ôï üíïìá êáé ôçí Ýêäïóç ôïõ port (óôåßëôå ôç ãñáììÞ `$FreeBSD:` áðü ôï `Makefile`) êáèþò êáé ôçí Ýîïäï ôïõ óöÜëìáôïò.

   > **Óçìåßùóç:** ÌåñéêÜ ports äåí óõíôçñïýíôáé áðü êÜðïéï óõãêåêñéìÝíï Üôïìï, áëëÜ áðü êÜðïéá mailing list (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/mailing-list-faq/article.html). ÐïëëÝò, áí ü÷é üëåò, áðü áõôÝò ôéò äéåõèýíóåéò Ý÷ïõí ôçí ìïñöÞ `<freebsd-listname@FreeBSD.org>`. Ðáñáêáëïýìå íá ôï Ý÷åôå õðüøç óáò êáôÜ ôç äéáôýðùóç ôùí åñùôÞóåùí óáò.
   >
   > ÓõãêåêñéìÝíá, ôá ports ðïõ öáßíïíôáé üôé óõíôçñïýíôáé áðü ôï `<ports@FreeBSD.org>`, äåí óõíôçñïýíôáé áðü êáíÝíáí óôçí ðñáãìáôéêüôçôá. Äéïñèþóåéò êáé õðïóôÞñéîç, áí õðÜñ÷ïõí, Ýñ÷ïíôáé ãåíéêÜ áðü ôçí êïéíüôçôá ðïõ óõììåôÝ÷åé óôçí óõãêåêñéìÝíç mailing list. ×ñåéáæüìáóôå ðÜíôïôå ðåñéóóüôåñïõò åèåëïíôÝò!

   Áí äåí ëÜâåôå áðÜíôçóç, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï send-pr(1) ãéá íá óôåßëåôå ìéá áíáöïñÜ óöÜëìáôïò (äåßôå ôï ÃñÜöïíôáò ÁíáöïñÝò ÓöÜëìáôïò ãéá ôï FreeBSD (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/problem-reports/article.html)).
3. Äéïñèþóôå ôï! Ôï Porter’s Handbook (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/porters-handbook/index.html) ðåñéÝ÷åé ëåðôïìåñåßò ðëçñïöïñßåò ãéá ôçí õðïäïìÞ ôùí “Ports” þóôå íá ìðïñåßôå íá äéïñèþóåôå ôï ðåñéóôáóéáêü ðñïâëçìáôéêü port Þ áêüìá êáé íá äçìéïõñãÞóåôå Ýíá äéêü óáò port!
4. ÁíáêôÞóôå ôï ðáêÝôï áðü Ýíá êïíôéíü óáò FTP site. Ç “êýñéá” óõëëïãÞ ðáêÝôùí âñßóêåôáé óôï `ftp.FreeBSD.org`, óôïí êáôÜëïãï ðáêÝôùí (ftp://ftp.FreeBSD.org/pub/FreeBSD/ports/packages/). Ðñéí ôç ÷ñçóéìïðïéÞóåôå, åëÝãîôå *ðñþôá* ôï ôïðéêü óáò mirror. Ôá ðáêÝôá åßíáé ðéï óßãïõñï üôé èá ëåéôïõñãÞóïõí, áðü ôï íá ðñïóðáèåßôå íá ìåôáãëùôôßóåôå ôïí ðçãáßï êþäéêá, êáé ç äéáäéêáóßá ôåëåéþíåé ðéï ãñÞãïñá. ×ñçóéìïðïéÞóôå ôï ðñüãñáììá pkg_add(1) ãéá íá åãêáôáóôÞóåôå ôï ðáêÝôï óôï óýóôçìá óáò.

ÊåöÜëáéï 6 Ôï Óýóôçìá X Window

Áíáíåþèçêå ãéá ôïí X11 server ôïõ X.Org áðü ôïí Ken Tom êáé Marc Fonvieille.

6.1 Óýíïøç

Ôï FreeBSD ÷ñçóéìïðïéåß ôï X11 ãéá íá ðáñÝ÷åé óôïõò ÷ñÞóôåò Ýíá éó÷õñü ãñáöéêü ðåñéâÜëëïí åñãáóßáò. Ôï ðåñéâÜëëïí X11 åßíáé ìéá õëïðïßçóç áíïéêôïý êþäéêá ôïõ óõóôÞìáôïò X Window ðïõ õëïðïéåßôáé óôï **Xorg** (êáèþò êáé óå Üëëï ëïãéóìéêü ðïõ äåí ðåñéãñÜöåôáé åäþ). Ç ðñïåðéëåãìÝíç êáé åðßóçìç äéáíïìÞ ôïõ X11 åßíáé ôï **Xorg**, ï X11 server ðïõ áíáðôý÷èçêå áðü ôï X.Org Foundation ìå Üäåéá ÷ñÞóçò áñêåôÜ üìïéá ìå áõôÞ ðïõ ÷ñçóéìïðïéåßôáé áðü ôï FreeBSD. ÕðÜñ÷ïõí åðßóçò äéáèÝóéìïé åìðïñéêïß X servers ãéá ôï FreeBSD.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ðïõ ó÷åôßæïíôáé ìå ôéò êÜñôåò ãñáöéêþí ðïõ õðïóôçñßæïíôáé áðü ôï ðåñéâÜëëïí X11, äåßôå ôçí äéêôõáêÞ ôïðïèåóßá Xorg (http://www.x.org/).

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôá äéÜöïñá ôìÞìáôá ôïõ óõóôÞìáôïò X Window, êáé ðùò óõíåñãÜæïíôáé ìåôáîý ôïõò.
- Ðùò íá åãêáôáóôÞóåôå êáé íá ñõèìßóåôå ôï ðåñéâÜëëïí X11.
- Ðùò íá åãêáôáóôÞóåôå êáé íá ñõèìßóåôå äéáöïñåôéêïýò äéá÷åéñéóôÝò ðáñáèýñùí (window managers).
- Ðùò íá ÷ñçóéìïðïéÞóåôå TrueType® ãñáììáôïóåéñÝò óôï X11.
- Ðùò íá ñõèìßóåôå ôï óýóôçìá óáò ãéá óýíäåóç (login) ìÝóù ãñáöéêïý ðåñéâÜëëïíôïò (**XDM**).

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá îÝñåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

6.2 Êáôáíüçóç ôïõ ðåñéâÜëëïíôïò X11

Ç ÷ñÞóç ôïõ ðåñéâÜëëïíôïò X11 ãéá ðñþôç öïñÜ ìðïñåß íá ðñïêáëÝóåé ìéá ìéêñÞ ôáñá÷Þ óå üðïéïí Ý÷åé óõíçèßóåé óå Üëëá ãñáöéêÜ ðåñéâÜëëïíôá, üðùò ôá Microsoft Windows Þ ôï Mac OS.

ÃåíéêÜ, äåí åßíáé áðáñáßôçôï íá êáôáëáâáßíåôå ìå êÜèå ëåðôïìÝñåéá ôùí äéáöüñùí ôìçìÜôùí ôïõ X11 êáé ðþò áëëçëåðéäñïýí ìåôáîý ôïõò. ÊÜðïéåò âáóéêÝò ãíþóåéò üìùò, åßíáé ÷ñÞóéìåò êáé âïçèïýí óôï íá åêìåôáëëåõôåßôå êáëýôåñá ôéò äõíáôüôçôåò ôïõ X11.

6.2.1 Ãéáôß ëÝãåôáé X11 ôï ðåñéâÜëëïí åñãáóßáò;

Ôï X äåí åßíáé ôï ðñþôï ðåñéâÜëëïí åñãáóßáò ðïõ ãñÜöôçêå ãéá óõóôÞìáôá UNIX, áëëÜ åßíáé óÞìåñá ôï ðéï äçìïöéëÝò. Ç áñ÷éêÞ ïìÜäá áíÜðôõîçò ôïõ X åß÷å äïõëÝøåé óå Ýíá Üëëï óýóôçìá ðñéí ãñÜøåé ôï X. Ôï üíïìá ôïõ ðáëéüôåñïõ óõóôÞìáôïò Þôáí “W” (áðü ôçí ÁããëéêÞ ëÝîç “window”). Ôï ãñÜììá X Þôáí áðëÜ ôï åðüìåíï ãñÜììá óôï Ëáôéíéêü áëöÜâçôï.

Ìðïñåßôå íá áíáöÝñåóèå óôï X ìå ôá ïíüìáôá “X”, “X Window System”, “X11”, êáèþò êáé ìå ìåñéêïýò Üëëïõò üñïõò. Ðñïóï÷Þ üìùò: êÜðïéïé Üíèñùðïé èåùñïýí ðñïóâëçôéêü ôïí üñï “X Windows”. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôü, äåßôå ôç óåëßäá manual X(7).

6.2.2 Ôï ÌïíôÝëï ÐåëÜôç/ÄéáêïìéóôÞ ôùí X11

Ôï ðñùôüêïëëï X11 Ý÷åé ó÷åäéáóôåß áðü ôçí áñ÷Þ Ýôóé þóôå íá Ý÷åé åããåíÞ äéêôõáêÞ õðïóôÞñéîç, ìå âÜóç Ýíá ìïíôÝëï "ðåëÜôç-äéáêïìéóôÞ".

Óôï ìïíôÝëï ëåéôïõñãßáò ôïõ X11, ï "äéáêïìéóôÞò X" åêôåëåßôáé óôïí õðïëïãéóôÞ óôïí ïðïßï Ý÷åé óõíäåèåß ôï ðëçêôñïëüãéï, ç ïèüíç êáé ôï ðïíôßêé. Ï äéáêïìéóôÞò X åßíáé õðåýèõíïò ãéá ôç äéá÷åßñéóç ôçò ïèüíçò, ôçò åéóüäïõ áðü ôï ðëçêôñïëüãéï, ôï ðïíôßêé, êëð. ÊÜèå åöáñìïãÞ X (ð.÷. ôï **XTerm** Þ ôï **Netscape**) åßíáé Ýíáò "ðåëÜôçò". ¸íáò ðåëÜôçò óôÝëíåé ìçíýìáôá óôïí äéáêïìéóôÞ üðùò "Ðáñáêáëþ ó÷åäßáóå Ýíá ðáñÜèõñï óå áõôÝò ôéò óõíôåôáãìÝíåò", êáé ï äéáêïìéóôÞò óôÝëíåé ðßóù ìçíýìáôá üðùò "Ï ÷ñÞóôçò ìüëéò ðÜôçóå ôï ðëÞêôñï OK".

Óå Ýíá óðßôé Þ Ýíá ìéêñü ãñáöåßï, ï äéáêïìéóôÞò êáé ïé ðåëÜôåò X óõ÷íÜ åêôåëïýíôáé óôïí ßäéï õðïëïãéóôÞ. ¼ìùò, åßíáé áðüëõôá åöéêôü íá åêôåëåßôáé ï äéáêïìéóôÞò X óå Ýíáí ëéãüôåñï éó÷õñü åðéôñáðÝæéï õðïëïãéóôÞ, êáé íá åêôåëïýíôáé ïé åöáñìïãÝò X (ïé ðåëÜôåò) óå Ýíá, áò ðïýìå, éó÷õñü êáé áêñéâü ìç÷Üíçìá ðïõ åîõðçñåôåß ôï ãñáöåßï. Óå áõôü ôï óåíÜñéï ç åðéêïéíùíßá ìåôáîý ôùí ðåëáôþí X êáé ôïõ äéáêïìéóôÞ ãßíåôáé ìÝóù äéêôýïõ.

Áõôü ðñïêáëåß óýã÷õóç óå ïñéóìÝíïõò, åðåéäÞ ç ïñïëïãßá ôïõ X åßíáé áêñéâþò áíôßèåôç áðü üôé ðåñßìåíáí. Ïé ÷ñÞóôåò óõíÞèùò ðåñéìÝíïõí ï "äéáêïìéóôÞò X" íá åßíáé Ýíá ìåãÜëï éó÷õñü ìç÷Üíçìá óå Ýíá äùìÜôéï êáé ï "ðåëÜôçò X" íá åßíáé ôï ìç÷Üíçìá ôïõ ãñáöåßïõ ôïõò.

Åßíáé óçìáíôéêü íá èõìÜóôå üôé ï äéáêïìéóôÞò X åßíáé ôï ìç÷Üíçìá ìå ôçí ïèüíç êáé ôï ðëçêôñïëüãéï, êáé ïé ðåëÜôåò X åßíáé ôá ðñïãñÜììáôá ðïõ åìöáíßæïõí ôá ðáñÜèõñá.

Äåí õðÜñ÷åé ôßðïôá óôï ðñùôüêïëëï ðïõ íá áíáãêÜæåé ôá ìç÷áíÞìáôá ôùí ðåëáôþí êáé ôïõ äéáêïìéóôÞ íá åêôåëïýíôáé óôï ßäéï ëåéôïõñãéêü óýóôçìá, Þ áêüìç íá åêôåëïýíôáé óôïí ßäéï ôýðï õðïëïãéóôÞ. Åßíáé áðüëõôá åöéêôü íá åêôåëåßôáé Ýíáò äéáêïìéóôÞò X óôá Microsoft Windows Þ óôï Mac OS ôçò Apple, êáé õðÜñ÷ïõí äéáèÝóéìåò äéÜöïñåò åëåýèåñåò êáé åìðïñéêÝò åöáñìïãÝò ðïõ êÜíïõí áêñéâþò áõôü.

6.2.3 Ï Äéá÷åéñéóôÞò Ðáñáèýñùí

Ç öéëïóïößá ó÷åäéáóìïý ôïõ X ìïéÜæåé ðïëý ìå ôçí öéëïóïößá ó÷åäéáóìïý ôïõ UNIX, "åñãáëåßá, ü÷é ðïëéôéêÞ". Áõôü óçìáßíåé üôé ôï X äåí ðñïóðáèåß íá õðáãïñåýóåé ðùò èá õëïðïéçèåß ìéá åñãáóßá. Áíôßèåôá, ðáñÝ÷ïíôáé åñãáëåßá óôïí ÷ñÞóôç, êáé åßíáé äéêÞ ôïõ åõèýíç íá áðïöáóßóåé ðùò èá ôá ÷ñçóéìïðïéÞóåé.

ÁõôÞ ç öéëïóïößá åðåêôåßíåôáé óôï üôé ôï X äåí õðáãïñåýåé ðùò ðñÝðåé íá åìöáíßæïíôáé ôá ðáñÜèõñá óôçí ïèüíç, ðùò èá ìåôáêéíçèïýí ìå ôï ðïíôßêé, ôé óõíäõáóìïß ðëÞêôñùí ðñÝðåé íá ÷ñçóéìïðïéçèïýí ãéá íá ìåôáêéíçèïýìå ìåôáîý ôùí ðáñáèýñùí (ð.÷., **Alt**+**Tab**, óôçí ðåñßðôùóç ôùí Microsoft Windows), ðþò ðñÝðåé íá ìïéÜæïõí ïé ìðÜñåò ôßôëùí óå êÜèå ðáñÜèõñï, áí èá Ý÷ïõí Þ ü÷é ðëÞêôñá êëåéóßìáôïò ðÜíù ôïõò, ê.o.ê.

Áíôßèåôá, ôï X áíáèÝôåé áõôÞí ôçí åõèýíç óå ìßá åöáñìïãÞ ðïõ ïíïìÜæåôáé "Äéá÷åéñéóôÞò Ðáñáèýñùí". ÕðÜñ÷ïõí ðÜñá ðïëëïß äéá÷åéñéóôÝò ðáñáèýñùí äéáèÝóéìïé ãéá ôï ðñùôüêïëëï X. ÏñéóìÝíïé áðü áõôïýò åßíáé ïé: **AfterStep**, **Blackbox**, **ctwm**, **Enlightenment**, **fvwm**, **Sawfish**, **twm**, **Window Maker**, êáé ðïëëïß Üëëïé. ÊÜèå Ýíáò áðü áõôïýò ôïõò äéá÷åéñéóôÝò ðáñáèýñùí Ý÷åé äéáöïñåôéêÞ áßóèçóç êáé åìöÜíéóç. Ìåñéêïß áðü áõôïýò õðïóôçñßæïõí "åéêïíéêÝò åðéöÜíåéåò åñãáóßáò", ìåñéêïß åðéôñÝðïõí ðñïóáñìïóìÝíïõò óõíäõáóìïýò ðëÞêôñùí ãéá ôçí äéá÷åßñéóç ôçò åðéöÜíåéáò åñãáóßáò, ìåñéêïß Ý÷ïõí Ýíá ðëÞêôñï "Start" Þ êÜôé ðáñüìïéï, ìåñéêïß õðïóôçñßæïõí "èÝìáôá" (themes), åðéôñÝðïíôáò ôçí ïëïêëçñùôéêÞ áëëáãÞ åìöÜíéóçò ìå ôçí åöáñìïãÞ åíüò íÝïõ èÝìáôïò. Ïé äéá÷åéñéóôÝò ðáñáèýñùí ðïõ Ý÷ïõìå áíáöÝñåé ùò ôþñá, êáé ðïëëïß Üëëïé, åßíáé äéáèÝóéìïé óôçí êáôçãïñßá `x11-wm` ôçò ÓõëëïãÞò ôùí Ports.

ÅðéðëÝïí, ôá äýï ðéï äçìïöéëÞ ïëïêëçñùìÝíá ðåñéâÜëëïíôá åñãáóßáò, ôï **KDE** êáé ôï **GNOME**, Ý÷ïõí ôïí äéêü ôïõò äéá÷åéñéóôÞ ðáñáèýñùí ðïõ åßíáé åíóùìáôùìÝíïò ìå ôï õðüëïéðï ðåñéâÜëëïí åñãáóßáò.

ÊÜèå äéá÷åéñéóôÞò ðáñáèýñùí Ý÷åé åðßóçò êáé äéáöïñåôéêü ìç÷áíéóìü ñýèìéóçò: ìåñéêïß ñõèìßæïíôáé óõìðëçñþíïíôáò ìå ÷åéñïêßíçôï ôñüðï Ýíá áñ÷åßï ñõèìßóåùí, Üëëïé äéáèÝôïõí ãñáöéêÜ åñãáëåßá ãéá ôéò ðåñéóóüôåñåò ñõèìßóåéò. ÕðÜñ÷åé áêüìá êé Ýíáò (**Sawfish**) ðïõ Ý÷åé áñ÷åßï ñõèìßóåùí ãñáììÝíï óå ìéá äéÜëåêôï ôçò ãëþóóáò Lisp.

> **ÐïëéôéêÞ Åóôßáóçò:** ¶ëëï Ýíá èÝìá ãéá ôï ïðïßï åßíáé õðåýèõíïò ï äéá÷åéñéóôÞò ðáñáèýñùí åßíáé ç "ðïëéôéêÞ åóôßáóçò" ôïõ ðïíôéêéïý. ÊÜèå óýóôçìá ðáñáèýñùí ÷ñåéÜæåôáé êÜðïéï ôñüðï åðéëïãÞò ôïõ ðáñáèýñïõ ðïõ èá äÝ÷åôáé áõôÜ ðïõ ðëçêôñïëïãïýíôáé, êáé èá ðñÝðåé íá öáßíåôáé êÜðùò üôé áõôü ôï ðáñÜèõñï åßíáé åíåñãü.
>
> Ìßá ãíùóôÞ ðïëéôéêÞ åóôßáóçò ëÝãåôáé "click-to-focus". Áõôü ôï ìïíôÝëï ÷ñçóéìïðïéåßôáé óôá Microsoft Windows, üðïõ Ýíá ðáñÜèõñï ãßíåôáé åíåñãü áí äå÷ôåß Ýíá ðÜôçìá ôïõ ðïíôéêéïý.
>
> Ôï X äåí õðïóôçñßæåé êáìßá óõãêåêñéìÝíç ðïëéôéêÞ åóôßáóçò. Áíôßèåôá, ï äéá÷åéñéóôÞò ðáñáèýñùí åëÝã÷åé ðïéï ðáñÜèõñï Ý÷åé åóôéáóôåß êÜèå óôéãìÞ. Äéáöïñåôéêïß äéá÷åéñéóôÝò ðáñáèýñùí õðïóôçñßæïõí äéáöïñåôéêÝò ìåèüäïõò åóôßáóçò. ¼ëïé ôïõò õðïóôçñßæïõí ôçí ìÝèïäï click to focus, êáé ïé ðåñéóóüôåñïé áðü áõôïýò õðïóôçñßæïõí êáé áñêåôÝò Üëëåò.
>
> Ïé ðéï äçìïöéëåßò ìÝèïäïé åóôßáóçò åßíáé:
>
> focus-follows-mouse
>
> Ôï ðáñÜèõñï ðïõ âñßóêåôáé êÜôù áðü ôïí äåßêôç ôïõ ðïíôéêéïý åßíáé ôï ðáñÜèõñï ðïõ Ý÷åé ôçí åóôßáóç. Ôï åíåñãü ðáñÜèõñï äåí åßíáé áðáñáßôçôï íá åßíáé áõôü ðïõ âñßóêåôáé ðÜíù áðü üëá ôá Üëëá. Ç åóôßáóç áëëÜæåé ìå ôçí óôü÷åõóç åíüò Üëëïõ ðáñáèýñïõ, ÷ùñßò íá åßíáé áðáñáßôçôï ôï êëéê ðÜíù ôïõ.
>
> sloppy-focus
>
> ÁõôÞ ç ðïëéôéêÞ åßíáé ìéá ìéêñÞ åðÝêôáóç ôïõ focus-follows-mouse. Ìå ôçí ðïëéôéêÞ åóôßáóçò focus-follows-mouse, áí ôï ðïíôßêé âñåèåß ðÜíù áðü ôï áñ÷éêü (root) ðáñÜèõñï (Þ ôï ðáñáóêÞíéï) äåí õðÜñ÷åé åóôßáóç óå êáíÝíá ðáñÜèõñï, êáé üôé ðëçêôñïëïãåßôáé áðëþò ÷Üíåôáé. Ìå ôç sloppy-focus, ç åóôßáóç áëëÜæåé ìüíï áí ï äåßêôçò âñåèåß ðÜíù áðü Ýíá íÝï ðáñÜèõñï, êáé ü÷é üôáí öåýãåé áðü ôï ôñÝ÷ïí ðáñÜèõñï.
>
> click-to-focus
>
> Ôï åíåñãü ðáñÜèõñï åðéëÝãåôáé ìå êëéê ôïõ ðïíôéêéïý. Ôï ðáñÜèõñï ôüôå "áíáóçêþíåôáé", êáé åìöáíßæåôáé ìðñïóôÜ áðü üëá ôá Üëëá ðáñÜèõñá. ¼ôé ðëçêôñïëïãçèåß èá ïäçãçèåß óå áõôü ôï ðáñÜèõñï, áêüìá êáé áí ï äåßêôçò ìåôáêéíçèåß óå Üëëï ðáñÜèõñï.
>
> Ðïëëïß äéá÷åéñéóôÝò ðáñáèýñùí õðïóôçñßæïõí áêüìá ðéï åîùôéêÝò ðïëéôéêÝò åóôßáóçò, êáèþò êáé ðáñáëëáãÝò ôùí ðáñáðÜíù. Óõìâïõëåõèåßôå ôçí ôåêìçñßùóç ôïõ åêÜóôïôå äéá÷åéñéóôÞ ðáñáèýñùí ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

6.2.4 ÃñáöéêÜ Óôïé÷åßá ÄéåðáöÞò (Widgets)

Ç ðñïóÝããéóç ôïõ X íá äéáèÝôåé åñãáëåßá êáé ü÷é íá õðáãïñåýåé ôïí ôñüðï ÷ñÞóçò ôïõò, äéåõñýíåôáé êáé óôá ãñáöéêÜ óôïé÷åßá äéåðáöÞò (widgets) ðïõ öáßíïíôáé óôçí ïèüíç óå êÜèå åöáñìïãÞ.

Ôá "widgets" åßíáé Ýíáò üñïò ãéá üëá ôá áíôéêåßìåíá óôï ðåñéâÜëëïí ôïõ ÷ñÞóôç ðïõ ìðïñåß êÜðïéïò íá êÜíåé êëéê Þ íá ôá ÷åéñéóôåß ìå êÜðïéïí ôñüðï: ðëÞêôñá, ðëáßóéá åðéëïãÞò, ðëÞêôñá åíáëëáãÞò, åéêïíßäéá, ëßóôåò, êáé Üëëá. Ôá Microsoft Windows ôá ïíïìÜæïõí "controls (÷åéñéóôÞñéá)".

Ôá Microsoft Windows êáé ôï Mac OS ôçò Apple Ý÷ïõí êáé ôá äýï ðïëý áõóôçñÞ ðïëéôéêÞ ãñáöéêþí óôïé÷åßùí äéåðáöÞò. Ïé ðñïãñáììáôéóôÝò åöáñìïãþí ðñÝðåé õðïôßèåôáé íá åîáóöáëßóïõí üôé ïé åöáñìïãÝò ôïõò èá Ý÷ïõí êïéíÞ áßóèçóç êáé åìöÜíéóç (look and feel). Óôï X, äåí èåùñÞèçêå áðáñáßôçôï íá ãßíåé åðéâïëÞ åíüò óõãêåêñéìÝíïõ óôõë ãñáöéêþí, Þ íá ôåèïýí êÜðïéá õðï÷ñåùôéêÜ ãñáöéêÜ óôïé÷åßá äéåðáöÞò.

Óáí áðïôÝëåóìá, ìçí ðåñéìÝíåôå ôéò åöáñìïãÝò ãéá X íá Ý÷ïõí êïéíÞ åìöÜíéóç. ÕðÜñ÷ïõí äéÜöïñåò äçìïöéëåßò óõëëïãÝò ãñáöéêþí óôïé÷åßùí äéåðáöÞò êáé ðáñáëëáãÝò ôïõò, óõìðåñéëáìâáíïìÝíçò êáé ôçò áõèåíôéêÞò Athena óõëëïãÞò ãñáöéêþí óôïé÷åßùí äéåðáöÞò ôïõ MIT, **Motif®** (ðáñáëëáãÞ ôçò ïðïßáò åßíáé êáé ç óõëëïãÞ ãñáöéêþí óôïé÷åßùí äéåðáöÞò ôùí Microsoft Windows, ìå ëïîÝò ãùíßåò êáé ôñåéò äéáâáèìßóåéò ôïõ ãêñé), ôï **OpenLook**, êáé Üëëá.

Ïé ðåñéóóüôåñåò íÝåò X åöáñìïãÝò óÞìåñá ÷ñçóéìïðïéïýí ìéá óõëëïãÞ ãñáöéêþí óôïé÷åßùí äéåðáöÞò ìå ìïíôÝñíá åìöÜíéóç, åßôå ôï Qt, ðïõ ÷ñçóéìïðïéåßôáé áðü ôï **KDE**, åßôå ôï GTK+, ðïõ ÷ñçóéìïðïéåßôáé áðü ôï **GNOME**. Áðü áõôÞ ôçí Üðïøç, õðÜñ÷åé êÜðïéá óýãêëéóç óôçí åìöÜíéóç ôïõ UNIX desktop, ôï ïðïßï ïðùóäÞðïôå êÜíåé ôá ðñÜãìáôá åõêïëüôåñá ãéá ôïí íÝï ÷ñÞóôç.

6.3 ÅãêáôÜóôáóç ôïõ X11

Ôï **Xorg** åßíáé ç ðñïåðéëåãìÝíç õëïðïßçóç X11 ãéá ôï FreeBSD. Ôï **Xorg** åßíáé ï äéáêïìéóôÞò × ôçò õëïðïßçóçò X Window System ôïõ X.Org Foundation, êáé åßíáé áíïéêôïý êþäéêá. Ï **Xorg** åßíáé âáóéóìÝíïò óôïí êþäéêá ôïõ **XFree86 4.4RC2** êáé ôïõ X11R6.6. Ç Ýêäïóç ôïõ **Xorg** ðïõ äéáôßèåôáé áðü ôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD åßíáé ç 7.5.2.

Ãéá íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå ôï **Xorg** áðü ôçí ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/x11/xorg
# make install clean
```

> **Óçìåßùóç:** Ãéá íá ìåôáãëùôôßóåôå ïëüêëçñï ôï **Xorg** óéãïõñåõèåßôå üôé Ý÷åôå ôï ëéãüôåñï 4 GB åëåýèåñï ÷þñï äéáèÝóéìï.

ÅíáëëáêôéêÜ, ôï X11 ìðïñåß íá åãêáôáóôáèåß Üìåóá áðü ðáêÝôá. ÕðÜñ÷ïõí äéáèÝóéìá Ýôïéìá ðáêÝôá ôïõ ×11 ãéá ÷ñÞóç ìå ôï åñãáëåßï pkg_add(1). Áí ÷ñçóéìïðïéÞóåôå ôç äõíáôüôçôá ôïõ pkg_add(1) ãéá ëÞøç ìÝóù äéêôýïõ, äåí èá ðñÝðåé óôçí ãñáììÞ åíôïëþí íá äþóåôå ôïí áñéèìü Ýêäïóçò (version number) ôïõ ðáêÝôïõ. Ôï pkg_add(1) èá "êáôåâÜóåé" áõôüìáôá ôçí ôåëåõôáßá Ýêäïóç ôçò åöáñìïãÞò.

¸ôóé, ãéá íá ãßíåé ç ëÞøç êáé ç åãêáôÜóôáóç ôïõ **Xorg**, áðëþò åêôåëÝóôå:

```
# pkg_add -r xorg
```

> **Óçìåßùóç:** Ôá ðáñáðÜíù ðáñáäåßãìáôá èá åãêáôáóôÞóïõí ïëüêëçñç ôçí äéáíïìÞ X11 ðïõ ðåñéëáìâÜíåé äéáêïìéóôÝò, ðåëÜôåò, ãñáììáôïóåéñÝò êëð. Äéáôßèåíôáé åðßóçò îå÷ùñéóôÜ, ôìçìáôéêÜ ðáêÝôá êáé ports ãéá ôï X11.
>
> Ãéá íá åãêáôáóôÞóåôå ôçí åëÜ÷éóôç äõíáôÞ äéáíïìÞ X11, ìðïñåßôå åíáëëáêôéêÜ íá ÷ñçóéìïðïéÞóåôå ôï port `x11/xorg-minimal`.

Ôï õðüëïéðï ôïõ êåöáëáßïõ èá óáò åîçãÞóåé ðùò ñõèìßæåôáé ôï X11, êáé ðùò íá óôÞóåôå Ýíá ðáñáãùãéêü desktop ðåñéâÜëëïí.

6.4 Ñýèìéóç ôïõ X11

ÓõíåéóöïñÜ ôïõ Christopher Shumway.

6.4.1 Ðñéí îåêéíÞóåôå

Ðñéí ôçí ñýèìéóç ôïõ X11 ÷ñåéÜæïíôáé ïé áêüëïõèåò ðëçñïöïñßåò ãéá ôï óýóôçìá:

- ÐñïäéáãñáöÝò ôçò ïèüíçò
- Chipset ôçò êÜñôáò ãñáöéêþí
- ÌíÞìç ôçò êÜñôáò ãñáöéêþí

Ïé ðñïäéáãñáöÝò ôçò ïèüíçò ÷ñçóéìïðïéïýíôáé áðü ôï X11 ãéá íá ïñéóèåß ç áíÜëõóç êáé ï ñõèìüò áíáíÝùóçò óôï ïðïßï èá ëåéôïõñãÞóåé. Ïé ðñïäéáãñáöÝò áõôÝò âñßóêïíôáé óõíÞèùò óôçí ôåêìçñßùóç ðïõ óõíïäåýåé ôçí ïèüíç Þ óôçí éóôïóåëßäá ôïõ êáôáóêåõáóôÞ. ×ñåéÜæïíôáé äýï óåéñÝò áñéèìþí, ï ïñéæüíôéïò ñõèìüò áíáíÝùóçò êáé ï êáôáêüñõöïò ñõèìüò áíáíÝùóçò.

Ôï chipset (ïëïêëçñùìÝíï êýêëùìá) ôçò êÜñôáò ãñáöéêþí ïñßæåé ðïéïò ïäçãüò óõóêåõÞò èá ÷ñçóéìïðïéçèåß áðü ôï X11 ãéá ôçí åðéêïéíùíßá ìå ôçí êÜñôá ãñáöéêþí. Ãéá ôá ðåñéóóüôåñá chipset, áõôü ìðïñåß íá áíé÷íåõèåß áõôüìáôá, áëëÜ åßíáé ÷ñÞóéìï íá ôï ãíùñßæåôå óå ðåñßðôùóç ðïõ äåí ðåôý÷åé ç áõôüìáôç áíß÷íåõóç.

Ç ìíÞìç ôçò êÜñôáò ãñáöéêþí êáèïñßæåé ôçí áíÜëõóç êáé ôï âÜèïò ÷ñþìáôïò óôï ïðïßï ìðïñåß íá ëåéôïõñãÞóåé ôï óýóôçìá. Áõôü åßíáé óçìáíôéêü þóôå íá ãíùñßæåé ï ÷ñÞóôçò ôá üñéá ôïõ óõóôÞìáôïò.

6.4.2 Ñýèìéóç ôïõ X11

Ôï **Xorg** ÷ñçóéìïðïéåß ôï HAL ãéá ôçí áõôüìáôç áíß÷íåõóç ôïõ ðëçêôñïëïãßïõ êáé ôïõ ðïíôéêéïý. Ôá ports `sysutils/hal` êáé `devel/dbus` åãêáèßóôáíôáé ùò åîáñôÞóåéò ôïõ `x11/xorg`, áëëÜ èá ðñÝðåé íá åíåñãïðïéçèïýí ìå ôéò áêüëïõèåò åããñáöÝò óôï `/etc/rc.conf`:

```
hald_enable="YES"
dbus_enable="YES"
```

Èá ðñÝðåé íá îåêéíÞóåôå ôéò õðçñåóßåò áõôÝò (åßôå ÷åéñïêßíçôá, åßôå êÜíïíôáò åðáíåêêßíçóç) ðñéí óõíå÷ßóåôå ìå ôç ñýèìéóç Þ ôçí ÷ñÞóç ôïõ **Xorg**.

Ôï **Xorg** ìðïñåß óõ÷íÜ íá ëåéôïõñãÞóåé ÷ùñßò êáìéÜ åðéðëÝïí ñýèìéóç, ãñÜöïíôáò áðëþò óôç ãñáììÞ åíôïëþí:

```
% startx
```

Óå êÜðïéåò ðåñéðôþóåéò, ç áõôüìáôç ñýèìéóç ìðïñåß íá ìç ëåéôïõñãÞóåé óùóôÜ, Þ íá ìç ñõèìßóåé ôéò óõóêåõÝò áêñéâþò üðùò åðéèõìåßôå. Óôéò ðåñéðôþóåéò áõôÝò, èá ÷ñåéáóôåß íá êÜíåôå ÷åéñïêßíçôåò ñõèìßóåéò.

> **Óçìåßùóç:** ÊÜðïéá ãñáöéêÜ ðåñéâÜëëïíôá, üðùò ôï **GNOME** ôï **KDE** Þ ôï **XFCE**, äéáèÝôïõí åñãáëåßá ðïõ åðéôñÝðïõí óôï ÷ñÞóôç íá ñõèìßóåé ìå åýêïëï ôñüðï äéÜöïñåò ðáñáìÝôñïõò ôçò ïèüíçò, üðùò ç áíÜëõóç. Áí ç ðñïåðéëåãìÝíç ñýèìéóç äåí åßíáé áðïäåêôÞ, êáé óêïðåýåôå íá åãêáôáóôÞóåôå êÜðïéï áðü áõôÜ ôá

ðåñéâÜëëïíôá, ìðïñåßôå íá óõíå÷ßóåôå ìå ôçí åãêáôÜóôáóç ôïõ, êáé íá ïëïêëçñþóåôå ôéò ñõèìßóåéò óáò ÷ñçóéìïðïéþíôáò ôï êáôÜëëçëï ãñáöéêü åñãáëåßï.

Ôï ðñþôï âÞìá åßíáé ç äçìéïõñãßá åíüò áñ÷éêïý áñ÷åßïõ ñõèìßóåùí. Ùò root, áðëþò åêôåëÝóôå:

```
# Xorg -configure
```

Áõôü èá äçìéïõñãÞóåé Ýíá ðñüôõðï áñ÷åßï ñõèìßóåùí ôïõ X11 óôïí êáôÜëïãï `/root` ìå ôï üíïìá `xorg.conf.new` (åßôå ÷ñçóéìïðïéÞóåôå ôï su(1) åßôå óõíäåèåßôå áðåõèåßáò, ç ìåôáâëçôÞ êáôáëüãïõ `$HOME` áëëÜæåé äåß÷íïíôáò ôïí êáôÜëïãï ôïõ root). Ôï X11 èá ðñïóðáèÞóåé íá áíé÷íåýóåé ôï õðïóýóôçìá ãñáöéêþí ôïõ óõóôÞìáôïò êáé íá äçìéïõñãÞóåé Ýíá áñ÷åßï ñõèìßóåùí ðïõ èá öïñôþíåé ôïõò óùóôïýò ïäçãïýò óõóêåõþí ãéá ôï õëéêü ðïõ áíé÷íåýèçêå óôï óýóôçìá óáò.

Ôï åðüìåíï âÞìá åßíáé ï Ýëåã÷ïò ôùí õðÜñ÷ïíôùí ñõèìßóåùí ãéá íá åðéâåâáéþóåôå üôé ôï **Xorg** ëåéôïõñãåß ìå ôï õðïóýóôçìá ãñáöéêþí ôïõ óõóôÞìáôïò óáò. ÐëçêôñïëïãÞóôå:

```
# Xorg -config xorg.conf.new -retro
```

ÅÜí åìöáíéóôåß Ýíá ìáýñï êáé ãêñé ðëÝãìá êáé Ýíáò äåßêôçò ðïíôéêéïý ìå ìïñöÞ X, ç ñýèìéóç Þôáí åðéôõ÷Þò. Ãéá íá ôåñìáôßóåôå ôç äïêéìÞ, ìåôáâåßôå óôçí åéêïíéêÞ êïíóüëá áðü ôçí ïðïßá ôçí îåêéíÞóáôå, ðéÝæïíôáò **Ctrl**+**Alt**+**F*n*** (**F1** ãéá ôçí ðñþôç åéêïíéêÞ êïíóüëá) êáé ðéÝóôå **Ctrl**+**C**.

Óçìåßùóç: Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôïí óõíäõáóìü ðëÞêôñùí **Ctrl**+**Alt**+**Backspace** ãéá ôïí ôåñìáôéóìü ôïõ ðñïãñÜììáôïò. Ãéá íá ôïí åíåñãïðïéÞóåôå, äþóôå ôçí ðáñáêÜôù åíôïëÞ óå êÜðïéï ôåñìáôéêü ôïõ X:

```
% setxkbmap -option terminate:ctrl_alt_bksp
```

ÅíáëëáêôéêÜ, äçìéïõñãÞóôå Ýíá áñ÷åßï ñõèìßóåùí ðëçêôñïëïãßïõ ãéá ôï **hald** ìå ôçí ïíïìáóßá `x11-input.fdi` êáé áðïèçêåýóôå ôï óôïí êáôÜëïãï `/usr/local/etc/hal/fdi/policy`. Ôï áñ÷åßï áõôü èá ðñÝðåé íá ðåñéÝ÷åé ôéò ðáñáêÜôù ãñáììÝò:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<deviceinfo version="0.2">
  <device>
    <match key="info.capabilities" contains="input.keyboard">
          <merge key="input.x11_options.XkbOptions" type="string">terminate:ctrl_alt_bksp</merge>
    </match>
  </device>
</deviceinfo>
```

Èá ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá óáò ãéá íá åîáíáãêÜóåôå ôï **hald** íá äéáâÜóåé áõôü ôï áñ÷åßï.

Èá ðñÝðåé åðßóçò íá ðñïóèÝóåôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `xorg.conf.new`, óôçí åíüôçôá `ServerLayout` Þ `ServerFlags`:

```
Option   "DontZap"       "off"
```

Áí ôï ðïíôßêé äåí ëåéôïõñãåß, èá ÷ñåéáóôåß íá ôï ñõèìßóåôå ðñéí óõíå÷ßóåôå. Äåßôå ôï ÔìÞìá 2.10.10 óôï êåöÜëáéï åãêáôÜóôáóçò ôïõ FreeBSD. Åðéðñüóèåôá, óôéò ðñüóöáôåò åêäüóåéò ôïõ **Xorg**, ïé åíüôçôåò `InputDevice` óôï `xorg.conf` áãíïïýíôáé êáèþò ãßíåôáé ÷ñÞóç ôùí óõóêåõþí ðïõ áíé÷íåýèçêáí áõôüìáôá. Ãéá íá åðáíáöÝñåôå ôçí ðáëéÜ óõìðåñéöïñÜ, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôçí åíüôçôá `ServerLayout` Þ `ServerFlags` ôïõ áñ÷åßïõ ñõèìßóåùí:

```
Option "AutoAddDevices" "false"
```

Èá ìðïñåßôå Ýðåéôá íá ñõèìßóåôå ôéò óõóêåõÝò åéóüäïõ üðùò óôéò ðñïçãïýìåíåò åêäüóåéò ôïõ **Xorg**, ÷ñçóéìïðïéþíôáò êáé üðïéåò Üëëåò åðéëïãÝò ÷ñåéÜæåóôå (ð.÷. åíáëëáãÞ ðëçêôñïëïãßïõ).

> **Óçìåßùóç:** ¼ðùò åîçãÞóáìå êáé ðñïçãïõìÝíùò, ï äáßìïíáò **hald** áíáëáìâÜíåé íá áíé÷íåýóåé áõôüìáôá ôï ðëçêôñïëüãéï óáò. ÕðÜñ÷åé ðåñßðôùóç íá ìçí ãßíåé óùóôÞ áíß÷íåõóç ôïõ ìïíôÝëïõ Þ ôçò äéÜôáîçò, ùóôüóï êÜðïéá ãñáöéêÜ ðåñéâÜëëïíôá üðùò ôï **GNOME** ôï **KDE** êáé ôï **Xfce** ðáñÝ÷ïõí ôá äéêÜ ôïõò åñãáëåßá ãéá ôç ñýèìéóç ôïõ. Ìðïñåßôå üìùò íá ñõèìßóåôå ôéò éäéüôçôåò ôïõ ðëçêôñïëïãßïõ êáé áðåõèåßáò, åßôå ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò setxkbmap(1) åßôå ìå ôçí ðñïóèÞêç åíüò êáíüíá óôïí **hald**.
>
> Ãéá ðáñÜäåéãìá, áí êÜðïéïò èÝëåé íá ÷ñçóéìïðïéÞóåé Ýíá ðëçêôñïëüãéï 102 ðëÞêôñùí ìå ãáëëéêÞ äéÜôáîç, èá ðñÝðåé íá äçìéïõñãÞóåé Ýíá áñ÷åßï ñõèìßóåùí ãéá ôï **hald** ìå ôï üíïìá `x11-input.fdi` êáé íá ôï áðïèçêåýóåé óôïí êáôÜëïãï `/usr/local/etc/hal/fdi/policy`. Ôï áñ÷åßï áõôü èá ðåñéÝ÷åé ôéò ðáñáêÜôù ãñáììÝò:
>
> ```
> <?xml version="1.0" encoding="ISO-8859-1"?>
> <deviceinfo version="0.2">
>   <device>
>     <match key="info.capabilities" contains="input.keyboard">
>           <merge key="input.x11_options.XkbModel" type="string">pc102</merge>
>           <merge key="input.x11_options.XkbLayout" type="string">fr</merge>
>     </match>
>   </device>
> </deviceinfo>
> ```
>
> Áí ôï áñ÷åßï áõôü õðÜñ÷åé Þäç, áðëþò áíôéãñÜøôå ôéò ðáñáðÜíù ãñáììÝò ìÝóá óôï õðÜñ÷ïí ðåñéå÷üìåíï.
>
> Èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá óáò ãéá íá åîáíáãêÜóåôå ôï **hald** íá äéáâÜóåé ôï áñ÷åßï.
>
> Ìðïñåßôå åðßóçò íá êÜíåôå ôçí ßäéá ñýèìéóç ìÝóá áðü Ýíá ôåñìáôéêü óôá × Þ áêüìá êáé áðü Ýíá script, åêôåëþíôáò ôçí ðáñáêÜôù åíôïëÞ:
>
> ```
> % setxkbmap -model pc102 -layout fr
> ```
>
> Ìðïñåßôå íá âñåßôå ôéò äéáèÝóéìåò åðéëïãÝò ðëçêôñïëïãßùí êáé äéáôÜîåùí óôï áñ÷åßï `/usr/local/share/X11/xkb/rules/base.lst`.

¸ðåéôá, ðñïóáñìüóôå ôï áñ÷åßï ñõèìßóåùí `xorg.conf.new` óôéò ðñïôéìÞóåéò óáò. Áíïßîôå ôï ìå Ýíáí óõíôÜêôç êåéìÝíïõ üðùò ï emacs(1) Þ ï ee(1). Ðñþôá, ðñïóèÝóôå ôéò óõ÷íüôçôåò ôçò ïèüíçò. ÓõíÞèùò áíáöÝñïíôáé ùò ïñéæüíôéïò êáé êáôáêüñõöïò ñõèìüò óõã÷ñïíéóìïý. ÁõôÝò ïé ôéìÝò ôïðïèåôïýíôáé óôï áñ÷åßï `xorg.conf.new` óôï Section `"Monitor"`:

```
Section "Monitor"
        Identifier   "Monitor0"
        VendorName   "Monitor Vendor"
        ModelName    "Monitor Model"
        HorizSync    30-107
        VertRefresh  48-120
EndSection
```

Ïé ìåôáâëçôÝò `HorizSync` êáé `VertRefresh` ìðïñåß íá ìçí õðÜñ÷ïõí óôï áñ÷åßï ñõèìßóåùí. Áí äåí õðÜñ÷ïõí, ðñÝðåé íá ðñïóôåèïýí, ìå ôïí óùóôü ïñéæüíôéï ñõèìü óõã÷ñïíéóìïý ìåôÜ ôçí ëÝîç `HorizSync` êáé ôïí êáôáêüñõöï ñõèìü óõã÷ñïíéóìïý ìåôÜ ôçí ëÝîç `VertRefresh`. Óôï ðáñáðÜíù ðáñÜäåéãìá, ðñïóèÝóáìå ôïõò áíôßóôïé÷ïõò ñõèìïýò áíáíÝùóçò ôçò ïèüíçò ìáò.

Ôï X åðéôñÝðåé ôç ÷ñÞóç ôùí äõíáôïôÞôùí DPMS (Energy Star) óå ïèüíåò ðïõ õðïóôçñßæïõí ôçí áíôßóôïé÷ç ëåéôïõñãßá. Ôï ðñüãñáììá xset(1) åëÝã÷åé ôïõò ÷ñüíïõò êáé ìðïñåß íá åðéâÜëëåé ôéò êáôáóôÜóåéò standby, suspend, Þ off. Áí èÝëåôå íá åíåñãïðïéÞóåôå ôéò äõíáôüôçôåò DPMS ôçò ïèüíçò óáò, ðñÝðåé íá ðñïóèÝóåôå ôçí áêüëïõèç ãñáììÞ óôï Section monitor:

```
        Option       "DPMS"
```

¼óï ôï áñ÷åßï ñõèìßóåùí `xorg.conf.new` åßíáé áêüìá áíïéêôü óå Ýíáí óõíôÜêôç êåéìÝíïõ, åðéëÝîôå ôçí áíÜëõóç êáé ôï âÜèïò ÷ñùìÜôùí ðïõ åðéèõìåßôå. Áõôü êáèïñßæåôáé óôï Section `"Screen"`:

```
Section "Screen"
        Identifier "Screen0"
        Device     "Card0"
        Monitor    "Monitor0"
        DefaultDepth 24
        SubSection "Display"
                Viewport  0 0
                Depth     24
                Modes     "1024x768"
        EndSubSection
EndSection
```

Ç ìåôáâëçôÞ `DefaultDepth` ïñßæåé ôï ðñïåðéëåãìÝíï âÜèïò ÷ñþìáôïò ðïõ èá ÷ñçóéìïðïéçèåß. Ìðïñåßôå íá ôçí ðáñáêÜìøåôå ìå ôïí äéáêüðôç `-depth` óôç ãñáììÞ åíôïëþí ôïõ Xorg(1). Ç åðéëïãÞ `Modes` ïñßæåé ôçí áíÜëõóç ìå ôçí ïðïßá èá ëåéôïõñãåß ç ïèüíç óå Ýíá óõãêåêñéìÝíï âÜèïò ÷ñùìÜôùí. ÐñïóÝîôå üôé õðïóôçñßæïíôáé ìüíï êáíïíéêÝò êáôáóôÜóåéò VESA, üðùò ïñßæïíôáé áðü ôï õðïóýóôçìá ãñáöéêþí ôïõ óõóôÞìáôïò. Óôï ðáñáðÜíù ðáñÜäåéãìá, ôï êáèïñéóìÝíï âÜèïò ÷ñùìÜôùí åßíáé åéêïóéôÝóóåñá bits áíÜ pixel. Óå áõôü ôï âÜèïò ÷ñùìÜôùí, ç áðïäåêôÞ áíÜëõóç åßíáé 1024×768 pixels.

ÔÝëïò, áðïèçêåýóôå ôï áñ÷åßï ñõèìßóåùí êáé åëÝãîôå ôï ìå ôçí ìÝèïäï åëÝã÷ïõ ðïõ åîçãÞóáìå ðáñáðÜíù.

> **Óçìåßùóç:** ¸íá áðü ôá åñãáëåßá ðïõ ìðïñåß íá óáò âïçèÞóïõí êáôÜ ôçí äéáäéêáóßá åðßëõóçò ðñïâëçìÜôùí, åßíáé ôá áñ÷åßá X11 log, ðïõ ðåñéÝ÷ïõí ðëçñïöïñßåò ãéá êÜèå óõóêåõÞ ðïõ åðéêïéíùíåß ìå ôïí äéáêïìéóôÞ X11. Ôá áñ÷åßá **Xorg** log ïíïìÜæïíôáé ìå ôçí ìïñöÞ `/var/log/Xorg.0.log`. Ôï áêñéâÝò üíïìá åíüò log ìðïñåß íá åßíáé `Xorg.0.log` Ýùò `Xorg.8.log` êáé ðÜåé ëÝãïíôáò.

Áí üëá åßíáé êáëÜ, ôï áñ÷åßï ñõèìßóåùí ðñÝðåé íá ôïðïèåôçèåß óå ìéá êïéíÞ ôïðïèåóßá þóôå íá åíôïðßæåôáé áðü ôï Xorg(1). ÁõôÞ óõíÞèùò åßíáé ç `/etc/X11/xorg.conf` Þ `/usr/local/etc/X11/xorg.conf`.

```
# cp xorg.conf.new /etc/X11/xorg.conf
```

Ç äéáäéêáóßá ñýèìéóçò ôïõ X11 Ý÷åé ôþñá ïëïêëçñùèåß. Ôï **Xorg** ìðïñåßôå íá ôï îåêéíÞóåôå ìå ôï âïçèçôéêü ðñüãñáììá startx(1). Ï äéáêïìéóôÞò X11 ìðïñåß åðßóçò íá åêêéíÞóåé ìå ôç âïÞèåéá ôïõ xdm(1).

6.4.3 ÅîåéäéêåõìÝíá ÈÝìáôá Ñõèìßóåùí

6.4.3.1 Ñõèìßóåéò ãéá ôá Intel® i810 Graphics Chipsets

Ãéá íá ÷ñçóéìïðïéÞóåôå êÜñôá ãñáöéêþí óôá Intel i810 integrated chipsets, áðáéôåßôáé ôï `agpgart`, ç äéåðáöÞ ðñïãñáììáôéóìïý ôùí X11 ãéá ôï AGP. Äåßôå ôçí óåëßäá manual ôïõ ðñïãñÜììáôïò ïäÞãçóçò agp(4) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Må áõôü ôïí ôñüðï, ç ñýèìéóç ôïõ õëéêïý óáò èá ìðïñåß íá ãßíåé üðùò êáé óå êÜèå Üëëç êÜñôá ãñáöéêþí. Ðñïóï÷Þ, óå óõóôÞìáôá ÷ùñßò åíóùìáôùìÝíï ôïí ïäçãü agp(4), ï ïäçãüò äåí èá öïñôùèåß ìå ôçí åíôïëÞ kldload(8). Ï ïäçãüò áõôüò ðñÝðåé íá âñßóêåôáé óôïí ðõñÞíá êáôÜ ôçí åêêßíçóç, åßôå óôáôéêÜ ìåôáãëùôôéóìÝíïò, åßôå ìå ÷ñÞóç ôïõ `/boot/loader.conf`.

6.4.3.2 ÐñïóèÝôïíôáò ìéá Widescreen Åðßðåäç Ïèüíç

Áõôü ôï ôìÞìá ðñïûðïèÝôåé ìåñéêÝò ãíþóåéò åîåéäéêåõìÝíùí ñõèìßóåùí. Áí ïé ðñïóðÜèåéåò ìå ôá óõíÞèç åñãáëåßá ñõèìßóåùí äåí êáôáëÞîïõí óå ìéá ñýèìéóç ðïõ íá ëåéôïõñãåß, õðÜñ÷ïõí áñêåôÝò ðëçñïöïñßåò óôá áñ÷åßá log ðïõ ìðïñïýí íá óáò âïçèÞóïõí. Ùóôüóï, åßíáé áðáñáßôçôç ç ÷ñÞóç åíüò óõíôÜêôç êåéìÝíïõ.

Ïé ôñÝ÷ïõóåò áíáëýóåéò widescreen (WSXGA, WSXGA+, WUXGA, WXGA, WXGA+, ê.á.) õðïóôçñßæïõí formats êáé aspect ratios (áíáëïãßåò) 16:10 êáé 16:9 ðïõ ìðïñåß íá äçìéïõñãÞóïõí ðñïâëÞìáôá. Ðáñáäåßãìáôá ìåñéêþí êïéíþí áíáëýóåùí ãéá áíáëïãßá 16:10 åßíáé ôá:

- 2560x1600
- 1920x1200
- 1680x1050
- 1440x900
- 1280x800

ÊÜðïéá óôéãìÞ, ç ñýèìéóç èá ãßíåôáé ðïëý áðëÜ ðñïóèÝôïíôáò ôçí áíÜëõóç ùò Ýíá ðéèáíü `Mode` óôï `Section "Screen"` üðùò åäþ:

```
Section "Screen"
Identifier "Screen0"
Device     "Card0"
Monitor    "Monitor0"
DefaultDepth 24
SubSection "Display"
        Viewport  0 0
        Depth     24
        Modes     "1680x1050"
EndSubSection
EndSection
```

Ôï **Xorg** åßíáé áñêåôÜ Ýîõðíï þóôå íá áíáêôÞóåé ôéò ðëçñïöïñßåò ôçò áíÜëõóçò ôçò widescreen ïèüíçò ìÝóù ôùí ðëçñïöïñéþí I2C/DDC, ãíùñßæïíôáò Ýôóé ôé ìðïñåß íá ÷åéñéóôåß ç ïèüíç üóï áöïñÜ ôéò óõ÷íüôçôåò êáé ôéò áíáëýóåéò.

Áí áõôÝò ïé `ModeLines` äåí õðÜñ÷ïõí óôïõò ïäçãïýò, ìðïñåß íá ÷ñåéáóôåß íá ôéò äþóåôå åóåßò óôï **Xorg**. ×ñçóéìïðïéþíôáò ôï `/var/log/Xorg.0.log` ìðïñåßôå íá áíáêôÞóåôå áñêåôÝò ðëçñïöïñßåò þóôå íá äçìéïõñãÞóåôå ìüíïé óáò Ýíá `ModeLine` ðïõ íá ëåéôïõñãåß. Áðëþò áíáæçôÞóôå ðëçñïöïñßåò ðïõ èá ìïéÜæïõí ìå áõôü:

```
(II) MGA(0): Supported additional Video Mode:
(II) MGA(0): clock: 146.2 MHz   Image Size:  433 x 271 mm
(II) MGA(0): h_active: 1680  h_sync: 1784  h_sync_end 1960 h_blank_end 2240 h_border: 0
(II) MGA(0): v_active: 1050  v_sync: 1053  v_sync_end 1059 v_blanking: 1089 v_border: 0
(II) MGA(0): Ranges: V min: 48  V max: 85 Hz, H min: 30  H max: 94 kHz, PixClock max 170 MHz
```

ÁõôÝò ïíïìÜæïíôáé ðëçñïöïñßåò EDID. Ç äçìéïõñãßá åíüò `ModeLine` áðü áõôÝò, ãßíåôáé âÜæïíôáò áðëþò ôïõò áñéèìïýò óôç óùóôÞ óåéñÜ:

```
ModeLine <name> <clock> <4 horiz. timings> <4 vert. timings>
```

ÔåëéêÜ, ôï `ModeLine` óôï `Section "Monitor"` óôï ðáñÜäåéãìá ìáò èá ìïéÜæåé ìå áõôü:

```
Section "Monitor"
Identifier      "Monitor1"
VendorName      "Bigname"
ModelName       "BestModel"
ModeLine        "1680x1050" 146.2 1680 1784 1960 2240 1050 1053 1059 1089
Option          "DPMS"
EndSection
```

Ôþñá ðïõ Ý÷åôå ôåëåéþóåé ìå áõôÜ ôá áðëÜ âÞìáôá, ôï X èá ðñÝðåé íá ëåéôïõñãÞóåé óôç íÝá widescreen ïèüíç óáò.

6.5 ×ñÞóç Ãñáììáôïóåéñþí óôï X11

ÓõíåéóöïñÜ ôïõ Murray Stokely.

6.5.1 ÃñáììáôïóåéñÝò ôýðïõ Type1

Ïé ðñïêáèïñéóìÝíåò ãñáììáôïóåéñÝò ðïõ óõíïäåýïõí ôï X11 äåí åßíáé éäáíéêÝò ãéá åöáñìïãÝò åðéôñáðÝæéáò ôõðïãñáößáò. Ïé ìåãÜëåò ãñáììáôïóåéñÝò ðáñïõóßáóçò öáßíïíôáé ïäïíôùôÝò êáé åñáóéôå÷íéêÝò, êáé ïé ìéêñÝò ãñáììáôïóåéñÝò óôï **Netscape** åßíáé ó÷åäüí áêáôÜëçðôåò. Åõôõ÷þò üìùò, õðÜñ÷ïõí äéáèÝóéìåò áñêåôÝò, õøçëÞò ðïéüôçôáò ãñáììáôïóåéñÝò Type1 (PostScript®) ðïõ ìðïñïýí íá ÷ñçóéìïðïéçèïýí Üìåóá áðü ôï X11. Ãéá ðáñÜäåéãìá, ç óõëëïãÞ ãñáììáôïóåéñþí URW (`x11-fonts/urwfonts`) ðåñéÝ÷åé åêäüóåéò õøçëÞò ðïéüôçôáò ôùí óõíçèéóìÝíùí type1 ãñáììáôïóåéñþí (Times Roman®, Helvetica®, Palatino® êáé Üëëåò). Ç óõëëïãÞ Freefonts (`x11-fonts/freefonts`) ðåñéÝ÷åé ðïëëÝò ðåñéóóüôåñåò ãñáììáôïóåéñÝò, áëëÜ ïé ðåñéóóüôåñåò áðü áõôÝò åßíáé ãéá ëïãéóìéêü ãñáöéêþí üðùò ôï **Gimp**, êáé äåí åßíáé êáôÜëëçëåò ãéá ãñáììáôïóåéñÝò ïèüíçò. Áêüìç, ôï X11 ìðïñåß ìå åëÜ÷éóôï êüðï íá ñõèìéóôåß þóôå íá ÷ñçóéìïðïéåß TrueType ãñáììáôïóåéñÝò. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äåßôå ôçí óåëßäá manual X(7) Þ ôï ôìÞìá ó÷åôéêÜ ìå ôéò ãñáììáôïóåéñÝò TrueType.

Ãéá íá åãêáôáóôÞóåôå ôéò ðáñáðÜíù óõëëïãÝò ãñáììáôïóåéñþí Type1 áðü ôçí ÓõëëïãÞ ôùí Ports, åêôåëÝóôå ôéò ðáñáêÜôù åíôïëÝò:

```
# cd /usr/ports/x11-fonts/urwfonts
# make install clean
```

Ìå ðáñüìïéï ôñüðï ìðïñåßôå íá åãêáôáóôÞóåôå êáé ôçí freefont Þ Üëëåò óõëëïãÝò. Ãéá íá áíé÷íåýóåé ï X server áõôÝò ôéò ãñáììáôïóåéñÝò, ðñïóèÝóôå ôçí êáôÜëëçëç ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ (`/etc/X11/xorg.conf`):

```
FontPath "/usr/local/lib/X11/fonts/URW/"
```

ÅíáëëáêôéêÜ, åêôåëÝóôå óôçí ãñáììÞ åíôïëþí ìéáò óõíüäïõ X:

```
% xset fp+ /usr/local/lib/X11/fonts/URW
% xset fp rehash
```

Áõôü èá ëåéôïõñãÞóåé, áëëÜ üôáí ôåñìáôßóåé ç óýíïäïò X, ïé ñõèìßóåéò èá ÷áèïýí, åêôüò áí ðñïóôåèïýí óôï áñ÷åßï åêêßíçóçò (ôï `~/.xinitrc` ãéá ìßá óõíçèéóìÝíç óýíïäï ìÝóù `startx`, ç ôï `~/.xsession` áí óõíäÝåóôå ìÝóù åíüò ãñáöéêïý äéá÷åéñéóôÞ óõíäÝóåùí üðùò ï **XDM**). ¸íáò áêüìç ôñüðïò åßíáé íá ÷ñçóéìïðïéÞóåôå ôï áñ÷åßï `/usr/local/etc/fonts/local.conf`: äåßôå ôï ôìÞìá anti-aliasing (åîïìÜëõíóçò).

6.5.2 ÃñáììáôïóåéñÝò TrueType®

Ôï **Xorg** Ý÷åé åíóùìáôùìÝíç õðïóôÞñéîç áðåéêüíéóçò ãñáììáôïóåéñþí TrueType. ÕðÜñ÷ïõí äýï äéáöïñåôéêÜ modules (áñèñþìáôá) ðïõ ìðïñïýí íá åíåñãïðïéÞóïõí áõôÞí ôçí ëåéôïõñãßá. Óå áõôü ôï ðáñÜäåéãìá ÷ñçóéìïðïéåßôáé ôï freetype module åðåéäÞ åßíáé ðéï óõíåñãÜóéìï ìå ôá Üëëá back-ends áðåéêüíéóçò ãñáììáôïóåéñþí. Ãéá íá åíåñãïðïéÞóåôå ôï freetype module, áðëþò ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï ôìÞìá `"Module"` ôïõ áñ÷åßïõ `/etc/X11/xorg.conf`.

```
Load  "freetype"
```

Ôþñá, äçìéïõñãÞóôå Ýíáí êáôÜëïãï ãéá ôéò ãñáììáôïóåéñÝò TrueType (ãéá ðáñÜäåéãìá, `/usr/local/lib/X11/fonts/TrueType`) êáé áíôéãñÜøôå üëåò ôéò ãñáììáôïóåéñÝò TrueType óå áõôüí. ÐñïóÝîôå üôé ïé ãñáììáôïóåéñÝò TrueType äåí ìðïñïýí íá åßíáé áðü Ýíá óýóôçìá Macintosh ðñÝðåé íá åßíáé óå ìïñöÞ UNIX/MS-DOS/Windows ãéá íá ëåéôïõñãïýí óôï X11. Ìüëéò áíôéãñáöïýí ôá áñ÷åßá óôïí êáôÜëïãï, ÷ñçóéìïðïéÞóôå ôï **ttmkfdir** ãéá íá äçìéïõñãÞóåôå ôï áñ÷åßï `fonts.dir`, þóôå ï X font renderer íá ãíùñßæåé ôçí ýðáñîç ôùí íÝùí áõôþí áñ÷åßùí. Ôï `ttmkfdir` äéáôßèåôáé áðü ôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD ùò `x11-fonts/ttmkfdir`.

```
# cd /usr/local/lib/X11/fonts/TrueType
# ttmkfdir -o fonts.dir
```

Ôþñá, ðñïóèÝóôå ôïí êáôÜëïãï TrueType óôç äéáäñïìÞ ôùí fonts. Áõôü ãßíåôáé ìå ôïí ßäéï ôñüðï ðïõ ðåñéãñÜøáìå ðáñáðÜíù óôéò Type1 ãñáììáôïóåéñÝò, ÷ñçóéìïðïéþíôáò ôï

```
% xset fp+ /usr/local/lib/X11/fonts/TrueType
% xset fp rehash
```

Þ áðëÜ ðñïóèÝóôå ìéá ãñáììÞ `FontPath` óôï áñ÷åßï `xorg.conf`.

Áõôü Þôáí. Ôþñá ï **Netscape**, ôï **Gimp**, ôï **StarOffice™**, êáé üëåò ïé Üëëåò åöáñìïãÝò X ðñÝðåé íá áíáãíùñßæïõí ôéò åãêáôåóôçìÝíåò TrueType ãñáììáôïóåéñÝò. Ðïëý ìéêñÝò ãñáììáôïóåéñÝò (üðùò áõôÝò ðïõ öáßíïíôáé óôï êåßìåíï ìéáò éóôïóåëßäáò óå õøçëÞ áíÜëõóç) êáé ðïëý ìåãÜëåò ãñáììáôïóåéñÝò (óôï **StarOffice**) èá öáßíïíôáé ôþñá ðïëý êáëýôåñá.

6.5.3 Anti-Aliased ÃñáììáôïóåéñÝò

Áíáíåþèçêå áðü ôïí Joe Marcus Clarke.

¼ëåò ïé ãñáììáôïóåéñÝò X11 ðïõ âñßóêïíôáé óôï `/usr/local/lib/X11/fonts/` êáé ôï `~/.fonts/` åßíáé áõôüìáôá äéáèÝóéìåò ãéá anti-aliasing óå åöáñìïãÝò Xft-aware, óõìðåñéëáìâáíïìÝíùí ôïõ **KDE**, **GNOME** êáé **Firefox**.

Ãéá íá åëÝãîåôå ðïéåò ãñáììáôïóåéñÝò åßíáé anti-aliased, Þ íá ñõèìßóåôå ôéò éäéüôçôåò ôïõ anti-aliasing, äçìéïõñãÞóôå (Þ ôñïðïðïéÞóôå, áí Þäç õðÜñ÷åé) ôï áñ÷åßï `/usr/local/etc/fonts/local.conf`. ÌÝóù áõôïý ôïõ áñ÷åßïõ ìðïñïýí íá ñõèìéóôïýí áñêåôÜ åîåéäéêåõìÝíá ÷áñáêôçñéóôéêÜ ôïõ óõóôÞìáôïò ãñáììáôïóåéñþí Xft. Áõôü ôï ôìÞìá ðåñéãñÜöåé ìüíï ìåñéêÝò áðëÝò äõíáôüôçôåò. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äåßôå ôï fonts-conf(5).

Ôï áñ÷åßï áõôü ðñÝðåé íá åßíáé ìïñöÞò XML. ÄþóôåìåãÜëç ðñïóï÷Þ óôá ðåæÜ / êåöáëáßá, êáé óéãïõñåõèåßôå üôé üëá ôá tags Ý÷ïõí êëåßóåé óùóôÜ. Ôï áñ÷åßï îåêéíÜ ìå ôçí óõíçèéóìÝíç åðéêåöáëßäá XML êáé Ýíá ïñéóìü DOCTYPE, êáé Ýðåéôá áêïëïõèåß ôï `<fontconfig>` tag:

```
<?xml version="1.0"?>
<!DOCTYPE fontconfig SYSTEM "fonts.dtd">
<fontconfig>
```

¼ðùò åßðáìå ðñïçãïõìÝíùò, üëåò ïé ãñáììáôïóåéñÝò óôï `/usr/local/lib/X11/fonts/` üðùò êáé óôï `~/.fonts/` äéáôßèåíôáé Þäç óå Xft-aware åöáñìïãÝò. Áí èÝëåôå íá ðñïóèÝóåôå êáé Üëëïõò êáôáëüãïõò åêôüò áðü áõôïýò ôïõò äýï, ðñïóèÝóôå ìéá ãñáììÞ ðáñüìïéá ìå áõôÞ ðïõ áêïëïõèåß óôï `/usr/local/etc/fonts/local.conf`:

```
<dir>/path/to/my/fonts</dir>
```

Áöïý ðñïóèÝóåôå íÝåò ãñáììáôïóåéñÝò, êáé åéäéêüôåñá íÝïõò êáôáëüãïõò ãñáììáôïóåéñþí, ðñÝðåé íá åêôåëÝóåôå ôçí áêüëïõèç åíôïëÞ ãéá íá áíáäçìéïõñãÞóåôå ôçí cache ãñáììáôïóåéñþí:

```
# fc-cache -f
```

Ôï anti-aliasing êÜíåé ôá Üêñá åëáöñþò óõãêå÷õìÝíá, êÜíïíôáò Ýôóé ôá ðïëý ìéêñÜ ãñÜììáôá ðéï áíáãíþóéìá, êáé áöáéñåß ôéò "êëßìáêåò" (óêáëïðÜôéá) áðü ôá ìåãÜëá ãñÜììáôá, áëëÜ ìðïñåß íá ðñïêáëÝóåé åíï÷ëÞóåéò óôá ìÜôéá áí ÷ñçóéìïðïéçèåß óå êáíïíéêÜ ìåãÝèç. Ãéá íá åîáéñÝóåôå áðü ôï anti-aliasing ìåãÝèç ãñáììáôïóåéñþí ìéêñüôåñá áðü 14 point, ðñïóèÝóôå áõôÝò ôéò ãñáììÝò:

```
<match target="font">
    <test name="size" compare="less">
        <double>14</double>
    </test>
    <edit name="antialias" mode="assign">
        <bool>false</bool>
    </edit>
</match>
<match target="font">
    <test name="pixelsize" compare="less" qual="any">
        <double>14</double>
    </test>
    <edit mode="assign" name="antialias">
        <bool>false</bool>
    </edit>
</match>
```

Ôï spacing (äéáóôÞìáôá) óå ìåñéêÝò monospaced ãñáììáôïóåéñÝò ìðïñåß åðßóçò íá åßíáé áêáôÜëëçëï üôáí ÷ñçóéìïðïéåßôáé anti-aliasing. Áõôü öáßíåôáé íá áðïôåëåß éäéáßôåñï ðñüâëçìá ìå ôï **KDE**. Ìéá äéüñèùóç ãéá áõôü, åßíáé íá åðéâÜëëåôå óôï spacing ôçí ôéìÞ 100 ãéá áõôÝò ôéò ãñáììáôïóåéñÝò. ÐñïóèÝóôå ôéò áêüëïõèåò ãñáììÝò:

```
<match target="pattern" name="family">
    <test qual="any" name="family">
        <string>fixed</string>
    </test>
    <edit name="family" mode="assign">
        <string>mono</string>
    </edit>
 </match>
 <match target="pattern" name="family">
     <test qual="any" name="family">
         <string>console</string>
     </test>
     <edit name="family" mode="assign">
         <string>mono</string>
     </edit>
 </match>
```

(áõôü ìåôïíïìÜæåé ôá Üëëá êïéíÜ ïíüìáôá ôùí fixed ãñáììáôïóåéñþí ùò `"mono"`), êáé Ýðåéôá ðñïóèÝóôå:

```
<match target="pattern" name="family">
    <test qual="any" name="family">
        <string>mono</string>
    </test>
    <edit name="spacing" mode="assign">
        <int>100</int>
    </edit>
</match>
```

ÓõãêåêñéìÝíåò ãñáììáôïóåéñÝò, üðùò ïé Helvetica, ìðïñåß íá åìöáíßæïõí ðñüâëçìá üôáí åßíáé anti-aliased. Ôï ðñüâëçìá óõ÷íÜ åêäçëþíåôáé ùò ìßá ãñáììáôïóåéñÜ êïììÝíç êÜèåôá óôçí ìÝóç. Óôçí ÷åéñüôåñç ðåñßðôùóç, ìðïñåß íá êÜíåé êÜðïéåò åöáñìïãÝò íá êáôáññåýóïõí. Ãéá íá ôï áðïöýãåôå áõôü, ìðïñåßôå íá ðñïóèÝóåôå ôï áêüëïõèï óôï `local.conf`:

```
<match target="pattern" name="family">
    <test qual="any" name="family">
        <string>Helvetica</string>
    </test>
    <edit name="family" mode="assign">
        <string>sans-serif</string>
    </edit>
</match>
```

Ìüëéò ôåëåéþóåôå ôçí ìåôáôñïðÞ ôïõ `local.conf` óéãïõñåõèåßôå üôé êëåßóáôå ôï áñ÷åßï ìå ôï `</fontconfig>` tag. Áí äåí ôï êÜíåôå, ïé áëëáãÝò óáò èá áãíïçèïýí.

ÔÝëïò, ïé ÷ñÞóôåò ìðïñïýí íá ðñïóèÝóïõí ôéò äéêÝò ôïõò ñõèìßóåéò ìÝóù ôùí ðñïóùðéêþí ôïõò áñ÷åßùí `.fonts.conf`. Ãéá íá ãßíåé áõôü, êÜèå ÷ñÞóôçò ðñÝðåé áðëþò íá äçìéïõñãÞóåé Ýíá `~/.fonts.conf`. Áõôü ôï áñ÷åßï ðñÝðåé íá åßíáé åðßóçò XML ìïñöÞò.

ÊÜôé ôåëåõôáßï: óå ìßá LCD ïèüíç, ìðïñåß íá åßíáé åðéèõìçôüò ï äåéãìáôéóìüò sub-pixel. Ï äåéãìáôéóìüò ÷åéñßæåôáé ÷ùñéóôÜ ôá (ïñéæüíôéá äéá÷ùñéóìÝíá) êüêêéíá, ðñÜóéíá êáé ìðëå óôïé÷åßá þóôå íá âåëôéþóåé ôçí ïñéæüíôéá áíÜëõóç. Ôá áðïôåëÝóìáôá ìðïñåß íá åßíáé äñáìáôéêÜ êáëýôåñá. Ãéá íá ôïí åíåñãïðïéÞóåôå, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ êÜðïõ óôï áñ÷åßï `local.conf`:

```
<match target="font">
    <test qual="all" name="rgba">
        <const>unknown</const>
    </test>
    <edit name="rgba" mode="assign">
        <const>rgb</const>
    </edit>
</match>
```

Óçìåßùóç: ÁíÜëïãá ìå ôïí ôýðï ôçò ïèüíçò, ôï `rgb` ìðïñåß íá ÷ñåéáóôåß íá áëëÜîåé óå `bgr`, `vrgb` Þ `vbgr`: ðåéñáìáôéóôåßôå êáé äåßôå ðïéï ëåéôïõñãåß êáëýôåñá.

6.6 Ï X Display Manager

ÓõíåéóöïñÜ ôïõ Seth Kingsley.

6.6.1 ÅéóáãùãÞ

Ï X Display Manager (**XDM**) åßíáé Ýíá ðñïáéñåôéêü ìÝñïò ôïõ óõóôÞìáôïò X Windows ðïõ ÷ñçóéìïðïéåßôáé ãéá äéá÷åßñéóç óõíäÝóåùí (logins). Áõôü åßíáé ÷ñÞóéìï óå ðïëëÝò ðåñéðôþóåéò, üðùò óå áðëÜ “X Terminals”, óå desktop ìç÷áíÞìáôá, êáèþò êáé óå äéáêïìéóôÝò ìåãÜëùí äéêôýùí. Áöïý ôï óýóôçìá X Windows åßíáé áíåîÜñôçôï ðñùôïêüëëùí êáé äéêôýùí, õðÜñ÷åé ìåãÜëï åýñïò ðéèáíþí ñõèìßóåùí ãéá ôçí ëåéôïõñãßá X ðåëáôþí êáé äéáêïìéóôþí óå äéáöïñåôéêÜ ìç÷áíÞìáôá óõíäåäåìÝíá óå Ýíá äßêôõï. Ï **XDM** ðáñÝ÷åé Ýíá ãñáöéêü ðåñéâÜëëïí ãéá ôçí åðéëïãÞ ôïõ äéáêïìéóôÞ ìå ôïí ïðïßï èá ãßíåé ç óýíäåóç, êáé ãéá ôçí åßóïäï ðëçñïöïñéþí ðéóôïðïßçóçò üðùò ôïõ ïíüìáôïò ÷ñÞóôç êáé ôïõ êùäéêïý ðñüóâáóçò.

Óêåöèåßôå ôïí **XDM** ùò ìéá åöáñìïãÞ ðïõ ðáñÝ÷åé ôéò ßäéåò äõíáôüôçôåò óôïí ÷ñÞóôç ìå ôï åñãáëåßï getty(8) (äåßôå ôï ÔìÞìá 27.3.2 ãéá ëåðôïìÝñåéåò). Ôï XDM åêôåëåß óõíäÝóåéò (logins) óôïí äéáêïìéóôÞ êáé Ýðåéôá åêôåëåß Ýíá äéá÷åéñéóôÞ óõíåäñßáò (session manager, óõíÞèùò Ýíáí X äéá÷åéñéóôÞ ðáñáèýñùí, window manager) ãéá ëïãáñéáóìü ôïõ ÷ñÞóôç. Ï **XDM** Ýðåéôá ðåñéìÝíåé íá ôåñìáôßóåé áõôü ôï ðñüãñáììá, ðïõ óçìáôïäïôåß üôé ï ÷ñÞóôçò ôåëåßùóå êáé ðñÝðåé íá áðïóõíäåèåß. Óå áõôü ôï óçìåßï, ï **XDM** ìðïñåß íá åìöáíßóåé îáíÜ ôçí ïèüíç åéóüäïõ (login) êáé ôçí ïèüíç åðéëïãÞò ãñáöéêÞò óýíäåóçò þóôå íá óõíäåèåß Ýíáò Üëëïò ÷ñÞóôçò.

6.6.2 ×ñÞóç ôïõ XDM

Ãéá íá îåêéíÞóåôå íá ÷ñçóéìïðïéåßôå ôï **XDM**, åãêáôáóôÞóôå ôï port `x11/xdm` (äåí åãêáèßóôáôáé áðü ðñïåðéëïãÞ óôéò ðñüóöáôåò åêäüóåéò ôïõ **Xorg**). Ìðïñåßôå Ýðåéôá íá âñåßôå ôïí äáßìïíá **XDM** óôï `/usr/local/bin/xdm`. Áõôü ôï ðñüãñáììá ìðïñåß íá åêôåëåóôåß ïðïéáäÞðïôå óôéãìÞ ùò `root` êáé èá îåêéíÞóåé íá äéá÷åéñßæåôáé ôçí ïèüíç ôïõ X óôï ôïðéêü ìç÷Üíçìá. Áí ï **XDM** ðñÝðåé íá åêôåëåßôáé êÜèå öïñÜ ðïõ åêêéíåßôáé ôï ìç÷Üíçìá, Ýíáò âïëéêüò ôñüðïò åßíáé ç ðñïóèÞêç ìéáò ãñáììÞò óôï `/etc/ttys`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ìïñöÞ êáé ôçí

÷ñÞóç áõôïý ôïõ áñ÷åßïõ, äåßôå ôï ÔìÞìá 27.3.2.1. ÕðÜñ÷åé ìßá ãñáììÞ óôï áñ÷éêü `/etc/ttys` áñ÷åßï ãéá ôçí åêôÝëåóç ôïõ **XDM** óå Ýíá åéêïíéêü ôåñìáôéêü:

```
ttyv8   "/usr/local/bin/xdm -nodaemon"  xterm   off secure
```

Áñ÷éêÜ áõôÞ ç ëåéôïõñãßá åßíáé áðåíåñãïðïéçìÝíç — ãéá íá ôçí åíåñãïðïéÞóåôå áëëÜîôå ôï ðåäßï 5 áðü `off` óå `on` êáé åðáíåêêéíÞóôå ôï init(8) ÷ñçóéìïðïéþíôáò ôéò ïäçãßåò ôïõ ÔìÞìá 27.3.2.2. Ôï ðñþôï ðåäßï, ôï üíïìá ôïõ ôåñìáôéêïý ðïõ èá äéá÷åéñßæåôáé ôï ðñüãñáììá, åßíáé ôï `ttyv8`. Áõôü óçìáßíåé üôé ï **XDM** èá åêôåëåßôáé óôï 9ï åéêïíéêü ôåñìáôéêü.

6.6.3 Ñýèìéóç ôïõ XDM

Ï êáôÜëïãïò ñõèìßóåùí ôïõ **XDM** âñßóêåôáé óôï `/usr/local/lib/X11/xdm`. Óå áõôüí ôïí êáôÜëïãï õðÜñ÷ïõí ðïëëÜ áñ÷åßá ðïõ ÷ñçóéìïðïéïýíôáé ãéá íá áëëÜîïõí ôçí óõìðåñéöïñÜ êáé åìöÜíéóç ôïõ **XDM**. ÔõðéêÜ, èá âñåßôå ôá ðáñáêÜôù áñ÷åßá:

Áñ÷åßï	**ÐåñéãñáöÞ**
`Xaccess`	Êáíüíåò ðéóôïðïßçóçò ðåëáôþí.
`Xresources`	ÐñïêáèïñéóìÝíåò ôéìÝò X resource.
`Xservers`	Ëßóôá áðïìáêñõóìÝíùí êáé ôïðéêþí ïèïíþí (× displays) óôéò ïðïßåò èá ãßíåôáé äéá÷åßñéóç.
`Xsession`	ÐñïåðéëåãìÝíï script óõíüäùí ãéá logins.
`Xsetup_*`	Script ãéá ôçí åêôÝëåóç åíôïëþí ðñéí ôçí åìöÜíéóç ôïõ ðåñéâÜëëïíôïò óýíäåóçò (login screen).
`xdm-config`	Ñõèìßóåéò ãéá üëåò ôéò áðåéêïíßóåéò (displays) ðïõ åêôåëïýíôáé óå áõôü ôï ìç÷Üíçìá.
`xdm-errors`	ËÜèç ðïõ äçìéïõñãïýíôáé áðü ôï ðñüãñáììá.
`xdm-pid`	Ôï ID ôçò äéåñãáóßáò ôïõ ôñÝ÷ïíôïò XDM.

Åðßóçò óå áõôüí ôïí êáôÜëïãï õðÜñ÷ïõí ìåñéêÜ scripts êáé ðñïãñÜììáôá ðïõ ÷ñçóéìïðïéïýíôáé ãéá íá ñõèìßóïõí ôçí åðéöÜíåéá åñãáóßáò üôáí åêôåëåßôáé ôï **XDM**. Èá ðåñéãñÜøïõìå ðåñéëçðôéêÜ ôï óêïðü êáèåíüò áðü áõôÜ ôá áñ÷åßá. Ç áêñéâÞò óýíôáîç êáé ÷ñÞóç üëùí áõôþí ôùí áñ÷åßùí ðåñéãñÜöåôáé óôï xdm(1).

Ç ðñïêáèïñéóìÝíç ñýèìéóç åßíáé Ýíá áðëü ïñèïãþíéï ðáñÜèõñï óýíäåóçò ìå ôï üíïìá ôïõ ìç÷áíÞìáôïò íá öáßíåôáé óôçí êïñõöÞ ìå ìåãÜëá ãñÜììáôá êáé ôéò ðñïôñïðÝò "Login:" êáé "Password:" áðü êÜôù. Áõôü åßíáé Ýíá êáëü óçìåßï åêêßíçóçò ãéá íá áëëÜîåôå ôçí åìöÜíéóç ôïõ **XDM**.

6.6.3.1 Xaccess

Ôï ðñùôüêïëëï ãéá óýíäåóç ìå áðåéêïíßóåéò ðïõ åëÝã÷ïíôáé áðü ôï **XDM** ïíïìÜæåôáé X Display Manager Connection Protocol (XDMCP). Ôï áñ÷åßï áõôü åßíáé Ýíá óýíïëï êáíüíùí ãéá ôùí Ýëåã÷ï ôùí óõíäÝóåùí XDMCP áðü áðïìáêñõóìÝíá ìç÷áíÞìáôá. Áãíïåßôáé, åêôüò êáé áí ôï `xdm-config` Ý÷åé ñõèìéóôåß þóôå íá äÝ÷åôáé åéóåñ÷üìåíåò óõíäÝóåéò. Ç ðñïåðéëïãÞ åßíáé íá ìçí åðéôñÝðåôáé óå êáíÝíá ðåëÜôç íá óõíäåèåß.

6.6.3.2 Xresources

Ðñüêåéôáé ãéá ôï áñ÷åßï ðñïêáèïñéóìÝíùí ôéìþí ãéá ôéò åöáñìïãÝò åìöÜíéóçò ôïõ ðáñÜèõñïõ óýíäåóçò (login) êáé åðéëïãÝá áðåéêüíéóçò (display chooser). ÌÝóá áðü áõôü ìðïñåß íá ôñïðïðïéçèåß ç åìöÜíéóç ôïõ ðñïãñÜììáôïò login. Ç ìïñöÞ ôïõ åßíáé ßäéá ìå ôï áñ÷åßï app-defaults ðïõ ðåñéãñÜöåôáé óôçí ôåêìçñßùóç ôïõ X11.

6.6.3.3 Xservers

ÁõôÞ åßíáé ìéá ëßóôá ôùí áðïìáêñõóìÝíùí óôáèìþí ðïõ ðñÝðåé íá åìöáíßæïíôáé ùò åðéëïãÝò óôïí ðñüãñáììá (chooser).

6.6.3.4 Xsession

Áõôü åßíáé ôï ðñïêáèïñéóìÝíï session script ðïõ åêôåëåß ôï **XDM** ìåôÜ ôç óýíäåóç êÜðïéïõ ÷ñÞóôç. ÊáíïíéêÜ, êÜèå ÷ñÞóôçò èá Ý÷åé Ýíá ôñïðïðïéçìÝíï, äéêü ôïõ, session script óôï `~/.xsession` ðïõ èá ðáñáêÜìðôåé áõôü ôï script.

6.6.3.5 Xsetup_*

Ôá áñ÷åßá áõôÜ åêôåëïýíôáé áõôüìáôá ðñéí ôçí åìöÜíéóç ôùí ðáñáèýñùí åðéëïãÞò Þ óýíäåóçò. ÕðÜñ÷åé Ýíá script ãéá êÜèå display ðïõ ÷ñçóéìïðïéåßôáé, ðïõ ïíïìÜæåôáé `Xsetup_` ìå ôï íïýìåñï ôïõ display óôï ôÝëïò (ãéá ðáñÜäåéãìá `Xsetup_0`). ÊáíïíéêÜ áõôÜ ôá scripts èá åêôåëïýí Ýíá Þ äõï ðñïãñÜììáôá óôï ðáñáóêÞíéï üðùò ð.÷. ôï `xconsole`.

6.6.3.6 xdm-config

Ôï áñ÷åßï áõôü ðåñéÝ÷åé ñõèìßóåéò óôçí ìïñöÞ ôùí app-defaults, ðïõ åöáñìüæïíôáé óå êÜèå display ðïõ äéá÷åéñßæåôáé ç óõãêåêñéìÝíç åãêáôÜóôáóç.

6.6.3.7 xdm-errors

Ôï áñ÷åßï áõôü ðåñéÝ÷åé ôçí Ýîïäï ôùí äéáêïìéóôþí X ðïõ ðñïóðáèåß íá åêôåëÝóåé ôï **XDM**. Áí Ýíá display ðïõ ðñïóðáèåß íá åêêéíÞóåé ï **XDM** êïëëÞóåé ãéá êÜðïéï ëüãï, êáëü åßíáé íá áíáæçôÞóåôå åäþ ôõ÷üí ìçíýìáôá óöáëìÜôùí. Ôá ìçíýìáôá áõôÜ êáôáãñÜöïíôáé êáé óôá áñ÷åßá ÷ñçóôþí `~/.xsession-errors`.

6.6.4 Äéáôçñþíôáò Ýíáí ÄéáêïìéóôÞ ÁðïìáêñõóìÝíùí ÓõíäÝóåùí

Ãéá íá óõíäÝïíôáé êáé Üëëïé ðåëÜôåò óôïí äéáêïìéóôÞ ïèüíçò, ôñïðïðïéÞóôå ôïõò êáíüíåò åëÝã÷ïõ ðñüóâáóçò, êáé åíåñãïðïéÞóôå ôéò åéóåñ÷üìåíåò óõíäÝóåéò. Ôá ðáñáðÜíù åßíáé, áðü ðñïåðéëïãÞ ñõèìéóìÝíá óå óõíôçñçôéêÝò ôéìÝò. Ãéá íá êÜíåôå ôï **XDM** íá äÝ÷åôáé óõíäÝóåéò, áñ÷éêÜ ìåôáôñÝøôå óå ó÷üëéï ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `xdm-config`:

```
! SECURITY: do not listen for XDMCP or Chooser requests
! Comment out this line if you want to manage X terminals with xdm
DisplayManager.requestPort:     0
```

êáé ìåôÜ åðáíåêêéíÞóôå ôïí **XDM**. Íá Ý÷åôå õðüøéí óáò üôé ôá ó÷üëéá óôá áñ÷åßá app-defaults îåêéíïýí ìå ôïí ÷áñáêôÞñá “!”, êáé ü÷é ôïí óõíÞèç “#”. Ìðïñåß íá åðéèõìåßôå ðéï áõóôçñïýò êáíüíåò åëÝã÷ïõ ðñüóâáóçò. Äåßôå ôá ðáñáäåßãìáôá óôï `Xaccess`, êáé óõìâïõëåõèåßôå ôç óåëßäá manual ôïõ xdm(1).

6.6.5 ÁíôéêáôáóôÜôåò ôïõ XDM

ÕðÜñ÷ïõí áñêåôïß áíôéêáôáóôÜôåò ãéá ôï ðñüãñáììá **XDM**. ¸íáò áðü áõôïýò, ï **kdm** (Ýñ÷åôáé ìå ôï **KDE**) áíáëýåôáé áñãüôåñá óå áõôü ôï êåöÜëáéï. Ï **kdm** display manager ðñïóöÝñåé ðïëëÜ ðñïôåñÞìáôá óôá ãñáöéêÜ êáé äéáêïóìçôéêÜ óôïé÷åßá, üðùò åðßóçò êáé ôçí äõíáôüôçôá íá åðéëÝãïõí ïé ÷ñÞóôåò ôïí åðéèõìçôü äéá÷åéñéóôÞ ðáñáèýñùí ôçí óôéãìÞ ôçò óýíäåóçò.

6.7 ÃñáöéêÜ ÐåñéâÜëëïíôá

ÓõíåéóöïñÜ ôïõ Valentino Vaschetto.

Áõôü ôï ôìÞìá ðåñéãñÜöåé ìåñéêÜ ãñáöéêÜ ðåñéâÜëëïíôá ðïõ äéáôßèåíôáé ãéá ôï X óôï FreeBSD. Ç Ýííïéá “ãñáöéêü ðåñéâÜëëïí” ìðïñåß íá óçìáßíåé ïôéäÞðïôå, áðü Ýíáí áðëü äéá÷åéñéóôÞ ðáñáèýñùí ìÝ÷ñé Ýíá ïëïêëçñùìÝíï ðáêÝôï desktop åöáñìïãþí, üðùò ôï **KDE** Þ ôï **GNOME**.

6.7.1 GNOME

6.7.1.1 Ó÷åôéêÜ ìå ôï GNOME

Ôï **GNOME** åßíáé Ýíá öéëéêü ðñïò ôïí ÷ñÞóôç ãñáöéêü ðåñéâÜëëïí ðïõ åðéôñÝðåé óôïõò ÷ñÞóôåò íá ÷ñçóéìïðïéïýí êáé íá ñõèìßæïõí åýêïëá ôïõò õðïëïãéóôÝò ôïõò. Ôï **GNOME** äéáèÝôåé Ýíá panel (ãéá ôçí åêêßíçóç åöáñìïãþí êáé ôçí ðñïâïëÞ êáôÜóôáóçò), åðéöÜíåéá åñãáóßáò (üðïõ åìöáíßæïíôáé äåäïìÝíá êáé åöáñìïãÝò), Ýíá ðëÞèïò áðü äéáäåäïìÝíá åñãáëåßá êáé åöáñìïãÝò, êáèþò êáé Ýíá óýíïëï ôõðïðïéÞóåùí ðïõ åðéôñÝðåé óôéò åöáñìïãÝò íá óõíåñãÜæïíôáé ìåôáîý ôïõò êáé íá äåß÷íïõí Ýíá óõíåðÝò ðåñéâÜëëïí åñãáóßáò. Ïé ÷ñÞóôåò Üëëùí ëåéôïõñãéêþí óõóôçìÜôùí Þ ðåñéâÜëëoíôùí èá áéóèÜíïíôáé óáí óôï óðßôé ôïõò ÷ñçóéìïðïéþíôáò ôï ðáíßó÷õñï ãñáöéêü ðåñéâÜëëïí ðïõ ðáñÝ÷åé ôï **GNOME**. Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï **GNOME** óôï FreeBSD ìðïñåßôå íá âñåßôå óôï äéáäéêôõáêü ôüðï ôïõ FreeBSD GNOME Project (http://www.FreeBSD.org/gnome). Ç ôïðïèåóßá ðåñéÝ÷åé åðßóçò êáé áíáëõôéêÜ FAQs ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç, ôçí ñýèìéóç, êáé ôçí äéá÷åßñéóç ôïõ **GNOME**.

6.7.1.2 ÅãêáôÜóôáóç ôïõ GNOME

Ôï **GNOME** ìðïñåß íá åãêáôáóôáèåß åýêïëá áðü ðáêÝôá Þ áðü ôçí ÓõëëïãÞ ôùí Ports:

Ãéá íá åãêáôáóôÞóåôå ôï Ýôïéìï ðáêÝôï ôïõ **GNOME** áðü ôï äßêôõï, áðëþò ðëçêôñïëïãÞóôå:

```
# pkg_add -r gnome2
```

Ãéá íá ìåôáãëùôôßóåôå ôï **GNOME** áðü ôïí ðçãáßï êþäéêá, ÷ñçóéìïðïéÞóôå ôçí ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/x11/gnome2
# make install clean
```

Ôï **GNOME** ÷ñåéÜæåôáé ôï óýóôçìá áñ÷åßùí `/proc` ãéá íá ëåéôïõñãÞóåé óùóôÜ. ÐñïóèÝóôå ôç ãñáììÞ

```
proc           /proc       procfs  rw  0   0
```

óôï áñ÷åßï `/etc/fstab` ãéá íá ãßíåôáé áõôüìáôá ðñïóÜñôçóç ôïõ procfs(5) êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò.

Ìüëéò åãêáôáóôáèåß ôï **GNOME**, èá ðñÝðåé íá ñõèìéóôåß ï äéáêïìéóôÞò X þóôå íá åêêéíåß ôï **GNOME** áíôß ãéá ôïí ðñïêáèïñéóìÝíï äéá÷åéñéóôÞ ðáñáèýñùí.

Ï åõêïëüôåñïò ôñüðïò ãéá íá îåêéíÞóåôå ôï **GNOME** åßíáé ìå ôï **GDM**, ôïí GNOME Display Manager. Ôï **GDM** åãêáèßóôáôáé ùò ìÝñïò ôïõ **GNOME**, áëëÜ åßíáé áíåíåñãü áñ÷éêÜ. Ìðïñåß íá åíåñãïðïéçèåß ìå ôçí ðñïóèÞêç ôçò ãñáììÞò

```
gdm_enable="YES"
```

óôï áñ÷åßï `/etc/rc.conf`.

Ìüëéò êÜíåôå åðáíåêêßíçóç, ôï **GDM** èá îåêéíÞóåé áõôüìáôá.

Åðéðñüóèåôá, åßíáé ÷ñÞóéìï íá îåêéíïýí üëåò ïé õðçñåóßåò ôéò ïðïßåò áðáéôåß ôï **GNOME** ôáõôü÷ñïíá ìå ôçí åêêßíçóç ôïõ **GDM**. Ãéá íá ãßíåôáé áõôü ðñïóèÝóôå ôç ãñáììÞ

```
gnome_enable="YES"
```

óôï áñ÷åßï `/etc/rc.conf`.

Ôï **GNOME** ìðïñåß åðßóçò íá îåêéíÞóåé áðü ôçí ãñáììÞ åíôïëþí ñõèìßæïíôáò êáôÜëëçëá ôï áñ÷åßï `.xinitrc`. Áí õðÜñ÷åé Þäç ôï áñ÷åßï `.xinitrc`, áðëþò áíôéêáôáóôÞóôå ôçí ãñáììÞ ðïõ åêêéíåß ôïí ôñÝ÷ïíôá äéá÷åéñéóôÞ ðáñáèýñùí ìå ìßá ðïõ íá åêêéíåß ôï **/usr/local/bin/gnome-session**. Áí äåí èÝëåôå íá êÜíåôå ðåñéóóüôåñåò ñõèìßóåéò óôï áñ÷åßï, ÷ñåéÜæåôáé áðëÜ íá ãñÜøåôå:

```
% echo "/usr/local/bin/gnome-session" > ~/.xinitrc
```

¸ðåéôá, ðëçêôñïëïãÞóôå `startx`, êáé èá îåêéíÞóåé ôï ãñáöéêü ðåñéâÜëëïí ôïõ **GNOME**

> **Óçìåßùóç:** Áí ÷ñçóéìïðïéåßôå êÜðïéï ðáëáéüôåñï display manager, üðùò ôï **XDM**, ôï ðáñáðÜíù äåí èá ëåéôïõñãÞóåé. Óôçí ðåñßðôùóç áõôÞ, äçìéïõñãÞóôå Ýíá åêôåëÝóéìï áñ÷åßï `.xsession` ôï ïðïßï íá ðåñéÝ÷åé ôçí ßäéá åíôïëÞ. ÔñïðïðïéÞóôå ôï áñ÷åßï `.xsession` êáé áíôéêáôáóôÞóôå ôçí åíôïëÞ ôïõ ôñÝ÷ïíôïò äéá÷åéñéóôÞ ðáñáèýñùí ìå ôï **/usr/local/bin/gnome-session**:

```
% echo "#!/bin/sh" > ~/.xsession
% echo "/usr/local/bin/gnome-session" >> ~/.xsession
% chmod +x ~/.xsession
```

¶ëëç ìéá åðéëïãÞ åßíáé íá ñõèìéóôåß ï display manager þóôå íá åðéôñÝðåé ôçí åðéëïãÞ ôïõ äéá÷åéñéóôÞ ðáñáèýñùí êáôÜ ôçí óýíäåóç. Ôï ôìÞìá ËåðôïìÝñåéåò KDE åîçãåß ðùò ìðïñåß íá ãßíåé áõôü ìÝóù ôïõ **kdm**, ôïõ display manager ôïõ **KDE**.

6.7.2 KDE

6.7.2.1 Ó÷åôéêÜ ìå ôï KDE

Ôï **KDE** åßíáé Ýíá óýã÷ñïíï, åýêïëï óôç ÷ñÞóç, ãñáöéêü ðåñéâÜëëïí. ÌåñéêÜ ðñÜãìáôá ðïõ ðñïóöÝñåé ôï **KDE** óôïí ÷ñÞóôç åßíáé:

- ¸íá üìïñöï óýã÷ñïíï ðåñéâÜëëïí

- ¸íá ðåñéâÜëëïí ìå ðëÞñç äéêôõáêÞ äéáöÜíåéá
- ¸íá åíóùìáôùìÝíï óýóôçìá âïÞèåéáò ðïõ åðéôñÝðåé åýêïëç, óõíåðÞ ðñüóâáóç óôçí âïÞèåéá ãéá ôçí ÷ñÞóç ôïõ **KDE** êáé ôùí åöáñìïãþí ôïõ
- ÓõíåðÞò åìöÜíéóç êáé óõìðåñéöïñÜ üëùí ôùí åöáñìïãþí ôïõ **KDE**
- ÔõðïðïéçìÝíá menu êáé ãñáììÝò åñãáëåßùí (toolbars), óõíäõáóìïß ðëÞêôñùí, ÷ñùìáôéêïß óõíäõáóìïß, êëð.
- Äéåèíåßò ñõèìßóåéò: ôï **KDE** äéáôßèåôáé óå ðåñéóóüôåñåò áðü 40 ãëþóóåò
- Êåíôñéêü êáé óõíåðÝò óýóôçìá ñõèìßóåùí âáóéóìÝíï óå äéáëüãïõò
- ÌåãÜëï áñéèìü ÷ñÞóéìùí åöáñìïãþí, ó÷åäéáóìÝíùí åéäéêÜ ãéá ôï **KDE**

Ôï **KDE** óõíïäåýåôáé áðü Ýíáí ðåñéçãçôÞ (browser) ðïõ ïíïìÜæåôáé **Konqueror**, êáé áíôáãùíßæåôáé óïâáñÜ ôïõò Üëëïõò ðåñéçãçôÝò ôùí óõóôçìÜôùí UNIX. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï **KDE** ìðïñåßôå íá âñåßôå óôï KDE website (http://www.kde.org/). Ãéá ðëçñïöïñßåò ó÷åôéêÝò ìå ôï FreeBSD êáé ôï **KDE**, óõìâïõëåõèåßôå ôïí äéáäéêôõáêü ôüðï ôïõ FreeBSD-KDE team (http://freebsd.kde.org/).

ÕðÜñ÷ïõí äéáèÝóéìåò äýï åêäüóåéò ôïõ **KDE** ãéá ôï FreeBSD. Ç ¸êäïóç 3, êõêëïöïñåß áñêåôü êáéñü êáé èåùñåßôáé ãåíéêÜ þñéìç. Óôç ÓõëëïãÞ ôùí Ports èá âñåßôå åðßóçò ôçí ¸êäïóç 4 áðü ôç íåüôåñç ãåíéÜ. Ïé äýï áõôÝò åêäüóåéò ìðïñïýí ìÜëéóôá íá óõíõðÜñ÷ïõí óôïí ßäéï õðïëïãéóôÞ.

6.7.2.2 ÅãêáôÜóôáóç ôïõ KDE

¼ðùò êáé ìå ôï **GNOME** Þ êÜèå Üëëï ãñáöéêü ðåñéâÜëëïí, ôï ëïãéóìéêü ìðïñåß íá åãêáôáóôáèåß åýêïëá ìÝóù ðáêÝôùí Þ áðü ôçí ÓõëëïãÞ ôùí Ports:

Ãéá íá åãêáôáóôÞóåôå ôï **KDE3** ìÝóù ðáêÝôùí áðü ôï äßêôõï, áðëþò ðëçêôñïëïãÞóôå:

```
# pkg_add -r kde
```

Ãéá íá åãêáôáóôÞóåôå ôï **KDE4** ìÝóù ðáêÝôùí áðü ôï äßêôõï, áðëþò ðëçêôñïëïãÞóôå:

```
# pkg_add -r kde4
```

Ôï pkg_add(1) èá áíáêôÞóåé áõôüìáôá ôçí ôåëåõôáßá Ýêäïóç ôçò åöáñìïãÞò.

Ãéá íá ìåôáãëùôôßóåôå ôï **KDE3** áðü ôïí ðçãáßï êþäéêá, ÷ñçóéìïðïéÞóôå ôç ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/x11/kde3
# make install clean
```

Ãéá íá ìåôáãëùôôßóåôå ôï **KDE4** áðü ôïí ðçãáßï êþäéêá, ÷ñçóéìïðïéÞóôå ôç ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/x11/kde4
# make install clean
```

Áöïý åãêáôáóôáèåß ôï **KDE**, èá ðñÝðåé íá ñõèìéóôåß ï äéáêïìéóôÞò X þóôå íá ôï åêêéíåß áíôß ãéá ôïí ðñïêáèïñéóìÝíï äéá÷åéñéóôÞ ðáñáèýñùí. Áõôü ãßíåôáé ìå ôçí áëëáãÞ ôïõ áñ÷åßïõ `.xinitrc`:

Ãéá ôï **KDE3**:

```
% echo "exec startkde" > ~/.xinitrc
```

Ãéá ôï **KDE4**:

```
% echo "exec /usr/local/kde4/bin/startkde" > ~/.xinitrc
```

Ôþñá, üðïôå ôï X Window System åêêéíåßôáé ìÝóù ôïõ `startx`, ôï ãñáöéêü ðåñéâÜëëïí èá åßíáé ôï **KDE**.

Áí ÷ñçóéìïðïéåßôå êÜðïéï display manager üðùò ôï **XDM**, ç ñýèìéóç åßíáé ëßãï äéáöïñåôéêÞ. Èá ðñÝðåé áíôß ãéá ôï `.xinitrc` íá ôñïðïðïéÞóåôå ôï `.xsession`. Ïäçãßåò ãéá ôï **kdm** äßíïíôáé áñãüôåñá óôï êåöÜëáéï áõôü.

6.7.3 Ðåñéóóüôåñåò ËåðôïìÝñåéåò ãéá ôï KDE

Ôþñá ðïõ ôï **KDE** Ý÷åé åãêáôáóôáèåß óôï óýóôçìá, ìðïñåßôå íá áíáêáëýøåôå ôéò ðåñéóóüôåñåò ëåéôïõñãßåò ìÝóù ôùí óåëßäùí âïÞèåéáò Þ äïêéìÜæïíôáò ìåíïý êáé åðéëïãÝò. Ïé ÷ñÞóôåò ôùí Windows ç ôïõ Mac® èá áéóèÜíïíôáé óáí óôï óðßôé ôïõò.

Ç êáëýôåñç âïÞèåéá ãéá ôï **KDE** åßíáé ç on-line ôåêìçñßùóç. Ôï **KDE** óõíïäåýåôáé áðü ôïí äéêü ôïõ ðåñéçãçôÞ, ôïí **Konqueror**, ðïëëÝò ÷ñÞóéìåò åöáñìïãÝò, êáé áíáëõôéêÞ ôåêìçñßùóç. Ôï õðüëïéðï áõôÞò ôçò åíüôçôáò óõæçôÜ ôå÷íéêÜ èÝìáôá ðïõ åßíáé äýóêïëï íá áíáêáëõöèïýí ìå äïêéìÝò.

6.7.3.1 Ï KDE Display Manager

Ï äéá÷åéñéóôÞò åíüò ðïëõ÷ñçóôéêïý óõóôÞìáôïò èÝëåé åíäå÷ïìÝíùò ç óýíäåóç ôùí ÷ñçóôþí íá ãßíåôáé ìÝóù ãñáöéêïý ðåñéâÜëëïíôïò. ¼ðùò ðåñéãñÜøáìå ðñßí, ìðïñåß íá ÷ñçóéìïðïéçèåß ôï XDM. ¼ìùò, ôï **KDE** ðåñéÝ÷åé ìéá åíáëëáêôéêÞ åðéëïãÞ, ôï **kdm**, ôï ïðïßï Ý÷åé ó÷åäéáóôåß íá åßíáé ðéï åëêõóôéêü êáé ðáñÝ÷åé ðåñéóóüôåñåò åðéëïãÝò êáôÜ ôç óýíäåóç. Óõãêåêñéìåíá, ïé ÷ñÞóôåò ìðïñïýí åýêïëá íá åðéëÝîïõí (ìÝóù ìåíïý) ðïéï ãñáöéêü ðåñéâÜëëïí (**KDE**, **GNOME**, Þ êÜðïéï Üëëï) èá åêôåëåóôåß ìåôÜ ôçí óýíäåóç ôïõò.

Ãéá íá åíåñãïðïéÞóåôå ôï **kdm**, èá ðñÝðåé íá åðåîåñãáóôåßôå êÜðïéá áñ÷åßá, ôá ïðïßá åßíáé äéáöïñåôéêÜ áíÜëïãá ìå ôçí Ýêäïóç ôïõ **KDE** ðïõ èá ÷ñçóéìïðïéÞóåôå.

Ãéá ôï **KDE3**, èá ðñÝðåé íá ôñïðïðïéÞóåôå ôçí åããñáöÞ ãéá ôï `ttyv8` óôï `/etc/ttys`, üðùò öáßíåôáé ðáñáêÜôù:

```
ttyv8 "/usr/local/bin/kdm -nodaemon" xterm on secure
```

Ãéá ôï **KDE4**, èá ðñÝðåé íá ðñïóèÝóåôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/rc.conf`:

```
local_startup="${local_startup} /usr/local/kde4/etc/rc.d"
kdm4_enable="YES"
```

6.7.4 Xfce

6.7.4.1 Ó÷åôéêÜ ìå ôï Xfce

Ôï **Xfce** åßíáé Ýíá ãñáöéêü ðåñéâÜëëïí ðïõ óôçñßæåôáé óôçí âéâëéïèÞêç GTK+ ðïõ ÷ñçóéìïðïéåßôáé êáé áðü ôï **GNOME**, áëëÜ åßíáé ðïëý ðéï åëáöñý êáé ðñïïñßæåôáé ãéá üóïõò èÝëïõí Ýíá áðëü, áðïôåëåóìáôéêü ãñáöéêü ðåñéâÜëëïí ðïõ åßíáé åýêïëï íá ÷ñçóéìïðïéçèåß êáé íá ñõèìéóôåß. ÏðôéêÜ, ìïéÜæåé ðïëý ìå ôï **CDE**, ðïõ óõíáíôÜôáé óå åìðïñéêÜ óõóôÞìáôá UNIX. ÌåñéêÜ áðü ôá ÷áñáêôçñéóôéêÜ ôïõ **Xfce** åßíáé:

- ¸íá áðëü, åýêïëï óôçí ÷ñÞóç ãñáöéêü ðåñéâÜëëïí
- ÐëÞñùò ðáñáìåôñïðïéÞóéìï ìå ôï ðïíôßêé, ìå drag and drop, êëð.

- Êåíôñéêü panel ðáñüìïéï ìå ôïõ **CDE**, ìå ìåíïý, ìéêñï-åöáñìïãÝò êáé ðëÞêôñá åêêßíçóçò åöáñìïãþí
- ÏëïêëçñùìÝíïò äéá÷åéñéóôÞò ðáñáèýñùí, äéá÷åéñéóôÞò áñ÷åßùí, äéá÷åéñéóôÞò Þ÷ïõ, óõìâáôüôçôá ìå ôï **GNOME**, êáé Üëëá
- Äõíáôüôçôá ÷ñÞóçò èåìÜôùí (themes, áöïý ÷ñçóéìïðïéåß ôï GTK+)
- ÃñÞãïñï, åëáöñý êáé áðïôåëåóìáôéêü: éäáíéêü ãéá ðáëéüôåñá/ðéï áñãÜ ìç÷áíÞìáôá Þ ìç÷áíÞìáôá ìå ëßãç ìíÞìç

Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï **Xfce** ìðïñåßôå íá âñåßôå óôç äéêôõáêÞ ôïðïèåóßá ôïõ Xfce (http://www.xfce.org/).

6.7.4.2 ÅãêáôÜóôáóç ôïõ Xfce

ÕðÜñ÷åé (ôçí þñá ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò) Ýôïéìï ðáêÝôï ãéá ôï **Xfce**. Ãéá íá ôï åãêáôáóôÞóåôå, áðëþò ðëçêôñïëïãÞóôå:

```
# pkg_add -r xfce4
```

Åíáëëáêôéêü, ãéá íá ôï ìåôáãëùôôßóåôå áðü ôïí ðçãáßï êþäéêá, ÷ñçóéìïðïéÞóôå ôçí ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/x11-wm/xfce4
# make install clean
```

Ôþñá, ðåßôå óôïí äéáêïìéóôÞ X íá åêêéíÞóåé ôï **Xfce** ôçí åðüìåíç öïñÜ ðïõ èá ãßíåé åêêßíçóç ôïõ ãñáöéêïý ðåñéâÜëëïíôïò. Áðëþò ðëçêôñïëïãÞóôå ôï ðáñáêÜôù:

```
% echo "/usr/local/bin/startxfce4" > ~/.xinitrc
```

Ôçí åðüìåíç öïñÜ ðïõ èá åêêéíÞóåôå ôï ×, èá åìöáíéóôåß ôï **Xfce**. ¼ðùò êáé ðñïçãïõìÝíùò, áí ÷ñçóéìïðïéåßôå êÜðïéï display manager üðùò ôï **XDM**, äçìéïõñãÞóôå Ýíá áñ÷åßï `.xsession`, üðùò ðåñéãñÜöåôáé óôçí ðáñÜãñáöï ôïõ GNOME, áëëÜ ìå ôçí åíôïëÞ `/usr/local/bin/startxfce4`, Þ ñõèìßóôå ôïí display manager íá åðéôñÝðåé ôçí åðéëïãÞ ãñáöéêïý ðåñéâÜëëïíôïò, üðùò ðåñéãñÜöåôáé óôçí ðáñÜãñáöï ó÷åôéêÜ ìå ôï kdm.

II. ÂáóéêÝò Åñãáóßåò

Ôþñá ðïõ Ý÷ïõìå êáëýøåé ðëÝïí ôá âáóéêÜ èÝìáôá, áõôü ôï ôìÞìá ôïõ Åã÷åéñéäßïõ ôïõ FreeBSD ðåñéãñÜöåé ôéò ðéï âáóéêÝò åñãáóßåò êáé ôá ðéï äçìïöéëÞ ÷áñáêôçñéóôéêÜ ôïõ FreeBSD. Ôá êåöÜëáéá áõôïý ôïõ ôìÞìáôïò:

- ÐáñïõóéÜæïõí ôéò ðéï äçìïöéëåßò êáé ÷ñÞóéìåò åöáñìïãÝò êáé ðåñéâÜëëïíôá åñãáóßáò: öõëëïìåôñçôÝò (browsers), ãñáöéêÜ ðåñéâÜëëïíôá åñãáóßáò, åñãáëåßá ðñïâïëÞò äéáöüñùí ìïñöþí áñ÷åßùí, êëð.
- ÐáñïõóéÜæïõí ïñéóìÝíá áðü ôá åñãáëåßá ðïëõìÝóùí (multimedia) ðïõ åßíáé äéáèÝóéìá ãéá ôï FreeBSD
- Åîçãïýí ôç äéáäéêáóßá ìåôáãëþôôéóçò êáé åãêáôÜóôáóçò åíüò ðñïóáñìïóìÝíïõ ðõñÞíá ãéá ôï FreeBSD, Ýôóé þóôå íá åíåñãïðïéçèïýí Ýîôñá ÷áñáêôçñéóôéêÜ ãéá ôï óýóôçìÜ óáò.
- ÐåñéãñÜöïõí óå âÜèïò ôï óýóôçìá åêôõðþóåùí, ôüóï ãéá åêôõðùôÝò ðïõ åßíáé áðåõèåßáò óõíäåäåìÝíïé ìå ôï óôáèìü åñãáóßáò óáò, üóï êáé ãéá äéêôõáêïýò åêôõðùôÝò.
- ÐåñéãñÜöïõí ðþò ìðïñåßôå íá ôñÝîåôå åöáñìïãÝò Linux óôï FreeBSD óýóôçìÜ óáò.

ÌåñéêÜ áðü áõôÜ ôá êåöÜëáéá áðáéôïýí íá Ý÷åôå ìåëåôÞóåé ðñéí êÜðïéï Üëëï êåöÜëáéï. ¼ðïõ åßíáé áðáñáßôçôï êÜôé ôÝôïéï, áíáöÝñåôáé óôç óýíïøç ôïõ êÜèå êåöáëáßïõ.

ÊåöÜëáéï 7 Desktop ÅöáñìïãÝò

ÓõíåéóöïñÜ ôïõ Christophe Juniet.

7.1 Óýíïøç

Ôï FreeBSD ìðïñåß íá åêôåëÝóåé ìéá åõñåßá ãêÜìá desktop åöáñìïãþí, üðùò öõëëïìåôñçôÝò (browsers) êáé åðåîåñãáóôÝò êåéìÝíïõ. Ïé ðåñéóóüôåñåò áðü áõôÝò åßíáé äéáèÝóéìåò ùò ðáêÝôá (packages) Þ ìðïñïýí íá åãêáôáóôáèïýí áõôüìáôá áðü ôçí ÓõëëïãÞ ôùí Ports. Ðïëëïß íÝïé ÷ñÞóôåò áíáìÝíïõí íá âñïõí ôÝôïéïõ åßäïõò åöáñìïãÝò óôï desktop ôïõò. Ôï êåöÜëáéï áõôü èá óáò äåßîåé ðùò íá åãêáôáóôÞóåôå ÷ùñßò êüðï ôéò ðéï äçìïöéëåßò desktop åöáñìïãÝò, åßôå áðü ðáêÝôá åßôå áðü ôç ÓõëëïãÞ ôùí Ports.

Óçìåéþóôå üôé üôáí åãêáèéóôÜôå ðñïãñÜììáôá áðü ôç ÓõëëïãÞ ôùí Ports, ãßíåôáé ìåôáãëþôôéóç áðü ôïí ðçãáßï êþäéêá. Áõôü ìðïñåß íá ÷ñåéáóôåß ðïëý ÷ñüíï, êáèþò åîáñôÜôáé áðü ôï ðñüãñáììá ôï ïðïßï ìåôáãëùôôßæåôå êáé ôçí õðïëïãéóôéêÞ éó÷ý ôïõ ìç÷áíÞìáôüò óáò. Áí ôï ÷ñïíéêü äéÜóôçìá ôï ïðïßï ÷ñåéÜæåôáé ç ìåôáãëþôôéóç åßíáé áðáãïñåõôéêÜ ìåãÜëï, ìðïñåßôå íá åãêáôáóôÞóåôå ôá ðåñéóóüôåñá ðñïãñÜììáôá ôçò ÓõëëïãÞò ôùí Ports áðü ðñï-ìåôáãëùôôéóìÝíá ðáêÝôá.

Êáèþò ôï FreeBSD äéáèÝôåé óõìâáôüôçôá ìå åêôåëÝóéìá ðñïãñÜììáôá ãéá Linux, ðïëëÝò åöáñìïãÝò ðïõ áíáðôý÷èçêáí áñ÷éêÜ ãéá ôï Linux åßíáé äéáèÝóéìåò ãéá ôï desktop óáò. Óáò óõíéóôïýìå èåñìÜ íá äéáâÜóåôå ôï ÊåöÜëáéï 11 ðñéí åãêáôáóôÞóåôå ïðïéáäÞðïôå áðü ôéò åöáñìïãÝò Linux. ÐïëëÜ áðü ôá ports ðïõ ÷ñçóéìïðïéïýí ôç óõìâáôüôçôá ìå Linux Ý÷ïõí ïíüìáôá ðïõ îåêéíïýí ìå “linux-”. Èõìçèåßôå ôï üôáí øÜ÷íåôå ãéá êÜðïéï óõãêåêñéìÝíï port, ãéá ðáñÜäåéãìá ìå ôçí whereis(1). Óôï êåßìåíï ðïõ áêïëïõèåß èåùñåßôáé üôé Ý÷åôå åíåñãïðïéÞóåé ôçí óõìâáôüôçôá ìå åêôåëÝóéìá ðñïãñÜììáôá Linux ðñéí åãêáôáóôÞóåôå ïðïéáäÞðïôå áðü ôéò åöáñìïãÝò ôïõ Linux.

Ïé êáôçãïñßåò ðïõ êáëýðôïíôáé áðü áõôü ôï êåöÜëáéï åßíáé ïé åîÞò:

- ÖõëëïìåôñçôÝò (üðùò **Firefox**, **Opera**, **Konqueror** **Chromium**)
- ÅöáñìïãÝò ãñáöåßïõ (üðùò **KOffice**, **AbiWord**, **The GIMP**, **OpenOffice.org**, **LibreOffice**)
- ÐñïãñÜììáôá ðñïâïëÞò åããñÜöùí (üðùò **Acrobat Reader®**, **gv**, **Xpdf**, **GQview**)
- ×ñçìáôïïéêïíïìéêÝò åöáñìïãÝò (üðùò **GnuCash**, **Gnumeric**, **Abacus**)

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï èá ðñÝðåé:

- Íá îÝñåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).
- Íá îÝñåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü Linux (ÊåöÜëáéï 11).

Ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç ðïëõìåóéêïý ðåñéâÜëëïíôïò äéáâÜóôå ôï ÊåöÜëáéï 8. Áí èÝëåôå íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå êÜðïéá õðçñåóßá çëåêôñïíéêïý ôá÷õäñïìåßïõ äåßôå ôï ÊåöÜëáéï 29.

7.2 ÖõëëïìåôñçôÝò (Browsers)

Ôï FreeBSD äåí Ý÷åé ðñïåãêáôåóôçìÝíï êÜðïéï óõãêåêñéìÝíï öõëëïìåôñçôÞ. Óôïí êáôÜëïãï www (http://www.FreeBSD.org/ports/www.html) ôçò óõëëïãÞò Ports ìðïñåßôå íá âñåßôå áñêåôïýò öõëëïìåôñçôÝò, Ýôïéìïõò ãéá åãêáôÜóôáóç. Áí äåí Ý÷åôå ÷ñüíï ãéá íá ìåôáãëùôôßóåôå üôé ÷ñåéÜæåóôå (ßóùò ÷ñåéáóôåßôå áñêåôÞ þñá), ðïëëïß áðü áõôïýò åßíáé äéáèÝóéìïé êáé ùò Ýôïéìá ðáêÝôá.

Ôá **KDE** êáé **GNOME**, ùò ðëÞñç ðåñéâÜëëïíôá åñãáóßáò, ðáñÝ÷ïõí ôïõò äéêïýò ôïõò öõëëïìåôñçôÝò HTML. Äåßôå ôï ÔìÞìá 6.7 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç ôïõò.

Áí åíäéáöÝñåóôå ãéá åëáöñåßò (áðü Üðïøç êáôáíÜëùóçò ðüñùí) öõëëïìåôñçôÝò, äåßôå ôéò áêüëïõèåò åöáñìïãÝò óôç óõëëïãÞ ôùí Ports: `www/dillo2`, `www/links`, Þ `www/w3m`.

Ôï ôìÞìá áõôü êáëýðôåé ôéò ðáñáêÜôù åöáñìïãÝò:

¼íïìá ÅöáñìïãÞò	Áðáéôïýìåíïé Ðüñïé	ÅãêáôÜóôáóç áðü Ports	ÂáóéêÝò ÅîáñôÞóåéò
Firefox	ìåóáßá	âáñéÜ	**Gtk+**
Opera	ëßãïé (åëáöñéÜ)	åëáöñéÜ	ÕðÜñ÷ïõí äéáèÝóéìåò åêäüóåéò ãéá FreeBSD êáé Linux. Ç Ýêäïóç ãéá Linux åîáñôÜôáé áðü ôçí äõáäéêÞ óõìâáôüôçôá ìå Linux (Linux Binary Compatibility) êáé ôï **linux-openmotif**.
Konqueror	ìåóáßá	âáñéÜ	ÂéâëéïèÞêåò **KDE**
Chromium	ìåóáßá	ìåóáßá	**Gtk+**

7.2.1 Firefox

Ï **Firefox** åßíáé Ýíáò ìïíôÝñíïò, åëåýèåñïò, áíïé÷ôüò êáé óôáèåñüò öõëëïìåôñçôÞò, ï ïðïßïò åßíáé ðëÞñùò ðñïóáñìïóìÝíïò ãéá ÷ñÞóç óôï FreeBSD. ÄéáèÝôåé ìç÷áíÞ áðåéêüíéóçò ç ïðïßá áíáñìïíßæåôáé ðëÞñùò ìå ôéò ôõðïðïéÞóåéò ôçò HTML, êáé äõíáôüôçôåò üðùò åìöÜíéóç ðïëëáðëþí óåëßäùí óå tabs, ìðëïêÜñéóìá áíáäõüìåíùí ðáñáèýñùí (popups), ðñüóèåôá ðñïãñÜììáôá, âåëôéùìÝíç áóöÜëåéá êáé ðïëëÜ áêüìç. Ï **Firefox** âáóßæåôáé óôïí áñ÷éêü ðçãáßï êþäéêá ôïõ **Mozilla**.

ÅãêáôáóôÞóôå ôï ðáêÝôï ãñÜöïíôáò:

```
# pkg_add -r firefox
```

Ç ðáñáðÜíù åíôïëÞ èá åãêáôáóôÞóåé ôïí **Firefox** 9.0. Áí èÝëåôå íá åãêáôáóôÞóåôå ôïí **Firefox** 3.6, ãñÜøôå:

```
# pkg_add -r firefox36
```

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports áí ðñïôéìÜôå íá ìåôáãëùôôßóåôå áðü ôïí ðçãáßï êþäéêá:

```
# cd /usr/ports/www/firefox
# make install clean
```

Ãéá ôïí **Firefox** 3.6, áíôéêáôáóôÞóôå óôçí ðáñáðÜíù åíôïëÞ ôç ëÝîç `firefox` ìå `firefox36`.

7.2.2 Ï Firefox êáé ôï Ðñüóèåôï (plugin) ôçò Java™

Óçìåßùóç: Óå áõôü ôï ôìÞìá êáé ôá äýï åðüìåíá, èåùñïýìå üôé Ý÷åôå Þäç åãêáôáóôÞóåé ôïí **Firefox**.

ÅãêáôáóôÞóôå ôï **OpenJDK 6** áðü ôç ÓõëëïãÞ ôùí Ports, ðëçêôñïëïãþíôáò:

```
# cd /usr/ports/java/openjdk6
# make install clean
```

ÅãêáôáóôÞóôå Ýðåéôá ôï port `java/icedtea-web`:

```
# cd /usr/ports/java/icedtea-web
# make install clean
```

Âåâáéùèåßôå üôé äåí áëëÜîáôå ôéò ðñïåðéëåãìÝíåò åðéëïãÝò óôéò ïèüíåò ñõèìßóåùí êáé ôùí äýï ports.

ÎåêéíÞóôå ôï öõëëïìåôñçôÞ óáò, ãñÜøôå `about:plugins` óôç ãñáììÞ äéåõèýíóåùí êáé ðéÝóôå **Enter**. Èá äåßôå ìéá óåëßäá ìå üëá ôá åãêáôåóôçìÝíá ðñüóèåôá. Óôç óåëßäá áõôÞ èá ðñÝðåé íá äåßôå êáé ôçí êáôá÷þñéóç ãéá ôï ðñüóèåôï ôçò **Java™**.

Áí ï öõëëïìåôñçôÞò äåí êáôáöÝñåé íá åíôïðßóåé ôï ðñüóèåôï, êÜèå ÷ñÞóôçò èá ÷ñåéáóôåß íá åêôåëÝóåé ôçí ðáñáêÜôù åíôïëÞ êáé íá åðáíåêêéíÞóåé ôï öõëëïìåôñçôÞ ôïõ:

```
% ln -s /usr/local/lib/IcedTeaPlugin.so \
  $HOME/.mozilla/plugins/
```

7.2.3 Ï Firefox êáé ôï Adobe® Flash™ Plugin

Ôï Adobe® Flash™ plugin äåí äéáôßèåôáé ãéá ôï FreeBSD. Ùóôüóï, õðÜñ÷åé Ýíá åðßðåäï åîïìïßùóçò (software layer, wrapper) ãéá ôçí åêôÝëåóç ôïõ áíôßóôïé÷ïõ plugin ôïõ Linux. To wrapper áõôü õðïóôçñßæåé åðßóçò êáé ôá plugins ãéá ôïí Adobe Acrobat®, ôï RealPlayer êáé Üëëá.

ÅêôåëÝóôå ôá ðáñáêÜôù âÞìáôá, áíÜëïãá ìå ôçí Ýêäïóç ôïõ FreeBSD ðïõ ÷ñçóéìïðïéåßôå:

1. Ãéá ôï FreeBSD 7.*X*

   ÅãêáôáóôÞóôå ôï port `www/nspluginwrapper`. Ôï port áõôü áðáéôåß ôï `emulators/linux_base-fc4` ôï ïðïßï åßíáé ìåãÜëï.

   Ôï åðüìåíï âÞìá åßíáé ç åãêáôÜóôáóç ôïõ port `www/linux-flashplugin9`. Èá åãêáôáóôáèåß ç Ýêäïóç Flash 9.*X* ç ïðïßá ãíùñßæïõìå üôé äïõëåýåé óùóôÜ óôï FreeBSD 7.*X*.

   > **Óçìåßùóç:** Óå åêäüóåéò ôïõ FreeBSD ðáëáéüôåñåò áðü ôçí 7.1-RELEASE, èá ðñÝðåé íá åãêáôáóôÞóåôå ôï ðáêÝôï `www/linux-flashplugin7` êáé íá ðáñáëåßøåôå ôï âÞìá ó÷åôéêÜ ìå ôï linprocfs(5) ðïõ öáßíåôáé ðáñáêÜôù.

2. Ãéá ôï FreeBSD 8.*X*

   ÅãêáôáóôÞóôå ôï port `www/nspluginwrapper`. Ôï port áõôü áðáéôåß ôï `emulators/linux_base-f10` ôï ïðïßï åßíáé ìåãÜëï.

   Ôï åðüìåíï âÞìá åßíáé ç åãêáôÜóôáóç ôïõ port `www/linux-f10-flashplugin10`. Èá åãêáôáóôáèåß ç Ýêäïóç Flash 10.*X* ç ïðïßá ãíùñßæïõìå üôé äïõëåýåé óùóôÜ óôï FreeBSD 8.*X*.

   Ãéá íá ëåéôïõñãÞóåé óùóôÜ áõôÞ ç Ýêäïóç, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå ôïí óõìâïëéêü óýíäåóìï ðïõ öáßíåôáé ðáñáêÜôù:

```
# ln -s /usr/local/lib/npapi/linux-f10-flashplugin/libflashplayer.so \
  /usr/local/lib/browser_plugins/
```

Èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå ÷åéñïêßíçôá ôïí êáôÜëïãï `/usr/local/lib/browser_plugins` áí äåí õðÜñ÷åé óôï óýóôçìá óáò.

ÌåôÜ ôçí åãêáôÜóôáóç ôïõ óùóôïý (óýìöùíá ìå ôçí Ýêäïóç ôïõ FreeBSD) Flash port, ï êÜèå ÷ñÞóôçò èá ðñÝðåé íá ïëïêëçñþóåé ôçí ðñïóùðéêÞ ôïõ åãêáôÜóôáóç ôïõ plugin åêôåëþíôáò ôçí ðáñáêÜôù åíôïëÞ ôïõ `nspluginwrapper`:

```
% nspluginwrapper -v -a -i
```

Èá ðñÝðåé íá ðñïóáñôÞóåôå ôï óýóôçìá áñ÷åßùí äéåñãáóéþí ôïõ Linux, linprocfs(5) óôïí êáôÜëïãï `/compat/linux/proc`, áí åðéèõìåßôå íá áíáðáñÜãåôå Flash óêçíÝò (animations). Áõôü ìðïñåß íá ãßíåé ìå ôçí åðüìåíç åíôïëÞ:

```
# mount -t linprocfs linproc /compat/linux/proc
```

Ç ðñïóÜñôçóç ìðïñåß åðßóçò íá ãßíåôáé áõôüìáôá êáôÜ ôçí åêêßíçóç, ðñïóèÝôïíôáò ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/fstab`:

```
linproc        /compat/linux/proc        linprocfs        rw          0         0
```

ÌåôÜ ôçí åãêáôÜóôáóç ôïõ plugin, îåêéíÞóôå ôï öõëëïìåôñçôÞ óáò, ãñÜøôå `about:plugins` óôç ãñáììÞ äéåõèýíóåùí êáé ðéÝóôå **Enter**. Èá ðñÝðåé íá äåßôå ìéá ëßóôá ìå üëá ôá ôñÝ÷ïíôá äéáèÝóéìá plugins.

7.2.4 Ï Firefox êáé ôï Swfdec Flash Plugin

To Swfdec åßíáé ìéá âéâëéïèÞêç ãéá áðïêùäéêïðïßçóç êáé áíáðáñáãùãÞ óêçíþí Flash. Ôï Swfdec-Mozilla åßíáé Ýíá plugin ãéá ôïõò öõëëïìåôñçôÝò **Firefox** ôï ïðïßï ÷ñçóéìïðïéåß áõôÞ ôç âéâëéïèÞêç ãéá ôçí áíáðáñáãùãÞ áñ÷åßùí SWF. Åßíáé áêüìá óôï óôÜäéï ôçò áíÜðôõîçò.

Áí äåí ìðïñåßôå Þ äåí èÝëåôå íá ôï ìåôáãëùôôßóåôå, áðëþò åãêáôáóôÞóôå ôï ðáêÝôï áðü ôï äßêôõï:

```
# pkg_add -r swfdec-plugin
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ôï ìåôáãëùôôßóåôå êáé íá ôï åãêáôáóôÞóåôå áðü ôç ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/www/swfdec-plugin
# make install clean
```

ÌåôÜ ôçí åãêáôÜóôáóç, åðáíåêêéíÞóôå ôï öõëëïìåôñçôÞ óáò ãéá íá åíåñãïðïéçèåß ôï plugin.

7.2.5 Opera

Ï **Opera** åßíáé Ýíáò öõëëïìåôñçôÞò ìå ðëÞñåéò äõíáôüôçôåò êáé óõìâáôüôçôá ìå ôá ðñüôõðá. ¸ñ÷åôáé åðßóçò ìå åíóùìáôùìÝíï ðñüãñáììá áíÜãíùóçò ôá÷õäñïìåßïõ (mail) êáé åéäÞóåùí (news), ðñüãñáììá ãéá IRC, áíáãíþóôç ãéá RSS/Atom êáé ðïëëÜ áêüìá. Ðáñ’üëá áõôÜ, ï **Opera** åßíáé ìéá ó÷åôéêÜ åëáöñéÜ êáé ðïëý ãñÞãïñç åöáñìïãÞ. ¸ñ÷åôáé óå äýï ôýðïõò: ìéá “åããåíÞò” Ýêäïóç ãéá ôï FreeBSD êáé ìéá Ýêäïóç ðïõ åêôåëåßôáé ìÝóù ôçò óõìâáôüôçôáò ìå ôï Linux.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí FreeBSD Ýêäïóç ôïõ **Opera**, åãêáôáóôÞóôå ôï ðáêÝôï:

```
# pkg_add -r opera
```

ÏñéóìÝíåò ôïðïèåóßåò FTP äåí äéáèÝôïõí üëá ôá ðáêÝôá, áëëÜ ìðïñåßôå íá Ý÷åôå ôï ßäéï áðïôÝëåóìá ìÝóù ôçò óõëëïãÞò ôùí Ports, ãñÜöïíôáò:

```
# cd /usr/ports/www/opera
# make install clean
```

Ãéá íá åãêáôáóôÞóåôå ôçí Linux Ýêäïóç ôïõ **Opera**, áíôéêáôáóôÞóôå ìå `linux-opera` ôï `opera` óôá ðáñáäåßãìáôá.

Ôï ðñüóèåôï Adobe Flash äåí åßíáé äéáèÝóéìï ãéá ôï FreeBSD. Äéáôßèåôáé ùóôüóï ìéá Ýêäïóç êáôÜëëçëç ãéá ôï Linux. Ãéá íá ôçí ÷ñçóéìïðïéÞóåôå èá ðñÝðåé áñ÷éêÜ íá åãêáôáóôÞóåôå ôï port `www/linux-f10-flashplugin10` êáé Ýðåéôá ôï port `www/opera-linuxplugins`:

```
# cd /usr/ports/www/linux-f10-flashplugin10
# make install clean
# cd /usr/ports/www/opera-linuxplugins
# make install clean
```

Ìðïñåßôå íá åëÝãîåôå åýêïëá ôçí ýðáñîç ôïõ plugin: îåêéíÞóôå ôïí öõëëïìåôñçôÞ óáò, ãñÜøôå `opera:plugins` óôç ãñáììÞ äéåõèýíóåùí êáé ðáôÞóôå **Enter**. Èá ðñÝðåé íá äåßôå ìéá ëßóôá ìå üëá ôá äéáèÝóéìá ðñüóèåôá.

Ãéá íá ðñïóèÝóåôå ôï ðñüóèåôï ôçò **Java**, áêïëïõèÞóôå ôéò áíôßóôïé÷åò ïäçãßåò ãéá ôïí Firefox.

7.2.6 Konqueror

Ï **Konqueror** åßíáé êïììÜôé ôïõ **KDE** áëëÜ ìðïñåß íá ÷ñçóéìïðïéçèåß êáé Ýîù áðü ôï **KDE** ìå ôçí åãêáôÜóôáóç ôïõ `x11/kdebase3`. Ï **Konqueror** åßíáé ðïëý ðåñéóóüôåñï áðü Ýíáò áðëüò öõëëïìåôñçôÞò, åßíáé åðßóçò äéá÷åéñéóôÞò áñ÷åßùí êáé ðñüãñáììá ðñïâïëÞò áñ÷åßùí ðïëõìÝóùí.

Ï **Konqueror** äéáôßèåôáé åðßóçò ìå Ýíá óåô áðü plugins, óôï `misc/konq-plugins`.

Ï **Konqueror** õðïóôçñßæåé åðßóçò **Flash** êáé ïé ó÷åôéêÝò ïäçãßåò (How To) åßíáé äéáèÝóéìåò óôï http://freebsd.kde.org/howtos/konqueror-flash.php.

7.2.7 Chromium

Ï **Chromium** åßíáé ìéá åöáñìïãÞ browser áíïéêôïý êþäéêá ðïõ óôï÷åýåé óôçí âåëôßùóç ôçò åìðåéñßáò ôïõ ÷ñÞóôç ðáñÝ÷ïíôáò Ýíá öõëëïìåôñçôÞ ï ïðïßïò åßíáé áóöáëÝóôåñïò, ôá÷ýôåñïò êáé ðéï óôáèåñüò. Ï **Chromium** ðáñÝ÷åé äõíáôüôçôá åìöÜíéóçò óåëßäùí óå êáñôÝëåò, áðïêëåéóìü áíáäõüìåíùí ðáñáèýñùí (popup blocker), ðñüóèåôá (extensions) êáé ðïëëÜ Üëëá. Ï **Chromium** åßíáé ôï ¸ñãï áíïéêôïý êþäéêá óôï ïðïßï âáóßæåôáé ï öõëëïìåôñçôÞò Google Chrome.

Ï **Chromium** ìðïñåß íá åãêáôáóôáèåß áðü ðáêÝôï, ìå ôçí åíôïëÞ:

```
# pkg_add -r chromium
```

ÅíáëëáêôéêÜ, ìðïñåßôå íá ìåôáãëùôôßóåôå ôïí **Chromium** ÷ñçóéìïðïéþíôáò ôç ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/www/chromium
# make install clean
```

Óçìåßùóç: Ï **Chromium** åãêáèéóôÜôáé ùò `/usr/local/bin/chrome` êáé ü÷é ùò `/usr/local/bin/chromium`.

7.2.8 Ï Chromium êáé ôï Ðñüóèåôï ôçò Java

Óçìåßùóç: Óôçí åíüôçôá áõôÞ èåùñïýìå üôé Ý÷åôå Þäç åãêáôáóôÞóåé ôïí **Chromium**.

ÅãêáôáóôÞóôå ôï **OpenJDK 6** ìÝóù ôçò ÓõëëïãÞò ôùí Ports, ãñÜöïíôáò:

```
# cd /usr/ports/java/openjdk6
# make install clean
```

¸ðåéôá, åãêáôáóôÞóôå ôï `java/icedtea-web` áðü ôç ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/java/icedtea-web
# make install clean
```

ÎåêéíÞóôå ôïí **Chromium** êáé ðëçêôñïëïãÞóôå `about:plugins` óôç ãñáììÞ äéåõèýíóåùí. Èá ðñÝðåé íá äåßôå ôï IcedTea-Web íá åìöáíßæåôáé ùò Ýíá áðü ôá ðñüóèåôá.

Áí ôï ðñüóèåôï äåí åìöáíßæåôáé óôïí **Chromium**, åêôåëÝóôå ôéò ðáñáêÜôù åíôïëÝò êáé åðáíåêêéíÞóôå ôï öõëëïìåôñçôÞ óáò:

```
# mkdir -p /usr/local/share/chromium/plugins
# ln -s /usr/local/lib/IcedTeaPlugin.so \
  /usr/local/share/chromium/plugins/
```

7.2.9 Ï Chromium êáé ôï Ðñüóèåôï Adobe Flash

Óçìåßùóç: Óôçí åíüôçôá áõôÞ èåùñïýìå üôé Ý÷åôå Þäç åãêáôáóôÞóåé ôïí **Chromium**.

Ãéá ôç ñýèìéóç ôïõ **Chromium** ãéá ÷ñÞóç ìå ôï ðñüóèåôï Adobe Flash, ÷ñçóéìïðïéÞóôå ôéò ïäçãßåò ãéá ôïí Firefox. Óôïí ðñïçãïýìåíï óýíäåóìï èá âñåßôå ðëÞñåéò ïäçãßåò ãéá ôçí åãêáôÜóôáóç ôïõ Adobe Flash óôï FreeBSD. Äåí áðáéôïýíôáé åðéðëÝïí âÞìáôá, êáèþò ï **Chromium** ìðïñåß íá ÷ñçóéìïðïéÞóåé êÜðïéá ðñüóèåôá áðü Üëëïõò öõëëïìåôñçôÝò.

7.3 ÅöáñìïãÝò Ãñáöåßïõ

¼óï áöïñÜ ôéò åöáñìïãÝò ãñáöåßïõ, ïé íÝïé ÷ñÞóôåò óõ÷íÜ áíáæçôïýí ìéá êáëÞ óïõßôá åöáñìïãþí Þ Ýíá öéëéêü åðåîåñãáóôÞ êåéìÝíïõ. Áí êáé êÜðïéá ãñáöéêÜ ðåñéâÜëëïíôá üðùò ôï **KDE** ðáñÝ÷ïõí ôç äéêÞ ôïõò óïõßôá åöáñìïãþí ãñáöåßïõ, äåí õðÜñ÷åé ìéá ðñïåðéëåãìÝíç åöáñìïãÞ. Ôï FreeBSD ðáñÝ÷åé üôé ÷ñåéÜæåóôå, Üó÷åôá áðü ôï ðåñéâÜëëïí åñãáóßáò óáò.

Ôï ôìÞìá áõôü êáëýðôåé ôéò ðáñáêÜôù åöáñìïãÝò:

¼íïìá ÅöáñìïãÞò	Áðáéôïýìåíïé Ðüñïé	ÅãêáôÜóôáóç áðü Ports	ÂáóéêÝò ÅîáñôÞóåéò
KOffice	ëßãïé (åëáöñéÜ)	âáñéÜ	**KDE**
AbiWord	ëßãïé (åëáöñéÜ)	åëáöñéÜ	**Gtk+** Þ **GNOME**
The Gimp	ëßãïé (åëáöñéÜ)	âáñéÜ	**Gtk+**
OpenOffice.org	ðïëëïß (âáñéÜ)	åîáéñåôéêÜ âáñéÜ	**JDK™**, **Mozilla**
LibreOffice	ó÷åôéêÜ âáñéÜ	ôåñÜóôéá	**Gtk+** Þ **KDE**/ **GNOME** Þ **JDK**

7.3.1 KOffice

Ç êïéíüôçôá ôïõ KDE åîïðëßæåé ôï ãñáöéêü ôçò ðåñéâÜëëïí ìå ìéá óïõßôá åöáñìïãþí ãñáöåßïõ ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß êáé Ýîù áðü ôï **KDE**. ÐåñéëáìâÜíåé ôá ôÝóóåñá âáóéêÜ ðñïãñÜììáôá ðïõ ìðïñåßôå åðßóçò íá âñåßôå êáé óå Üëëåò óïõßôåò ãñáöåßïõ. Ôï **KWord** åßíáé ï åðåîåñãáóôÞò êåéìÝíïõ, ôï **KSpread** åßíáé ôï ðñüãñáììá õðïëïãéóôéêþí öýëëùí, ôï **KPresenter** äéá÷åéñßæåôáé ôéò ðáñïõóéÜóåéò, åíþ ôï **Kontour** óáò åðéôñÝðåé íá äçìéïõñãÞóåôå Ýããñáöá ìå ãñáöéêÜ.

Ðñéí åãêáôáóôÞóåôå ôï ôåëåõôáßï **KOffice**, âåâáéùèåßôå üôé Ý÷åôå áíáíåùìÝíç Ýêäïóç ôïõ **KDE**.

Ãéá íá åãêáôáóôÞóåôå ôï **KOffice** ùò ðáêÝôï, äþóôå ôçí áêüëïõèç åíôïëÞ:

```
# pkg_add -r koffice
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports. Ãéá ðáñÜäåéãìá, ãéá íá åãêáôáóôÞóåôå ôï **KOffice** ãéá ôï **KDE3**, ãñÜøôå:

```
# cd /usr/ports/editors/koffice-kde3
# make install clean
```

7.3.2 AbiWord

Ôï **AbiWord** åßíáé Ýíá åëåýèåñï ðñüãñáììá åðåîåñãáóßáò êåéìÝíïõ, üìïéï óôçí áßóèçóç êáé ôçí åìöÜíéóç ìå ôï **Microsoft Word**. Åßíáé êáôÜëëçëï ãéá ôçí ðëçêôñïëüãçóç Üñèñùí, ãñáììÜôùí, áíáöïñþí, õðïìíçìÜôùí ê.ï.ê. Åßíáé ðïëý ãñÞãïñï, Ý÷åé áñêåôÝò äõíáôüôçôåò êáé åßíáé éäéáßôåñá öéëéêü óôï ÷ñÞóôç.

Ôï **AbiWord** ìðïñåß íá åéóÜãåé Þ íá åîÜãåé áñ÷åßá äéÜöïñùí ìïñöþí, ðåñéëáìâáíïìÝíùí êáé êÜðïéùí êëåéóôþí üðùò ôï `.doc` ôçò Microsoft.

Ôï **AbiWord** åßíáé äéáèÝóéìï ùò ðáêÝôï. Ìðïñåßôå íá ôï åãêáôáóôÞóåôå ãñÜöïíôáò:

```
# pkg_add -r abiword
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï ãéá êÜðïéï ëüãï, ìðïñåßôå íá ôï ìåôáãëùôôßóåôå áðü ôçí ÓõëëïãÞ ôùí Ports. Óå áõôÞ ôçí ðåñßðôùóç ðéèáíþò íá åãêáôáóôÞóåôå íåþôåñç Ýêäïóç óå ó÷Ýóç ìå ôï Ýôïéìï ðáêÝôï. Ìðïñåßôå íá ôï êÜíåôå ùò åîÞò:

```
# cd /usr/ports/editors/abiword
# make install clean
```

7.3.3 Ôï GIMP

Ôï **The GIMP** åßíáé Ýíá éäéáßôåñá åîåëéãìÝíï ðñüãñáììá äéá÷åßñéóçò ãñáöéêþí ãéá äçìéïõñãßá åéêüíùí Þ åðåîåñãáóßá öùôïãñáöéþí. Ìðïñåß íá ÷ñçóéìïðïéçèåß ùò áðëü ðñüãñáììá æùãñáöéêÞò Þ óáí óïõßôá åðåîåñãáóßáò êáé äéüñèùóçò öùôïãñáöéþí. Õðïóôçñßæåé ìåãÜëï áñéèìü áðü plugins åíþ äéáèÝôåé êáé scripting interface. Ôï **The GIMP** ìðïñåß íá äéáâÜóåé êáé íá ãñÜøåé ìåãÜëï öÜóìá áñ÷åßùí åéêüíáò. Ðåñéëáìâ Üíåé åðßóçò äéåðáöÝò äéáóýíäåóçò ìå óáñùôÝò êáé tablets.

Ìðïñåßôå íá åãêáôáóôÞóåôå ôï ðáêÝôï äßíïíôáò ôçí åíôïëÞ:

```
# pkg_add -r gimp
```

Áí ç ôïðïèåóßá FTP ðïõ ÷ñçóéìïðïéåßôå äåí äéáèÝôåé áõôü ôï ðáêÝôï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports. Ï êáôÜëïãïò graphics (http://www.FreeBSD.org/ports/graphics.html) ôçò ÓõëëïãÞò ôùí Ports ðåñéÝ÷åé åðßóçò êáé ôï **The Gimp Manual (åã÷åéñßäéï ÷ñÞóçò)**. Äåßôå ðáñáêÜôù ðùò íá ôï åãêáôáóôÞóåôå:

```
# cd /usr/ports/graphics/gimp
# make install clean
# cd /usr/ports/graphics/gimp-manual-pdf
# make install clean
```

> **Óçìåßùóç:** Ï êáôÜëïãïò graphics (http://www.FreeBSD.org/ports/graphics.html) ôçò óõëëïãÞò ôùí Ports Ý÷åé åðßóçò ôçí õðü åîÝëéîç Ýêäïóç ôçò åöáñìïãÞò **The GIMP** óôï `graphics/gimp-devel`. Ìðïñåßôå íá âñåßôå ôçí HTML Ýêäïóç ôïõ åã÷åéñéäßïõ, **The Gimp Manual** óôï `graphics/gimp-manual-html`.

7.3.4 OpenOffice.org

Ôï **OpenOffice.org** ðåñéÝ÷åé üëåò ôéò áðáñáßôçôåò åöáñìïãÝò óå ìéá ðëÞñç óïõßôá åöáñìïãþí ãñáöåßïõ: åðåîåñãáóôÞ êåéìÝíïõ, õðïëïãéóôéêü öýëëï, äéá÷åéñéóôÞ ðáñïõóéÜóåùí êáé ðñüãñáììáó÷åäßáóçò. Ôï ðåñéâÜëëïí åñãáóßáò ôïõ åßíáé ðïëý üìïéï ìå Üëëåò óïõßôåò ãñáöåßïõ, êáé ìðïñåß íá ÷ñçóéìïðïéÞóåé äéÜöïñïõò äçìïöéëåßò ôýðïõò áñ÷åßùí. Åßíáé äéáèÝóéìï óå ðïëëÝò äéáöïñåôéêÝò ãëþóóåò, ôüóï ùò ðñïò ôï ðåñéâÜëëïí åñãáóßáò üóï êáé ùò ðñïò ôá ëåîéêÜ êáé ôïí ïñèïãñáöéêü Ýëåã÷ï.

Ï åðåîåñãáóôÞò êåéìÝíïõ ôïõ **OpenOffice.org** ÷ñçóéìïðïéåß åããåíþò ìïñöÞ áñ÷åßïõ XML ãéá áõîçìÝíç öïñçôüôçôá êáé åõåëéîßá. Ôï ðñüãñáììá õðïëïãéóôéêþí öýëëùí äéáèÝôåé ãëþóóá ìáêñïåíôïëþí êáé ìðïñåß íá äéáóõíäåèåß ìå åîùôåñéêÝò âÜóåéò äåäïìÝíùí. Ôï **OpenOffice.org** åßíáé óôáèåñÞ åöáñìïãÞ êáé åêôåëåßôáé åããåíþò óôá Windows, ôï Solaris™, ôï Linux, ôï FreeBSD, êáèþò êáé óôï Mac OS X. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï **OpenOffice.org** ìðïñåßôå íá âñåßôå óôçí äéêôõáêÞ ôïðïèåóßá ôïõ OpenOffice.org (http://www.openoffice.org/). Ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí Ýêäïóç ãéá FreeBSD, êáèþò êáé ãéá áðåõèåßáò êáôÝâáóìá ðáêÝôùí, ÷ñçóéìïðïéÞóôå ôçí äéêôõáêÞ ôïðïèåóßá FreeBSD OpenOffice.org Porting Team (http://porting.openoffice.org/freebsd/).

Ãéá íá åãêáôáóôÞóåôå ôï **OpenOffice.org**, ãñÜøôå:

```
# pkg_add -r openoffice.org
```

> **Óçìåßùóç:** Áí ÷ñçóéìïðïéåßôå -RELEASE Ýêäïóç ôïõ FreeBSD, ôï ðáñáðÜíù ðñÝðåé íá äïõëÝøåé. ÄéáöïñåôéêÜ, èá ðñÝðåé íá äåßôå ôçí äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD **OpenOffice.org** Porting Team ãéá íá êáôåâÜóåôå êáé íá åãêáôáóôÞóåôå ôï áíôßóôïé÷ï ðáêÝôï ÷ñçóéìïðïéþíôáò ôçí pkg_add(1). Ôüóï ç ôñÝ÷ïõóá üóï êáé ç õðü åîÝëéîç Ýêäïóç åßíáé äéáèÝóéìåò ãéá êáôÝâáóìá áðü ôçí ðáñáðÜíù ôïðïèåóßá.

Áðü ôç óôéãìÞ ðïõ ôï ðáêÝôï åãêáôáóôáèåß, ðñÝðåé íá ãñÜøåôå áðëþò ôçí ðáñáêÜôù åíôïëÞ ãéá íá åêôåëÝóåôå ôï **OpenOffice.org**:

```
% openoffice.org
```

> **Óçìåßùóç:** ÊáôÜ ôçí ðñþôç åêêßíçóç, èá óáò ãßíïõí äéÜöïñåò åñùôÞóåéò êáé èá äçìéïõñãçèåß Ýíáò êáôÜëïãïò ìå üíïìá `.openoffice.org` ìÝóá óôïí ðñïóùðéêü óáò êáôÜëïãï.

Áí ôá ðáêÝôá ôïõ **OpenOffice.org** äåí åßíáé äéáèÝóéìá, Ý÷åôå ðÜíôá ôçí åðéëïãÞ íá ìåôáãëùôôßóåôå ôï áíôßóôïé÷ï port. Ùóôüóï, íá Ý÷åôå õðüøç óáò üôé áõôü áðáéôåß áñêåôü ÷þñï óôï äßóêï êáé èá ÷ñåéáóôåß êáé ðÜñá ðïëý ÷ñüíï ãéá íá ïëïêëçñùèåß.

```
# cd /usr/ports/editors/openoffice.org-3
# make install clean
```

> **Óçìåßùóç:** Áí èÝëåôå íá äçìéïõñãÞóåôå ìéá Ýêäïóç ìå ôéò äéêÝò óáò ôïðéêÝò ñõèìßóåéò, áíôéêáôáóôÞóôå ôçí ðñïçãïýìåíç ãñáììÞ åíôïëþí ìå ôçí åðüìåíç:
>
> ```
> # make LOCALIZED_LANG=your_language install clean
> ```
>
> ÐñÝðåé íá áíôéêáôáóôÞóåôå ôï *`your_language`* ìå ôï óùóôü ISO êùäéêü ãéá ôç ãëþóóá óáò. Ç ëßóôá ìå ôïõò õðïóôçñéæüìåíïõò êùäéêïýò ãëùóóþí åßíáé äéáèÝóéìç óôï áñ÷åßï `files/Makefile.localized`, ôï ïðïßï âñßóêåôáé óôïí êáôÜëïãï ôïõ port.

Ìüëéò ãßíåé áõôü, ìðïñåßôå íá îåêéíÞóåôå ôçí åöáñìïãÞ **OpenOffice.org** äßíïíôáò ôçí åíôïëÞ:

```
% openoffice.org
```

7.3.5 LibreOffice

Ôï **LibreOffice** åßíáé ìéá åëåýèåñç óïõßôá åöáñìïãþí ãñáöåßïõ ç ïðïßá áíáðôýóóåôáé áðü ôï The Document Foundation (http://www.documentfoundation.org/). Åßíáé óõìâáôÞ ìå ôéò Üëëåò ãíùóôÝò óïõßôåò ãñáöåßïõ êáé äéáôßèåôáé ãéá ôéò ðåñéóóüôåñåò ðëáôöüñìåò. Ðñüêåéôáé ãéá fork ôçò ãíùóôÞò åöáñìïãÞò **OpenOffice.org** ç ïðïßá ðåñéëáìâÜíåé üëá ôá áðáñáßôçôá ìéáò óïõßôáò ãñáöåßïõ: åðåîåñãáóôÞ êåéìÝíïõ, õðïëïãéóôéêü öýëëï, ðñüãñáììá ðáñïõóéÜóåùí, ðñüãñáììá ó÷åäßáóçò êáé Ýíá åñãáëåßï ãéá äçìéïõñãßá êáé åðåîåñãáóßá ìáèçìáôéêþí ôýðùí. Äéáôßèåôáé óå ðëÞèïò ãëùóóþí — ç äéåèíÞò õðïóôÞñéîç åðåêôåßíåôáé ìÜëéóôá ôüóï óôï ðåñéâÜëëïí üóï êáé óôá åðéðëÝïí ðñïãñÜììáôá åëÝã÷ïõ ïñèïãñáößáò êáé ëåîéêþí.

Ï åðåîåñãáóôÞò êåéìÝíïõ ôïõ **OpenOffice** ÷ñçóéìïðïéåß åããåíþò ìïñöÞ áñ÷åßïõ XML ôï ïðïßï åîáóöáëßæåé áõîçìÝíç öïñçôüôçôá êáé åõåëéîßá. Ôï õðïëïãéóôéêü öýëëï äéáèÝôåé ìéá ãëþóóá ìáêñïåíôïëþí êáé ìðïñåß íá äéáóõíäåèåß ìå åîùôåñéêÝò âÜóåéò äåäïìÝíùí. Ôï **LibreOffice** åßíáé Þäç óôáèåñü êáé äéáôßèåôáé óå åêäüóåéò ãéá Windows, Linux, FreeBSD êáé Mac OS X. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï **LibreOffice** åðéóêåöèåßôå ôçí äéêôõáêÞ ôïðïèåóßá ôïõ (http://www.libreoffice.org/).

Ãéá íá åãêáôáóôÞóåôå ôï **LibreOffice** áðü Ýôïéìï ðáêåôü, ãñÜøôå:

```
# pkg_add -r libreoffice
```

> **Óçìåßùóç:** Ôï ðáñáðÜíù èá ëåéôïõñãÞóåé áí ôñÝ÷åôå êÜðïéï åðßóçìï -RELEASE ôïõ FreeBSD.

ÌåôÜ ôçí åãêáôÜóôáóç ôïõ ðáêÝôïõ, ÷ñåéÜæåôáé íá ãñÜøåôå ôï ðáñáêÜôù ãéá íá åêôåëÝóåôå ôï **LibreOffice**:

```
% libreoffice
```

> **Óçìåßùóç:** ÊáôÜ ôçí ðñþôç åêêßíçóç, èá óáò ãßíïõí êÜðïéåò åñùôÞóåéò êáé èá äçìéïõñãçèåß Ýíáò êáôÜëïãïò `.libreoffice` ìÝóá óôïí ðñïóùðéêü óáò êáôÜëïãï.

Áí äåí õðÜñ÷ïõí äéáèÝóéìá ðáêÝôá ãéá ôï **LibreOffice**, Ý÷åôå åðßóçò ôçí åðéëïãÞ íá ôï ìåôáãëùôôßóåôå áðü ôï áíôßóôïé÷ï port. Èá ðñÝðåé ùóôüóï íá ãíùñßæåôå üôé áðáéôåßôáé áñêåôüò ÷þñïò óôï äßóêï êáé áñêåôüò ÷ñüíïò ãéá ôç ìåôáãëþôôéóç.

```
# cd /usr/ports/editors/libreoffice
# make install clean
```

> **Óçìåßùóç:** Áí èÝëåôå íá äçìéïõñãÞóåôå ìéá Ýêäïóç ìå õðïóôÞñéîç êÜðïéáò óõãêåêñéìÝíçò ãëþóóáò, áíôéêáôáóôÞóôå ôçí ðñïçãïýìåíç åíôïëÞ ìå:
>
> ```
> # make LOCALIZED_LANG=your_language install clean
> ```
>
> Èá ðñÝðåé íá áíôéêáôáóôÞóåôå ôï *`your_language`* ìå ôï óùóôü ISO êùäéêü ôçò ãëþóóáò ðïõ åðéèõìåßôå íá ÷ñçóéìïðïéÞóåôå. Ãéá íá âñåßôå ôïí êùäéêü, äåßôå ôï áñ÷åßï `Makefile` ôïõ port êáé åéäéêüôåñá ôçí åíüôçôá `pre-fetch`.

Ìðïñåßôå Ýðåéôá íá åêôåëÝóåôå ôï **LibreOffice** ÷ñçóéìïðïéþíôáò ôçí ðáñáêÜôù åíôïëÞ:

```
% libreoffice
```

7.4 ÐñïãñÜììáôá ÐñïâïëÞò ÅããñÜöùí

Ðñüóöáôá Ý÷ïõí ãßíåé áñêåôÜ äçìïöéëÞò êÜðïéåò íÝåò ìïñöÝò áñ÷åßùí. Ôá ðñïãñÜììáôá ðñïâïëÞò ðïõ áðáéôïýíôáé ãéá ôá áñ÷åßá áõôÜ ßóùò íá ìçí åßíáé äéáèÝóéìá óôï âáóéêü óýóôçìá. Óôï ôìÞìá áõôü èá äïýìå ðùò ìðïñåßôå íá ôá åãêáôáóôÞóåôå.

Ôï ôìÞìá áõôü êáëýðôåé ôéò åöáñìïãÝò:

¼íïìá ÅöáñìïãÞò	Áðáéôïýìåíïé Ðüñïé	ÅãêáôÜóôáóç áðü Ports	ÂáóéêÝò ÅîáñôÞóåéò

¼íïìá ÅöáñìïãÞò	Áðáéôïýìåíï Ðüñïé	ÅãêáôÜóôáóç áðü Ports	ÂáóéêÝò Åîáñôçóåéò
Acrobat Reader	ëßãïé (åëáöñéÜ)	åëáöñéÜ	Äõíáéêþ óõìâáôüôçôá ìå Linux (Linux Binary Compatibility)
gv	ëßãïé (åëáöñéÜ)	åëáöñéÜ	**Xaw3d**
Xpdf	ëßãïé (åëáöñéÜ)	åëáöñéÜ	**FreeType**
GQview	ëßãïé (åëáöñéÜ)	åëáöñéÜ	**Gtk+** Þ **GNOME**

7.4.1 Acrobat Reader®

ÐïëëÜ Ýããñáöá äéáíÝìïíôáé ðëÝïí ùò áñ÷åßá PDF ôï ïðïßï óçìáßíåé “Portable Document Format” (ÖïñçôÞ ÌïñöÞ ÅããñÜöïõ). ¸íá áðü ôá óõíéóôþìåíá ðñïãñÜììáôá ðñïâïëÞò ãéá áõôü ôïí ôýðï áñ÷åßùí åßíáé ôï **Acrobat Reader**, ôï ïðïßï ç Adobe äéáèÝôåé ãéá Linux. Êáèþò ôï FreeBSD ìðïñåß íá ÷ñçóéìïðïéÞóåé åêôåëÝóéìá ôïõ Linux, ç åöáñìïãÞ åßíáé åðßóçò äéáèÝóéìç ãéá ôï FreeBSD.

Ãéá íá åãêáôáóôÞóåôå ôï **Acrobat Reader 8** áðü ôç ÓõëëïãÞ ôùí Ports, ãñÜøôå:

```
# cd /usr/ports/print/acroread8
# make install clean
```

Äåí õðÜñ÷åé äéáèÝóéìï ðáêÝôï, ëüãù ðåñéïñéóìþí óôçí Üäåéá ÷ñÞóçò.

7.4.2 gv

Ôï **gv** åßíáé Ýíá ðñüãñáììá ðñïâïëÞò åããñÜöùí ãéá áñ÷åßá PostScript êáé PDF. Åßíáé áñ÷éêÜ âáóéóìÝíï óôçí åöáñìïãÞ **ghostview** áëëÜ Ý÷åé êáëýôåñç åìöÜíéóç ÷Üñç óôç âéâëéïèÞêç **Xaw3d**. Åßíáé ãñÞãïñï, êáé ôï interface ôïõ åßíáé îåêÜèáñï. Ôï **gv** Ý÷åé ðïëëÝò äõíáôüôçôåò, üðùò ðñïóáíáôïëéóìü êáé ìÝãåèïò ÷áñôéïý, åìöÜíéóç õðü êëßìáêá êáé åîïìÜëõíóç åìöÜíéóçò ãñáììáôïóåéñþí (antialias). Ó÷åäüí êÜèå ëåéôïõñãßá ôïõ ìðïñåß íá åêôåëåóôåß ôüóï áðü ôï ðëçêôñïëüãéï üóï êáé áðü ôï ðïíôßêé.

Ãéá íá åãêáôáóôÞóåôå ôï **gv** ùò ðáêÝôï, ãñÜøôå:

```
# pkg_add -r gv
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports:

```
# cd /usr/ports/print/gv
# make install clean
```

7.4.3 Xpdf

Áí èÝëåôå Ýíá ìéêñü ðñüãñáììá ðñïâïëÞò áñ÷åßùí PDF ãéá ôï FreeBSD, ôï **Xpdf** åßíáé åëáöñý êáé áðïäïôéêü. Áðáéôåß åëÜ÷éóôïõò ðüñïõò êáé åßíáé éäéáßôåñá óôáèåñü. ×ñçóéìïðïéåß ôéò âáóéêÝò ãñáììáôïóåéñÝò ôùí X êáé äåí áðáéôåß ÷ñÞóç ôïõ **Motif** Þ Üëëçò åñãáëåéïèÞêçò ôùí ×.

Ãéá íá åãêáôáóôÞóåôå ôï **Xpdf** ùò ðáêÝôï, äþóôå ôçí åíôïëÞ:

```
# pkg_add -r xpdf
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï Þ ðñïôéìÜôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports, ãñÜøôå:

```
# cd /usr/ports/graphics/xpdf
# make install clean
```

Ìüëéò ïëïêëçñùèåß ç åãêáôÜóôáóç, ìðïñåßôå íá îåêéíÞóåôå ôï **Xpdf** êáé íá ÷ñçóéìïðïéÞóåôå ôï äåîß ðëÞêôñï ôïõ ðïíôéêéïý ãéá íá åíåñãïðïéÞóåôå ôï ìåíïý.

7.4.4 GQview

Ôï **GQview** åßíáé Ýíáò äéá÷åéñéóôÞò åéêüíùí. Ìðïñåßôå íá äåßôå Ýíá áñ÷åßï ìå Ýíá áðëü êëéê, íá îåêéíÞóåôå Ýíá åîùôåñéêü ðñüãñáììá åðåîåñãáóßáò, íá äåßôå ðñïåðéóêüðçóç óå ìïñöÞ thumbnail êáé ðïëëÜ Üëëá. ÄéáèÝôåé åðßóçò ðñïâïëÞ ðáñïõóßáóçò êáé êÜðïéåò âáóéêÝò ëåéôïõñãßåò áñ÷åßùí. Ìðïñåßôå íá äéá÷åéñéóôåßôå óõëëïãÝò åéêüíùí êáé íá âñåßôå ìå åýêïëï ôñüðï ôéò äéðëÝò. Ôï **GQview** ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ðñïâïëÞ óå ðëÞñç ïèüíç êáé õðïóôçñßæåé ôïðéêÝò / äéåèíåßò ñõèìßóåéò.

Áí èÝëåôå íá åãêáôáóôÞóåôå ôï **GQview** ùò ðáêÝôï, ãñÜøôå:

```
# pkg_add -r gqview
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, Þ ðñïôéìÜôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports, ãñÜøôå:

```
# cd /usr/ports/graphics/gqview
# make install clean
```

7.5 ×ñçìáôïïéêïíïìéêÝò ÅöáñìïãÝò

Áí, ãéá ïðïéïäÞðïôå ëüãï, èÝëåôå íá äéá÷åéñßæåóôå ôá ÷ñçìáôïïéêïíïìéêÜ óáò ìÝóù ôïõ FreeBSD desktop óáò, õðÜñ÷ïõí êÜðïéåò éó÷õñÝò êáé åýêïëåò óôç ÷ñÞóç åöáñìïãÝò, Ýôïéìåò ðñïò åãêáôÜóôáóç. ÏñéóìÝíåò áðü áõôÝò åßíáé óõìâáôÝò ìå äéáäåäïìÝíåò ìïñöÝò áñ÷åßùí, üðùò áõôÝò ðïõ ÷ñçóéìïðïéïýíôáé óôá Ýããñáöá ôïõ **Quicken®** Þ ôïõ **Excel**.

Ôï ôìÞìá áõôü êáëýðôåé ôéò åöáñìïãÝò:

¼íïìá ÅöáñìïãÞò	Áðáéôïýìåíïé Ðüñïé	ÅãêáôÜóôáóç Áðü Ports	ÂáóéêÝò ÅîáñôÞóåéò
GnuCash	ëßãïé (åëáöñéÜ)	âáñéÜ	**GNOME**
Gnumeric	ëßãïé (åëáöñéÜ)	âáñéÜ	**GNOME**
Abacus	ëßãïé (åëáöñéÜ)	åëáöñéÜ	**Tcl/Tk**
KMyMoney	ëßãïé (åëáöñéÜ)	âáñéÜ	**KDE**

7.5.1 GnuCash

Ôï **GnuCash** åßíáé ìÝñïò ôçò ðñïóðÜèåéáò ôïõ **GNOME** íá ðáñÝ÷åé öéëéêÝò åöáñìïãÝò óôïõò ôåëéêïýò ÷ñÞóôåò. Ìå ôï **GnuCash**, ìðïñåßôå íá êñáôÜôå ëïãáñéáóìü ôùí åóüäùí êáé åîüäùí óáò, ôùí ôñáðåæéêþí óáò ëïãáñéáóìþí êáé ôùí ìåôï÷þí óáò. ÄéáèÝôåé ðåñéâÜëëïí åñãáóßáò ôï ïðïßï åßíáé åýêïëï óôç ÷ñÞóç ÷ùñßò íá ÷ñåéÜæåôáé éäéáßôåñç åêìÜèçóç, áëëÜ åßíáé ôáõôü÷ñïíá êáé ðïëý åðáããåëìáôéêü.

Ôï **GnuCash** ðáñÝ÷åé Ýîõðíï óýóôçìá êáôá÷þñçóçò, éóïæýãéá ëïãáñéáóìþí, ðïëëÜ ðëÞêôñá óõíôüìåõóçò êáé ðïëëáðëÝò ìåèüäïõò ãéá êáôá÷þñçóç êéíÞóåùí. Ìðïñåß íá äéá÷ùñßóåé ìéá óõíáëëáãÞ óå ðïëëÜ ëåðôïìåñÞ ôìÞìáôá. Ôï **GnuCash** ìðïñåß íá åéóÜãåé êáé íá óõã÷ùíåýóåé áñ÷åßá QIF ôïõ **Quicken**. Ìðïñåß åðßóçò íá ÷åéñéóôåß ôéò ðåñéóóüôåñåò äéåèíåßò ìïñöÝò çìåñïìçíéþí êáé íïìéóìáôéêþí ìïíÜäùí.

Ãéá íá åãêáôáóôÞóåôå ôï **GnuCash** óôï óýóôçìá óáò, ãñÜøôå:

```
# pkg_add -r gnucash
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí Óõëëïãþ ôùí Ports:

```
# cd /usr/ports/finance/gnucash
# make install clean
```

7.5.2 Gnumeric

Ôï **Gnumeric** åßíáé Ýíá õðïëïãéóôéêü öýëëï êáé áðïôåëåß ìÝñïò ôïõ ðåñéâÜëëïíôïò åñãáóßáò **GNOME**. ÄéáèÝôåé âïëéêÞ áõôüìáôç "ðñüâëåøç" ôçò åéóüäïõ ôïõ ÷ñÞóôç óýìöùíá ìå ôç ìïñöÞ ôïõ êåëéïý êáèþò êáé óýóôçìá áõôüìáôçò óõìðëÞñùóçò (autofill) ãéá äéÜöïñåò áêïëïõèßåò. Ìðïñåß íá åéóÜãåé áñ÷åßá äéÜöïñùí äçìïöéëþí ìïñöþí, üðùò áõôÜ ðïõ ÷ñçóéìïðïéïýíôáé óôï **Excel**, ôï **Lotus 1-2-3**, Þ ôï **Quattro Pro**. Ôï **Gnumeric** õðïóôçñßæåé ãñáöÞìáôá ìÝóù ôïõ ðñïãñÜììáôïò ãñáöéêþí `math/guppi`. ¸÷åé ìåãÜëï áñéèìü åíóùìáôùìÝíùí óõíáñôÞóåùí êáé åðéôñÝðåé üëåò ôéò óõíÞèåéò ìïñöÝò êåëéþí, üðùò áñéèìïýò, íïìéóìáôéêÝò ìïíÜäåò, çìåñïìçíßåò, þñåò êáé ðïëëÝò áêüìá.

Ãéá íá åãêáôáóôÞóåôå ôï **Gnumeric** ùò ðáêÝôï, ãñÜøôå:

```
# pkg_add -r gnumeric
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí Óõëëïãþ ôùí Ports, ãñÜöïíôáò:

```
# cd /usr/ports/math/gnumeric
# make install clean
```

7.5.3 Abacus

Ôï **Abacus** åßíáé Ýíá ìéêñü êáé åýêïëï óôç ÷ñÞóç õðïëïãéóôéêü öýëëï. ÐåñéëáìâÜíåé ðïëëÝò åíóùìáôùìÝíåò óõíáñôÞóåéò ÷ñÞóéìåò óå äéÜöïñá ðåäßá, üðùò ç óôáôéóôéêÞ, ôá ÷ñçìáôïïéêïíïìéêÜ êáé ôá ìáèçìáôéêÜ. Ìðïñåß íá åéóÜãåé êáé íá åîÜãåé áñ÷åßá ôïõ **Excel**. Ôï **Abacus** ìðïñåß íá ðáñÜãåé Ýîïäï ìïñöÞò PostScript.

Ãéá íá åãêáôáóôÞóåôå ôï **Abacus** ùò ðáêÝôï, ãñÜøôå:

```
# pkg_add -r abacus
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí Óõëëïãþ ôùí Ports, ãñÜöïíôáò:

```
# cd /usr/ports/deskutils/abacus
# make install clean
```

7.5.4 KMyMoney

Ôï **KMyMoney** åßíáé ìéá åöáñìïãÞ äéá÷åßñéóçò ôùí ðñïóùðéêþí óáò ïéêïíïìéêþí, öôéáãìÝíç ãéá ôï ðåñéâÜëëïí **KDE**. To **KMyMoney** óôï÷åýåé íá ðáñÝ÷åé êáé íá åíóùìáôþóåé üëåò ôéò ëåéôïõñãßåò ðïõ äéáôßèåíôáé óå áíôßóôïé÷åò åìðïñéêÝò åöáñìïãÝò. Ôï **KMyMoney** ìðïñåß íá åéóÜãåé áñ÷åßá ôïõ ðñïôýðïõ QIF (Quicken Interchange Format), íá ôçñåß êáôáãñáöÞ ôùí åðåíäýóåùí óáò, íá ÷åéñßæåôáé ðïëëáðëÝò íïìéóìáôéêÝò ìïíÜäåò êáé íá ðáñÝ÷åé ðëÞèïò áíáöïñþí. ÌÝóá áðü îå÷ùñéóôü plugin, ðáñÝ÷åôáé åðßóçò ç äõíáôüôçôá åéóáãùãÞò áñ÷åßùí OFX.

Ãéá íá åãêáôáóôÞóåôå ôï **KMyMoney** ùò ðáêÝôï, åêôåëÝóôå ôçí åíôïëÞ:

```
# pkg_add -r kmymoney2
```

Áí ôï ðáêÝôï äåí åßíáé äéáèÝóéìï, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ÓõëëïãÞ ôùí Ports, üðùò öáßíåôáé ðáñáêÜôù:

```
# cd /usr/ports/finance/kmymoney2
# make install clean
```

7.6 Ðåñßëçøç

Áí êáé ôï FreeBSD åßíáé äçìïöéëÝò óôïõò ðáñï÷åßò Internet (ISPs) ãéá ôçí áðüäïóç êáé ôç óôáèåñüôçôá ôïõ, åßíáé åðßóçò Ýôïéìï êáé ãéá êáèçìåñéíÞ ÷ñÞóç ùò desktop. Ìå áñêåôÝò ÷éëéÜäåò åöáñìïãÝò äéáèÝóéìåò ùò ðáêÝôá (http://www.FreeBSD.org/applications.html) Þ ports (http://www.FreeBSD.org/ports/index.html), ìðïñåßôå íá äçìéïõñãÞóåôå ôï ôÝëåéï desktop ðïõ êáëýðôåé üëåò ôéò áíÜãêåò óáò.

ÐáñáêÜôù, öáßíåôáé ìéá ãñÞãïñç ðåñßëçøç üëùí ôùí desktop åöáñìïãþí ðïõ ðáñïõóéÜóôçêáí óå áõôü ôï êåöÜëáéï:

¼íïìá ÅöáñìïãÞò	¼íïìá ÐáêÝôïõ	¼íïìá Port
Opera	`opera`	`www/opera`
Firefox	`firefox`	`www/firefox`
Chromium	`chromium`	`www/chromium`
KOffice	`koffice`	`editors/koffice-kde3`
AbiWord	`abiword`	`editors/abiword`
The GIMP	`gimp`	`graphics/gimp`
OpenOffice.org	`openoffice`	`editors/openoffice.org-3`
LibreOffice	`libreoffice`	`editors/libreoffice`
Acrobat Reader	`acroread`	`print/acroread8`
gv	`gv`	`print/gv`
Xpdf	`xpdf`	`graphics/xpdf`
GQview	`gqview`	`graphics/gqview`
GnuCash	`gnucash`	`finance/gnucash`
Gnumeric	`gnumeric`	`math/gnumeric`
Abacus	`abacus`	`deskutils/abacus`
KMyMoney	`kmymoney2`	`finance/kmymoney2`

ÊåöÜëáéï 8 ÐïëõìÝóá

Åðåîåñãáóßá áðü ôïí Ross Lippert.

8.1 Óýíïøç

Ôï FreeBSD õðïóôçñßæåé ìåãÜëç ðïéêéëßá áðü êÜñôåò Þ÷ïõ, åðéôñÝðïíôáò óáò Ýôóé íá áðïëáýóåôå õøçëÞò ðéóôüôçôáò Þ÷ï áðü ôïí õðïëïãéóôÞ óáò. ÐåñéëáìâÜíåôáé ç äõíáôüôçôá íá åããñÜøåôå êáé íá áíáðáñÜãåôå Þ÷ï MPEG Audio Layer 3 (MP3), WAV, êáé Ogg Vorbis êáèþò êáé ðïëëÜ Üëëá formats. Ôï FreeBSD Ports Collection åðßóçò ðåñéÝ÷åé åöáñìïãÝò ðïõ óáò åðéôñÝðïõí íá åðåîåñãáóôåßôå ôïí ç÷ïãñáöçìÝíï óáò Þ÷ï, íá ðñïóèÝóåôå ç÷çôéêÜ åöÝ, êáé íá åëÝãîåôå óõóêåõÝò MIDI.

Ìå ëßãï ðåéñáìáôéóìü, ôï FreeBSD ìðïñåß íá õðïóôçñßîåé áíáðáñáãùãÞ áñ÷åßùí video êáé DVD. Ï áñéèìüò ôùí åöáñìïãþí ðïõ êùäéêïðïéïýí, ìåôáôñÝðïõí, êáé áíáðáñÜãïõí äéÜöïñïõò ôýðïõò video åßíáé ðéï ðåñéïñéóìÝíïò áðü ôïí áñéèìü ôùí åöáñìïãþí Þ÷ïõ. Ãéá ðáñÜäåéãìá, üôáí ãñÜöçêå áõôü ôï êåßìåíï, äåí õðÞñ÷å êáìéÜ êáëÞ åöáñìïãÞ åðáíáêùäéêïðïßçóçò óôç óõëëïãÞ ôùí Ports ôïõ FreeBSD, ðïõ èá ìðïñïýóå íá ÷ñçóéìïðïéçèåß ãéá ìåôáôñïðÞ ìåôáîý formats, üðùò ôï `audio/sox`. Ðáñ’ üëá áõôÜ, ôï ôïðßï óå áõôü ôïí ôïìÝá, êáé üóï áöïñÜ ôï ëïãéóìéêü, áëëÜæåé ñáãäáßá.

Ôï êåöÜëáéï áõôü èá ðåñéãñÜøåé ôá áðáñáßôçôá âÞìáôá ãéá ôç ñýèìéóç ôçò êÜñôáò Þ÷ïõ óáò. Ç ñýèìéóç êáé åãêáôÜóôáóç ôïõ X11 (ÊåöÜëáéï 6) Ý÷åé Þäç öñïíôßóåé ãéá ôá ðéèáíÜ ðñïâëÞìáôá õëéêïý ôçò êÜñôáò ãñáöéêþí óáò, áí êáé ìðïñåß íá ÷ñåéÜæåôáé íá åöáñìüóåôå êÜðïéåò áêüìá ìéêñï-ñõèìßóåéò ãéá êáëýôåñç áíáðáñáãùãÞ.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá ñõèìßóåôå ôï óýóôçìá óáò þóôå íá áíáãíùñßæåôáé ç êÜñôá Þ÷ïõ óáò.
- Ìåèüäïõò ãéá íá åëÝãîåôå ôç ëåéôïõñãßá ôçò êÜñôáò óáò.
- Ðùò íá åðéëýóåôå ðñïâëÞìáôá ó÷åôéêÜ ìå ôéò ñõèìßóåéò Þ÷ïõ.
- Ðùò íá áíáðáñÜãåôå êáé íá êùäéêïðïéÞóåôå MP3 êáé Üëëïõò ôýðïõò áñ÷åßùí Þ÷ïõ.
- Ðùò õðïóôçñßæåôáé ôï video áðü ôïí X server.
- ÊÜðïéá ports áíáðáñáãùãÞò/êùäéêïðïßçóçò video ðïõ äßíïõí êáëÜ áðïôåëÝóìáôá.
- Ðùò íá áíáðáñÜãåôå DVD, êáé áñ÷åßá `.mpg` êáé `.avi`.
- Ðùò íá êÜíåôå rip ôï ðåñéå÷üìåíï CD êáé DVD óå áñ÷åßá.
- Ðùò íá ñõèìßóåôå ìéá êÜñôá ôçëåüñáóçò.
- Ðùò íá ñõèìßóåôå Ýíá óáñùôÞ åéêüíùí.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá îÝñåôå ðùò èá ñõèìßóåôå êáé èá åãêáôáóôÞóåôå íÝï ðõñÞíá (ÊåöÜëáéï 9).

> **Ðñïåéäïðïßçóç:** Áí ðñïóðáèÞóåôå íá ðñïóáñôÞóåôå ìïõóéêÜ CD ìå ôçí åíôïëÞ mount(8) èá ðñïêëçèåß êáô’ åëÜ÷éóôïí óöÜëìá, Þ óôç ÷åéñüôåñç ðåñßðôùóç *kernel panic*. ÔÝôïéá ìÝóá Ý÷ïõí åîåéäéêåõìÝíåò êùäéêïðïéÞóåéò ðïõ äéáöÝñïõí áðü ôï óõíçèéóìÝíï óýóôçìá áñ÷åßùí ISO.

8.2 Ñýèìéóç ôçò ÊÜñôáò ¹÷ïõ

ÓõíåéóöïñÜ áðü ôïí Moses Moore. Âåëôéþèçêå áðü ôïí Marc Fonvieille.

8.2.1 Ñõèìßæïíôáò ôï Óýóôçìá

Ðñéí îåêéíÞóåôå, èá ðñÝðåé íá îÝñåôå ôï ìïíôÝëï ôçò êÜñôáò ðïõ Ý÷åôå, ôï ïëïêëçñùìÝíï êýêëùìá ðïõ ÷ñçóéìïðïéåß, êáèþò êáé áí åßíáé PCI Þ ISA. Ôï FreeBSD õðïóôçñßæåé ìåãÜëç ðïéêéëßá êáñôþí Þ÷ïõ, ôüóï PCI üóï êáé ISA. ÅëÝãîôå ôéò õðïóôçñéæüìåíåò óõóêåõÝò Þ÷ïõ óôéò Óçìåéþóåéò Õëéêïý (http://www.FreeBSD.org/releases/9.1R/hardware.html) ãéá íá äåßôå áí ç êÜñôá óáò õðïóôçñßæåôáé. Óôéò Óçìåéþóåéò Õëéêïý áíáöÝñåôáé åðßóçò ðïéï ðñüãñáììá ïäÞãçóçò õðïóôçñßæåé ôçí êÜñôá óáò.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí óõóêåõÞ Þ÷ïõ ðïõ äéáèÝôåôå, èá ðñÝðåé íá öïñôþóåôå ôïí êáôÜëëçëï ïäçãü óõóêåõÞò. Áõôü ìðïñåß íá åðéôåõ÷èåß ìå äýï ôñüðïõò. Ï åõêïëüôåñïò åßíáé áðëþò íá öïñôþóåôå Ýíá module (Üñèñùìá) ãéá ôçí êÜñôá Þ÷ïõ óôïí ðõñÞíá, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ kldload(8), ìå ôç âïÞèåéá ôçò ãñáììÞò åíôïëþí:

```
# kldload snd_emu10k1
```

Þ ðñïóèÝôïíôáò ôçí êáôÜëëçëç ãñáììÞ óôï áñ÷åßï `/boot/loader.conf` üðùò ðáñáêÜôù:

```
snd_emu10k1_load="YES"
```

Ôá ðáñáðÜíù ðáñáäåßãìáôá åßíáé ãéá ìéá êÜñôá Þ÷ïõ Creative SoundBlaster® Live!. ÕðÜñ÷ïõí äéáèÝóéìá êáé Üëëá modules ãéá êÜñôåò Þ÷ïõ êáé ìðïñåßôå íá ôá äåßôå óôï áñ÷åßï `/boot/defaults/loader.conf`. Áí äåí åßóôå óßãïõñïò ãéá ôï ðñüãñáììá ïäÞãçóçò ðïõ ðñÝðåé íá ÷ñçóéìïðïéÞóåôå, ìðïñåßôå íá ðñïóðáèÞóåôå íá öïñôþóåôå ôï module `snd_driver`:

```
# kldload snd_driver
```

Ðñüêåéôáé ãéá Ýíá ìåôá-ðñüãñáììá ïäÞãçóçò, ôï ïðïßï öïñôþíåé ìå ìéáò üëá ôá êïéíÜ ðñïãñÜììáôá ïäÞãçóçò ãéá êÜñôåò Þ÷ïõ. Ìå ôïí ôñüðï áõôü ìðïñåßôå íá åðéôá÷ýíåôå ôçí áíß÷íåõóç ãéá ôï óùóôü ïäçãü. Ìðïñåßôå åðßóçò íá öïñôþóåôå üëá ôá ðñïãñÜììáôá ïäÞãçóçò ìÝóù ôïõ áñ÷åßïõ `/boot/loader.conf`.

Áí åðéèõìåßôå íá âñåßôå ôï åðéëåãìÝíï ðñüãñáììá ïäÞãçóçò ôçò êÜñôáò óáò ìåôÜ ôç öüñôùóç ôïõ `snd_driver`, ìðïñåßôå íá åëÝãîåôå ôï áñ÷åßï `/dev/sndstat` ìå ôçí âïÞèåéá ôçò åíôïëÞò `cat /dev/sndstat`.

Ìéá äåýôåñç ìÝèïäïò åßíáé íá ìåôáãëùôôßóåôå ôçí õðïóôÞñéîç ôçò êÜñôáò Þ÷ïõ óáò, óôáôéêÜ, áðåõèåßáò óôïí ðõñÞíá. Ôï ðáñáêÜôù ôìÞìá ðáñÝ÷åé ôéò ðëçñïöïñßåò ðïõ ÷ñåéÜæåóôå ãéá íá ðñïóèÝóåôå õðïóôÞñéîç ãéá ôï õëéêü óáò ìå áõôü ôïí ôñüðï. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ìåôáãëþôôéóç ôïõ ðõñÞíá, äåßôå ôï ÊåöÜëáéï 9.

8.2.1.1 Äçìéïõñãþíôáò ÐñïóáñìïóìÝíï ÐõñÞíá ìå ÕðïóôÞñéîç ¹÷ïõ

Áñ÷éêÜ, ðñÝðåé íá ðñïóèÝóåôå ôï ãåíéêü ðñüãñáììá ïäÞãçóçò Þ÷ïõ (audio framework driver) sound(4) óôïí ðõñÞíá óáò. Èá ÷ñåéáóôåß íá ðñïóèÝóåôå ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá:

```
device sound
```

¸ðåéôá, èá ðñÝðåé íá ðñïóèÝóåôå õðïóôÞñéîç ãéá ôçí êÜñôá Þ÷ïõ óáò. ÐñÝðåé íá ãíùñßæåôå áðü ðñéí ðïéï ðñüãñáììá ïäÞãçóçò õðïóôçñßæåé. ÅëÝãîôå ôç ëßóôá ôùí õðïóôçñéæüìåíùí êáñôþí óôéò Óçìåéþóåéò Õëéêïý (http://www.FreeBSD.org/releases/9.1R/hardware.html), ãéá íá êáèïñßóåôå ôï óùóôü ïäçãü ãéá ôçí äéêÞ óáò. Ãéá ðáñÜäåéãìá, Þ Creative SoundBlaster Live!, õðïóôçñßæåôáé áðü ôïí ïäçãü snd_emu10k1(4). Ãéá íá ðñïóèÝóåôå õðïóôÞñéîç ãéá áõôÞ ôçí êÜñôá, ÷ñçóéìïðïéÞóôå ôçí áêüëïõèç ãñáììÞ:

```
device snd_emu10k1
```

Âåâáéùèåßôå üôé äéáâÜóáôå ôçí óåëßäá ôïõ manual ãéá ôï ðñüãñáììá ïäÞãçóçò, þóôå íá ÷ñçóéìïðïéÞóåôå ôç óùóôÞ óýíôáîç. Ç áêñéâÞò óýíôáîç ãéá êÜèå õðïóôçñéæüìåíç êÜñôá Þ÷ïõ óôï áñ÷åßï ñõèìßóåùí ðõñÞíá, ìðïñåß íá âñåèåß åðßóçò óôï áñ÷åßï `/usr/src/sys/conf/NOTES`.

Ãéá êÜñôá Þ÷ïõ ôýðïõ ISA ðïõ äåí åßíáé Plug’N’Play ìðïñåß íá ÷ñåéáóôåß íá äþóåôå óôïí ðõñÞíá ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ñõèìßóåéò ôçò (üðùò ôï IRQ, èýñá I/O êëð), üðùò ãßíåôáé ôõðéêÜ óå áõôÝò ôéò ðåñéðôþóåéò. Áõôü ìðïñåß íá ãßíåé ìÝóù ôïõ áñ÷åßïõ `/boot/device.hints`. ÊáôÜ ôç äéáäéêáóßá ôçò åêêßíçóçò, ï loader(8) èá äéáâÜóåé ôï áñ÷åßï êáé èá ìåôáâéâÜóåé ôéò ñõèìßóåéò óôïí ðõñÞíá. Ãéá ðáñÜäåéãìá, ìéá ðáëéÜ Creative SoundBlaster 16 ISA ìç-PnP êÜñôá ÷ñçóéìïðïéåß ôï ðñüãñáììá ïäÞãçóçò snd_sbc(4) óå óõíäõáóìü ìå ôï `snd_sb16`. Ãéá ôçí êÜñôá áõôÞ ðñÝðåé íá ðñïóôåèïýí ïé ðáñáêÜôù ãñáììÝò óôï áñ÷åßï ñõèìßóåùí ðõñÞíá:

```
device snd_sbc
device snd_sb16
```

êáé ïé ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/boot/device.hints`:

```
hint.sbc.0.at="isa"
hint.sbc.0.port="0x220"
hint.sbc.0.irq="5"
hint.sbc.0.drq="1"
hint.sbc.0.flags="0x15"
```

Óôçí ðåñßðôùóç áõôÞ, ç êÜñôá ÷ñçóéìïðïéåß ôç èýñá I/O `0x220` êáé ôï IRQ `5`.

Ç óýíôáîç ðïõ ÷ñçóéìïðïéåßôáé óôï áñ÷åßï `/boot/device.hints` åîçãåßôáé óôç óåëßäá manual ôïõ sound(4) êáèþò êáé óôç óåëßäá manual ôïõ áíôßóôïé÷ïõ ðñïãñÜììáôïò ïäÞãçóçò.

Ïé ñõèìßóåéò ðïõ öáßíïíôáé ðáñáðÜíù åßíáé ïé ðñïåðéëåãìÝíåò. Óå ïñéóìÝíåò ðåñéðôþóåéò, ìðïñåß íá ÷ñåéáóôåß íá áëëÜîåôå ôï IRQ Þ Üëëåò ñõèìßóåéò þóôå íá ôáéñéÜæïõí ìå ôéò ñõèìßóåéò ôçò êÜñôáò óáò. Äåßôå ôç óåëßäá manual ôçò snd_sbc(4) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí êÜñôá áõôÞ.

8.2.2 ÄïêéìÜæïíôáò ôçí ÊÜñôá ¹÷ïõ

Áöïý êÜíåôå åðáíåêêßíçóç ìå ôïí íÝï ðõñÞíá (Þ áöïý öïñôþóåôå ôï áðáñáßôçôï module), Èá ðñÝðåé íá äåßôå ìçíýìáôá ó÷åôéêÜ ìå ôçí êÜñôá Þ÷ïõ óôçí ðñïóùñéíÞ ìíÞìç (buffer) êáôáãñáöÞò ôïõ óõóôÞìáôïò (dmesg(8)) áíôßóôïé÷á ìå ôá ðáñáêÜôù:

```
pcm0: <Intel ICH3 (82801CA)> port 0xdc80-0xdcbf,0xd800-0xd8ff irq 5 at device 31.5 on pci0
pcm0: [GIANT-LOCKED]
pcm0: <Cirrus Logic CS4205 AC97 Codec>
```

Ç êáôÜóôáóç ôçò êÜñôáò Þ÷ïõ ìðïñåß íá åëåã÷èåß ìÝóù ôïõ áñ÷åßïõ `/dev/sndstat`:

```
# cat /dev/sndstat
FreeBSD Audio Driver (newpcm)
Installed devices:
pcm0: <Intel ICH3 (82801CA)> at io 0xd800, 0xdc80 irq 5 bufsz 16384
```

```
kld snd_ich (1p/2r/0v channels duplex default)
```

Ôá ìçíýìáôá óôï óýóôçìá óáò ìðïñåß íá åßíáé äéáöïñåôéêÜ. Áí äåí äåßôå óõóêåõÝò ôýðïõ `pcm`, åðéóôñÝøôå êáé åëÝãîôå ôá âÞìáôá ðïõ êÜíáôå ðñïçãïõìÝíùò. ÊïéôÜîôå ôï áñ÷åßï ñõèìßóåùí ðõñÞíá êáé âåâáéùèåßôå üôé Ý÷åôå åðéëÝîåé ôï óùóôü ðñüãñáììá ïäÞãçóçò. Ãéá óõíÞèç ðñïâëÞìáôá êáé ôçí áíôéìåôþðéóç ôïõò, äåßôå ôï ôìÞìá ÔìÞìá 8.2.2.1.

Áí üëá ðÜíå êáëÜ, ç êÜñôá Þ÷ïõ óáò èá ëåéôïõñãåß. Áí ï ïäçãüò CD Þ DVD ðïõ äéáèÝôåôå åßíáé óõíäåìÝíïò ìå ôçí êÜñôá Þ÷ïõ ìÝóù ôçò áíáëïãéêÞò ôïõ åîüäïõ, ìðïñåßôå íá âÜëåôå Ýíá ìïõóéêü CD êáé íá ôï áíáðáñÜãåôå ìå ôï ðñüãñáììá cdcontrol(1):

```
% cdcontrol -f /dev/acd0 play 1
```

¶ëëåò åöáñìïãÝò, üðùò ôï `audio/workman` ðáñÝ÷ïõí öéëéêüôåñï ðåñéâÜëëïí åñãáóßáò. ºóùò èÝëåôå íá åãêáôáóôÞóåôå ìéá åöáñìïãÞ üðùò ôï `audio/mpg123` ãéá íá áíáðáñÜãåôå áñ÷åßá Þ÷ïõ MP3.

¸íáò Üëëïò ãñÞãïñïò ôñüðïò ãéá íá åëÝãîåôå ôçí êÜñôá Þ÷ïõ óáò, åßíáé íá óôåßëåôå äåäïìÝíá óôçí óõóêåõÞ `/dev/dsp`, üðùò ðáñáêÜôù:

```
% cat filename > /dev/dsp
```

üðïõ ôï *`filename`* ìðïñåß íá åßíáé ïðïéïäÞðïôå áñ÷åßï. Ç ðáñáðÜíù åíôïëÞ èá ðñÝðåé íá ðáñÜãåé êÜðïéï Þ÷ï (èüñõâï) åðéâåâáéþíïíôáò ôç óùóôÞ ëåéôïõñãßá ôçò êÜñôáò Þ÷ïõ.

> **Óçìåßùóç:** Ôá áñ÷åßá óõóêåõþí `/dev/dsp*` äçìéïõñãïýíôáé áõôüìáôá üôáí ÷ñåéÜæïíôáé. Äåí õðÜñ÷ïõí áí äåí ÷ñçóéìïðïéïýíôáé êáé äåí èá åìöáíéóôïýí óôçí Ýîïäï ôçò ls(1)

Ç Ýíôáóç Þ÷ïõ ôçò êÜñôáò ìðïñåß íá áëëÜîåé ìÝóù ôçò åíôïëÞò mixer(8). Ðåñéóóüôåñåò ðëçñïöïñßåò ìðïñåßôå íá âñåßôå óôçí óåëßäá ôïõ manual ôçò mixer(8).

8.2.2.1 ÓõíçèéóìÝíá ÐñïâëÞìáôá

Ðñüâëçìá	**Ëýóç**
`sb_dspwr(XX) timed out`	Äåí åßíáé óùóôÜ ñõèìéóìÝíç ç èýñá I/O.
`bad irq XX`	Ôï IRQ äåí åßíáé óùóôÜ ñõèìéóìÝíï. Âåâáéùèåßôå üôé ôï IRQ ðïõ Ý÷åôå äçëþóåé åßíáé ôï ßäéï ìå áõôü ðïõ Ý÷åé ñõèìéóôåß óôçí êÜñôá.
`xxx: gus pcm not attached, out of memory`	Äåí õðÜñ÷åé áñêåôÞ äéáèÝóéìç ìíÞìç ãéá íá ãßíåé ÷ñÞóç ôçò óõóêåõÞò.
`xxx: can't open /dev/dsp!`	ÅëÝãîôå ìå ôçí âïÞèåéá ôçò åíôïëÞò `fstat | grep dsp` áí êÜðïéá Üëëç åöáñìïãÞ áðáó÷ïëåß ôç óõãêåêñéìÝíç óõóêåõÞ. ÓõíÞèåéò ýðïðôïé åßíáé ç åöáñìïãÞ **esound** êáèþò êáé ôï óýóôçìá õðïóôÞñéîçò Þ÷ïõ ôïõ ðåñéâÜëëïíôïò **KDE**.

¸íá áêüìá ðñüâëçìá äçìéïõñãåßôáé áðü ïñéóìÝíåò óýã÷ñïíåò êÜñôåò ãñáöéêþí ïé ïðïßåò ðåñéÝ÷ïõí ìéá äéêÞ ôïõò óõóêåõÞ Þ÷ïõ ãéá ÷ñÞóç ìÝóù óõíäÝóåùí HDMI Þ áíôßóôïé÷ùí. Óå ïñéóìÝíåò ðåñéðôþóåéò, åßíáé ðéèáíüí áõôÞ ç óõóêåõÞ íá åíôïðéóèåß ðñéí ôçí êáíïíéêÞ êÜñôá Þ÷ïõ ìå áðïôÝëåóìá íá ðÜñåé ôç èÝóç ôçò ðñïåðéëåãìÝíçò óõóêåõÞò

Þ÷ïõ. Ãéá íá åëÝãîåôå áí óõìâáßíåé áõôü, åêôåëÝóôå ôçí åíôïëÞ **dmesg** êáé øÜîôå ãéá ôç ëÝîç `pcm`. Ç Ýîïäïò èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
...
hdac0: HDA Driver Revision: 20100226_0142
hdac1: HDA Driver Revision: 20100226_0142
hdac0: HDA Codec #0: NVidia (Unknown)
hdac0: HDA Codec #1: NVidia (Unknown)
hdac0: HDA Codec #2: NVidia (Unknown)
hdac0: HDA Codec #3: NVidia (Unknown)
pcm0: <HDA NVidia (Unknown) PCM #0 DisplayPort> at cad 0 nid 1 on hdac0
pcm1: <HDA NVidia (Unknown) PCM #0 DisplayPort> at cad 1 nid 1 on hdac0
pcm2: <HDA NVidia (Unknown) PCM #0 DisplayPort> at cad 2 nid 1 on hdac0
pcm3: <HDA NVidia (Unknown) PCM #0 DisplayPort> at cad 3 nid 1 on hdac0
hdac1: HDA Codec #2: Realtek ALC889
pcm4: <HDA Realtek ALC889 PCM #0 Analog> at cad 2 nid 1 on hdac1
pcm5: <HDA Realtek ALC889 PCM #1 Analog> at cad 2 nid 1 on hdac1
pcm6: <HDA Realtek ALC889 PCM #2 Digital> at cad 2 nid 1 on hdac1
pcm7: <HDA Realtek ALC889 PCM #3 Digital> at cad 2 nid 1 on hdac1
...
```

Óôï ðáñÜäåéãìá ìáò, ç êÜñôá ãñáöéêþí (`NVidia`) åíôïðßóôçêå ðñéí ôçí êáíïíéêÞ êÜñôá Þ÷ïõ (`Realtek ALC889`). Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí ðñáãìáôéêÞ êÜñôá Þ÷ïõ ùò ôçí ðñïåðéëåãìÝíç óõóêåõÞ Þ÷ïõ, áëëÜîôå ôï `hw.snd.default_unit` üðùò öáßíåôáé ðáñáêÜôù:

```
# sysctl hw.snd.default_unit=n
```

Ôï *n* åßíáé ï áñéèìüò ôçò óõóêåõÞò ðïõ èá ÷ñçóéìïðïéçèåß, óôï ðáñÜäåéãìá ìáò ôï 4. ÐñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/sysctl.conf` ãéá íá ãßíåé ìüíéìç áõôÞ ç áëëáãÞ:

```
hw.snd.default_unit=4
```

8.2.3 ×ñçóéìïðïéþíôáò ÐïëëáðëÝò ÐçãÝò ^{1}÷ïõ

ÓõíåéóöïñÜ áðü ôïí Munish Chopra.

Åßíáé ðïëëÝò öïñÝò åðéèõìçôü íá Ý÷ïõìå ðïëëáðëÝò ðçãÝò Þ÷ïõ ðïõ íá áíáðáñÜãïíôáé ôáõôü÷ñïíá, üðùò üôáí ãéá ðáñÜäåéãìá ôï **esound** Þ ôï **artsd** äåí åðéôñÝðïõí êïéíÞ ÷ñÞóç ôçò óõóêåõÞò Þ÷ïõ óå êÜðïéá óõãêåêñéìÝíç åöáñìïãÞ.

Ôï FreeBSD åðéôñÝðåé áõôÞ ôç ëåéôïõñãßá ìÝóù ôùí *Åéêïíéêþí Êáíáëéþí ^{1}÷ïõ (Virtual Sound Channels)*, ôá ïðïßá ìðïñïýí íá åíåñãïðïéçèïýí ìÝóù ôùí äõíáôïôÞôùí ðïõ ðáñÝ÷ïíôáé áðü ôï sysctl(8). Ôá ÅéêïíéêÜ ÊáíÜëéá óáò åðéôñÝðïõí íá ðïëõðëÝîåôå ôïõò Þ÷ïõò ðïõ áíáðáñÜãåé ç êÜñôá óáò, áíáìéãíýïíôáò ôïí Þ÷ï óôïí ðõñÞíá.

Ãéá íá ñõèìßóåôå ôï ðëÞèïò ôùí åéêïíéêþí êáíáëéþí, õðÜñ÷ïõí ôñåéò ñõèìßóåéò sysctl ðïõ ìðïñïýí íá ãßíïõí áí åßóôå ï ÷ñÞóôçò `root`, üðùò öáßíåôáé ðáñáêÜôù:

```
# sysctl dev.pcm.0.play.vchans=4
# sysctl dev.pcm.0.rec.vchans=4
# sysctl hw.snd.maxautovchans=4
```

Ôï ðáñáðÜíù ðáñÜäåéãìá ðáñá÷ùñåß ôÝóóåñá åéêïíéêÜ êáíÜëéá, ôá ïðïßá Üíåôá åðáñêïýí ãéá êáèçìåñéíÞ ÷ñÞóç. Ïé ôéìÝò `dev.pcm.0.play.vchans=4` êáé `dev.pcm.0.rec.vchans=4` áíáöÝñïíôáé óôïí áñéèìü ôùí åéêïíéêþí êáíáëéþí ðïõ äéáèÝôåé ç óõóêåõÞ `pcm0` ãéá áíáðáñáãùãÞ êáé åããñáöÞ, êáé ìðïñïýí íá ñõèìéóôïýí ìåôÜ ôçí ðñïóÜñôçóç ôçò óõóêåõÞò. Ç ìåôáâëçôÞ `hw.snd.maxautovchans` åßíáé ï áñéèìüò ôùí åéêïíéêþí êáíáëéþí ðïõ ðáñá÷ùñïýíôáé óå ìéá íÝá óõóêåõÞ Þ÷ïõ üôáí áõôÞ ðñïóáñôÜôáé ìÝóù ôçò åíôïëÞò kldload(8). Êáèþò ôï module `pcm` ìðïñåß íá öïñôùèåß áíåîÜñôçôá áðü ôá ðñïãñÜììáôá ïäÞãçóçò ôïõ õëéêïý, ôï `hw.snd.maxautovchans` ìðïñåß íá áðïèçêåýóåé ôï ìÝãéóôï ðëÞèïò ôùí åéêïíéêþí êáíáëéþí ðïõ èá ðáñá÷ùñçèïýí óå üóåò óõóêåõÝò Þ÷ïõ ðñïóáñôçèïýí áñãüôåñá. Äåßôå ôç óåëßäá manual pcm(4) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

> **Óçìåßùóç:** Äåí ìðïñåßôå íá áëëÜîåôå ôïí áñéèìü ôùí åéêïíéêþí êáíáëéþí ìéáò óõóêåõÞò üóï áõôÞ åßíáé óå ÷ñÞóç. Ðñþôá êëåßóôå üóá ðñïãñÜììáôá ÷ñçóéìïðïéïýí ôç óõóêåõÞ, üðùò ðñïãñÜììáôá áíáðáñáãùãÞò ìïõóéêÞò Þ äáßìïíåò Þ÷ïõ.

Ç óùóôÞ óõóêåõÞ `pcm` áðïäßäåôáé áõôüìáôá êáé äéÜöáíá óå êÜèå ðñüãñáììá ðïõ æçôÜ íá ÷ñçóéìïðïéÞóåé ôï `/dev/dsp0`.

8.2.4 Ñõèìßæïíôáò ÐñïåðéëåãìÝíåò ÔéìÝò ãéá ôá ÊáíÜëéá ôïõ Ìßêôç

ÓõíåéóöïñÜ áðü ôïí Josef El-Rayes.

Ïé ðñïåðéëåãìÝíåò ôéìÝò ãéá ôá äéÜöïñá êáíÜëéá ôïõ ìßêôç, åßíáé åíóùìáôùìÝíåò óôïí ðçãáßï êþäéêá ôïõ ðñïãñÜììáôïò ïäÞãçóçò pcm(4). ÕðÜñ÷ïõí ðïëëÝò äéáöïñåôéêÝò åöáñìïãÝò êáé äáßìïíåò ðïõ óáò åðéôñÝðïõí íá áëëÜîåôå ôéìÝò óôïí ìßêôç, áðïìíçìïíåýïíôáò ôéò ìåôáîý äéáäï÷éêþí êëÞóåùí, áëëÜ Þ ëýóç áõôÞ äåí åßíáé êáé ç êáëýôåñç. Åßíáé äõíáôüí íá ïñßóåôå ðñïåðéëåãìÝíåò ôéìÝò ìßîçò óå åðßðåäï ðñïãñÜììáôïò ïäÞãçóçò. Áõôü ìðïñåß íá åðéôåõ÷èåß ìå ôçí ñýèìéóç êáôÜëëçëùí ôéìþí óôï áñ÷åßï `/boot/device.hints`, ð.÷.:

```
hint.pcm.0.vol="50"
```

Ôï ðáñáðÜíù ñõèìßæåé ôçí Ýíôáóç ôïõ Þ÷ïõ óôçí ðñïåðéëåãìÝíç ôéìÞ 50, üôáí öïñôùèåß ôï module pcm(4).

8.3 ¹÷ïò MP3

ÓõíåéóöïñÜ áðü ôïí Chern Lee.

Ôá áñ÷åßá Þ÷ïõ MP3 (MPEG Layer 3 Audio) åðéôõã÷Üíïõí ðïéüôçôá Þ÷ïõ ðïëý êïíôÜ óôï ìïõóéêü CD, êáé åßíáé êáëü íá Ý÷åôå äõíáôüôçôá áíáðáñáãùãÞò ôïõò óôï FreeBSD óýóôçìá óáò.

8.3.1 ÐñïãñÜììáôá ÁíáðáñáãùãÞò MP3

Ôï ðéï äçìïöéëÝò, ìå ìåãÜëç äéáöïñÜ, ðñüãñáììá áíáðáñáãùãÞò MP3 ãéá ôï ×11, åßíáé ç åöáñìïãÞ **XMMS** (X Multimedia System). Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá skins ôïõ **Winamp** ìå ôï **XMMS** êáèþò ôï ãñáöéêü ôïõ ðåñéâÜëëïí åßíáé ó÷åäüí üìïéï ìå ôï **Winamp** ôçò Nullsoft. Ôï **XMMS** Ý÷åé åðßóçò åíóùìáôùìÝíç äõíáôüôçôá ÷ñÞóçò plug-ins.

Ôï **XMMS** ìðïñåß íá åãêáôáóôáèåß áðü ôï port `multimedia/xmms` Þ áðü ðáêÝôï.

Ôï ðåñéâÜëëïí ôïõ **XMMS** ôï êáèéóôÜ åýêïëï óôç ÷ñÞóç, êáèþò äéáèÝôåé ëßóôá áíáðáñáãùãÞò (playlist), ãñáöéêü éóïóôáèìéóôÞ êáé Üëëåò ëåéôïõñãßåò. ¼óïé åßíáé åîïéêåéùìÝíïé ìå ôï **Winamp** èá âñïõí ôï **XMMS** áðëü óôç ÷ñÞóç ôïõ.

Ôï port `audio/mpg123` åßíáé Ýíá åíáëëáêôéêü ðñüãñáììá áíáðáñáãùãÞò MP3 ìÝóù ôçò ãñáììÞò åíôïëþí.

Ôï **mpg123** ìðïñåß íá åêôåëåóôåß êáèïñßæïíôáò ôç óõóêåõÞ Þ÷ïõ êáé ôï áñ÷åßï MP3 óôç ãñáììÞ åíôïëþí. Èåùñþíôáò üôé ç óõóêåõÞ Þ÷ïõ åßíáé ôï `/dev/dsp1.0` êáé èÝëåôå íá áíáðáñÜãåôå ôï áñ÷åßï *`Foobar-GreatestHits.mp3`*, èá ÷ñçóéìïðïéÞóåôå ôçí ðáñáêÜôù åíôïëÞ:

```
# mpg123 -a /dev/dsp1.0 Foobar-GreatestHits.mp3
High Performance MPEG 1.0/2.0/2.5 Audio Player for Layer 1, 2 and 3.
Version 0.59r (1999/Jun/15). Written and copyrights by Michael Hipp.
Uses code from various people. See 'README' for more!
THIS SOFTWARE COMES WITH ABSOLUTELY NO WARRANTY! USE AT YOUR OWN RISK!






Playing MPEG stream from Foobar-GreatestHits.mp3 ...
MPEG 1.0 layer III, 128 kbit/s, 44100 Hz joint-stereo
```

8.3.2 ÁðïèÞêåõóç (Rip) Áñ÷åßùí áðü ÌïõóéêÜ CD

Ðñéí êùäéêïðïéÞóåôå Ýíá ïëüêëçñï CD Þ Ýíá êïììÜôé áðü CD óå áñ÷åßï MP3, èá ðñÝðåé íá áíôéãñÜøåôå ôá ìïõóéêÜ äåäïìÝíá áðü ôï CD óôï óêëçñü óáò äßóêï. Áõôü ãßíåôáé ãñÜöïíôáò ôá äåäïìÝíá ôýðïõ CDDA (CD Digital Audio) óå áñ÷åßá WAV.

Ôï åñãáëåßï `cdda2wav`, ôï ïðïßï áíÞêåé óôç óõëëïãÞ åñãáëåßùí `sysutils/cdrtools` ìðïñåß íá ÷ñçóéìïðïéçèåß ôüóï ãéá ôçí áíÜêôçóç ôùí äåäïìÝíùí Þ÷ïõ áðü ìïõóéêÜ CD, üóï êáé ðëçñïöïñéþí ðïõ ó÷åôßæïíôáé ìå áõôÜ.

¸÷ïíôáò ôï ìïõóéêü CD óôïí ïäçãü, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí áêüëïõèç åíôïëÞ (ùò `root`) ãéá íá áðïèçêåýóåôå Ýíá ïëüêëçñï CD óå ÷ùñéóôÜ (áíÜ êïììÜôé) áñ÷åßá WAV:

```
# cdda2wav -D 0,1,0 -B
```

Ôï **cdda2wav** õðïóôçñßæåé ïäçãïýò CDROM ôýðïõ ATAPI (IDE). Ãéá íá äéáâÜóåôå äåäïìÝíá áðü ìéá óõóêåõÞ IDE, ÷ñçóéìïðïéÞóôå ôï üíïìá óõóêåõÞò áíôß ãéá ôïí áñéèìü ìïíÜäáò SCSI. Ãéá ðáñÜäåéãìá, ãéá íá áðïèçêåýóåôå ôï êïììÜôé 7 áðü Ýíá ïäçãü IDE:

```
# cdda2wav -D /dev/acd0 -t 7
```

Ôï `-D 0,1,0` äåß÷íåé ôç óõóêåõÞ SCSI `0,1,0`, ðïõ áíôéóôïé÷åß óôçí Ýîïäï ôçò åíôïëÞò `cdrecord -scanbus`.

Ãéá íá äéáâÜóåôå ìåìïíùìÝíá êïììÜôéá, ÷ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-t` üðùò öáßíåôáé ðáñáêÜôù:

```
# cdda2wav -D 0,1,0 -t 7
```

Ôï ðáñÜäåéãìá áõôü äéáâÜæåé ôï êïììÜôé åðôÜ ôïõ ìïõóéêïý CD. Ãéá íá äéáâÜóåôå ìéá óåéñÜ áðü êïììÜôéá, ãéá ðáñÜäåéãìá áðü ôï Ýíá ùò ôï åðôÜ, êáèïñßóôå ìéá ðåñéï÷Þ:

```
# cdda2wav -D 0,1,0 -t 1+7
```

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôï âïçèçôéêü ðñüãñáììá dd(1) ãéá íá äéáâÜóåôå ìïõóéêÜ êïììÜôéá áðü ïäçãïýò ATAPI. ÄéáâÜóôå ôï ÔìÞìá 19.6.5 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÞ ôç äõíáôüôçôá.

8.3.3 Êùäéêïðïéþíôáò MP3

Óôéò ìÝñåò ìáò, ôï ðñïôéìþìåíï ðñüãñáììá êùäéêïðïßçóçò åßíáé ôï **Lame**. Ìðïñåßôå íá ôï âñåßôå óôç óõëëïãÞ ôùí ports, óôï `audio/lame`.

×ñçóéìïðïéþíôáò ôá áñ÷åßá WAV ðïõ Ý÷åôå áðïèçêåýóåé, ìðïñåßôå íá ìåôáôñÝøåôå ôï áñ÷åßï *`audio01.wav`* óå *`audio01.mp3`* ìå ôçí åíôïëÞ:

```
# lame -h -b 128 \
--tt "Foo Song Title" \
--ta "FooBar Artist" \
--tl "FooBar Album" \
--ty "2001" \
--tc "Ripped and encoded by Foo" \
--tg "Genre" \
audio01.wav audio01.mp3
```

Ôá 128 kbits åßíáé ç ôõðéêÜ ÷ñçóéìïðïéïýìåíç ðïéüôçôá ãéá áñ÷åßá MP3. Ùóôüóï, ðïëëïß ðñïôéìïýí ìåãáëýôåñç ðïéüôçôá üðùò 160 Þ 192. ¼óï ìåãáëýôåñïò åßíáé ï ñõèìüò äåäïìÝíùí (bitrate), ôüóï ðåñéóóüôåñï ÷þñï áðïèÞêåõóçò èá ÷ñåéÜæåôáé ôï áñ÷åßï MP3 ðïõ èá ðñïêýøåé, ùóôüóï êáé ç ðïéüôçôá èá åßíáé õøçëüôåñç. Ç åðéëïãÞ `-h` åíåñãïðïéåß ôç ëåéôïõñãßá "õøçëüôåñçò ðïéüôçôáò áëëÜ åëáöñÜ ðéï áñãÞò êùäéêïðïßçóçò". Ïé åðéëïãÝò ðïõ îåêéíïýí ìå `--t` äåß÷íïõí åôéêÝôåò (tags) ID3, ïé ïðïßåò óõíÞèùò ðåñéÝ÷ïõí ðëçñïöïñßåò ó÷åôéêÝò ìå ôï ôñáãïýäé êáé ïé ïðïßåò ìðïñïýí íá åíóùìáôùèïýí ìÝóá óå áñ÷åßá MP3. Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò åðéëïãÝò ó÷åôéêÜ ìå ôçí êùäéêïðïßçóç, áí óõìâïõëåõôåßôå ôç óåëßäá manual ôïõ ðñïãñÜììáôïò **lame**.

8.3.4 Áðïêùäéêïðïéþíôáò MP3

Ãéá íá ìðïñÝóåôå íá ãñÜøåôå ìïõóéêü CD áðü áñ÷åßá MP3, èá ðñÝðåé íá ôá ìåôáôñÝøåôå îáíÜ óå ìïñöÞ áóõìðßåóôïõ áñ÷åßïõ WAV. Ôüóï ôï **XMMS** üóï êáé ôï **mpg123** õðïóôçñßæïõí åîáãùãÞ áñ÷åßïõ MP3 óå áóõìðßåóôç ìïñöÞ áñ÷åßïõ.

ÃñÜöïíôáò óôï Äßóêï ìÝóù ôïõ **XMMS**:

1. ÎåêéíÞóôå ôï **XMMS**.
2. ÊÜíôå äåîß êëéê óôï ðáñÜèõñï ôçò åöáñìïãÞò ãéá íá áíïßîåôå ôï ìåíïý ôïõ **XMMS**.
3. ÅðéëÝîôå `Preferences` áðü ôá `Options`.
4. ÁëëÜîôå ôï Output Plugin óå "Disk Writer Plugin".
5. ÐéÝóôå `Configure`.
6. ÃñÜøôå (Þ åðéëÝîôå browse) Ýíá êáôÜëïãï ãéá íá áðïèçêåýóåôå ôá áðïóõìðéåóìÝíá áñ÷åßá.
7. Öïñôþóôå ôï áñ÷åßï MP3 óôï **XMMS** üðùò óõíÞèùò, ìå ôçí Ýíôáóç óôï 100% êáé ôéò ñõèìßóåéò EQ áíåíåñãÝò.
8. ÐéÝóôå ôï `Play`. Ôï **XMMS** èá öáßíåôáé üôé áíáðáñÜãåé ôï MP3, áëëÜ äåí èá áêïýãåôáé êáíåßò Þ÷ïò. Óôçí ðñáãìáôéêüôçôá áíáðáñÜãåé ôï MP3 óå áñ÷åßï.
9. ¼ôáí ôåëåéþóåôå, âåâáéùèåßôå üôé åðáíáöÝñáôå ôç ñýèìéóç ôïõ ðñïåðéëåãìÝíïõ Output Plugin óôçí ðñïçãïýìåíç åðéëïãÞ ôçò, ãéá íá ìðïñÝóåôå íá áêïýóåôå îáíÜ áñ÷åßá MP3.

ÃñÜöïíôáò óôçí Ýîïäï ìÝóù ôïõ **mpg123**:

1. ÅêôåëÝóôå `mpg123 -s audio01.mp3 > audio01.pcm`

Ôï **XMMS** ãñÜöåé áñ÷åßá óå ìïñöÞ WAV, åíþ ôï **mpg123** ìåôáôñÝðåé ôï MP3 óå ìç- åðåîåñãáóìÝíá (raw) äåäïìÝíá Þ÷ïõ PCM. Êáé ïé äýï áõôÝò ìïñöÝò ìðïñïýí íá ÷ñçóéìïðïéçèïýí ìå ôçí åöáñìïãÞ **cdrecord** ãéá ôç äçìéïõñãßá ìïõóéêþí CD. Ãéá ôçí åöáñìïãÞ burncd(8) èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå äåäïìÝíá PCM. Áí ÷ñçóéìïðïéÞóåôå áñ÷åßá WAV èá ðáñáôçñÞóåôå Ýíá ìéêñü Þ÷ï (tick) óôçí áñ÷Þ êÜèå êïììáôéïý. Ï Þ÷ïò áõôüò ðñïÝñ÷åôáé áðü ôçí åðéêåöáëßäá (header) ôïõ áñ÷åßïõ WAV. Ìðïñåßôå íá áöáéñÝóåôå ôçí åðéêåöáëßäá ìå ôç âïÞèåéá ôïõ ðñïãñÜììáôïò **SoX** (ìðïñåßôå íá ôï åãêáôáóôÞóåôå áðü ôï port `audio/sox` Þ ôï áíôßóôïé÷ï ðáêÝôï):

```
% sox -t wav -r 44100 -s -w -c 2 track.wav track.raw
```

ÄéáâÜóôå ôï ÔìÞìá 19.6 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ÷ñÞóç CD åããñáöÞò óôï FreeBSD

8.4 ÁíáðáñáãùãÞ Video

ÓõíåéóöïñÜ áðü ôïí Ross Lippert.

Ç áíáðáñáãùãÞ video åßíáé ìéá êáéíïýñéá êáé ñáãäáßá áíáðôõóóüìåíç ðåñéï÷Þ åöáñìïãþí. Èá ÷ñåéáóôåß íá äåßîåôå õðïìïíÞ. Äåí ðñüêåéôáé íá ëåéôïõñãÞóïõí üëá ôüóï ïìáëÜ üðùò óôïí Þ÷ï.

Ðñéí îåêéíÞóåôå, èá ðñÝðåé íá ãíùñßæåôå ôï ìïíôÝëï ôçò êÜñôáò ãñáöéêþí ðïõ Ý÷åôå êáèþò êáé ôï ïëïêëçñùìÝíï êýêëùìá ðïõ ÷ñçóéìïðïéåß. Áí êáé ôï **Xorg** õðïóôçñßæåé ìåãÜëç ãêÜìá áðü êÜñôåò ãñáöéêþí, áõôÝò ðïõ ðáñÝ÷ïõí êáëÞ áðüäïóç åßíáé ëéãüôåñåò. Ãéá íá ðÜñåôå ìéá ëßóôá ôùí åêôåôáìÝíùí äõíáôïôÞôùí ðïõ õðïóôçñßæïíôáé áðü ôçí êÜñôá óáò, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ xdpyinfo(1) ôçí þñá ðïõ åêôåëåßôáé ôá X11.

Åßíáé ãåíéêÜ êáëÞ éäÝá íá Ý÷åôå Ýíá ìéêñü áñ÷åßï MPEG ôï ïðïßï ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá äïêéìÝò äéáöïñåôéêþí ðåéêôþí êáé ðñïãñáììÜôùí áíáðáñáãùãÞò. ÊÜðïéá ðñïãñÜììáôá áíáðáñáãùãÞò DVD áíáæçôïýí áðü ðñïåðéëïãÞ ôï äßóêï DVD óôç óõóêåõÞ `/dev/dvd`. Óå ïñéóìÝíá ôï üíïìá ôçò óõóêåõÞò åßíáé åíóùìáôùìÝíï óôïí êþäéêá ôïõ ðñïãñÜììáôïò. Ãéá ôï ëüãï áõôü, ßóùò åßíáé ÷ñÞóéìï íá öôéÜîåôå óõìâïëéêÝò óõíäÝóåéò ðñïò ôéò ðñáãìáôéêÝò óõóêåõÝò:

```
# ln -sf /dev/acd0 /dev/dvd
# ln -sf /dev/acd0 /dev/rdvd
```

Óçìåéþóôå üôé ëüãù ôçò öýóçò ôïõ óõóôÞìáôïò devfs(5), áõôïý ôïõ åßäïõò ïé óõíäÝóåéò äåí ðáñáìÝíïõí ìåôÜ ôçí åðáíåêêßíçóç ôïõ óõóôÞìáôïò óáò. Ãéá íá äçìéïõñãïýíôáé ïé óõìâïëéêÝò óõíäÝóåéò áõôüìáôá óå êÜèå åêêßíçóç ôïõ óõóôÞìáôïò óáò, ðñïóèÝóôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï `/etc/devfs.conf`:

```
link acd0 dvd
link acd0 rdvd
```

Åðéðñüóèåôá, ç áðïêùäéêïðïßçóç DVD, ç ïðïßá ÷ñåéÜæåôáé êëÞóç åéäéêþí ëåéôïõñãéþí ôïõ DVD-ROM, áðáéôåß êáé Üäåéá åããñáöÞò (write permission) óôéò óõóêåõÝò DVD.

Ãéá ôç âåëôßùóç ôçò ëåéôïõñãßáò ôçò êïéíü÷ñçóôçò ìíÞìçò ôïõ óõóôÞìáôïò X11, óõíßóôáôáé íá áõîÞóåôå ôéò ôéìÝò êÜðïéùí ìåôáâëçôþí sysctl(8):

```
kern.ipc.shmmax=67108864
kern.ipc.shmall=32768
```

8.4.1 Ðñïóáéñåóéìüò ÄõíáôïôÞôùí ÊÜñôáò Ãñáöéêþí

ÕðÜñ÷ïõí áñêåôïß äéáöïñåôéêïß ôñüðïé ãéá ôçí áðåéêüíéóç video óôï X11. Ôï ôé èá äïõëÝøåé ôåëéêÜ, åîáñôÜôáé óå ìåãÜëï âáèìü áðü ôï õëéêü óáò. ÊÜèå ìÝèïäïò ðïõ ðåñéãñÜöïõìå ðáñáêÜôù èá äþóåé äéáöïñåôéêÞ ðïéüôçôá óå äéáöïñåôéêü õëéêü. Åðßóçò, ç áíáðáñáãùãÞ video óôï X11 åßíáé Ýíá èÝìá óôï ïðïßï ðñüóöáôá äßíåôáé ìåãÜëç óçìáóßá, êáé ðéèáíüí èá õðÜñ÷ïõí áñêåôÝò âåëôéþóåéò óå êÜèå íÝá Ýêäïóç ôïõ **Xorg**.

ÊáôÜëïãïò êïéíþí äéåðáöþí video:

1. X11: ÓõíçèéóìÝíç Ýîïäïò ôïõ X11 ìå ÷ñÞóç êïéíü÷ñçóôçò ìíÞìçò.
2. XVideo: ìéá åðÝêôáóç ôçò äéåðáöÞò X11 ðïõ õðïóôçñßæåé áíáðáñáãùãÞ video óå ïðïéáäÞðïôå ó÷åäéÜóéìç åðéöÜíåéá ôïõ X11.
3. SDL: Simple Directmedia Layer.
4. DGA: Direct Graphics Access.
5. SVGAlib: Åðßðåäï ãñáöéêþí ÷áìçëïý åðéðÝäïõ ãéá êïíóüëá.

8.4.1.1 XVideo

Ôï **Xorg** äéáèÝôåé ìéá åðÝêôáóç ðïõ ïíïìÜæåôáé *XVideo* (ãíùóôÞ êáé ùò Xvideo, Xv, xv) êáé ôï ïðïßï åðéôñÝðåé ôçí áðåõèåßáò áðåéêüíéóç video óå ó÷åäéÜóéìá áíôéêåßìåíá ìÝóù åéäéêÞò åðéôÜ÷õíóçò. Ç åðÝêôáóç áõôÞ ðáñÝ÷åé áíáðáñáãùãÞ ðïëý êáëÞò ðïéüôçôáò, áêüìá êáé óå ìç÷áíÞìáôá ÷áìçëþí ðñïäéáãñáöþí.

Ãéá íá äåßôå áí ÷ñçóéìïðïéåßôáé ç åðÝêôáóç, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `xvinfo`:

```
% xvinfo
```

Ôï XVideo õðïóôçñßæåôáé áðü ôçí êÜñôá óáò áí ôï áðïôÝëåóìá äåß÷íåé üðùò ðáñáêÜôù:

```
X-Video Extension version 2.2
screen #0
  Adaptor #0: "Savage Streams Engine"
    number of ports: 1
    port base: 43
    operations supported: PutImage
    supported visuals:
      depth 16, visualID 0x22
      depth 16, visualID 0x23
    number of attributes: 5
      "XV_COLORKEY" (range 0 to 16777215)
              client settable attribute
              client gettable attribute (current value is 2110)
      "XV_BRIGHTNESS" (range -128 to 127)
              client settable attribute
              client gettable attribute (current value is 0)
      "XV_CONTRAST" (range 0 to 255)
              client settable attribute
              client gettable attribute (current value is 128)
      "XV_SATURATION" (range 0 to 255)
              client settable attribute
              client gettable attribute (current value is 128)
      "XV_HUE" (range -180 to 180)
```

```
              client settable attribute
              client gettable attribute (current value is 0)
    maximum XvImage size: 1024 x 1024
    Number of image formats: 7
      id: 0x32595559 (YUY2)
        guid: 59555932-0000-0010-8000-00aa00389b71
        bits per pixel: 16
        number of planes: 1
        type: YUV (packed)
      id: 0x32315659 (YV12)
        guid: 59563132-0000-0010-8000-00aa00389b71
        bits per pixel: 12
        number of planes: 3
        type: YUV (planar)
      id: 0x30323449 (I420)
        guid: 49343230-0000-0010-8000-00aa00389b71
        bits per pixel: 12
        number of planes: 3
        type: YUV (planar)
      id: 0x36315652 (RV16)
        guid: 52563135-0000-0000-0000-000000000000
        bits per pixel: 16
        number of planes: 1
        type: RGB (packed)
        depth: 0
        red, green, blue masks: 0x1f, 0x3e0, 0x7c00
      id: 0x35315652 (RV15)
        guid: 52563136-0000-0000-0000-000000000000
        bits per pixel: 16
        number of planes: 1
        type: RGB (packed)
        depth: 0
        red, green, blue masks: 0x1f, 0x7e0, 0xf800
      id: 0x31313259 (Y211)
        guid: 59323131-0000-0010-8000-00aa00389b71
        bits per pixel: 6
        number of planes: 3
        type: YUV (packed)
      id: 0x0
        guid: 00000000-0000-0000-0000-000000000000
        bits per pixel: 0
        number of planes: 0
        type: RGB (packed)
        depth: 1
        red, green, blue masks: 0x0, 0x0, 0x0
```

ÐáñáôçñÞóôå åðßóçò üôé ôá formats ðïõ åìöáíßæïíôáé (YUV2, YUV12, ê.ë.ð.) äåí äéáôßèåíôáé óå üëåò ôéò åêäüóåéò ôïõ XVideo, êáé ç áðïõóßá ôïõò ìðïñåß íá åðçñåÜóåé êÜðïéá ðñïãñÜììáôá áíáðáñáãùãÞò.

Áí ôï áðïôÝëåóìá äåß÷íåé êÜðùò Ýôóé:

```
X-Video Extension version 2.2
screen #0
no adaptors present
```

Ôüôå ðéèáíþò ôï XVideo äåí õðïóôçñßæåôáé áðü ôçí êÜñôá óáò.

Áí ôï XVideo äåí õðïóôçñßæåôáé áðü ôçí êÜñôá óáò, áõôü óçìáßíåé áðëÜ üôé èá åßíáé ðéï äýóêïëï ï õðïëïãéóôÞò óáò íá áíôáðïêñéèåß óôéò õðïëïãéóôéêÝò áðáéôÞóåéò ôçò áðåéêüíéóçò video. Ùóôüóï, áíÜëïãá ìå ôçí êÜñôá ãñáöéêþí êáé ôïí åðåîåñãáóôÞ óáò, åßíáé áêüìá ðéèáíüí íá Ý÷åôå éêáíïðïéçôéêÞ áíáðáñáãùãÞ. ºóùò ðñÝðåé íá äéáâÜóåôå ìåèüäïõò ãéá ôç âåëôßùóç ôçò áðüäïóçò, óôá ðñï÷ùñçìÝíá èÝìáôá, ÔìÞìá 8.4.3.

8.4.1.2 Ôï Åðßðåäï Simple Directmedia Layer

Ôï Simple Directmedia Layer, SDL, ðñïïñßæïíôáí íá ãßíåé Ýíá åðßðåäï óõìâáôüôçôáò ìåôáîý ôùí Microsoft Windows, BeOS, êáé ôïõ UNIX, åðéôñÝðïíôáò áíÜðôõîç åöáñìïãþí Þ÷ïõ êáé åéêüíáò, êáôÜëëçëåò ãéá êÜèå ìéá áðü áõôÝò ôéò ðëáôöüñìåò (cross-platform). Ôï åðßðåäï SDL ðáñÝ÷åé ÷áìçëïý åðéðÝäïõ ðñüóâáóç óôï õëéêü, êáé óå ïñéóìÝíåò ðåñéðôþóåéò ìðïñåß íá åßíáé ðéï áðïäïôéêü áðü ôçí äéåðáöÞ X11.

Ôï SDL ìðïñåß íá âñåèåß óôï `devel/sdl12`.

8.4.1.3 Ôï Åðßðåäï Direct Graphics Access

Ôï Direct Graphics Access åßíáé ìéá åðÝêôáóç ôïõ X11 ðïõ åðéôñÝðåé óå Ýíá ðñüãñáììá íá ðñïóðåñÜóåé ôïí X server êáé íá áëëÜîåé áðåõèåßáò ôá ðåñéå÷üìåíá ôïõ framebuffer (ìíÞìçò ãñáöéêþí). ÄåäïìÝíïõ üôé âáóßæåôáé óå äéá÷åßñéóç ìíÞìçò ÷áìçëïý åðéðÝäïõ, ôá ðñïãñÜììáôá ðïõ ôï ÷ñçóéìïðïéïýí ðñÝðåé íá åêôåëïýíôáé ùò `root`.

Ç åðÝêôáóç DGA ìðïñåß íá åëåã÷èåß êáé íá ìåôñçèåß ùò ðñïò ôçí áðüäïóç ôçò ìå ôï ðñüãñáììá dga(1). ¼ôáí åêôåëåßôáé ç åíôïëÞ `dga`, áëëÜæåé ôá ÷ñþìáôá ôçò ïèüíçò óå êÜèå ðßåóç åíüò ðëÞêôñïõ. Ãéá íá ôåñìáôßóåôå ôçí åêôÝëåóç, ðéÝóôå **q**.

8.4.2 ÐáêÝôá êáé Ports ðïõ Ó÷åôßæïíôáé ìå Video

Ôï ôìÞìá áõôü ðåñéãñÜöåé ôï ëïãéóìéêü ðïõ äéáôßèåôáé óôçí óõëëïãÞ ôùí ports ôïõ FreeBSD êáé ôï ïðïßï ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá áíáðáñáãùãÞ video. Ï ôïìÝáò ôçò áíáðáñáãùãÞò video åßíáé éäéáßôåñá åíåñãüò üóï áöïñÜ ôçí áíÜðôõîç ëïãéóìéêïý, êáé Ýôóé ïé äõíáôüôçôåò ôùí åöáñìïãþí ðéèáíþò íá áðïêëßíïõí êÜðùò áðü áõôÝò ðïõ ðåñéãñÜöïíôáé åäþ.

Åßíáé áñ÷éêÜ óçìáíôéêü íá ãíùñßæåôå üôé áñêåôÝò áðü ôéò åöáñìïãÝò video ðïõ åêôåëïýíôáé óôï FreeBSD áíáðôý÷èçêáí áñ÷éêÜ ùò åöáñìïãÝò Linux. ÐïëëÝò áðü áõôÝò ôéò åöáñìïãÝò åßíáé áêüìá ðïéüôçôáò beta. ÊÜðïéá áðü ôá ðñïâëÞìáôá ðïõ ìðïñåß íá óõíáíôÞóåôå óôéò åöáñìïãÝò video ôïõ FreeBSD ðåñéëáìâÜíïõí:

1. Ìéá åöáñìïãÞ äåí ìðïñåß íá áíáðáñÜãåé Ýíá áñ÷åßï ðïõ äçìéïõñãÞèçêå áðü êÜðïéá Üëëç.
2. Ìéá åöáñìïãÞ äåí ìðïñåß íá áíáðáñÜãåé Ýíá áñ÷åßï ðïõ äçìéïýñãçóå ç ßäéá.
3. Ç ßäéá åöáñìïãÞ, óå äõï äéáöïñåôéêÜ ìç÷áíÞìáôá, êáé áöïý Ý÷åé ìåôáãëùôôéóôåß óå êÜèå ìç÷Üíçìá åéäéêÜ ãéá áõôü, áíáðáñÜãåé ôï ßäéï áñ÷åßï ìå äéáöïñåôéêü ôñüðï.
4. ÊÜðïéï öáéíïìåíéêÜ áðëüößëôñï, üðùò áõôü ôçò áëëáãÞò ìåãÝèïõò åéêüíáò (rescaling), Ý÷åé ùò áðïôÝëåóìá ôçí äçìéïõñãßá êáêÞò ðïéüôçôáò video (ôå÷íïõñãçìÜôùí) åîáéôßáò ðñïâëçìáôéêÞò ñïõôßíáò ìåãÝèõíóçò
5. ÊÜðïéá åöáñìïãÞ ôåñìáôßæåôáé áðüôïìá óõ÷íÜ.
6. Äåí åãêáèßóôáôáé ç ôåêìçñßùóç ôïõ ðñïãñÜììáôïò êáôÜ ôçí åãêáôÜóôáóç ôïõ port, åíþ ìðïñåß íá âñåèåß åßôå óôï äéêôõáêü ôüðï ôïõ ðñïãñÜììáôïò åßôå óôïí êáôÜëïãï `work` ôïõ port.

ÐïëëÝò áðü ôéò åöáñìïãÝò áõôÝò ìðïñåß åðßóçò íá ðáñïõóéÜóïõí óõìðôþìáôá “Linux-éóìïý”. Ìðïñåß äçë. íá åìöáíßæïõí ðñïâëÞìáôá ðïõ ïöåßëïíôáé óôïí ôñüðï ìå ôïí ïðïßï õëïðïéïýíôáé êÜðïéåò óôÜíôáñ âéâëéïèÞêåò ôéò äéáíïìÝò ôïõ Linux, Þ ßóùò ïé óõããñáöåßò íá Ý÷ïõí èåùñÞóåé ùò äåäïìÝíåò êÜðïéåò äõíáôüôçôåò ôïõ ðõñÞíá üðùò õðÜñ÷ïõí óôï Linux. Ôá ðñïâëÞìáôá áõôÜ äåí åßíáé óßãïõñï üôé áíáêáëýðôïíôáé êáé äéïñèþíïíôáé ðÜíôá áðü ôïõò óõíôçñçôÝò ôïõ port, ôï ïðïßï ìðïñåß íá ïäçãÞóåé óå ðñïâëÞìáôá üðùò ôá ðáñáêÜôù:

1. ×ñÞóç ôïõ áñ÷åßïõ `/proc/cpuinfo` ãéá ôçí áíß÷íåõóç ôùí äõíáôïôÞôùí ôïõ åðåîåñãáóôÞ.
2. ÊáêÞ ÷ñÞóç ôùí threads (íçìÜôùí) ôï ïðïßï ïäçãåß ôï ðñüãñáììá óå êüëëçìá áíôß ãéá êáíïíéêü ôåñìáôéóìü óôï ôÝëïò ôçò åêôÝëåóçò.
3. ×ñÞóç ëïãéóìéêïý ðïõ äåí õðÜñ÷åé áêüìá óôç óõëëïãÞ ôùí ports ôïõ FreeBSD óå óõíäõáóìü ìå ôçí åöáñìïãÞ.

ÌÝ÷ñé óôéãìÞò ïé óõããñáöåßò ôùí åöáñìïãþí áõôþí Ý÷ïõí áðïäå÷èåß óõíåñãÜóéìïé ìå ôïõò óõíôçñçôÝò ôùí ports, þóôå íá åëá÷éóôïðïéçèïýí ïé åðåìâÜóåéò ðïõ ÷ñåéÜæïíôáé ãéá ôçí ìåôáöïñÜ (porting) ôùí åöáñìïãþí.

8.4.2.1 MPlayer

Ï **MPlayer** åßíáé ìéá åöáñìïãÞ áíáðáñáãùãÞò video ðïõ áíáðôý÷èçêå ðñüóöáôá êáé åîåëßóóåôáé ôá÷ýôáôá. Ïé óôü÷ïé ôçò ïìÜäáò áíÜðôõîçò ôïõ **MPlayer** åßíáé ç ôá÷ýôçôá êáé ç åõåëéîßá óôï Linux êáé óôá Üëëá Unix. Ç äçìéïõñãßá ôïõ îåêßíçóå üôáí ï áñ÷çãüò ôçò ïìÜäáò áíÜðôõîçò êïõñÜóôçêå íá áíôéìåôùðßæåé ôá ðñïâëÞìáôá áíáðáñáãùãÞò ôùí ìÝ÷ñé ôüôå äéáèÝóéìùí ðñïãñáììÜôùí. ÊÜðïéïé õðïóôçñßæïõí üôé ôï ãñáöéêü ðåñéâÜëëïí èõóéÜóôçêå ãéá íá äçìéïõñãçèåß ìéá ïìïéüìïñöç ó÷åäßáóç. Ùóôüóï, ìüëéò óõíçèßóåôå ôéò åðéëïãÝò ðïõ äßíïíôáé áðü ôç ãñáììÞ åíôïëþí êáé ôá áíôßóôïé÷á ðëÞêôñá, èá ìðïñÝóåôå íá ôïí ÷ñçóéìïðïéÞóåôå áñêåôÜ êáëÜ.

8.4.2.1.1 Ìåôáãëþôôéóç ôïõ MPlayer

Ï **MPlayer** âñßóêåôáé óôï `multimedia/mplayer`. Ï **MPlayer** êÜíåé ðëÞèïò åëÝã÷ùí ôïõ õëéêïý êáôÜ ôç äéáäéêáóßá ôçò ìåôáãëþôôéóçò, öôéÜ÷íïíôáò Ýôóé Ýíá åêôåëÝóéìï ôï ïðïßï äåí Ý÷åé öïñçôüôçôá áðü Ýíá óýóôçìá óå Ýíá Üëëï. Ãéá ôï óêïðü áõôü, åßíáé óçìáíôéêü íá ôïí åãêáôáóôÞóåôå áðü ôá ports êáé ü÷é áðü Ýôïéìï ðáêÝôï. ÅðéðñüóèåôÜ, ìðïñåßôå íá êáèïñßóåôå ðëÞèïò åðéëïãþí óôçí ãñáììÞ åíôïëþí ôïõ `make` üðùò ðåñéãñÜöåôáé óôï `Makefile` êáé êáôÜ ôçí Ýíáñîç ôçò äéáäéêáóßáò ìåôáãëþôôéóçò:

```
# cd /usr/ports/multimedia/mplayer
# make
N - O - T - E

Take a careful look into the Makefile in order
to learn how to tune mplayer towards you personal preferences!
For example,
make WITH_GTK1
builds MPlayer with GTK1-GUI support.
If you want to use the GUI, you can either install
/usr/ports/multimedia/mplayer-skins
or download official skin collections from
http://www.mplayerhq.hu/homepage/dload.html
```

Ïé ðñïåðéëåãìÝíåò åðéëïãÝò ìÜëëïí åßíáé êáôÜëëçëåò ãéá ôïõò ðåñéóóüôåñïõò ÷ñÞóôåò. Áí ùóôüóï ÷ñåéÜæåóôå ôïí áðïêùäéêïðïéçôÞ XviD, èá ðñÝðåé íá êáèïñßóåôå ôçí åðéëïãÞ `WITH_XVID` óôçí ãñáììÞ åíôïëþí. Ìðïñåßôå åðßóçò íá ïñßóåôå ôçí ðñïåðéëåãìÝíç óõóêåõÞ DVD ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `WITH_DVD_DEVICE`, äéáöïñåôéêÜ èá ÷ñçóéìïðïéçèåß ç ðñïåðéëåãìÝíç óõóêåõÞ `/dev/acd0`.

¼ôáí ãñÜöïíôáí áõôü ôï êåßìåíï, ôï port ôïõ **MPlayer** äçìéïõñãïýóå åðßóçò ôçí ôåêìçñßùóç ôïõ ðñïãñÜììáôïò êáé äýï åêôåëÝóéìá, ôïí `mplayer`, êáé ôïí `mencoder`, ôï ïðïßï åßíáé Ýíá åñãáëåßï ãéá åðáíáêùäéêïðïßçóç video.

Ç HTML ôåêìçñßùóç ôïõ **MPlayer** åßíáé éäéáßôåñá ðëçñïöïñéáêÞ. Áí ï áíáãíþóôçò âñåé üôé ïé ðëçñïöïñßåò áõôïý ôïõ êåöáëáßïõ üóïí áöïñÜ ôï õëéêü êáé ôéò äéåðáöÝò video åßíáé åëëéðåßò, ç ôåêìçñßùóç ôïõ **MPlayer** áðïôåëåß Ýíá éäéáßôåñá áíáëõôéêü óõìðëÞñùìá. Èá ðñÝðåé óßãïõñá íá äéáèÝóåôå ÷ñüíï ãéá íá äéáâÜóåôå ôçí ôåêìçñßùóç ôïõ **MPlayer** áí áíáæçôÜôå ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí õðïóôÞñéîç video óôï UNIX.

8.4.2.1.2 ×ñçóéìïðïéþíôáò ôïí MPlayer

ÊÜèå ÷ñÞóôçò ôïõ **MPlayer** ðñÝðåé íá äçìéïõñãÞóåé Ýíá õðïêáôÜëïãï `.mplayer` ìÝóá óôïí ðñïóùðéêü ôïõ êáôÜëïãï. Ãéá íá äçìéïõñãÞóåôå ôïí áðáñáßôçôï õðïêáôÜëïãï, ìðïñåßôå íá ãñÜøåôå ôï ðáñáêÜôù:

```
% cd /usr/ports/multimedia/mplayer
% make install-user
```

Ïé åðéëïãÝò ôçò ãñáììÞò åíôïëþí ôïõ `mplayer` ðåñéãñÜöïíôáé óôç óåëßäá ôïõ manual. Ãéá áêüìá ðåñéóóüôåñåò ëåðôïìÝñåéåò, õðÜñ÷åé ôåêìçñßùóç óå ìïñöÞ HTML. Óôï ôìÞìá áõôü èá ðåñéãñÜøïõìå ìåñéêÝò ìüíï êïéíÝò ÷ñÞóåéò.

Ãéá íá áíáðáñÜãåôå Ýíá áñ÷åßï, üðùò ôï `testfile.avi`, ìÝóù åíüò áðü ôá áñêåôÜ video interfaces ÷ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-vo`:

```
% mplayer -vo xv testfile.avi

% mplayer -vo sdl testfile.avi

% mplayer -vo x11 testfile.avi

# mplayer -vo dga testfile.avi

# mplayer -vo ’sdl:dga’ testfile.avi
```

Áîßæåé ôïí êüðï íá äïêéìÜóåôå üëåò áõôÝò ôéò åðéëïãÝò, êáèþò ç áðüäïóç ôïõò åîáñôÜôáé áðü ðïëëïýò ðáñÜãïíôåò êáé äéáöïñïðïéåßôáé áñêåôÜ áíÜëïãá ìå ôï õëéêü ôïõ õðïëïãéóôÞ óáò.

Ãéá áíáðáñáãùãÞ áðü DVD, áíôéêáôáóôÞóôå ôï `testfile.avi` ìå `dvd://N -dvd-device DEVICE` üðïõ ôï *N* åßíáé ï áñéèìüò ôïõ ôßôëïõ (title number) ðïõ åðéèõìåßôå íá áíáðáñÜãåôå êáé *DEVICE* åßíáé ôï üíïìá óõóêåõÞò ôïõ DVD-ROM. Ãéá ðáñÜäåéãìá, ãéá íá áíáðáñÜãåôå ôïí ôßôëï 3 áðü ôç óõóêåõÞ `/dev/dvd`:

```
# mplayer -vo xv dvd://3 -dvd-device /dev/dvd
```

> **Óçìåßùóç:** Ç ðñïåðéëåãìÝíç óõóêåõÞ DVD ìðïñåß íá êáèïñéóôåß êáôÜ ôç äéÜñêåéá ôçò ìåôáãëþôôéóçò ôïõ **MPlayer** port ìÝóù ôçò åðéëïãÞò `WITH_DVD_DEVICE`. Áðü ðñïåðéëïãÞ, ç óõóêåõÞ áõôÞ åßíáé ç `/dev/acd0`. Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò óôï áñ÷åßï `Makefile` ôïõ port.

Ãéá ôá ðëÞêôñá ðïõ ÷ñçóéìïðïéïýíôáé ãéá ðáýóç, äéáêïðÞ, ìåôáêßíçóç êëð. êáôÜ ôç äéÜñêåéá ôçò áíáðáñáãùãÞò, óõìâïõëåõôåßôå ôçí âïÞèåéá ðïõ ìðïñåßôå íá äåßôå åêôåëþíôáò `mplayer -h` Þ äéáâÜóôå ôç óåëßäá ôïõ manual.

Åðéðñüóèåôá, óçìáíôéêÝò åðéëïãÝò áíáðáñáãùãÞò åßíáé: `-fs -zoom` ôï ïðïßï åíåñãïðïéåß áðåéêüíéóç óå ðëÞñç ïèüíç êáé ôï `-framedrop` ôï ïðïßï âïçèÜåé óôçí áýîçóç ôçò áðüäïóçò.

Ãéá íá ìåßíåé ôï ìÝãåèïò ôçò ãñáììÞò åíôïëþí ôï äõíáôüí ìéêñü, ï ÷ñÞóôçò ìðïñåß íá äçìéïõñãÞóåé Ýíá áñ÷åßï `.mplayer/config` êáé íá ïñßóåé åêåß ôéò ðñïåðéëåãìÝíåò åðéëïãÝò:

```
vo=xv
fs=yes
zoom=yes
```

ÔÝëïò, ï `mplayer` ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí åîáãùãÞ (rip) åíüò ôßôëïõ DVD óå Ýíá áñ÷åßï `.vob` file. Ãéá ôçí åîáãùãÞ ôïõ äåýôåñïõ ôßôëïõ áðü Ýíá DVD, ãñÜøôå:

```
# mplayer -dumpstream -dumpfile out.vob dvd://2 -dvd-device /dev/dvd
```

Ôï áñ÷åßï åîüäïõ, `out.vob`, èá åßíáé ôýðïõ MPEG êáé ìðïñåßôå íá ôï ìåôá÷åéñéóôåßôå ìÝóù Üëëùí ðáêÝôùí video ðïõ ðåñéãñÜöïíôáé óå áõôü ôï ôìÞìá.

8.4.2.1.3 mencoder

Ðñéí ÷ñçóéìïðïéÞóåôå ôï `mencoder` åßíáé êáëÞ éäÝá íá åîïéêåéùèåßôå ìå ôéò åðéëïãÝò ðïõ áíáöÝñïíôáé óôçí ôåêìçñßùóç HTML. ÕðÜñ÷åé óåëßäá manual, áëëÜ äåí åßíáé ðïëý ÷ñÞóéìç ÷ùñßò ôçí HTML ôåêìçñßùóç. ÕðÜñ÷ïõí ðÜñá ðïëëïß ôñüðïé ãéá íá âåëôéþóåôå ôçí ðïéüôçôá, íá ìåéþóåôå ôï ñõèìü äåäïìÝíùí (bitrate) íá áëëÜîåôå ìïñöÞ áñ÷åßïõ, êáé êÜðïéá áðü áõôÜ ôá êüëðá ìðïñåß íá êÜíïõí ôç äéáöïñÜ ìåôáîý êáëÞò êáé êáêÞò áðüäïóçò. Åäþ èá äåßôå ìåñéêÜ ðáñáäåßãìáôá ãéá íá îåêéíÞóåôå. Ðñþôá ìéá áðëÞ áíôéãñáöÞ:

```
% mencoder input.avi -oac copy -ovc copy -o output.avi
```

ËáíèáóìÝíïé óõíäõáóìïß óôç ãñáììÞ åíôïëþí, ìðïñåß íá äþóïõí áñ÷åßá åîüäïõ ôá ïðïßá äåí ìðïñåß íá áíáðáñÜãåé ïýôå ï ßäéïò ï `mplayer`. ¸ôóé, áí áðëþò èÝëåôå íá êÜíåôå rip Ýíá áñ÷åßï, ìåßíåôå óôçí åðéëïãÞ `-dumpfile` ôïõ `mplayer`.

Ãéá íá ìåôáôñÝøåôå ôï *`input.avi`* óå codec MPEG4 ìå Þ÷ï MPEG3 (áðáéôåßôáé ôï `audio/lame`):

```
% mencoder input.avi -oac mp3lame -lameopts br=192 \
  -ovc lavc -lavcopts vcodec=mpeg4:vhq -o output.avi
```

Ìå ôïí ôñüðï áõôü ðáñÜãåôáé Ýîïäïò ðïõ ìðïñåß íá áíáðáñá÷èåß áðü ôïí `mplayer` êáé ôï `xine`.

Ìðïñåßôå íá áíôéêáôáóôÞóåôå ôï *`input.avi`* ìå ôçí åðéëïãÞ `dvd://1 -dvd-device /dev/dvd` êáé íá ôï åêôåëÝóåôå ùò `root` ãéá íá åðáíáêùäéêïðïéÞóåôå áðåõèåßáò Ýíá ôßôëï DVD. Ìéá êáé ðéèáíþò äåí èá ìåßíåôå éêáíïðïéçìÝíïò ìå ôï áðïôÝëåóìá áðü ôçí ðñþôç öïñÜ, óáò óõíéóôïýìå íá êáôåâÜóåôå ôïí ôßôëï óå Ýíá áñ÷åßï êáé íá äïõëÝøåôå óå áõôü.

8.4.2.2 Ôï Ðñüãñáììá ÁíáðáñáãùãÞò xine

Ôï **xine** åßíáé Ýíá project ìå åõñý óêïðü, ôï ïðïßï ðñïïñßæåôáé ü÷é ìüíï íá ãßíåé Ýíá ðñüãñáììá üëá óå Ýíá üóï áöïñÜ ôï video, áëëÜ åðßóçò óôï íá ðáñÜãåé ìéá åðáíá÷ñçóéìïðïéÞóéìç âáóéêÞ âéâëéïèÞêç êáé Ýíá áñèñùôü åêôåëÝóéìï ôï ïðïßï ìðïñåß íá åðåêôáèåß ìå ðñüóèåôá (plugins). Ìðïñåßôå íá ôï åãêáôáóôÞóåôå ôüóï áðü ðáêÝôï, üóï êáé áðü ôï port, `multimedia/xine`.

Ôï **xine** åßíáé áêüìá êÜðùò ÷ïíôñïêïììÝíï, áëëÜ óßãïõñá Ý÷åé îåêéíÞóåé êáëÜ. Óôçí ðñÜîç, ôï xine ÷ñåéÜæåôáé åßôå ãñÞãïñç åðåîåñãáóôÞ êáé êÜñôá ãñáöéêþí, Þ õðïóôÞñéîç ôçò åðÝêôáóçò XVideo. Ôï ãñáöéêü ðåñéâÜëëïí åßíáé ÷ñçóéìïðïéÞóéìï, áëëÜ êÜðùò áäÝîéá öôéáãìÝíï.

Ôçí þñá ðïõ ãñÜöïíôáí áõôÝò ïé ãñáììÝò äåí äéáíÝìïíôáí module ìáæß ìå ôçí åöáñìïãÞ **xine**, éêáíü íá áíáðáñÜãåé DVD ìå CSS êùäéêïðïßçóç. ÕðÜñ÷ïõí åêäüóåéò áðü ôñßôïõò êáôáóêåõáóôÝò ïé ïðïßåò Ý÷ïõí åíóùìáôùìÝíï ôï ðáñáðÜíù module áëëÜ êáìéÜ áðü áõôÝò äåí âñßóêåôáé óôçí óõëëïãÞ ôùí ports ôïõ FreeBSD.

Óå óýãêñéóç ìå ôïí **MPlayer**, ôï **xine** êÜíåé ðåñéóóüôåñá ãéá ôï ÷ñÞóôç, áëëÜ ôçí ßäéá óôéãìÞ, äåí åðéôñÝðåé ôüóï ëåðôïìåñåéáêü Ýëåã÷ï. Ôï **xine** áðïäßäåé êáëýôåñá óå ëåéôïõñãßá XVideo.

Áðü ðñïåðéëïãÞ, ôï **xine** èá îåêéíÞóåé óå ãñáöéêü ðåñéâÜëëïí (GUI). Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ìåíïý ãéá íá áíïßîåôå Ýíá óõãêåêñéìÝíï áñ÷åßï:

```
% xine
```

Åíáëëáêôéêü, ìðïñåßôå íá ôï êáëÝóåôå íá áíáðáñÜãåé Ýíá áñ÷åßï áðåõèåßáò áðü ôçí ãñáììÞ åíôïëþí, ÷ùñßò ôç ÷ñÞóç ôïõ GUI:

```
% xine -g -p mymovie.avi
```

8.4.2.3 Ôá Âïçèçôéêü ÐñïãñÜììáôá transcode

Ç åöáñìïãÞ **transcode** äåí åßíáé ðñüãñáììá áíáðáñáãùãÞò, áëëÜ ìéá óïõßôá åñãáëåßùí ãéá åðáíáêùäéêïðïßçóç áñ÷åßùí video êáé Þ÷ïõ. Ìå ôçí åöáñìïãÞ **transcode**, Ý÷åôå ôçí äõíáôüôçôá íá áíáìßîåôå áñ÷åßá video, íá åðéóêåõÜóåôå ÷áëáóìÝíá áñ÷åßá, ÷ñçóéìïðïéþíôáò åñãáëåßá ôçò ãñáììÞò åíôïëþí ôá ïðïßá ÷åéñßæïíôáé äåäïìÝíá áðü ôá êáíÜëéá `stdin/stdout`.

ÌåãÜëï ðëÞèïò åöáñìïãþí ìðïñïýí íá êáèïñéóôïýí êáôÜ ôç äéÜñêåéá ôçò ìåôáãëþôôéóçò ôïõ port `multimedia/transcode` êáé óõíéóôïýìå ôçí áêüëïõèç ãñáììÞ åíôïëþí ãéá ôç ìåôáãëþôôéóç ôïõ **transcode**:

```
# make WITH_OPTIMIZED_CFLAGS=yes WITH_LIBA52=yes WITH_LAME=yes WITH_OGG=yes \
WITH_MJPEG=yes -DWITH_XVID=yes
```

Ïé ðñïôåéíüìåíåò åðéëïãÝò åßíáé êáôÜëëçëåò ãéá ôïõò ðåñéóóüôåñïõò ÷ñÞóôåò.

Ãéá íá óáò äåßîïõìå ôéò éêáíüôçôåò ôïõ `transcode`, äåßôå Ýíá ðáñÜäåéãìá ìåôáôñïðÞò áñ÷åßïõ DivX óå PAL MPEG-1 (PAL VCD):

```
% transcode -i input.avi -V --export_prof vcd-pal -o output_vcd
% mplex -f 1 -o output_vcd.mpg output_vcd.m1v output_vcd.mpa
```

Ôï áñ÷åßï MPEG ðïõ ðñïêýðôåé, ôï *`output_vcd.mpg`*, ìðïñåß íá áíáðáñá÷èåß áðü ôïí **MPlayer**. Ìðïñåßôå åðßóçò íá ãñÜøåôå ôï áñ÷åßï óå Ýíá CD-R ãéá íá äçìéïõñãÞóåôå Ýíá Video CD, êáé óôçí ðåñßðôùóç áõôÞ èá ÷ñåéáóôåß íá åãêáôáóôÞóåôå ôá ðñïãñÜììáôá `multimedia/vcdimager` êáé `sysutils/cdrdao`.

ÕðÜñ÷åé óåëßäá manual ãéá ôï `transcode`, áëëÜ ðñÝðåé åðßóçò íá óõìâïõëåõôåßôå ôï transcode wiki (http://www.transcoding.org/cgi-bin/transcode) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò êáé ðáñáäåßãìáôá.

8.4.3 ÅðéðëÝïí ÄéÜâáóìá

ÕðÜñ÷åé ñáãäáßá åîÝëéîç óôá äéáèÝóéìá ðáêÝôá video ãéá ôï FreeBSD. Åßíáé áñêåôÜ ðéèáíü üôé óôï Üìåóï ìÝëëïí ðïëëÜ áðü ôá ðñïâëÞìáôá ðïõ áíáöÝñïíôáé åäþ èá Ý÷ïõí åðéëõèåß. Óôï åíäéÜìåóï äéÜóôçìá, üóïé åíäéáöÝñïíôáé íá ÷ñçóéìïðïéÞóïõí ôéò äõíáôüôçôåò A/V ôïõ FreeBSD óôï Ýðáêñï èá ðñÝðåé íá óõíäõÜóïõí ãíþóåéò áðü äéÜöïñá FAQ êáé tutorials êáé íá ÷ñçóéìïðïéÞóïõí áñêåôÝò äéáöïñåôéêÝò åöáñìïãÝò. Ôï ôìÞìá áõôü õðÜñ÷åé áêñéâþò ãéá íá äåßîåé óôïí áíáãíþóôç ðïõ ìðïñåß íá âñåé ôÝôïéåò ðñüóèåôåò ðëçñïöïñßåò.

Ç Ôåêìçñßùóç ôïõ Mplayer (http://www.mplayerhq.hu/DOCS/) åßíáé áñêåôÜ ðëçñïöïñéáêÞ üóï áöïñÜ ôï ôå÷íéêü åðßðåäï. Áí Ý÷åôå óêïðü íá áðïêôÞóåôå õøçëü åðßðåäï åìðåéñßáò óå ó÷Ýóç ìå ôï video óôï UNIX, èá ðñÝðåé ïðùóäÞðïôå íá ôçí óõìâïõëåõôåßôå. Ç ëßóôá áëëçëïãñáößáò ôïõ **MPlayer** åßíáé å÷èñéêÞ óå üðïéïí äåí Ý÷åé êÜíåé ôïí êüðï íá äéáâÜóåé ôçí ôåêìçñßùóç, Ýôóé áí óêïðåýåôå íá êÜíåôå áíáöïñÝò óöáëìÜôùí, âåâáéùèåßôå üôé ôçí Ý÷åôå äéáâÜóåé.

Ôï xine HOWTO (http://dvd.sourceforge.net/xine-howto/en_GB/html/howto.html) ðåñéÝ÷åé Ýíá êåöÜëáéï ó÷åôéêÜ ìå ôçí âåëôßùóç ôçò áðüäïóçò, ôï ïðïßï åßíáé êïéíü ãéá üëá ôá ðñïãñÜììáôá áíáðáñáãùãÞò.

ÔÝëïò, õðÜñ÷ïõí êÜðïéåò Üëëåò ðïëëÜ õðïó÷üìåíåò åöáñìïãÝò ðïõ ßóùò åðéèõìåßôå íá äïêéìÜóåôå:

- Ôï Avifile (http://avifile.sourceforge.net/) ôï ïðïßï åßíáé åðßóçò port, `multimedia/avifile`.
- Ôï Ogle (http://www.dtek.chalmers.se/groups/dvd/) ôï ïðïßï åßíáé åðßóçò port, `multimedia/ogle`.
- Ôï Xtheater (http://xtheater.sourceforge.net/)
- Ôï `multimedia/dvdauthor`, ôï ïðïßï åßíáé åöáñìïãÞ DVD authoring áíïéêôïý êþäéêá.

8.5 Ñýèìéóç ÊÜñôáò Ôçëåüñáóçò

Áñ÷éêÞ óõíåéóöïñÜ áðü ôïí Josef El-Rayes. Âåëôéþèçêå êáé ðñïóáñìüóôçêå áðü ôïí Marc Fonvieille.

8.5.1 ÅéóáãùãÞ

Ïé êÜñôåò ôçëåüñáóçò óáò åðéôñÝðïõí íá âëÝðåôå ôçëåüñáóç, êáíïíéêÞ Þ êáëùäéáêÞ, óôïí õðïëïãéóôÞ óáò. Ïé ðåñéóóüôåñåò áðü áõôÝò äÝ÷ïíôáé åðßóçò óÞìá óýíèåôïõ (composite) video, ìÝóù åéóüäïõ RCA Þ S-video, êáé êÜðïéåò áðü áõôÝò äéáèÝôïõí êáé ñáäéïöùíéêü äÝêôç FM.

Ôï FreeBSD ðáñÝ÷åé õðïóôÞñéîç ãéá êÜñôåò TV ôýðïõ PCI ðïõ ÷ñçóéìïðïéïýí ôá ïëïêëçñùìÝíá êõêëþìáôá óýëëçøçò video, Brooktree Bt848/849/878/879 Þ Conexant CN-878/Fusion 878a ìå ôï ðñüãñáììá ïäÞãçóçò bktr(4). Èá ðñÝðåé åðßóçò íá âåâáéùèåßôå üôé ç êÜñôá Ýñ÷åôáé ìå äÝêôç ðïõ õðïóôçñßæåôáé. Óõìâïõëåõôåßôå ôç óåëßäá manual ôïõ bktr(4) ãéá íá äåßôå ôç ëßóôá ôùí õðïóôçñéæüìåíùí äåêôþí.

8.5.2 Åãêáèéóôþíôáò ôï Ðñüãñáììá ÏäÞãçóçò

Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí êÜñôá èá ðñÝðåé íá öïñôþóåôå ôï ðñüãñáììá ïäÞãçóçò bktr(4), ðñïóèÝôïíôáò ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`:

```
bktr_load="YES"
```

ÅíáëëáêôéêÜ, ìðïñåßôå íá ðñïóèÝóåôå óôáôéêÞ õðïóôÞñéîç ãéá ôçí êÜñôá óôï ðõñÞíá óáò, êáé ãéá ôï óêïðü áõôü ðñïóèÝóôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá:

```
device  bktr
device  iicbus
device  iicbb
device  smbus
```

Ïé åðéðñüóèåôïé ïäçãïß óõóêåõþí åßíáé áðáñáßôçôïé, åðåéäÞ ôá åîáñôÞìáôá ôçò êÜñôáò åðéêïéíùíïýí ìåôáîý ôïõò äéáìÝóïõ åíüò äéáýëïõ I2C. Áöïý êÜíåôå ôéò áðáñáßôçôåò áëëáãÝò óôï áñ÷åßï, ìåôáãëùôôßóôå êáé åãêáôáóôÞóôå ôï íÝï ðõñÞíá.

Ìüëéò ôåëåéþóåôå ìå áõôÞ ôç äéáäéêáóßá, èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï óýóôçìá óáò. ÊáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò, èá ðñÝðåé íá äåßôå êÜðïéá ìçíýìáôá áðü ôçí êÜñôá óáò, üðùò ôá ðáñáêÜôù:

```
bktr0: <BrookTree 848A> mem 0xd7000000-0xd7000fff irq 10 at device 10.0 on pci0
iicbb0: <I2C bit-banging driver> on bti2c0
iicbus0: <Philips I2C bus> on iicbb0 master-only
iicbus1: <Philips I2C bus> on iicbb0 master-only
smbus0: <System Management Bus> on bti2c0
bktr0: Pinnacle/Miro TV, Philips SECAM tuner.
```

ÖõóéêÜ, ôá ìçíýìáôá áõôÜ èá äéáöÝñïõí áíÜëïãá ìå ôï õëéêü óáò. Ùóôüóï èá ðñÝðåé íá åëÝãîåôå üôé áíé÷íåýèçêå óùóôÜ ï äÝêôçò. Åßíáé äõíáôüí íá áëëÜîåôå êÜðïéåò áðü ôéò ðáñáìÝôñïõò ðïõ áíé÷íåýèçêáí ÷ñçóéìïðïéþíôáò MIBs ôïõ sysctl(8) êáèþò êáé åðéëïãÝò óôï áñ÷åßï ñõèìßóåùí ðõñÞíá. Ãéá ðáñÜäåéãìá, íá èÝëåôå íá åðéâÜëåôå ï äÝêôçò íá åßíáé ôýðïõ Philips SECAM, èá ðñÝðåé íá ðñïóèÝóåôå ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò:

```
options OVERRIDE_TUNER=6
```

Þ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áðåõèåßáò ôï sysctl(8):

```
# sysctl hw.bt848.tuner=6
```

Äåßôå ôç óåëßäá manual ôïõ bktr(4) êáèþò êáé ôï áñ÷åßï `/usr/src/sys/conf/NOTES` ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôéò äéáèÝóéìåò åðéëïãÝò.

8.5.3 ×ñÞóéìåò ÅöáñìïãÝò

Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí êÜñôá ôçëåüñáóçò, èá ðñÝðåé íá åãêáôáóôÞóåôå ìéá áðü ôéò ðáñáêÜôù åöáñìïãÝò:

- Ôï `multimedia/fxtv` ðáñÝ÷åé äõíáôüôçôá íá äåßôå ôçëåüñáóç óå ðáñÜèõñï, êáèþò êáé ôçí äõíáôüôçôá óýëëçøçò åéêüíáò / Þ÷ïõ / video.
- Ôï `multimedia/xawtv` åßíáé åðßóçò åöáñìïãÞ ôçëåüñáóçò, ìå äõíáôüôçôåò üìïéåò ìå ôï **fxtv**.
- Ôï `misc/alevt` áðïêùäéêïðïéåß êáé áðåéêïíßæåé Videotext/Teletext.
- Ôï `audio/xmradio` åßíáé ìéá åöáñìïãÞ ãéá íá ÷ñçóéìïðïéÞóåôå ôï äÝêôç FM ðïõ åßíáé åíóùìáôùìÝíïò óå êÜðïéåò êÜñôåò ôçëåüñáóçò.
- Ôï `audio/wmtune` åßíáé ìéá âïëéêÞ desktop åöáñìïãÞ ãéá ñáäéïöùíéêïýò äÝêôåò.

Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò åöáñìïãÝò óôç óõëëïãÞ ôùí Ports ôïõ FreeBSD.

8.5.4 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Áí áíôéìåôùðßóåôå êÜðïéï ðñüâëçìá ìå ôçí êÜñôá ôçëåüñáóçò, èá ðñÝðåé ðñþôá íá åëÝãîåôå áí ôï ïëïêëçñùìÝíï óýëëçøçò video êáèþò êáé ï äÝêôçò õðïóôçñßæïíôáé áðü ôï ðñüãñáììá ïäÞãçóçò bktr(4) êáé áí Ý÷åôå ÷ñçóéìïðïéÞóåé ôéò óùóôÝò ñõèìßóåéò óôéò åðéëïãÝò óáò. Ãéá åðéðëÝïí õðïóôÞñéîç êáèþò êáé äéÜöïñåò åñùôÞóåéò ó÷åôéêÜ ìå ôçí êÜñôá óáò, ßóùò èÝëåôå íá åðéêïéíùíÞóåôå ìå ôç ëßóôá freebsd-multimedia (http://lists.FreeBSD.org/mailman/listinfo/freebsd-multimedia) êáé íá äéáâÜóåôå ôéò ðáëéüôåñåò äçìïóéåýóåéò áðü ôá áñ÷åßá ôçò ëßóôáò.

8.6 MythTV

Ôï MythTV åßíáé Ýíá ðñüãñáììá ôýðïõ PVR (Ðñïóùðéêüò êáôáãñáöÝáò video).

Óôïí êüóìï ôïõ Linux ôï MythTV åßíáé Ýíá ãíùóôü ðñüãñáììá ìå ðïëëÝò åîáñôÞóåéò ïé ïðïßåò äõóêïëåýïõí ôçí åãêáôÜóôáóç ôïõ. Ôï port ôïõ FreeBSD áðëïðïéåß ôï ìåãáëýôåñï ìÝñïò ôçò äéáäéêáóßáò áëëÜ ïñéóìÝíá ôìÞìáôá ôïõ ðñÝðåé íá åãêáôáóôáèïýí ÷åéñïêßíçôá. Ç åíüôçôá áõôÞ ðåñéÝ÷åé ïäçãßåò ðïõ èá óáò âïçèÞóïõí íá ñõèìßóåôå ôï MythTV.

8.6.1 Õëéêü

Ôï MythTV Ý÷åé ó÷åäéáóôåß íá ÷ñçóéìïðïéåß ôï V4L ãéá ôçí ðñüóâáóç óå óõóêåõÝò video üðùò êùäéêïðïéçôÝò (encoders) êáé äÝêôåò. Ôç äåäïìÝíç óôéãìÞ, ôï MythTV ëåéôïõñãåß êáëýôåñá ìå êÜñôåò DVB-S/C/T ìå äéáóýíäåóç USB ðïõ õðïóôçñßæïíôáé áðü ôï `multimedia/webcamd` êáèþò ôï **webcamd** ðáñÝ÷åé ìéá åöáñìïãÞ ÷ñÞóôç ãéá ôï V4L. ÏðïéáäÞðïôå êÜñôá DVB ðïõ õðïóôçñßæåôáé áðü ôï **webcamd** èá ðñÝðåé öõóéïëïãéêÜ íá ëåéôïõñãåß ìå ôï MythTV. Ìðïñåßôå ùóôüóï íá âñåßôå åäþ (http://wiki.freebsd.org/WebcamCompat) ìéá ëßóôá ìå äïêéìÜóìåíåò êÜñôåò. Ãéá êÜñôåò ôéò Hauppauge ìðïñåßôå íá âñåßôå ðñïãñÜììáôá ïäÞãçóçò óôá ðáêÝôá `multimedia/pvr250` êáé `multimedia/pvrxxx`, áëëÜ íá Ý÷åôå õðüøç óáò üôé ÷ñçóéìïðïéïýí ìéá ìç-ôõðïðïéçìÝíç äéåðáöÞ ç ïðïßá äåí ëåéôïõñãåß ìå åêäüóåéò ôïõ MythTV ìåôáãåíÝóôåñåò ôçò 0.23.

Ôï HTPC (http://wiki.freebsd.org/HTPC) ðåñéÝ÷åé ìéá ëßóôá üëùí ôùí äéáèÝóéìùí ðñïãñáììÜôùí ïäÞãçóçò DVB.

8.6.2 ÅîáñôÞóåéò

Êáèþò ôï MythTV åßíáé åõÝëéêôï êáé áñèñùôü, åðéôñÝðåé óôïí ÷ñÞóôç íá Ý÷åé ôï frontend êáé ôï backend óå äéáöïñåôéêÜ ìç÷áíÞìáôá.

Ãéá ôï frontend, áðáéôåßôáé ôï `multimedia/mythtv-frontend` êáé ï åîõðçñåôçôÞò X ôïí ïðïßï ìðïñåßôå íá âñåßôå óôï `x11/xorg`. Éäáíéêü, ï õðïëïãéóôÞò ðïõ èá åêôåëåß ôï frontend èá ðñÝðåé åðßóçò íá Ý÷åé ìéá êÜñôá ãñáöéêþí ç ïðïßá íá õðïóôçñßæåé XvMC êáé ðñïáéñåôéêÜ Ýíá ôçëå÷åéñéóôÞñéï óõìâáôü ìå LIRC.

Ãéá ôï backend, ÷ñåéÜæåôáé ôï `multimedia/mythtv` üðùò êáé ìéá âÜóç äåäïìÝíùí MySQL™ êáé ðñïáéñåôéêÜ Ýíáò äÝêôçò êáé áðïèçêåõôéêüò ÷þñïò ãéá åããñáöÝò. Ôï ðáêÝôï ãéá ôçí MySQL èá ðñÝðåé íá åãêáôáóôáèåß áõôüìáôá ùò åîÜñôçóç êáôÜ ôçí åãêáôÜóôáóç ôïõ `multimedia/mythtv`.

8.6.3 ÅãêáôÜóôáóç MythTV

Ãéá íá åãêáôáóôÞóåôå ôï MythTV, ÷ñçóéìïðïéÞóôå ôá ðáñáêÜôù âÞìáôá. Áñ÷éêÜ åãêáôáóôÞóôå ôï MythTV áðü ôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD:

```
# cd /usr/ports/multimedia/mythtv
# make install
```

ÅãêáôáóôÞóôå ôç âÜóç äåäïìÝíùí ôïõ MythTV:

```
# mysql -uroot -p < /usr/local/share/mythtv/database/mc.sql
```

Ñõèìßóôå ôï backend:

```
# mythtv-setup
```

ÎåêéíÞóôå ôï backend:

```
# echo ’mythbackend_enable="YES"’ >> /etc/rc.conf
# /usr/local/etc/rc.d/mythbackend start
```

8.7 ÓáñùôÝò Åéêüíáò

ÃñÜöçêå áðü ôïí Marc Fonvieille.

8.7.1 ÅéóáãùãÞ

Óôï FreeBSD ç ðñüóâáóç óå óáñùôÝò ðáñÝ÷åôáé áðü ôï **SANE** (Scanner Access Now Easy) API ôï ïðïßï äéáôßèåôáé ìÝóá áðü ôçí óõëëïãÞ ôùí Ports ôïõ FreeBSD. Ôï **SANE** ÷ñçóéìïðïéåß åðßóçò êÜðïéïõò ïäçãïýò óõóêåõþí ôïõ FreeBSD ãéá íá áðïêôÞóåé ðñüóâáóç óôï õëéêü ôïõ óáñùôÞ.

Ôï FreeBSD õðïóôçñßæåé óáñùôÝò SCSI êáé USB. Âåâáéùèåßôå üôé ï óáñùôÞò óáò õðïóôçñßæåôáé áðü ôï **SANE** ðñéí îåêéíÞóåôå ïðïéáäÞðïôå åãêáôÜóôáóç êáé ñýèìéóç. Ôï **SANE** äéáèÝôåé ìéá ëßóôá õðïóôçñéæüìåíùí óõóêåõþí (http://www.sane-project.org/sane-supported-devices.html) ç ïðïßá ðáñÝ÷åé ðëçñïöïñßåò ãéá ôçí õðïóôÞñéîç êÜèå óáñùôÞ êáé ôçí åîÝëéîç ôçò. Óå óõóôÞìáôá ðñéí ôï FreeBSD 8.X èá âñåßôå åðßóçò ôç ëßóôá ôùí õðïóôçñéæüìåíùí USB óáñùôþí óôç óåëßäá manual ôïõ uscanner(4).

8.7.2 Ñýèìéóç ôïõ ÐõñÞíá

¼ðùò åßðáìå ðáñáðÜíù, õðïóôçñßæïíôáé óáñùôÝò ôüóï SCSI üóï êáé USB. ÁíÜëïãá ìå ôï ôñüðï äéáóýíäåóçò ôïõ óáñùôÞ óáò, èá ÷ñåéáóôåßôå äéáöïñåôéêïýò ïäçãïýò óõóêåõþí.

8.7.2.1 Äéáóýíäåóç USB

Ï ðõñÞíáò `GENERIC`, áðü ðñïåðéëïãÞ, ðåñéÝ÷åé ôïõò ïäçãïýò óõóêåõþí ðïõ áðáéôïýíôáé ãéá ôçí õðïóôÞñéîç óáñùôþí USB. Áí áðïöáóßóåôå íá ÷ñçóéìïðïéÞóåôå åîåéäéêåõìÝíï ðõñÞíá, âåâáéùèåßôå üôé Ý÷åôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï ñõèìßóåùí óáò:

```
device usb
device uhci
device ohci
device ehci
```

Óå óõóôÞìáôá ðñéí ôï FreeBSD 8.X, èá ÷ñåéáóôåßôå åðßóçò ôçí ðáñáêÜôù ãñáììÞ:

```
device uscanner
```

Óå áõôÝò ôéò åêäüóåéò ôïõ FreeBSD, ç õðïóôÞñéîç ôùí óáñùôþí USB ãßíåôáé ìÝóù ôçò óõóêåõÞò uscanner(4). Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ç õðïóôÞñéîç áõôÞ ðáñÝ÷åôáé áðåõèåßáò áðü ôç âéâëéïèÞêç libusb(3).

Áöïý åðáíåêêéíÞóåôå ìå ôï óùóôü ðõñÞíá, óõíäÝóôå ôï USB óáñùôÞ óáò. Èá ðñÝðåé íá äåßôå ìéá ãñáììÞ ó÷åôéêÞ ìå ôçí áíß÷íåõóç ôïõ óáñùôÞ óôçí ðñïóùñéíÞ ìíÞìç ìçíõìÜôùí ôïõ óõóôÞìáôïò (dmesg(8)):

```
ugen0.2: <EPSON> at usbus0
```

Þ óå Ýíá óýóôçìá FreeBSD 7.X:

```
uscanner0: EPSON EPSON Scanner, rev 1.10/3.02, addr 2
```

Ôá ìçíýìáôá áõôÜ äåß÷íïõí üôé ï óáñùôÞò ìáò ÷ñçóéìïðïéåß ôçí óõóêåõÞ `/dev/ugen0.2` Þ ôçí óõóêåõÞ `/dev/uscanner0` áíÜëïãá ìå ôçí Ýêäïóç ôïõ FreeBSD ðïõ ÷ñçóéìïðïéåßôáé. Óôï ðáñÜäåéãìá ìáò, ÷ñçóéìïðïéÞóáìå Ýíá óáñùôÞ EPSON Perfection® 1650 USB.

8.7.2.2 Äéáóýíäåóç Ôýðïõ SCSI

Áí ï óáñùôÞò óáò Ýñ÷åôáé ìå äéáóýíäåóç ôýðïõ SCSI, åßíáé óçìáíôéêü íá ãíùñßæåôå ôé êÜñôá åëåãêôÞ SCSI èá ÷ñçóéìïðïéÞóåôå. ÁíÜëïãá ìå ôï ïëïêëçñùìÝíï êýêëùìá ôçò êÜñôáò SCSI ðïõ ÷ñçóéìïðïéåßôáé, èá ðñÝðåé íá ñõèìßóåôå êáôÜëëçëá ôï áñ÷åßï ñõèìßóåùí ðõñÞíá. Ï ðõñÞíáò `GENERIC` õðïóôçñßæåé ôïõò ðéï êïéíïýò åëåãêôÝò SCSI. Âåâáéùèåßôå üôé äéáâÜóáôå ôï áñ÷åßï `NOTES` êáé ðñïóèÝóôå ôç óùóôÞ ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ðõñÞíá. Åêôüò áðü ôï ðñüãñáììá ïäÞãçóçò ôïõ åëåãêôÞ SCSI, èá ðñÝðåé áêüìá íá Ý÷åôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò:

```
device scbus
device pass
```

Ìüëéò ìåôáãëùôôßóåôå êáé åãêáôáóôÞóåôå ôïí ðõñÞíá, èá ìðïñÝóåôå íá äåßôå ôéò óõóêåõÝò óôçí ðñïóùñéíÞ ìíÞìç ìçíõìÜôùí óõóôÞìáôïò, êáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò:

```
pass2 at aic0 bus 0 target 2 lun 0
pass2: <AGFA SNAPSCAN 600 1.10> Fixed Scanner SCSI-2 device
pass2: 3.300MB/s transfers
```

Áí ï óáñùôÞò óáò äåí Þôáí åíåñãïðïéçìÝíïò êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò óáò, åßíáé áêüìá äõíáôüí íá åîáíáãêÜóåôå ôïí åíôïðéóìü ôïõ, åêôåëþíôáò áíß÷íåõóç ôïõ äéáýëïõ SCSI ìå ôçí âïÞèåéá ôçò åíôïëÞò camcontrol(8):

```
# camcontrol rescan all
Re-scan of bus 0 was successful
Re-scan of bus 1 was successful
Re-scan of bus 2 was successful
Re-scan of bus 3 was successful
```

Ï óáñùôÞò èá åìöáíéóôåß ôüôå óôç ëßóôá ôùí óõóêåõþí SCSI:

```
# camcontrol devlist
<IBM DDRS-34560 S97B>              at scbus0 target 5 lun 0 (pass0,da0)
<IBM DDRS-34560 S97B>              at scbus0 target 6 lun 0 (pass1,da1)
<AGFA SNAPSCAN 600 1.10>           at scbus1 target 2 lun 0 (pass3)
<PHILIPS CDD3610 CD-R/RW 1.00>     at scbus2 target 0 lun 0 (pass2,cd0)
```

Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò óõóêåõÝò SCSI åßíáé äéáèÝóéìåò óôéò óåëßäåò manual scsi(4) êáé camcontrol(8).

8.7.3 Ñýèìéóç ôïõ SANE

Ôï óýóôçìá **SANE** ÷ùñßæåôáé óå äýï êïììÜôéá: óôï backend (`graphics/sane-backends`) êáé óôï frontend (`graphics/sane-frontends`). Ôï backend ðáñÝ÷åé ðñüóâáóç óôïí ßäéï ôï óáñùôÞ. Óôç ëßóôá õðïóôçñéæüìåíùí óõóêåõþí (http://www.sane-project.org/sane-supported-devices.html) ôïõ **SANE** ìðïñåßôå íá âñåßôå ðïéï backend õðïóôçñßæåé ôïí óáñùôÞ óáò. Åßíáé ðïëý óçìáíôéêü íá âñåßôå ôï óùóôü backend ãéá íá ìðïñÝóåôå íá ÷ñçóéìïðïéÞóåôå ôï óáñùôÞ óáò. Ôï ôìÞìá ôïõ frontend ðáñÝ÷åé ôï ãñáöéêü ðåñéâÜëëïí óÜñùóçò (**xscanimage**).

Ôï ðñþôï âÞìá åßíáé íá åãêáôáóôÞóåôå ôï port Þ ôï ðáêÝôï `graphics/sane-backends`. ÌåôÜ ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `sane-find-scanner` ãéá íá åëÝãîåôå ôçí áíß÷íåõóç ôïõ óáñùôÞ óáò áðü ôï óýóôçìá **SANE**:

```
# sane-find-scanner -q
found SCSI scanner "AGFA SNAPSCAN 600 1.10" at /dev/pass3
```

Ç Ýîïäïò èá óáò äåßîåé ôï åßäïò óýíäåóçò ôïõ óáñùôÞ êáèþò êáé ôï üíïìá óõóêåõÞò ðïõ ÷ñçóéìïðïéåßôáé ãéá ôç óýíäåóç ìå ôï óýóôçìá óáò. Ôï üíïìá ôïõ êáôáóêåõáóôÞ êáé ôïõ ìïíôÝëïõ ßóùò íá ìçí åìöáíéóôïýí, áëëÜ áõôü äåí åßíáé óçìáíôéêü.

> **Óçìåßùóç:** ÏñéóìÝíïé USB óáñùôÝò áðáéôïýí ôç öüñôùóç firmware. Ç äéáäéêáóßá åîçãåßôáé óôç óåëßäá manual ôïõ backend. Èá ðñÝðåé åðßóçò íá äéáâÜóåôå ôéò óåëßäåò manual sane-find-scanner(1) êáé sane(7).

ÐñÝðåé ôþñá íá åëÝãîïõìå áí ï óáñùôÞò èá áíáãíùñßæåôáé áðü ôï frontend ðñüãñáììá óÜñùóçò. Áðü ðñïåðéëïãÞ, ôï **SANE** backend Ýñ÷åôáé ìå Ýíá åñãáëåßï ãñáììÞò åíôïëþí, ôï scanimage(1). Ç åíôïëÞ áõôÞ óáò åðéôñÝðåé ôçí áðáñßèìçóç ôùí óõóêåõþí êáé ôç óÜñùóç åéêüíùí áðü ôç ãñáììÞ åíôïëþí. Ç åðéëïãÞ `-L` ÷ñçóéìïðïéåßôáé ãéá ôçí áðáñßèìçóç ôùí óõóêåõþí óÜñùóçò:

```
# scanimage -L
device ‘snapscan:/dev/pass3’ is a AGFA SNAPSCAN 600 flatbed scanner
```

¹ ãéá ðáñÜäåéãìá ìå ôïí óáñùôÞ ðïõ ÷ñçóéìïðïéÞóáìå óôï ÔìÞìá 8.7.2.1:

```
# scanimage -L
device ’epson2:libusb:/dev/usb:/dev/ugen0.2’ is a Epson GT-8200 flatbed scanner
```

Ç ðáñáðÜíù Ýîïäïò ðñïÝñ÷åôáé áðü Ýíá óýóôçìá FreeBSD 8.X êáé ç ãñáììÞ `’epson2:libusb:/dev/usb:/dev/ugen0.2’` ìáò ðëçñïöïñåß üôé ôï üíïìá ôïõ backend (`epson2`) êáé ôï üíïìá ôçò óõóêåõÞò (`/dev/ugen0.2`) ðïõ ÷ñçóéìïðïéåß ï óáñùôÞò ìáò.

> **Óçìåßùóç:** Áí äåí äåßôå Ýîïäï, Þ äåßôå Ýíá ìÞíõìá üôé äåí áíé÷íåýèçêå óáñùôÞò, óçìáßíåé üôé ôï scanimage(1) äåí ìðüñåóå íá áíáãíùñßóåé ôï óáñùôÞ. Áí óõìâåß áõôü, èá ÷ñåéáóôåß íá åðåîåñãáóôåßôå ôï áñ÷åßï ñõèìßóåùí ôïõ backend êáé íá ïñßóåôå ôï óáñùôÞ ðïõ èá ÷ñçóéìïðïéçèåß. Ï êáôÜëïãïò `/usr/local/etc/sane.d/` ðåñéÝ÷åé üëá ôá áñ÷åßá ñõèìßóåùí ôùí backend. Ôï ðñüâëçìá áíáãíþñéóçò åìöáíßæåôáé óå ïñéóìÝíá ìïíôÝëá USB óáñùôþí.
>
> Ãéá ðáñÜäåéãìá, ìå ôï óáñùôÞ USB ðïõ ÷ñçóéìïðïéåßôáé óôï ÔìÞìá 8.7.2.1, ç åíôïëÞ `sane-find-scanner` äßíåé ôéò áêüëïõèåò ðëçñïöïñßåò:

```
# sane-find-scanner -q
found USB scanner (UNKNOWN vendor and product) at device /dev/uscanner0
```

Ï óáñùôÞò âñÝèçêå, ÷ñçóéìïðïéåß äéáóýíäåóç USB êáé ôï üíïìá óõóêåõÞò ôïõ åßíáé `/dev/uscanner0`. Ôþñá ðñÝðåé íá äïýìå áí áíáãíùñßæåôáé êáé óùóôÜ:

```
# scanimage -L

No scanners were identified. If you were expecting something different,
check that the scanner is plugged in, turned on and detected by the
sane-find-scanner tool (if appropriate). Please read the documentation
which came with this software (README, FAQ, manpages).
```

Áöïý ï óáñùôÞò äåí áíáãíùñßóôçêå, èá ÷ñåéáóôåß íá åðåîåñãáóôïýìå ôï áñ÷åßï `/usr/local/etc/sane.d/epson2.conf`. Ôï ìïíôÝëï óáñùôÞ ðïõ ÷ñçóéìïðïéÞèçêå Þôáí ôï EPSON Perfection 1650, Ýôóé îÝñïõìå üôé ï óáñùôÞò èá ÷ñçóéìïðïéåß ôï backend `epson2`. Âåâáéùèåßôå üôé äéáâÜóáôå ôá âïçèçôéêÜ ó÷üëéá óôï áñ÷åßï ñõèìßóåùí ôïõ backend. Åßíáé áñêåôÜ áðëü íá áëëÜîåôå ãñáììÝò: ÌåôáôñÝøôå óå ó÷üëéá üóåò ãñáììÝò äåß÷íïõí ëÜèïò ôýðï äéáóýíäåóçò ãéá ôï óáñùôÞ óáò (óôçí ðåñßðôùóç ìáò èá ìåôáôñÝøïõìå óå ó÷üëéá üëåò ôéò ãñáììÝò ðïõ îåêéíÜíå ìå ôç ëÝîç `scsi` êáèþò ï óáñùôÞò ìáò ÷ñçóéìïðïéåß äéáóýíäåóç USB), êáé ðñïóèÝóôå óôï ôÝëïò ôïõ áñ÷åßïõ ìéá ãñáììÞ ðïõ íá ïñßæåé ôï åßäïò äéáóýíäåóçò êáé ôï üíïìá óõóêåõÞò ðïõ ÷ñçóéìïðïéåßôå. Óôçí ðåñßðôùóç ìáò ðñïóèÝóáìå ôçí áêüëïõèç ãñáììÞ:

```
usb /dev/uscanner0
```

Óáò ðáñáêáëïýìå íá âåâáéùèåßôå üôé äéáâÜóáôå ôá ó÷üëéá ðïõ ðáñÝ÷ïíôáé óôï áñ÷åßï ñõèìßóåùí ôïõ backend êáèþò êáé óôéò áíôßóôïé÷åò óåëßäåò manual ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò êáèþò êáé ãéá ôç óýíôáîç ðïõ ðñÝðåé íá ÷ñçóéìïðïéÞóåôå. Ìðïñïýìå ôþñá íá åðéâåâáéþóïõìå üôé ï óáñùôÞò áíáãíùñßæåôáé:

```
# scanimage -L
device ‘epson:/dev/uscanner0’ is a Epson GT-8200 flatbed scanner
```

Ï USB óáñùôÞò ìáò áíáãíùñßóôçêå. Äåí åßíáé óçìáíôéêü üôé ç ìÜñêá êáé ôï ìïíôÝëï äåí ôáéñéÜæïõí áêñéâþò ìå ôï äéêü ìáò. Ôï âáóéêü óçìåßï åßíáé ôï ðåäßï `‘epson:/dev/uscanner0’`, ôï ïðïßï äåß÷íåé ôï óùóôü backend êáé üíïìá óõóêåõÞò.

Ìüëéò ç åíôïëÞ `scanimage -L` ìðïñÝóåé íá äåé ôï óáñùôÞ, ç ñýèìéóç Ý÷åé ïëïêëçñùèåß. Ç óõóêåõÞ åßíáé Ýôïéìç íá ÷ñçóéìïðïéçèåß.

Áí êáé ç scanimage(1) ìáò åðéôñÝðåé íá óáñþóïõìå åéêüíá áðü ôç ãñáììÞ åíôïëþí, åßíáé ðñïôéìüôåñï íá ÷ñçóéìïðïéÞóïõìå êÜðïéï ðñüãñáììá óå ãñáöéêü ðåñéâÜëëïí ãéá ôçí åñãáóßá áõôÞ. Ôï **SANE** ìáò ðñïóöÝñåé Ýíá áðëü áëëÜ áðïäïôéêü ãñáöéêü ðåñéâÜëëïí: ôï **xscanimage** (`graphics/sane-frontends`).

Ôï **Xsane** (`graphics/xsane`) åßíáé åðßóçò Ýíá äçìïöéëÝò frontend ðñüãñáììá óÜñùóçò. To frontend áõôü ðñïóöÝñåé ðñï÷ùñçìÝíåò äõíáôüôçôåò, üðùò äéáöïñåôéêïýò ôñüðïõò óÜñùóçò (öùôïôõðßá, fax, êëð) äéüñèùóç ÷ñùìÜôùí, ðïëëáðëÞ óÜñùóç ê.á. Êáé ïé äýï áõôÝò åöáñìïãÝò äéáôßèåíôáé åðßóçò óáí ðñüóèåôï (plugin) ðñüãñáììá ãéá ÷ñÞóç ìå ôï **GIMP**.

8.7.4 Äßíïíôáò óå ¶ëëïõò ×ñÞóôåò Ðñüóâáóç óôïí ÓáñùôÞ óáò

¼ëåò ïé ðáñáðÜíù ëåéôïõñãßåò Ýãéíáí ìå ôá ðñïíüìéá ôïõ ÷ñÞóôç `root`. Ìðïñåß ùóôüóï, íá èÝëåôå íá äþóåôå ðñüóâáóç óôïí óáñùôÞ óáò êáé óå Üëëïõò ÷ñÞóôåò. Ï ÷ñÞóôçò ÷ñåéÜæåôáé Üäåéá áíÜãíùóçò êáé åããñáöÞò óôï áñ÷åßï óõóêåõÞò ðïõ ÷ñçóéìïðïéåßôáé áðü ôï óáñùôÞ. Óáí ðáñÜäåéãìá, ï óáñùôÞò ìáò ÷ñçóéìïðïéåß ôï áñ÷åßï óõóêåõÞò `/dev/ugen0.2` ôï ïðïßï óôçí ðñáãìáôéêüôçôá åßíáé Ýíáò óõìâïëéêüò äåóìüò ðñïò ôï ðñáãìáôéêü áñ÷åßï óõóêåõÞò, ôï `/dev/usb/0.2.0` (ìðïñåßôå íá ôï åðéâåâáéþóåôå åýêïëá ìå ìéá ìáôéÜ óôïí êáôÜëïãï `/dev`). Ôüóï ï óõìâïëéêüò äåóìüò üóï êáé ôï áñ÷åßï óõóêåõÞò áíÞêïõí óôéò ïìÜäåò `wheel` êáé `operator`. Áí ðñïóèÝóïõìå ôï ÷ñÞóôç *`joe`* óå áõôÝò ôéò ïìÜäåò, èá ìðïñåß íá ÷ñçóéìïðïéÞóåé ôï óáñùôÞ. Ãéá ëüãïõò áóöáëåßáò üìùò èá ðñÝðåé íá åßìáóôå éäéáßôåñá ðñïóåêôéêïß üôáí ðñïóèÝôïõìå Ýíá ÷ñÞóôç óå ìéá ïìÜäá, åéäéêÜ áí ðñüêåéôáé ãéá ôçí `wheel`. Ìéá êáëýôåñç ëýóç èá Þôáí íá äçìéïõñãÞóïõìå ìéá ïìÜäá åéäéêÜ ãéá ôç ÷ñÞóç ôùí óõóêåõþí USB, êáé íá åðéôñÝøïõìå ðñüóâáóç óôïí óáñùôÞ óôá ìÝëç ôçò ïìÜäáò áõôÞò.

Ãéá ðáñÜäåéãìá, èá ÷ñçóéìïðïéÞóïõìå ìéá ïìÜäá ìå ôï üíïìá *`usb`*. Ôï ðñþôï âÞìá åßíáé ç äçìéïõñãßá áõôÞò ôçò ïìÜäáò ìå ôç âïÞèåéá ôçò åíôïëÞò pw(8):

```
# pw groupadd usb
```

Èá ðñÝðåé Ýðåéôá íá áëëÜîïõìå ôá äéêáéþìáôá ôïõ óõìâïëéêïý äåóìïý `/dev/ugen0.2` êáé ôïõ áñ÷åßïõ óõóêåõÞò `/dev/ugen0.2.0` þóôå íá åßíáé ðñïóâÜóéìá áðü ôçí ïìÜäá `usb` ìå äõíáôüôçôá åããñáöÞò (äéêáéþìáôá `0660` Þ `0664`). Áðü ðñïåðéëïãÞ, ìüíï ï éäéïêôÞôçò áõôþí ôùí áñ÷åßùí (ï `root`) Ý÷åé ôá áðáñáßôçôá äéêáéþìáôá åããñáöÞò. ¼ëá ôá ðáñáðÜíù ìðïñïýí íá ãßíïõí ìå ôéò ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/etc/devfs.rules`:

```
[system=5]
add path ugen0.2 mode 660 group usb
add path usb/0.2.0 mode 0660 group usb
```

Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ÷ñåéáóôïýí ôéò ðáñáêÜôù ãñáììÝò, ìå ôï óùóôü áñ÷åßï óõóêåõÞò (ôéò ðåñéóóüôåñåò öïñÝò èá åßíáé ôï `/dev/uscanner0`):

```
[system=5]
add path uscanner0 mode 0660 group usb
```

¸ðåéôá, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï `/etc/rc.conf` êáé åðáíåêêéíÞóôå ôï ìç÷Üíçìá:

```
devfs_system_ruleset="system"
```

Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÝò ôéò ãñáììÝò, ìðïñåßôå íá âñåßôå óôç óåëßäá manual ôïõ devfs(8).

¸ðåéôá áðü ôá ðáñáðÜíù âÞìáôá, ãéá íá äþóåôå ðñüóâáóç óôïí USB óáñùôÞ óå êÜðïéï ÷ñÞóôç, áñêåß íá ðñïóèÝóåôå ôï ëïãáñéáóìü ôïõ óôçí ïìÜäá *`usb`*:

```
# pw groupmod usb -m joe
```

Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äéáâÜóôå ôç óåëßäá manual ôïõ pw(8).

ÊåöÜëáéï 9 Ñõèìßæïíôáò ôïí ÐõñÞíá ôïõ FreeBSD

Áíáíåþèçêå êáé áíáäïìÞèçêå áðü ôïí Jim Mock. Áñ÷éêÜ óõíåéóöïñÜ áðü ôïí Jake Hamby.

9.1 Óýíïøç

Ï ðõñÞíáò åßíáé ç êáñäéÜ ôïõ ëåéôïõñãéêïý óõóôÞìáôïò FreeBSD. Åßíáé õðåýèõíïò ãéá ôç äéá÷åßñéóç ôçò ìíÞìçò, ôçí åðéâïëÞ ôùí ñõèìßóåùí áóöáëåßáò, ôç äéêôýùóç, ôçí ðñüóâáóç óôïí äßóêï, êáé ðïëëÜ Üëëá. ¸á óõíå÷þò áõîáíüìåíï ìÝñïò ôïõ FreeBSD ìðïñåß íá ñõèìéóôåß äõíáìéêÜ, áëëÜ õðÜñ÷ïõí áêüìá ðåñéðôþóåéò ïé ïðïßåò áðáéôïýí ñõèìßóåéò êáé ìåôáãëþôôéóç ôïõ ðõñÞíá ôïõ FreeBSD ìå ðñïóáñìïóìÝíåò ðáñáìÝôñïõò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ãéá ðïéïõò ëüãïõò ìðïñåß íá ÷ñåéáóôåß íá öôéÜîåôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá.
- Ðùò íá ãñÜøåôå Ýíá áñ÷åßï ñõèìßóåùí ðõñÞíá, Þ íá áëëÜîåôå Ýíá õðÜñ÷ïí áñ÷åßï ñõèìßóåùí.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá ãéá íá öôéÜîåôå êáé íá ìåôáãëùôôßóåôå Ýíá íÝï ðõñÞíá.
- Ðùò íá åãêáôáóôÞóåôå ôï íÝï ðõñÞíá.
- Ðùò íá åðéëýóåôå ôõ÷üí ðñïâëÞìáôá ìå ôï íÝï ðõñÞíá.

¼ëåò ïé åíôïëÝò ðïõ åìöáíßæïíôáé óå áõôü ôï êåöÜëáéï ùò ðáñáäåßãìáôá ðñÝðåé íá åêôåëåóôïýí ùò `root` ãéá íá åßíáé åðéôõ÷åßò.

9.2 Ãéáôß íá ÖôéÜîåôå ÐñïóáñìïóìÝíï ÐõñÞíá;

ÊáôÜ ðáñÜäïóç, ôï FreeBSD åß÷å áõôü ðïõ áðïêáëïýìå “ìïíïëéèéêü” ðõñÞíá. Áõôü óçìáßíåé üôé ï ðõñÞíáò Þôáí Ýíá ìåãÜëï ðñüãñáììá, õðïóôÞñéæå Ýíá óôáèåñü áñéèìü óõóêåõþí, êáé áí èÝëáôå íá áëëÜîåôå ôç óõìðåñéöïñÜ ôïõ, èá Ýðñåðå íá ìåôáãëùôôßóåôå êáéíïýñéï êáé íá åðáíåêêéíÞóåôå ôïí õðïëïãéóôÞ óáò ìå áõôüí.

ÓÞìåñá, ôï FreeBSD êéíåßôáé ôá÷ýôáôá ðñïò Ýíá ìïíôÝëï üðïõ ïé ðåñéóóüôåñåò ëåéôïõñãßåò ôïõ ðõñÞíá ðåñéÝ÷ïíôáé óå modules (áñèñþìáôá) ôá ïðïßá ìðïñïýí íá öïñôùèïýí êáé íá áðïöïñôùèïýí êáôÜ áðáßôçóç, äõíáìéêÜ óôïí ðõñÞíá. Áõôü åðéôñÝðåé óôïí ðõñÞíá íá ðñïóáñìüæåôáé óå õëéêü ôï ïðïßï åìöáíßæåôáé îáöíéêÜ óôï óýóôçìá (üðùò ãéá ðáñÜäåéãìá üôáí åéóÝñ÷åôáé ìéá êÜñôá PCMCIA óå Ýíá öïñçôü õðïëïãéóôÞ). Åðßóçò åðéôñÝðåé óôïí ðõñÞíá íá åðåêôåßíåé äõíáìéêÜ ôç ëåéôïõñãéêüôçôÜ ôïõ, ðñïóèÝôïíôáò ÷áñáêôçñéóôéêÜ ôá ïðïßá äåí Þôáí áðáñáßôçôá üôáí åß÷å ìåôáãëùôôéóôåß áñ÷éêÜ. Áõôüò ôïõ åßäïõò ï ðõñÞíáò åßíáé ãíùóôüò ùò modular (áñèñùôüò).

Ðáñ’ üëá áõôÜ, åßíáé áêüìá áðáñáßôçôï íá ãßíïõí êÜðïéåò óôáôéêÝò ñõèìßóåéò óôïí ðõñÞíá. Óå ïñéóìÝíåò ðåñéðôþóåéò, áõôü óõìâáßíåé åðåéäÞ ç óõãêåêñéìÝíç ëåéôïõñãßá åßíáé ôüóï óôåíÜ óõíäåìÝíç ìå ôïí ðõñÞíá þóôå äåí ìðïñåß íá öïñôùèåß äõíáìéêÜ. Óå Üëëåò, óõìâáßíåé åðåéäÞ áðëÜ êáíåßò äåí Ý÷åé áêüìá áó÷ïëçèåß íá ãñÜøåé Ýíá äõíáìéêü module ðïõ íá ðáñÝ÷åé áõôÞ ôç ëåéôïõñãéêüôçôá.

Ç äçìéïõñãßá ðñïóáñìïóìÝíïõ ðõñÞíá åßíáé áðü ôéò ðëÝïí óçìáíôéêÝò ôåëåôïõñãßåò êÜèå ðñï÷ùñçìÝíïõ ÷ñÞóôç ôïõ BSD. Ç äéáäéêáóßá áõôÞ, áí êáé ÷ñïíïâüñá, èá áðïâåß éäéáßôåñá ùöÝëéìç ãéá ôï FreeBSD óýóôçìá óáò. Óå áíôßèåóç ìå ôïí ðõñÞíá `GENERIC`, ï ïðïßïò ðñÝðåé íá õðïóôçñßîåé ìåãÜëï åýñïò óõóêåõþí, Ýíáò ðñïóáñìïóìÝíïò ðõñÞíáò ðåñéÝ÷åé õðïóôÞñéîç ìüíï ãéá ôï õëéêü ôïõ *äéêïý óáò* õðïëïãéóôÞ. ¸óé Ý÷åôå êÜðïéá ïöÝëç, üðùò:

- Ôá÷ýôåñç åêêßíçóç. Êáèþò ï ðõñÞíáò èá áíé÷íåýåé ìüíï ôï õëéêü ðïõ Ý÷åôå óôï óýóôçìá óáò, ï ÷ñüíïò ðïõ ÷ñåéÜæåôáé ãéá ôçí åêêßíçóç ôïõ óõóôÞìáôïò óáò èá ìåéùèåß äñáìáôéêÜ.
- ×áìçëüôåñç êáôáíÜëùóç ìíÞìçò. ¸íáò ðñïóáñìïóìÝíïò ðõñÞíáò, óõ÷íÜ ÷ñçóéìïðïéåß ëéãüôåñç ìíÞìç áðü ôïí ðõñÞíá `GENERIC`, áöïý áðïõóéÜæïõí áðü áõôüí óõóêåõÝò êáé ÷áñáêôçñéóôéêÜ ðïõ äåí ÷ñçóéìïðïéïýíôáé. Áõôü åßíáé óçìáíôéêü, êáèþò ï ðõñÞíáò âñßóêåôáé ðÜíôá öïñôùìÝíïò óôçí öõóéêÞ ìíÞìç, ìåéþíïíôáò Ýôóé ôç ìíÞìç ðïõ åßíáé äéáèÝóéìç ãéá åöáñìïãÝò. Ãéá ôï ëüãï áõôü, ï ðñïóáñìïóìÝíïò ðõñÞíáò åßíáé éäéáßôåñá ÷ñÞóéìïò óå óõóôÞìáôá ìå ìéêñü ìÝãåèïò öõóéêÞò ìíÞìçò (RAM).
- Åðéðñüóèåôç õðïóôÞñéîç óõóêåõþí. Ï ðñïóáñìïóìÝíïò ðõñÞíáò óáò åðéôñÝðåé íá ðñïóèÝóåôå õðïóôÞñéîç ãéá óõóêåõÝò ïé ïðïßåò äåí õðÜñ÷ïõí óôïí `GENERIC` ðõñÞíá, üðùò ãéá ðáñÜäåéãìá ãéá êÜñôåò Þ÷ïõ.

9.3 Áíáêáëýðôïíôáò ôéò ÓõóêåõÝò ôïõ ÓõóôÞìáôïò óáò

ÃñÜöçêå áðü ôïí Tom Rhodes.

Ðñéí îåêéíÞóåôå ìå ôç ñýèìéóç ôïõ ðõñÞíá óáò, èá Þôáí óêüðéìï íá êÜíåôå ìéá áðïãñáöÞ ôïõ õëéêïý ôïõ õðïëïãéóôÞ óáò. Óå ðåñéðôþóåéò ðïõ ôï FreeBSD äåí åßíáé ôï âáóéêü óáò ëåéôïõñãéêü óýóôçìá, ìðïñåßôå åýêïëá íá äçìéïõñãÞóåôå áõôÞ ôç ëßóôá, åîåôÜæïíôáò ôéò ñõèìßóåéò ôïõ ôñÝ÷ïíôïò ëåéôïõñãéêïý óõóôÞìáôïò. Ãéá ðáñÜäåéãìá, ç **Äéá÷åßñéóç Óõóêåõþí (Device Manager)** ôçò Microsoft äåß÷íåé óõíÞèùò óçìáíôéêÝò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò åãêáôåóôçìÝíåò óõóêåõÝò. Ìðïñåßôå íá âñåßôå ôçí **Äéá÷åßñéóç Óõóêåõþí** óôïí ðßíáêá åëÝã÷ïõ.

> **Óçìåßùóç:** ÌåñéêÝò åêäüóåéò ôùí Microsoft Windows äéáèÝôïõí Ýíá åéêïíßäéï ìå ôßôëï **Óýóôçìá (System)**. Áðü ôçí ïèüíç ðïõ åìöáíßæåôáé ìðïñåßôå íá åðéëÝîåôå ôçí **Äéá÷åßñéóç Óõóêåõþí**.

Áí äåí õðÜñ÷åé Üëëï ëåéôïõñãéêü óýóôçìá óôïí õðïëïãéóôÞ, ï äéá÷åéñéóôÞò èá ðñÝðåé íá âñåé áõôÝò ôéò ðëçñïöïñßåò ÷åéñïêßíçôá. Ìéá ìÝèïäïò åßíáé ìå ôç ÷ñÞóç ôïõ âïçèçôéêïý ðñïãñÜììáôïò dmesg(8) êáé ôçò åíôïëÞò man(1). Ôá ðåñéóóüôåñá ðñïãñÜììáôá ïäçãþí ôïõ FreeBSD äéáèÝôïõí óåëßäá manual, ç ïðïßá äåß÷íåé ôï õðïóôçñéæüìåíï õëéêü. ÊáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò, åìöáíßæåôáé ìéá ëßóôá ìå ôéò óõóêåõÝò ðïõ áíé÷íåýèçêáí. Ãéá ðáñÜäåéãìá, ïé ðáñáêÜôù ãñáììÝò äåß÷íïõí üôé ôï ðñüãñáììá ïäÞãçóçò `psm` åíôüðéóå Ýíá ðïíôßêé:

```
psm0: <PS/2 Mouse> irq 12 on atkbdc0
psm0: [GIANT-LOCKED]
psm0: [ITHREAD]
psm0: model Generic PS/2 mouse, device ID 0
```

Áõôü ôï ðñüãñáììá ïäÞãçóçò èá ðñÝðåé íá ðåñéëçöèåß óôï áñ÷åßï ñõèìßóåùí ôïõ ðñïóáñìïóìÝíïõ ðõñÞíá óáò, Þ íá öïñôùèåß äõíáìéêÜ ìÝóù ôïõ loader.conf(5).

Óå ïñéóìÝíåò ðåñéðôþóåéò, ç Ýîïäïò ôçò `dmesg` ìðïñåß íá äåß÷íåé ìüíï ôá ìçíýìáôá ôïõ óõóôÞìáôïò êáé ü÷é ôá áðïôåëÝóìáôá ôçò áíß÷íåõóçò óõóêåõþí. Óôéò ðåñéðôþóåéò áõôÝò, ìðïñåßôå íá äåßôå ôçí åðéèõìçôÞ Ýîïäï óôï ðåñéå÷üìåíï ôïõ áñ÷åßïõ `/var/run/dmesg.boot`.

Ìéá Üëëç ìÝèïäïò ãéá ôçí áíß÷íåõóç ôïõ õëéêïý, åßíáé ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò pciconf(8), ôï ïðïßï ðáñÝ÷åé ðéï áíáëõôéêÞ ðåñéãñáöÞ. Ãéá ðáñÜäåéãìá:

```
ath0@pci0:3:0:0:        class=0x020000 card=0x058a1014 chip=0x1014168c rev=0x01 hdr=0x00
vendor     = 'Atheros Communications Inc.'
device     = 'AR5212 Atheros AR5212 802.11abg wireless'
class      = network
```

```
subclass   = ethernet
```

Ç ðáñáðÜíù Ýîïäïò, ðïõ ëÞöèçêå ìÝóù ôçò åíôïëÞò `pciconf -lv`, äåß÷íåé üôé ôï ðñüãñáììá ïäÞãçóçò `ath` åíôüðéóå ìéá óõóêåõÞ áóýñìáôïõ Ethernet. Ìðïñåßôå íá äåßôå ôçí áíôßóôïé÷ç óåëßäá manual ôïõ ðñïãñÜììáôïò ath(4), ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `man ath`.

Ìðïñåßôå åðßóçò íá ðÜñåôå ÷ñÞóéìåò ðëçñïöïñßåò áðü ôçí åíôïëÞ man(1), áí äþóåôå ôçí åðéëïãÞ `-k`. Óôï ðáñáðÜíù ðáñÜäåéãìá, äßíïíôáò:

```
# man -k Atheros
```

Èá äåßôå ìéá ëßóôá áðü óåëßäåò manual ðïõ ðåñéÝ÷ïõí ôç óõãêåêñéìÝíç ëÝîç:

```
ath(4)                   - Atheros IEEE 802.11 wireless network driver
ath_hal(4)               - Atheros Hardware Access Layer (HAL)
```

¸÷ïíôáò äéáèÝóéìç ôçí áðïãñáöÞ õëéêïý ôïõ õðïëïãéóôÞ óáò, ç äéáäéêáóßá äçìéïõñãßáò ðñïóáñìïóìÝíïõ ðõñÞíá óßãïõñá öáßíåôáé ëéãüôåñï áðïèáññõíôéêÞ.

9.4 ÐñïãñÜììáôá ÏäÞãçóçò, ÕðïóõóôÞìáôá êáé Áñèñþìáôá (modules)

Ðñéí äçìéïõñãÞóåôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá, èá ðñÝðåé ðñþôá íá óêåöôåßôå ãéá ðïéïõò ëüãïõò ôïí ÷ñåéÜæåóôå. Óå ðïëëÝò ðåñéðôþóåéò, ç õðïóôÞñéîç êÜðïéáò óõãêåêñéìÝíçò óõóêåõÞò ìðïñåß íá åðéôåõ÷èåß ìå ôçí ÷ñÞóç êÜðïéïõ áñèñþìáôïò (module).

Ôá áñèñþìáôá ôïõ ðõñÞíá âñßóêïíôáé óôïí êáôÜëïãï `/boot/kernel/` êáé ìðïñïýí íá öïñôùèïýí äõíáìéêÜ óôïí ðõñÞíá ðïõ åêôåëåßôáé ôç äåäïìÝíç óôéãìÞ, ìå ôç ÷ñÞóç ôçò åíôïëÞò kldload(8). Ôá ðåñéóóüôåñá, áí êáé ü÷é üëá, ôá ðñïãñÜììáôá ïäÞãçóçò óôïí ðõñÞíá, äéáèÝôïõí êáé óá ìïñöÞ áñèñþìáôïò· Ý÷ïõí åðßóçò ôç äéêÞ ôïõ óåëßäá âïÞèåéáò ôï êáèÝíá. Ãéá ðáñÜäåéãìá, óôçí ðñïçãïýìåíç åíüôçôá, åßäáìå ôï ðñüãñáììá ïäÞãçóçò áóýñìáôïõ Ethernet `ath`. Ç óåëßäá âïÞèåéáò ãéá áõôÞ ôç óõóêåõÞ áíáöÝñåé:

```
Alternatively, to load the driver as a module at boot time, place the
following line in loader.conf(5):

      if_ath_load="YES"
```

¼ðùò áíáöÝñåôáé óôéò ïäçãßåò, áí âÜëåôå ôçí ãñáììÞ `if_ath_load="YES"` óôï áñ÷åßï `/boot/loader.conf`, ôï Üñèñùìá èá öïñôùèåß äõíáìéêÜ êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò óáò.

Óå ìåñéêÝò ðåñéðôþóåéò ùóôüóï, äåí õðÜñ÷åé Üñèñùìá ãéá íá óõíïäåýåé êÜðïéï ðñüãñáììá ïäÞãçóçò. Áõôü éó÷ýåé ðåñéóóüôåñï ãéá êÜðïéá éäéáßôåñá õðïóõóôÞìáôá êáé ðïëý óçìáíôéêÜ ðñïãñÜììáôá ïäÞãçóçò. Ãéá ðáñÜäåéãìá, ôï ðñüãñáììá ïäÞãçóçò ôïõ óõóôÞìáôïò áñ÷åßùí fast file system (FFS) áðáéôåßôáé íá åßíáé åíóùìáôùìÝíï óôïí ðõñÞíá. Ôï ßäéï óõìâáßíåé êáé ìå ôçí õðïóôÞñéîç äéêôýïõ (INET). Äõóôõ÷þò, ï ìüíïò ôñüðïò ãéá íá äåßôå áí Ýíá ðñüãñáììá ïäÞãçóçò ðñÝðåé íá åßíáé õðï÷ñåùôéêÜ åíóùìáôùìÝíï óôïí ðõñÞíá, åßíáé íá åëÝãîåôå áí õðÜñ÷åé ôï áíôßóôïé÷ï Üñèñùìá.

> **Ðñïåéäïðïßçóç:** Åßíáé áñêåôÜ åýêïëï íá áöáéñÝóåôå ôçí õðïóôÞñéîç ãéá êÜðïéá óõóêåõÞ Þ Üëëç åðéëïãÞ, êáé íá êáôáëÞîåôå ìå Ýíá ðõñÞíá ðïõ äåí ìðïñåß íá îåêéíÞóåé. Ãéá ðáñÜäåéãìá, áí âãÜëåôå ôï ðñüãñáììá ïäÞãçóçò ata(4) áðü ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò, áí ôï óýóôçìá óáò ÷ñçóéìïðïéåß äßóêïõò ATA äåí èá ìðïñåß íá îåêéíÞóåé. Óôçí ðåñßðôùóç áõôÞ èá ðñÝðåé íá âÜëåôå ôçí áíôßóôïé÷ç ãñáììÞ óôï áñ÷åßï

> `loader.conf` ãéá íá öïñôþóåôå ôï ó÷åôéêü Üñèñùìá. Áí äåí åßóôå óßãïõñïé, åëÝãîôå ãéá ôçí ýðáñîç ôïõ áñèñþìáôïò, êáé áðëþò áöÞóôå ôçí õðïóôÞñéîç åíóùìáôùìÝíç óôïí ðõñÞíá.

9.5 Äçìéïõñãßá êáé ÅãêáôÜóôáóç ÐñïóáñìïóìÝíïõ ÐõñÞíá

> **Óçìåßùóç:** ×ñåéÜæåôáé íá Ý÷åôå åãêáôáóôÞóåé üëï ôïí ðçãáßï êþäéêá ôïõ FreeBSD ãéá íá ìåôáãëùôôßóåôå ôïí ðõñÞíá.

Áñ÷éêÜ, èá êÜíïõìå ìéá ãñÞãïñç ðáñïõóßáóç ôïõ êáôáëüãïõ óôïí ïðïßï ãßíåôáé ç ìåôáãëþôôéóç ôïõ ðõñÞíá. ¼ëïé ïé êáôÜëïãïé ðïõ èá áíáöÝñïõìå âñßóêïíôáé êÜôù áðü ôïí êáôÜëïãï `/usr/src/sys` ï ïðïßïò åßíáé åðßóçò ðñïóâÜóéìïò ìÝóù ôçò äéáäñïìÞò `/sys`. ÕðÜñ÷åé åäþ Ýíáò áñéèìüò õðïêáôáëüãùí ï ïðïßïò áíôéðñïóùðåýåé äéáöïñåôéêÜ ôìÞìáôá ôïõ ðõñÞíá, áëëÜ ïé ðëÝïí óçìáíôéêïß ãéá ôï óêïðü ìáò åßíáé ïé *`arch`*`/conf`, üðïõ èá åðåîåñãáóôåßôå ôéò ñõèìßóåéò ãéá ôïí ðñïóáñìïóìÝíï ðõñÞíá óáò, êáé ï `compile`, ðïõ åßíáé ï ÷þñïò åñãáóßáò óôïí ïðïßï èá ãßíåé ç ìåôáãëþôôéóç ôïõ. Ï *`arch`* áíôéðñïóùðåýåé Ýíá áðü ôá `i386`, `amd64`, `ia64`, `powerpc`, `sparc64`, Þ `pc98` (Ýíáò åíáëëáêôéêüò ôýðïò PC, äéáäåäïìÝíïò óôçí Éáðùíßá). Ïôéäçðïôå âñßóêåôáé ìÝóá óôïí óõãêåêñéìÝíï êáôÜëïãï ìéáò áñ÷éôåêôïíéêÞò, ó÷åôßæåôáé ìüíï ìå ôçí áñ÷éôåêôïíéêÞ áõôÞ. Ôï õðüëïéðï ôïõ êþäéêá, åßíáé áíåîÜñôçôï áðü ôçí áñ÷éôåêôïíéêÞ êáé êïéíü óå êÜèå ðëáôöüñìá üðïõ èá ìðïñïýóå íá ìåôáãëùôôéóôåß ôï FreeBSD. ÐáñáôçñÞóôå ôç ëïãéêÞ ïñãÜíùóç ôçò äïìÞò ôùí êáôáëüãùí, üðïõ êÜèå õðïóôçñéæüìåíç óõóêåõÞ, óýóôçìá áñ÷åßùí êáé åðéëïãÞ âñßóêåôáé óôï äéêü ôçò êáôÜëïãï.

Óôá ðáñáäåßãìáôá áõôïý ôïõ êåöáëáßïõ õðïèÝôïõìå üôé ÷ñçóéìïðïéåßôå ôçí áñ÷éôåêôïíéêÞ i386. Áí ÷ñçóéìïðïéåßôå äéáöïñåôéêÞ áñ÷éôåêôïíéêÞ, èá ÷ñåéáóôåß íá áëëÜîåôå ôá ïíüìáôá ôùí êáôáëüãùí êáé äéáäñïìþí þóôå íá óõìâáäßæïõí ìå áõôÞ.

> **Óçìåßùóç:** Áí *äåí õðÜñ÷åé* ï êáôÜëïãïò `/usr/src/sys` óôï óýóôçìá óáò (Þ áí åßíáé Üäåéïò), ôüôå äåí Ý÷åôå åãêáôáóôÞóåé ôïí ðçãáßï êþäéêá ôïõ ðõñÞíá. Ï åõêïëüôåñïò ôñüðïò ãéá íá ôïí åãêáôáóôÞóåôå åßíáé åêôåëþíôáò ôï `sysinstall` ùò `root`, åðéëÝãïíôáò Configure, ìåôÜ Distributions, Ýðåéôá src êáé ôÝëïò All. Èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå êáé Ýíá óõìâïëéêü äåóìü ðñïò ôïí êáôÜëïãï `/usr/src/sys/` áí äåí õðÜñ÷åé Þäç:
>
> ```
> # ln -s /usr/src/sys /sys
> ```

¸ðåéôá, ìåôáêéíçèåßôå óôïí êáôÜëïãï *`arch`*`/conf` êáé áíôéãñÜøôå ôï áñ÷åßï ñõèìßóåùí `GENERIC` óôï üíïìá ôï ïðïßï èÝëåôå íá äþóåôå óôï íÝï óáò ðõñÞíá. Ãéá ðáñÜäåéãìá:

```
# cd /usr/src/sys/i386/conf
# cp GENERIC MYKERNEL
```

ÊáôÜ ðáñÜäïóç, ôï üíïìá áõôü ãñÜöåôáé åî’ ïëïêëÞñïõ ìå êåöáëáßá ãñÜììáôá êáé áí Ý÷åôå ðïëëÜ ìç÷áíÞìáôá FreeBSD ìå äéáöïñåôéêü õëéêü, åßíáé êáëÞ éäÝá íá ôïõ äþóåôå ôï üíïìá ôïõ ìç÷áíÞìáôïò. Ãéá ôï ðáñÜäåéãìá ìáò, èá ôï áðïêáëïýìå *`MYKERNEL`*.

> **Õðüäåéîç:** Äåí åßíáé ãåíéêÜ êáëÞ éäÝá íá áðïèçêåýóåôå ôï áñ÷åßï ñõèìßóåùí óáò áðåõèåßáò óôïí êáôÜëïãï `/usr/src`. Áí áíôéìåôùðßóåôå ðñïâëÞìáôá, ßóùò ìðåßôå óôïí ðåéñáóìü íá äéáãñÜøåôå áðëþò ôïí êáôÜëïãï `/usr/src` êáé íá îåêéíÞóåôå áðü ôçí áñ÷Þ. ÓõíÞèùò ëßãá äåõôåñüëåðôá ìåôÜ áðü áõôü èá

óõíåéäçôïðïéÞóåôå üôé Ý÷åôå åðßóçò äéáãñÜøåé ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò. Åðßóçò, ìçí åðåîåñãÜæåóôå áðåõèåßáò ôï áñ÷åßï `GENERIC`, êáèþò ìðïñåß ïé áëëáãÝò óáò íá ÷áèïýí ôçí åðüìåíç öïñÜ ðïõ èá áíáíåþóåôå ôïí ðçãáßï óáò êþäéêá.

Êáëü èá åßíáé íá áðïèçêåýóåôå ôï áñ÷åßï ñõèìßóåùí óå Üëëï êáôÜëïãï êáé íá äçìéïõñãÞóåôå Ýíá óõìâïëéêü äåóìü ðñïò ôï áñ÷åßï, óôïí êáôÜëïãï *`i386`*.

Ãéá ðáñÜäåéãìá:

```
# cd /usr/src/sys/i386/conf
# mkdir /root/kernels
# cp GENERIC /root/kernels/MYKERNEL
# ln -s /root/kernels/MYKERNEL
```

Ôþñá, ôñïðïðïéÞóôå ôï áñ÷åßï *`MYKERNEL`* ìå ôïí åðåîåñãáóôÞ êåéìÝíïõ ðïõ ðñïôéìÜôå. Áí îåêéíÜôå ìüëéò ôþñá, ðéèáíüí ï ìüíïò äéáèÝóéìïò åðåîåñãáóôÞò êåéìÝíïõ íá åßíáé ôï **vi**, ï ïðïßïò åßíáé áñêåôÜ ðïëýðëïêïò ãéá íá ôïí åîçãÞóïõìå åäþ, áëëÜ êáëýðôåôáé áñêåôÜ êáëÜ áðü ðïëëÜ âéâëßá óôçí âéâëéïãñáößá. Ùóôüóï, ôï FreeBSD äéáèÝôåé åðßóçò Ýíá åõêïëüôåñï åðåîåñãáóôÞ êåéìÝíïõ, ôïí **ee** ï ïðïßïò åßíáé ç êáôÜëëçëç åðéëïãÞ áí åßóôå áñ÷Üñéïò. ÁëëÜîôå êáôÜ âïýëçóç ôá ó÷üëéá óôçí áñ÷Þ ôïõ áñ÷åßïõ ñõèìßóåùí þóôå íá áíôáíáêëïýí ôéò áëëáãÝò ðïõ Ý÷åôå êÜíåé êáé ïé ïðïßåò ôï äéá÷ùñßæïõí áðü ôï `GENERIC`.

Áí Ý÷åôå äçìéïõñãÞóåé ðõñÞíá óôï SunOS Þ óå êÜðïéï Üëëï ëåéôïõñãéêü óýóôçìá ôýðïõ BSD, ôï ìåãáëýôåñï ìÝñïò áõôïý ôïõ áñ÷åßïõ èá óáò öáíåß ãíùóôü. Áðü ôçí Üëëç, áí Ýñ÷åóôå áðü êÜðïéï Üëëï ëåéôïõñãéêü, üðùò ôï DOS ôï áñ÷åßï ñõèìßóåùí `GENERIC` ßóùò íá óáò åßíáé äýóêïëï óôçí êáôáíüçóç, ãéá ôï ëüãï áõôü áêïëïõèÞóôå áñãÜ êáé ðñïóåêôéêÜ ôéò ðåñéãñáöÝò ôïõ ôìÞìáôïò Áñ÷åßï Ñõèìßóåùí.

Óçìåßùóç: Áí óõã÷ñïíßóåôå ôïí ðçãáßï êþäéêá ìå ôéò ôåëåõôáßåò áëëáãÝò ôïõ FreeBSD project, íá äéáâÜóåôå ôï áñ÷åßï `/usr/src/UPDATING` ðñéí ðñï÷ùñÞóåôå óå ïðïéïäÞðïôå âÞìá áíáâÜèìéóçò. Ôï áñ÷åßï áõôü ðåñéãñÜöåé ðéèáíÜ óçìáíôéêÜ ðñïâëÞìáôá Þ ðåñéï÷Ýò ðïõ ÷ñåéÜæïíôáé éäéáßôåñç ðñïóï÷Þ üóïí áöïñÜ ôïí áíáíåùìÝíï ðçãáßï êþäéêá. Ôï áñ÷åßï `/usr/src/UPDATING` ôáéñéÜæåé ðÜíôá ìå ôçí Ýêäïóç ôïõ ðçãáßïõ êþäéêá ôïõ FreeBSD ðïõ Ý÷åôå, êáé åßíáé ãéá áõôü ôï ëüãï ðéï åíçìåñùìÝíï óå ó÷Ýóç ìå üôé äéáâÜóåôå óôï ðáñüí âéâëßï.

Èá ðñÝðåé ôþñá íá ìåôáãëùôôßóåôå ôïí ðçãáßï êþäéêá ôïõ ðõñÞíá.

Ìåôáãëþôôéóç ôïõ ÐõñÞíá

Óçìåßùóç: ×ñåéÜæåôáé íá Ý÷åôå åãêáôáóôÞóåé üëï ôïí ðçãáßï êþäéêá ôïõ FreeBSD ãéá íá ìåôáãëùôôßóåôå ôïí ðõñÞíá.

1. Ìåôáêéíçèåßôå óôïí êáôÜëïãï `/usr/src`:

   ```
   # cd /usr/src
   ```

2. Ìåôáãëùôôßóôå ôïí ðõñÞíá:

   ```
   # make buildkernel KERNCONF=MYKERNEL
   ```

3. ÅãêáôáóôÞóôå ôïí íÝï ðõñÞíá:

   ```
   # make installkernel KERNCONF=MYKERNEL
   ```

Õðüäåéîç: Áðü ðñïåðéëïãÞ, üôáí äçìéïõñãåßôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá, äçìéïõñãïýíôáé åðßóçò êáé *üëá* ôá modules (áñèñþìáôá) ðõñÞíá. Áí èÝëåôå íá êÜíåôå ðéï ãñÞãïñç áíáíÝùóç ôïõ ðõñÞíá Þ íá äçìéïõñãÞóåôå ìüíï óõãêåêñéìÝíá modules, èá ðñÝðåé íá ôñïðïðïéÞóåôå ôï áñ÷åßï `/etc/make.conf` ðñéí îåêéíÞóåôå ôç äçìéïõñãßá ôïõ ðõñÞíá:

```
MODULES_OVERRIDE = linux acpi sound/sound sound/driver/ds1 ntfs
```

Óôç ìåôáâëçôÞ áõôÞ äßíåôå ìéá ëßóôá ôùí modules ðïõ èÝëåôå íá äçìéïõñãçèïýí, áíôß íá äçìéïõñãçèïýí üëá.

```
WITHOUT_MODULES = linux acpi sound ntfs
```

Óôç ìåôáâëçôÞ áõôÞ äßíåôå ìéá ëßóôá âáóéêþí (top level) modules ðïõ èÝëåôå íá ðáñáëåßøåôå êáôÜ ôç äéáäéêáóßá äçìéïõñãßáò. Ãéá Üëëåò ìåôáâëçôÝò ðïõ ßóùò åßíáé ÷ñÞóéìåò óôç äéáäéêáóßá äçìéïõñãßáò ðõñÞíá, äåßôå ôç óåëßäá manual ôïõ make.conf(5).

Ï íÝïò ðõñÞíáò èá áíôéãñáöåß óôïí êáôÜëïãï `/boot/kernel` ìå ôï üíïìá `/boot/kernel/kernel` åíþ ï ðáëéüò ðõñÞíáò èá ìåôáêéíçèåß óôï `/boot/kernel.old/kernel`. Ôåñìáôßóôå ôþñá ôï óýóôçìá óáò êáé åðáíåêêéíÞóôå ãéá íá ÷ñçóéìïðïéÞóåôå ôï íÝï ðõñÞíá. Áí êÜôé ðÜåé óôñáâÜ, õðÜñ÷ïõí êÜðïéåò ðëçñïöïñßåò ãéá Áíôéìåôþðéóç ÐñïâëçìÜôùí ðïõ ßóùò óáò öáíïýí ÷ñÞóéìåò, óôï ôÝëïò áõôïý ôïõ êåöáëáßïõ. Âåâáéùèåßôå üôé äéáâÜóáôå ôï ôìÞìá ðïõ åîçãåß ðùò íá åðáíáöÝñåôå ôï óýóôçìá óáò óå ðåñßðôùóç ðïõ ï íÝïò ðõñÞíáò äåí åêêéíåß.

> **Óçìåßùóç:** ¶ëëá áñ÷åßá ðïõ ó÷åôßæïíôáé ìå ôç äéáäéêáóßá åêêßíçóçò, üðùò ï loader(8) êáé ïé ñõèìßóåéò ôïõ, âñßóêïíôáé óôïí êáôÜëïãï `/boot`. Åîåéäéêåõìåíá modules Þ modules ôñßôùí êáôáóêåõáóôþí ìðïñïýí íá ôïðïèåôçèïýí óôïí êáôÜëïãï `/boot/kernel`, áí êáé ïé ÷ñÞóôåò èá ðñÝðåé íá ãíùñßæïõí üôé åßíáé óçìáíôéêü ôá modules íá åßíáé óå óõã÷ñïíéóìü ìå ôïí ðõñÞíá. Modules ôá ïðïßá äåí ðñïïñßæïíôáé ãéá åêôÝëåóç ìå ôïí ôñÝ÷ïíôá ðõñÞíá, ìðïñïýí íá ðñïêáëÝóïõí áóôÜèåéá Þ åóöáëìÝíç ëåéôïõñãßá ôïõ óõóôÞìáôïò óáò.

9.6 Ôï Áñ÷åßï Ñõèìßóåùí

Áíáíåþèçêå ãéá ôï FreeBSD Joel Dahl.

Ç ãåíéêÞ ìïñöÞ åíüò áñ÷åßïõ ñõèìßóåùí ðõñÞíá, åßíáé áñêåôÜ áðëÞ. ÊÜèå ãñáììÞ ðåñéÝ÷åé ìéá ëÝîç-êëåéäß êáé Ýíá Þ ðåñéóóüôåñá ïñßóìáôá. Ãéá ëüãïõò áðëüôçôáò, ïé ðåñéóóüôåñåò ãñáììÝò ðåñéÝ÷ïõí ìüíï Ýíá üñéóìá. Ïôéäçðïôå âñßóêåôáé ìåôÜ ôï óýìâïëï # èåùñåßôáé ó÷üëéï êáé áãíïåßôáé. Óôá åðüìåíá ôìÞìáôá èá âñåßôå ðåñéãñáöÞ ãéá ôéò ëÝîåéò-êëåéäéÜ, ìå ôç óåéñÜ ðïõ åìöáíßæïíôáé óôï áñ÷åßï ñõèìßóåùí `GENERIC`. Ãéá åîáíôëçôéêÞ ëßóôá ôùí ðáñáìÝôñùí êáé óõóêåõþí ðïõ åîáñôþíôáé áðü ôçí áñ÷éôåêôïíéêÞ, äåßôå ôï áñ÷åßï `NOTES` ôï ïðïßï âñßóêåôáé óôïí ßäéï êáôÜëïãï ìå ôï áñ÷åßï `GENERIC`. Ãéá åðéëïãÝò êáé ñõèìßóåéò ðïõ åßíáé áíåîÜñôçôåò áðü ôçí áñ÷éôåêôïíéêÞ, äåßôå ôï áñ÷åßï `/usr/src/sys/conf/NOTES`.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ïäçãßá `include` óôá áñ÷åßá ñõèìßóåùí. Ç ïäçãßá áõôÞ åðéôñÝðåé ôçí ëïãéêÞ óõìðåñßëçøç åíüò Üëëïõ áñ÷åßïõ ñõèìßóåùí ìÝóá óôï ôñÝ÷ïí, êÜíïíôáò ðéï åýêïëç ôç óõíôÞñçóç ôïõ üôáí ïé áëëáãÝò ðïõ ÷ñåéÜæïíôáé åßíáé ëßãåò óå ó÷Ýóç ìå ôï áñ÷éêü áñ÷åßï. Ãéá ðáñÜäåéãìá, áí ÷ñåéÜæåóôå Ýíá ðõñÞíá `GENERIC` ìå ëßãåò ìüíï ðáñáðÜíù åðéëïãÝò Þ ðñïãñÜììáôá ïäÞãçóçò, ìðïñåßôå íá äçìéïõñãÞóåôå Ýíá ìéêñü áñ÷åßï äéáöïñþí óå ó÷Ýóç ìå ôïí `GENERIC`:

```
include GENERIC
ident MYKERNEL
```

```
options         IPFIREWALL
options         DUMMYNET
options         IPFIREWALL_DEFAULT_TO_ACCEPT
options         IPDIVERT
```

Ðïëëïß äéá÷åéñéóôÝò âñßóêïõí üôé áõôü ôï ìïíôÝëï ðñïóöÝñåé óçìáíôéêÜ ðëåïíåêôÞìáôá óå ó÷Ýóç ìå ôïí ðáñáäïóéáêü ôñüðï óõãêñáôÞò áñ÷åßùí ñõèìßóåùí áðü ôï ìçäÝí: ôï ôïðéêü áñ÷åßï ñõèìßóåùí ðåñéÝ÷åé ìüíï ôéò äéáöïñÝò áðü Ýíá ðõñÞíá `GENERIC`. Êáèþò ãßíïíôáé áíáâáèìßóåéò óôï óýóôçìá, ôá íÝá ÷áñáêôçñéóôéêÜ êáé äõíáôüôçôåò ðïõ ðñïóôßèåíôáé óôïí `GENERIC` èá ðñïóôåèïýí êáé óôïí ðñïóáñìïóìÝíï ðõñÞíá, åêôüò áí ôï áðïôñÝøåôå ÷ñçóéìïðïéþíôáò ôï `nooptions` Þ ôï `nodevice`. Ôï õðüëïéðï áõôïý ôïõ êåöáëáßïõ, åîçãåß ôï ðåñéå÷üìåíï åíüò ôõðéêïý áñ÷åßïõ ñõèìßóåùí êáé ôï ñüëï ðïõ Ý÷ïõí ïé äéÜöïñåò åðéëïãÝò êáé ôá ðñïãñÜììáôá ïäÞãçóçò ðïõ åìöáíßæïíôáé óå áõôü.

> **Óçìåßùóç:** Ãéá íá äçìéïõñãÞóåôå Ýíá áñ÷åßï ôï ïðïßï íá ðåñéÝ÷åé üëåò ôéò äéáèÝóéìåò åðéëïãÝò, üðùò ãßíåôáé óõíÞèùò ãéá äïêéìÝò, åêôåëÝóôå ôçí áêüëïõèç åíôïëÞ ùò `root`:
>
> ```
> # cd /usr/src/sys/i386/conf && make LINT
> ```

Ôï ðáñáêÜôù åßíáé Ýíá ðáñÜäåéãìá ôïõ áñ÷åßïõ ñõèìßóåùí `GENERIC` ìå åðéðñüóèåôá äéåõêñéíéóôéêÜ ó÷üëéá üðïõ åßíáé áðáñáßôçôï. Ôï ðáñÜäåéãìá èá ðñÝðåé íá ôáéñéÜæåé áñêåôÜ êáëÜ ìå ôï áíôßãñáöï ôïõ áñ÷åßïõ ðïý Ý÷åôå óôï `/usr/src/sys/i386/conf/GENERIC`.

```
machine         i386
```

Ñüèìéóç ãéá ôçí áñ÷éôåêôïíéêÞ ôïõ ìç÷áíÞìáôïò. ÐñÝðåé íá åßíáé `amd64`, `i386`, `ia64`, `pc98`, `powerpc`, Þ `sparc64`.

```
cpu             I486_CPU
cpu             I586_CPU
cpu             I686_CPU
```

Ç ðáñáðÜíù åðéëïãÞ êáèïñßæåé ôïí ôýðï ôçò CPU ðïõ Ý÷åôå óôï óýóôçìá óáò. Ìðïñåß íá Ý÷åôå ðáñáðÜíù áðü ìéá ôÝôïéåò ãñáììÝò (áí ãéá ðáñÜäåéãìá äåí åßóôå óßãïõñïò áí èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå `I586_CPU` Þ `I686_CPU`), áëëÜ ãéá Ýíá ðñïóáñìïóìÝíï ðõñÞíá åßíáé êáëýôåñá íá êáèïñßóåôå ìüíï ôç CPU ðïõ Ý÷åôå. Áí äåí åßóôå óßãïõñïò ãéá ôïí ôýðï ôçò CPU ìðïñåßôå íá åëÝãîåôå ôï áñ÷åßï `/var/run/dmesg.boot` ãéá íá äåßôå ôá ìçíýìáôá åêêßíçóçò ôïõ óõóôÞìáôïò óáò.

```
ident           GENERIC
```

Áõôü åßíáé ôï áíáãíùñéóôéêü üíïìá ôïõ ðõñÞíá. Èá ðñÝðåé íá ôï áëëÜîåôå óôï üíïìá ðïõ äþóáôå óôïí ðõñÞíá óáò, ð.÷. `MYKERNEL` áí Ý÷åôå áêïëïõèÞóåé ôéò ïäçãßåò áðü ôá ðñïçãïýìåíá ìáò ðáñáäåßãìáôá. Ç ôéìÞ ðïõ èá âÜëåôå óôï áëöáñéèìçôéêü `ident` èá åêôõðþíåôáé üôáí åêêéíåßôå ìå ôïí óõãêåêñéìÝíï ðõñÞíá, êáé Ýôóé åßíáé ÷ñÞóéìï íá äþóåôå óôïí íÝï ðõñÞíá Ýíá äéáöïñåôéêü üíïìá áí èÝëåôå íá ôïí îå÷ùñßæåôå áðü ôïí óõíçèéóìÝíï ðõñÞíá óáò (áí ð.÷. èÝëåôå íá öôéÜîåôå Ýíá ðåéñáìáôéêü ðõñÞíá).

```
#To statically compile in device wiring instead of /boot/device.hints
#hints          "GENERIC.hints"         # Default places to look for devices.
```

Ôï áñ÷åßï device.hints(5) ÷ñçóéìïðïéåßôáé ãéá ôïí êáèïñéóìü åðéëïãþí ðïõ ó÷åôßæïíôáé ìå ôïõò ïäçãïýò óõóêåõþí. Ç ðñïåðéëåãìÝíç èÝóç ôçí ïðïßá åëÝã÷åé ï loader(8) êáôÜ ôçí åêêßíçóç åßíáé ôï `/boot/device.hints`.

×ñçóéìïðïéþíôáò ôçí åðéëïãÞ `hints` ìðïñåßôå íá åíóùìáôþóåôå óôáôéêÜ ôéò ïäçãßåò áõôÝò ìÝóá óôïí ðõñÞíá. Óôçí ðåñßðôùóç áõôÞ äåí õðÜñ÷åé ëüãïò íá äçìéïõñãÞóåôå ôï áñ÷åßï `device.hints` óôïí êáôÜëïãï `/boot`.

```
makeoptions     DEBUG=-g            # Build kernel with gdb(1) debug symbols
```

Ç öõóéïëïãéêÞ äéáäéêáóßá äçìéïõñãßáò ôïõ FreeBSD ðåñéëáìâÜíåé ðëçñïöïñßåò åêóöáëìÜôùóçò (debugging) üôáí ï ðõñÞíáò äçìéïõñãåßôáé ìå ôçí åðéëïãÞ `-g`, åðéôñÝðïíôáò Ýôóé ôçí ÷ñÞóç ôïõò üôáí äïèïýí óôï gcc(1).

```
options         SCHED_ULE           # ULE scheduler
```

Ï ðñïåðéëåãìÝíïò scheduler ôïõ FreeBSD. ÊñáôÞóôå ôçí åðéëïãÞ áõôÞ.

```
options         PREEMPTION           # Enable kernel thread preemption
```

ÅðéôñÝðåé óå íÞìáôá ôïõ ðõñÞíá íá ðñïóðåñáóôïýí áðü Üëëá, õøçëüôåñçò ðñïôåñáéüôçôáò. ÂïçèÜåé óôçí áýîçóç áðüêñéóçò ôïõ óõóôÞìáôïò êáé åðéôñÝðåé óå íÞìáôá äéáêïðþí (interrupts) íá åêôåëåóôïýí ðéï ãñÞãïñá, áíôß íá ìÝíïõí óå áíáìïíÞ.

```
options         INET                # InterNETworking
```

ÕðïóôÞñéîç äéêôýïõ. ÁöÞóôå ôçí åðéëïãÞ áõôÞ åíåñãïðïéçìÝíç, áêüìá êáé áí äåí óêïðåýåôå íá óõíäåèåßôå óå êÜðïéï äßêôõï. Ôá ðåñéóóüôåñá ðñïãñÜììáôá ÷ñåéÜæïíôáé Ýóôù êáé ôçí åóùôåñéêÞ (loopback) äéêôýùóç (ôç äõíáôüôçôá äçë. íá êÜíïõí óõíäÝóåéò äéêôýïõ ìÝóá óôï ßäéï óáò ôï ìç÷Üíçìá), êáèéóôþíôáò ôçí åðéëïãÞ áõôÞ ïõóéáóôéêÜ õðï÷ñåùôéêÞ.

```
options         INET6               # IPv6 communications protocols
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôá ðñùôüêïëëá åðéêïéíùíßáò IPv6.

```
options         FFS                 # Berkeley Fast Filesystem
```

Ðñüêåéôáé ãéá ôï âáóéêü óýóôçìá áñ÷åßùí ôïõ óêëçñïý äßóêïõ. ÁöÞóôå ôçí åðéëïãÞ áõôÞ åíåñãïðïéçìÝíç, áí îåêéíÜôå áðü ôï óêëçñü äßóêï.

```
options         SOFTUPDATES         # Enable FFS Soft Updates support
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôá Soft Updates óôïí ðõñÞíá, ôï ïðïßï âïçèÜåé ôçí åðéôÜ÷õíóç ôçò åããñáöÞò óôïõò äßóêïõò. Áêüìá êáé áí ç ëåéôïõñãßá áõôÞ ðáñÝ÷åôáé áðü ôïí ðõñÞíá, èá ðñÝðåé åðßóçò íá åíåñãïðïéçèåß ãéá óõãêåêñéìÝíïõò äßóêïõò. Äåßôå ôçí Ýîïäï ôçò åíôïëÞò mount(8) ãéá íá äåßôå áí åßíáé åíåñãïðïéçìÝíá ôá Soft Updates óôïõò äßóêïõò ôïõ óõóôÞìáôïò óáò. Áí äåí äåßôå ôçí åðéëïãÞ `soft-updates` èá ÷ñåéáóôåß íá ôçí åíåñãïðïéÞóåôå ìå ôçí åíôïëÞ tunefs(8) (ãéá õðÜñ÷ïíôá óõóôÞìáôá áñ÷åßùí) Þ newfs(8) (ãéá íÝá óõóôÞìáôá áñ÷åßùí).

```
options         UFS_ACL             # Support for access control lists
```

Ìå ôçí åðéëïãÞ áõôÞ, åíåñãïðïéåßôáé ç õðïóôÞñéîç ôïõ ðõñÞíá ãéá ëßóôåò åëÝã÷ïõ ðñüóâáóçò (access control lists). Ôá ACLs åîáñôéïýíôáé áðü ôç ÷ñÞóç åêôåôáìÝíùí éäéïôÞôùí êáé áðü ôï óýóôçìá áñ÷åßùí UFS2, êáé ðåñéãñÜöïíôáé ìå ëåðôïìÝñåéá óôï ÔìÞìá 15.12. Ôá ACLs åßíáé åíåñãïðïéçìÝíá áðü ðñïåðéëïãÞ, êáé äåí èá ðñÝðåé íá ôá áðåíåñãïðïéÞóåôå áðü ôïí ðõñÞíá áí Ý÷ïõí ÷ñçóéìïðïéçèåß óôï ðáñåëèüí óå êÜðïéï óýóôçìá áñ÷åßùí, êáèþò áõôü èá ôá áöáéñÝóåé áðü ôá áñ÷åßá, áëëÜæïíôáò Ýôóé ôïí ôñüðï ðñïóôáóßáò ôïõò ìå áðñüâëåðôïõò ôñüðïõò.

```
options         UFS_DIRHASH         # Improve performance on big directories
```

Ìå ôçí åðéëïãÞ áõôÞ, ðåñéëáìâÜíïíôáé ëåéôïõñãßåò ðïõ áõîÜíïõí ôçí ôá÷ýôçôá ðñüóâáóçò ôïõ äßóêïõ óå ìåãÜëïõò êáôáëüãïõò, ìå êüóôïò ôç ÷ñÞóç åðéðñüóèåôçò ìíÞìçò. Öõóéïëïãéêá, èá èÝëáôå íá êñáôÞóåôå ôçí åðéëïãÞ áõôÞ óå Ýíá ìåãÜëï åîõðçñåôçôÞ Þ óôáèìü åñãáóßáò, êáé íá ôçí áöáéñÝóåôå üôáí ÷ñçóéìïðïéåßôå ôï FreeBSD óå Ýíá ìéêñü óýóôçìá üðïõ ç ìíÞìç åßíáé ðåñéïñéóìÝíç êáé ç ôá÷ýôçôá ðñüóâáóçò óôï äßóêï åßíáé ëéãüôåñï óçìáíôéêÞ, üðùò ãéá ðáñÜäåéãìá óå Ýíá firewall.

```
options         MD_ROOT                 # MD is a potential root device
```

Ìå ôçí åðéëïãÞ áõôÞ åíåñãïðïéåßôáé ç õðïóôÞñéîç ÷ñÞóçò åíüò åéêïíéêïý äßóêïõ óôç ìíÞìç RAM (ramdrive) ãéá ÷ñÞóç ùò óõóêåõÞ root.

```
options         NFSCLIENT               # Network Filesystem Client
options         NFSSERVER               # Network Filesystem Server
options         NFS_ROOT                # NFS usable as /, requires NFSCLIENT
```

Ôï äéêôõáêü óýóôçìá áñ÷åßùí. Áí äåí Ý÷åôå óêïðü íá ðñïóáñôÞóåôå óõóôÞìáôá áñ÷åßùí áðü Üëëï åîõðçñåôçôÞ áñ÷åßùí UNIX ìÝóù TCP/IP, ìðïñåßôå íá ìåôáôñÝøåôå áõôÝò ôéò ãñáììÝò óå ó÷üëéá.

```
options         MSDOSFS                 # MSDOS Filesystem
```

Ôï óýóôçìá áñ÷åßùí ôïõ MS-DOS. Áí äåí óêïðåýåôå íá ðñïóáñôÞóåôå äßóêï DOS êáôÜ ôçí åêêßíçóç, ìðïñåßôå ìå áóöÜëåéá íá ìåôáôñÝøåôå ôçí åðéëïãÞ áõôÞ óå ó÷üëéï. Ç õðïóôÞñéîç èá öïñôùèåß áõôüìáôá ôçí ðñþôç öïñÜ ðïõ èá ðñïóáñôÞóåôå êáôÜôìçóç DOS üðùò ðåñéãñÜøáìå ðáñáðÜíù. Åðßóçò, ôï åîáéñåôéêü ðñüãñáììá `emulators/mtools` óáò åðéôñÝðåé íá Ý÷åôå ðñüóâáóç óå äéóêÝôåò DOS ÷ùñßò íá ÷ñåéÜæåôáé íá ôéò ðñïóáñôÞóåôå êáé íá áðïðñïóáñôÞóåôå (êáé åðßóçò äåí áðáéôåß ôç ÷ñÞóç ôïõ `MSDOSFS`).

```
options         CD9660                  # ISO 9660 Filesystem
```

Ôï óýóôçìá áñ÷åßùí ISO 9660 ãéá CDROM. ÌåôáôñÝøôå ôï óå ó÷üëéï áí äåí Ý÷åôå ïäçãü CDROM Þ áí óðÜíéá ðñïóáñôÜôå CD äåäïìÝíùí (êáèþò èá öïñôùèåß äõíáìéêÜ ôçí ðñþôç öïñÜ ðïõ èá ðñïóáñôÞóåôå ôÝôïéï CD). Ôá ìïõóéêÜ CD äåí ÷ñåéÜæïíôáé áõôü ôï óýóôçìá áñ÷åßùí.

```
options         PROCFS                  # Process filesystem (requires PSEUDOFS)
```

Áõôü ôï óýóôçìá áñ÷åßùí ðåñéÝ÷åé ôéò äéåñãáóßåò ôïõ óõóôÞìáôïò. Ðñüêåéôáé ãéá Ýíá “åéêïíéêü” óýóôçìá áñ÷åßùí ôï ïðïßï ðñïóáñôÜôáé óôïí êáôÜëïãï `/proc` êáé åðéôñÝðåé óå ðñïãñÜììáôá üðùò ôï ps(1) íá äßíïõí ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôéò äéåñãáóßåò ðïõ åêôåëïýíôáé. Ç ÷ñÞóç ôïõ `PROCFS` äåí áðáéôåßôáé óôéò ðåñéóóüôåñåò ðåñéðôþóåéò, êáèþò ôá ðåñéóóüôåñá åñãáëåßá ðáñáêïëïýèçóçò êáé åêóöáëìÜôùóçò Ý÷ïõí ðñïóáñìïóôåß íá åêôåëïýíôáé ÷ùñßò ôï `PROCFS`. Óôéò íÝåò åãêáôáóôÜóåéò, áõôü ôï óýóôçìá áñ÷åßùí äåí ðñïóáñôÜôáé áðü ðñïåðéëïãÞ.

```
options         PSEUDOFS                # Pseudo-filesystem framework
```

ÐõñÞíåò ðïõ ÷ñçóéìïðïéïýí ôï `PROCFS` ðñÝðåé åðßóçò íá ðáñÝ÷ïõí õðïóôÞñéîç ãéá ôï `PSEUDOFS`.

```
options         GEOM_PART_GPT           # GUID Partition Tables.
```

Ìå ôçí åðéëïãÞ áõôÞ äßíåôáé ç äõíáôüôçôá ýðáñîçò ìåãÜëïõ áñéèìïý êáôáôìÞóåùí óå Ýíá ìüíï äßóêï.

```
options         COMPAT_43               # Compatible with BSD 4.3 [KEEP THIS!]
```

Óõìâáôüôçôá ìå ôï 4.3BSD. ÁöÞóôå ôçí åðéëïãÞ áõôÞ åíåñãÞ: êÜðïéá ðñïãñÜììáôá èá óõìðåñéöÝñïíôáé ðáñÜîåíá áí ôçí áðåíåñãïðïéÞóåôå.

```
options         COMPAT_FREEBSD4   # Compatible with FreeBSD4
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ãéá ôçí õðïóôÞñéîç åöáñìïãþí ðïõ Ý÷ïõí ìåôáãëùôôéóôåß óå ðáëéüôåñåò åêäüóåéò ôïõ FreeBSD êáé ïé ïðïßåò ÷ñçóéìïðïéïýí ðáëéÝò äéåðáöÝò êëÞóåéò óõóôÞìáôïò. Óõíßóôáôáé íá õðÜñ÷åé áõôÞ ç åðéëïãÞ óå üëá ôá óõóôÞìáôá i386 ôá ïðïßá åêôåëïýí ðáëéüôåñåò åöáñìïãÝò. Áñ÷éôåêôïíéêÝò üðùò ç ia64 êáé ç SPARC64 ðïõ Üñ÷éóáí íá õðïóôçñßæïíôáé áðü ôçí Ýêäïóç 5.× êáé ìåôÜ äåí ÷ñåéÜæïíôáé áõôÞ ôçí åðéëïãÞ.

```
options         COMPAT_FREEBSD5   # Compatible with FreeBSD5
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé óôï ãéá ôçí õðïóôÞñéîç åöáñìïãþí ðïõ Ý÷ïõí ìåôáãëùôôéóôåß óôï FreeBSD 5.X êáé ÷ñçóéìïðïéïýí ôéò áíôßóôïé÷åò êëÞóåéò áõôïý ôïõ óõóôÞìáôïò.

```
options         COMPAT_FREEBSD6   # Compatible with FreeBSD6
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé óôï ãéá ôçí õðïóôÞñéîç åöáñìïãþí ðïõ Ý÷ïõí ìåôáãëùôôéóôåß óôï FreeBSD 6.X êáé ÷ñçóéìïðïéïýí ôéò áíôßóôïé÷åò êëÞóåéò áõôïý ôïõ óõóôÞìáôïò.

```
options         COMPAT_FREEBSD7   # Compatible with FreeBSD75
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé óôï ãéá ôçí õðïóôÞñéîç åöáñìïãþí ðïõ Ý÷ïõí ìåôáãëùôôéóôåß óôï FreeBSD 7.X êáé ÷ñçóéìïðïéïýí ôéò áíôßóôïé÷åò êëÞóåéò áõôïý ôïõ óõóôÞìáôïò.

```
options         SCSI_DELAY=5000  # Delay (in ms) before probing SCSI
```

Ìå ôçí åðéëïãÞ áõôÞ ï ðõñÞíáò ðåñéìÝíåé 5 äåõôåñüëåðôá ðñéí áíé÷íåýóåé êÜèå óõóêåõÞ SCSI óôï óýóôçìá óáò. Áí Ý÷åôå ìüíï IDE äßóêïõò ìðïñåßôå íá ôçí áãíïÞóåôå, äéáöïñåôéêÜ ìðïñåßôå íá äïêéìÜóåôå íá ìåéþóåôå ôïí áñéèìü áõôü, ãéá íá åðéôá÷ýíåôå ôçí åêêßíçóç. ÖõóéêÜ, áí ôï êÜíåôå áõôü êáé áíáêáëýøåôå üôé ôï FreeBSD Ý÷åé ðñüâëçìá óôçí áíáãíþñéóç ôùí óõóêåõþí óáò, èá ðñÝðåé íá ôçí áõîÞóåôå îáíÜ.

```
options         KTRACE            # ktrace(1) support
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôï tracing ôùí äéåñãáóéþí ôïõ ðõñÞíá, ôï ïðïßï åßíáé ÷ñÞóéìï óôçí åêóöáëìÜôùóç.

```
options         SYSVSHM           # SYSV-style shared memory
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôçí êïéíü÷ñçóôç ìíÞìç óýìöùíá ìå ôï ðñüôõðï ôïõ System V. Ç ðëÝïí êïéíÞ ÷ñÞóç ôçò, åßíáé ç åðÝêôáóç XSHM óôá × ç ïðïßá ÷ñçóéìïðïéåßôáé áõôüìáôá áðü ðïëëÝò âáñéÝò åöáñìïãÝò ãñáöéêþí ãéá êáëýôåñç ôá÷ýôçôá. Áí ÷ñçóéìïðïéåßôå ×, óßãïõñá èÝëåôå íá ðåñéëÜâåôå áõôÞ ôçí åðéëïãÞ.

```
options         SYSVMSG           # SYSV-style message queues
```

ÕðïóôÞñéîç ãéá ìçíýìáôá ôïõ System V. Ç åðéëïãÞ áõôÞ ðñïóèÝôåé ìüíï ìåñéêÝò åêáôïíôÜäåò bytes óôïí ðõñÞíá.

```
options         SYSVSEM           # SYSV-style semaphores
```

ÕðïóôÞñéîç óçìáôïöïñÝùí ôïõ System V. ×ñçóéìïðïéåßôáé ëéãüôåñï óõ÷íÜ, áëëÜ ðñïóèÝôåé ìüíï ìåñéêÝò åêáôïíôÜäåò bytes óôïí ðõñÞíá.

> **Óçìåßùóç:** Ç åðéëïãÞ `-p` ôçò åíôïëÞò ipcs(1) èá óáò äåßîåé ðïéåò äéåñãáóßåò ÷ñçóéìïðïéïýí êÜèå ìéá áðü áõôÝò ôéò ëåéôïõñãßåò ôïõ System V.

```
options               _KPOSIX_PRIORITY_SCHEDULING # POSIX P1003_1B real-time extensions
```

ÅðåêôÜóåéò ðñáãìáôéêïý ÷ñüíïõ (Real-time) ðïõ ðñïóôÝèçêáí óôï POSIX® ôï 1993. ×ñçóéìïðïéåßôáé áðü êÜðïéåò åöáñìïãÝò ôçò óõëëïãÞò ôùí ports (üðùò ôï **StarOffice**).

```
options          KBD_INSTALL_CDEV  # install a CDEV entry in /dev
```

Ç åðéëïãÞ áõôÞ åßíáé áðáñáßôçôç ãéá ôç äçìéïõñãßá ôïõ áñ÷åßïõ óõóêåõÞò ðëçêôñïëïãßïõ óôïí êáôÜëïãï `/dev`.

```
options          ADAPTIVE_GIANT    # Giant mutex is adaptive.
```

Ôï Giant åßíáé ôï üíïìá åíüò óõóôÞìáôïò áìïéâáßïõ áðïêëåéóìïý (sleep mutex) ôï ïðïßï ðñïóôáôåýåé Ýíá ìåãÜëï áñéèìü ðüñùí ôïõ ðõñÞíá. Óôéò ìÝñåò ìáò, áõôü èåùñåßôáé áíåðßôñåðôï áðü ðëåõñÜò áðüäïóçò êáé áíôéêáèßóôáôáé ìå êëåéäþìáôá ôá ïðïßá ðñïóôáôåýïõí óõãêåêñéìÝíïõò ðüñïõò. Ç åðéëïãÞ `ADAPTIVE_GIANT` åðéôñÝðåé óôï Giant íá óõìðåñéëçöèåß óôï óåô ôùí mutexes ðïõ ìðïñïýí íá åêôåëåóôïýí ðåñéëåêôéêÜ. ¸ôóé, áí Ýíá íÞìá èÝëåé íá êëåéäþóåé ôï Giant mutex, áëëÜ áõôü åßíáé Þäç êëåéäùìÝíï áðü Ýíá íÞìá óå ìéá Üëëç CPU, ôï ðñþôï íÞìá èá óõíå÷ßóåé íá åêôåëåßôáé, êáé èá ðåñéìÝíåé ãéá ôçí áðåëåõèÝñùóç ôïõ êëåéäþìáôïò. Öõóéïëïãéêþò, ôï íÞìá èá åðÝóôñåöå óôçí êáôÜóôáóç ýðíïõ (sleep) êáé èá ðåñßìåíå ãéá ôçí åðüìåíç åõêáéñßá åêôÝëåóçò ôïõ. Áí äåí åßóôå óßãïõñïò, áöÞóôå áõôÞ ôçí åðéëïãÞ åíåñãÞ.

> **Óçìåßùóç:** Óçìåéþóôå üôé áðü ôï FreeBSD 8.0-RELEASE êáé ôéò åðüìåíåò åêäüóåéò, üëá ôá mutexes Ý÷ïõí áðü ðñïåðéëïãÞ ôç äõíáôüôçôá ðñïóáñìïãÞò, åêôüò áí Ý÷åé åðßôçäåò ãßíåé äéáöïñåôéêÞ ñýèìéóç, ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `NO_ADAPTIVE_MUTEXES` êáôÜ ôç ìåôáãëþôôéóç. Ôï Giant Ý÷åé åðßóçò äõíáôüôçôá ðñïóáñìïãÞò ðëÝïí, êáé Ýôóé ç åðéëïãÞ `ADAPTIVE_GIANT` Ý÷åé áöáéñåèåß áðü ôï áñ÷åßï ñõèìßóåùí ðõñÞíá.

```
device           apic              # I/O APIC
```

Ç óõóêåõÞ apic åðéôñÝðåé ôç ÷ñÞóç ôïõ I/O APIC ãéá ôçí ðáñÜäïóç ôùí interrupts (äéáêïðþí). Ç óõóêåõÞ apic ìðïñåß íá ÷ñçóéìïðïéçèåß ôüóï óå ðõñÞíåò ãéá Ýíá åðåîåñãáóôÞ (UP) üóï êáé ãéá ðïëëáðëïýò (SMP), áëëÜ óôçò äåýôåñçò ðåñßðôùóçò åßíáé áðáñáßôçôç. ÐñïóèÝóôå ôçí åðéëïãÞ `options SMP` ãéá íá Ý÷åôå õðïóôÞñéîç ðïëëáðëþí åðåîåñãáóôþí.

> **Óçìåßùóç:** Ç óõóêåõÞ apic õðÜñ÷åé ìüíï óôçí áñ÷éôåêôïíéêÞ i386, ç ãñáììÞ áõôÞ äåí èá ðñÝðåé íá ÷ñçóéìïðïéçèåß óå Üëëåò áñ÷éôåêôïíéêÝò.

```
device           eisa
```

Èá ðñÝðåé íá óõìðåñéëÜâåôå ôçí åðéëïãÞ áõôÞ áí Ý÷åôå ìçôñéêÞ ìå äßáõëï ôýðïõ EISA. Åíåñãïðïéåßôáé Ýôóé ç áõôüìáôç áíß÷íåõóç êáé ñýèìéóç üëùí ôùí óõóêåõþí óôï äßáõëï EISA.

```
device           pci
```

Èá ðñÝðåé íá óõìðåñéëÜâåôå áõôÞ ôçí åðéëïãÞ áí Ý÷åôå ìçôñéêÞ ìå äßáõëï PCI. Åíåñãïðïéåßôáé Ýôóé ç áõôüìáôç áíß÷íåõóç ôùí êáñôþí PCI êáé ç åðéêïéíùíßá ìåôáîý ôùí äéáýëùí PCI êáé ISA.

```
# Floppy drives
```

```
device          fdc
```

Ðñüêåéôáé ãéá ôïí åëåãêôÞ ìïíÜäáò äéóêÝôáò.

```
# ATA and ATAPI devices
device          ata
```

Áõôüò ï ïäçãüò õðïóôçñßæåé üëåò ôéò óõóêåõÝò ôýðïõ ATA êáé ATAPI. ×ñåéÜæåóôå ìüíï ìéá êáôá÷þñçóç `device ata` ãéá íá áíé÷íåýóåé ï ðõñÞíáò üëåò ôéò óõóêåõÝò ATA/ATAPI ôýðïõ PCI óôá óýã÷ñïíá ìç÷áíÞìáôá.

```
device          atadisk                 # ATA disk drives
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ìáæß ìå ôï `device ata` ãéá ôçí õðïóôÞñéîç äßóêùí ATA.

```
device          ataraid                 # ATA RAID drives
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ìáæß ìå ôï`device ata` ãéá ôçí õðïóôÞñéîç äßóêùí ATA RAID.

```
device          atapicd                 # ATAPI CDROM drives
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ìáæß ìå ôï `device ata` ãéá ôçí õðïóôÞñéîç ïäçãþí ATAPI CDROM.

```
device          atapifd                 # ATAPI floppy drives
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ìáæß ìå ôï `device ata` ãéá ôçí õðïóôÞñéîç ïäçãþí äéóêÝôáò ATAPI.

```
device          atapist                 # ATAPI tape drives
```

Ç åðéëïãÞ áõôÞ áðáéôåßôáé ìáæß ìå ôï `device ata` ãéá ôçí õðïóôÞñéîç ìïíÜäùí ôáéíßáò ATAPI.

```
options         ATA_STATIC_ID           # Static device numbering
```

Ìå ôçí åðéëïãÞ áõôÞ, ï áñéèìüò ôïõ åëåãêôÞ ãßíåôáé óôáôéêüò. ×ùñßò áõôÞ, ïé áñéèìïß óõóêåõþí áðïäßäïíôáé äõíáìéêÜ.

```
# SCSI Controllers
device          ahb         # EISA AHA1742 family
device          ahc         # AHA2940 and onboard AIC7xxx devices
options         AHC_REG_PRETTY_PRINT    # Print register bitfields in debug
                                        # output.  Adds ~128k to driver.
device          ahd         # AHA39320/29320 and onboard AIC79xx devices
options         AHD_REG_PRETTY_PRINT    # Print register bitfields in debug
                                        # output.  Adds ~215k to driver.
device          amd         # AMD 53C974 (Teckram DC-390(T))
device          isp         # Qlogic family
#device         ispfw       # Firmware for QLogic HBAs- normally a module
device          mpt         # LSI-Logic MPT-Fusion
#device         ncr         # NCR/Symbios Logic
device          sym         # NCR/Symbios Logic (newer chipsets + those of ‘ncr’)
device          trm         # Tekram DC395U/UW/F DC315U adapters

device          adv         # Advansys SCSI adapters
device          adw         # Advansys wide SCSI adapters
device          aha         # Adaptec 154x SCSI adapters
device          aic         # Adaptec 15[012]x SCSI adapters, AIC-6[23]60.
device          bt          # Buslogic/Mylex MultiMaster SCSI adapters

device          ncv         # NCR 53C500
device          nsp         # Workbit Ninja SCSI-3
device          stg         # TMC 18C30/18C50
```

ÅëåãêôÝò SCSI. Ìðïñåßôå íá ìåôáôñÝøåôå óå ó÷üëéï ïðïéïíäÞðïôå äåí Ý÷åôå óôï óýóôçìá óáò. Áí ôï óýóôçìá óáò Ý÷åé ìüíï óõóêåõÝò IDE, ìðïñåßôå íá áöáéñÝóåôå üëåò ôéò ãñáììÝò. Ïé ãñáììÝò ôýðïõ `*_REG_PRETTY_PRINT` ÷ñçóéìïðïéïýíôáé ãéá íá äßíïõí ðåñéóóüôåñåò äéáãíùóôéêÝò ðëçñïöïñßåò ãéá ôïõò áíôßóôïé÷ïõò ïäçãïýò.

```
# SCSI peripherals
device          scbus       # SCSI bus (required for SCSI)
device          ch          # SCSI media changers
device          da          # Direct Access (disks)
device          sa          # Sequential Access (tape etc)
device          cd          # CD
device          pass        # Passthrough device (direct SCSI access)
device          ses         # SCSI Environmental Services (and SAF-TE)
```

ÐåñéöåñåéáêÜ SCSI. Ìðïñåßôå êáé ðÜëé íá ìåôáôñÝøåôå óå ó÷üëéï üóåò óõóêåõÝò äåí Ý÷åôå, Þ áí Ý÷åôå ìüíï óõóêåõÝò IDE, ìðïñåßôå íá áöáéñÝóåôå åíôåëþò áõôÝò ôéò ãñáììÝò.

> **Óçìåßùóç:** Ï ïäçãüò USB umass(4) êáé êÜðïéïé Üëëïé ïäçãïß ÷ñçóéìïðïéïýí ôï õðïóýóôçìá SCSI áí êáé äåí åßíáé ðñáãìáôéêÝò SCSI óõóêåõÝò. Ãéá ôï ëüãï áõôü, óéãïõñåõôåßôå üôé äåí áöáéñÝóáôå ôçí õðïóôÞñéîç SCSI áí ðåñéëáìâÜíïíôáé ôÝôïéïé ïäçãïß óôï áñ÷åßï ñýèìéóçò ôïõ ðõñÞíá óáò.

```
# RAID controllers interfaced to the SCSI subsystem
device          amr         # AMI MegaRAID
device          arcmsr      # Areca SATA II RAID
device          asr         # DPT SmartRAID V, VI and Adaptec SCSI RAID
device          ciss        # Compaq Smart RAID 5*
device          dpt         # DPT Smartcache III, IV - See NOTES for options
device          hptmv       # Highpoint RocketRAID 182x
device          hptrr       # Highpoint RocketRAID 17xx, 22xx, 23xx, 25xx
device          iir         # Intel Integrated RAID
device          ips         # IBM (Adaptec) ServeRAID
device          mly         # Mylex AcceleRAID/eXtremeRAID
device          twa         # 3ware 9000 series PATA/SATA RAID

# RAID controllers
device          aac         # Adaptec FSA RAID
device          aacp        # SCSI passthrough for aac (requires CAM)
device          ida         # Compaq Smart RAID
device          mfi         # LSI MegaRAID SAS
device          mlx         # Mylex DAC960 family
device          pst         # Promise Supertrak SX6000
device          twe         # 3ware ATA RAID
```

Õðïóôçñéæüìåíïé åëåãêôÝò RAID. Áí äåí Ý÷åôå êáíÝíá áðü áõôïýò, ìðïñåßôå íá ôïõò ìåôáôñÝøåôå óå ó÷üëéá Þ íá ôïõò áöáéñÝóåôå åíôåëþò.

```
# atkbdc0 controls both the keyboard and the PS/2 mouse
device          atkbdc     # AT keyboard controller
```

Ï åëåãêôÞò ðëçêôñïëïãßïõ (`atkbdc`) ðáñÝ÷åé õðçñåóßåò I/O ãéá ðëçêôñïëüãéá ôýðïõ AT êáé óõóêåõÝò êáôÜäåéîçò (ðïíôßêéá) ôýðïõ PS/2. Ï åëåãêôÞò áðáéôåßôáé ãéá ôç ëåéôïõñãßá ôïõ ïäçãïý ðëçêôñïëïãßïõ (`atkbd`) êáé ôïõ ïäçãïý óõóêåõÞò êáôÜäåéîçò PS/2 (`psm`).

```
device          atkbd      # AT keyboard
```

Ï ïäçãüò `atkbd`, ìáæß ìå ôïí åëåãêôÞ `atkbdc`, ðáñÝ÷åé ðñüóâáóç óå ðëçêôñïëüãéï ôýðïõ AT 84 Þ åêôåôáìÝíïõ AT ôï ïðïßï óõíäÝåôáé óôïí åëåãêôÞ ðëçêôñïëïãßïõ.

```
device          psm        # PS/2 mouse
```

×ñçóéìïðïéÞóôå áõôÞ ôç óõóêåõÞ áí ôï ðïíôßêé óáò óõíäÝåôáé óôçí èýñá PS/2.

```
device          kbdmux        # keyboard multiplexer
```

ÂáóéêÞ õðïóôÞñéîç ðïëõðëåîßáò ðëçêôñïëïãßùí. Áí äå óêïðåýåôå íá ÷ñçóéìïðïéÞóåôå ðåñéóóüôåñá áðü Ýíá ðëçêôñïëüãéá óôï óýóôçìá óáò, ìðïñåßôå ìå áóöÜëåéá íá áöáéñÝóåôå áõôÞ ôç ãñáììÞ.

```
device          vga        # VGA video card driver
```

Ôï ðñüãñáììá ïäÞãçóçò ôçò êÜñôáò ãñáöéêþí.

```
device          splash     # Splash screen and screen saver support
```

ÃñáöéêÞ ïèüíç (splash) êáôÜ ôçí åêêßíçóç! Ç óõóêåõÞ áõôÞ ÷ñçóéìïðïéåßôáé åðßóçò áðü ôá ðñïãñÜììáôá ðñïöýëáîçò ïèüíçò (êïíóüëáò).

```
# syscons is the default console driver, resembling an SCO console
device          sc
```

Ï ïäçãüò `sc` åßíáé ï ðñïåðéëåãìÝíïò ïäçãüò êïíóüëáò êáé ðñïóïìïéþíåé êïíóüëá ôýðïõ SCO. Êáèþò ôá ðåñéóóüôåñá ðñïãñÜììáôá ðëÞñïõò ïèüíçò áðïêôïýí ðñüóâáóç óôçí êïíóüëá ìÝóù êÜðïéáò âéâëéïèÞêçò âÜóçò äåäïìÝíùí ôåñìáôéêþí üðùò ôï `termcap`, äåí èá ðñÝðåé íá Ý÷åé óçìáóßá áí ÷ñçóéìïðïéÞóåôå áõôüí ôïí ïäçãü Þ ôïí `vt` ï ïðïßïò åßíáé óõìâáôüò ìå êïíóüëá `VT220`. ÌåôÜ ôçí åßóïäï óáò óôï óýóôçìá, èÝóôå ôçí ìåôáâëçôÞ `TERM` óôçí ôéìÞ `scoansi` áí êÜðïéá ðñïãñÜììáôá ðëÞñïõò ïèüíçò Ý÷ïõí ðñüâëçìá üôáí ÷ñçóéìïðïéåßôáé áõôÞ ç êïíóüëá.

```
# Enable this for the pcvt (VT220 compatible) console driver
#device         vt
#options        XSERVER          # support for X server on a vt console
#options        FAT_CURSOR       # start with block cursor
```

Ðñüêåéôáé ãéá Ýíá ïäçãü êïíóüëáò óõìâáôü ìå VT220, êáé ìå ðñïò ôá ðßóù óõìâáôüôçôá ìå VT100/102. Ëåéôïõñãåß êáëÜ óå êÜðïéïõò öïñçôïýò õðïëïãéóôÝò ðïõ Ý÷ïõí áóõìâáôüôçôá õëéêïý ìå ôïí `sc`. ÌåôÜ ôçí åßóïäï óáò óôï óýóôçìá, èÝóôå ôçí ìåôáâëçôÞ `TERM` óå `vt100` Þ `vt220`. Ï ïäçãüò ìðïñåß åðßóçò íá áðïäåé÷èåß ÷ñÞóéìïò üôáí óõíäÝåóôå óå ìåãÜëï áñéèìü äéáöïñåôéêÜ ìç÷áíÞìáôá ìÝóù äéêôýïõ, üðïõ äåí õðÜñ÷ïõí êáôá÷ùñÞóåéò ãéá ôç óõóêåõÞ `sc` óôï `termcap` Þ `terminfo` — ôï `vt100` èá ðñÝðåé íá åßíáé äéáèÝóéìï ðñáêôéêÜ óå êÜèå ðëáôöüñìá.

```
device          agp
```

ÓõìðåñéëÜâåôå ôç óõóêåõÞ áõôÞ áí Ý÷åôå AGP êÜñôá óôï óýóôçìá óáò. Èá åíåñãïðïéÞóåôå ìå áõôü ôïí ôñüðï ôçí õðïóôÞñéîç ãéá AGP êáé AGP GART ãéá ìçôñéêÝò ðïõ õðïóôçñßæïõí áõôÝò ôéò ëåéôïõñãßåò.

```
# Power management support (see NOTES for more options)
#device          apm
```

ÕðïóôÞñéîç Advanced Power Management (ðñï÷ùñçìÝíçò äéá÷åßñéóçò éó÷ýïò). ×ñÞóéìï ãéá öïñçôÜ, áí êáé ç åðéëïãÞ áõôÞ, áðü ðñïåðéëïãÞ, åßíáé áíåíåñãÞ óôïí ðõñÞíá `GENERIC`.

```
# Add suspend/resume support for the i8254.
device           pmtimer
```

Ðñüãñáììá ïäÞãçóçò ìåôñçôÞ ÷ñüíïõ (Timer) ãéá óõìâÜíôá ðïõ ó÷åôßæïíôáé ìå äéá÷åßñéóç åíÝñãåéáò üðùò ôï APM êáé ôï ACPI.

```
# PCCARD (PCMCIA) support
# PCMCIA and cardbus bridge support
device          cbb               # cardbus (yenta) bridge
device          pccard            # PC Card (16-bit) bus
device          cardbus           # CardBus (32-bit) bus
```

ÕðïóôÞñéîç PCMCIA. Ôçí ÷ñåéÜæåóôå áí ÷ñçóéìïðïéåßôå öïñçôü õðïëïãéóôÞ.

```
# Serial (COM) ports
device          sio               # 8250, 16[45]50 based serial ports
```

Ðñüêåéôáé ãéá ôéò óåéñéáêÝò èýñåò ïé ïðïßåò åßíáé ãíùóôÝò óôïí êüóìï ôïõ MS-DOS/Windows ùò èýñåò `COM`.

> **Óçìåßùóç:** Áí Ý÷åôå åóùôåñéêü ìüíôåì óôçí èýñá `COM4` êáé Ý÷åôå êáé óåéñéáêÞ èýñá `COM2`, èá ðñÝðåé íá áëëÜîåôå ôï IRQ ôïõ ìüíôåì óôï 2 (ãéá ðåñßåñãïõò ôå÷íéêïýò ëüãïõò, IRQ2 = IRQ 9) ãéá íá ìðïñÝóåôå íá ôï ÷ñçóéìïðïéÞóåôå áðü ôï FreeBSD. Áí Ý÷åôå êÜñôá ðïëëáðëþí óåéñéáêþí åîüäùí, åëÝãîôå ôç óåëßäá manual ôïõ sio(4) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò óùóôÝò ôéìÝò ðïõ ðñÝðåé íá ðñïóèÝóåôå óôï `/boot/device.hints`. ÊÜðïéåò êÜñôåò ãñáöéêþí (åéäéêÜ áõôÝò ðïõ âáóßæïíôáé óå ïëïêëçñùìÝíá S3) ÷ñçóéìïðïéïýí äéåõèýíóåéò IO ìïñöÞò `0x*2e8`, êáé êáèþò ðïëëÝò öôçíÝò óåéñéáêÝò êÜñôåò äåí áðïêùäéêïðïéïýí ðëÞñùò ôç 16 bit ðåñéï÷Þ äéåõèýíóåùí, óõãêñïýïíôáé ìå ôéò êÜñôåò áõôÝò, êáèéóôþíôáò Ýôóé ðñáêôéêÜ Ü÷ñçóôç ôç èýñá `COM4`.
>
> ÊÜèå óåéñéáêÞ èýñá ÷ñåéÜæåôáé íá Ý÷åé ìéá ìïíáäéêÞ IRQ (åêôüò áí ÷ñçóéìïðïéåßôå êÜñôá ðïëëáðëþí óåéñéáêþí ðïõ õðïóôçñßæåé êïéíÞ ÷ñÞóç interrupts), êáé Ýôóé äåí ìðïñïýí íá ÷ñçóéìïðïéçèïýí ôá ðñïåðéëåãìÝíá interrupts ãéá ôçí `COM3` êáé ôçí `COM4`.

```
# Parallel port
device          ppc
```

Ðñüêåéôáé ãéá ôçí ðáñÜëëçëç èýñá óôï äßáõëï ISA.

```
device          ppbus      # Parallel port bus (required)
```

ÐñÝðåé õðïóôÞñéîç ãéá ôï äßáõëï ôçò ðáñÜëëçëçò èýñáò.

```
device          lpt        # Printer
```

ÐñÝðåé õðïóôÞñéîç ãéá åêôõðùôÝò ðáñÜëëçëçò èýñáò.

Óçìåßùóç: ×ñåéÜæåóôå êáé ôá ôñßá ðáñáðÜíù ãéá íá åíåñãïðïéÞóåôå ôçí õðïóôÞñéîç åêôõðùôÞ ðáñÜëëçëçò èýñáò.

```
device          plip       # TCP/IP over parallel
```

Ðñüêåéôáé ãéá ôï ðñüãñáììá ïäÞãçóçò äéêôýïõ ìÝóù ðáñÜëëçëçò èýñáò.

```
device          ppi        # Parallel port interface device
```

Ðñüãñáììá I/O ãåíéêÞò ÷ñÞóçò (“geek port”) + IEEE1284 I/O.

```
#device         vpo        # Requires scbus and da
```

×ñçóéìïðïéåßôáé ãéá ìïíÜäá äéóêÝôáò Iomega Zip. Áðáéôåß õðïóôÞñéîç áðü ôïõò ïäçãïýò `scbus` êáé `da`. Ç êáëýôåñç áðüäïóç åðéôõã÷Üíåôáé ìå èýñá óå êáôÜóôáóç ëåéôïõñãßáò EPP 1.9.

```
#device         puc
```

Åíåñãïðïéåßóôå áõôÞ ôç óõóêåõÞ áí Ý÷åôå ìéá “÷áæÞ” óåéñéáêÞ Þ ðáñÜëëçëç PCI êÜñôá ç ïðïßá õðïóôçñßæåôáé áðü ôï ðñüãñáììá ïäÞãçóçò puc(4) (glue driver).

```
# PCI Ethernet NICs.
device          de         # DEC/Intel DC21x4x (“Tulip”)
device          em         # Intel PRO/1000 adapter Gigabit Ethernet Card
device          ixgb       # Intel PRO/10GbE Ethernet Card
device          txp        # 3Com 3cR990 (“Typhoon”)
device          vx         # 3Com 3c590, 3c595 (“Vortex”)
```

ÄéÜöïñá ðñïãñÜììáôá ïäÞãçóçò ãéá PCI êÜñôåò äéêôýïõ. ÌåôáôñÝøôå óå ó÷üëéï Þ áöáéñÝóôå ôåëåßùò üóåò äåí õðÜñ÷ïõí óôï óýóôçìá óáò.

```
# PCI Ethernet NICs that use the common MII bus controller code.
# NOTE: Be sure to keep the ’device miibus’ line in order to use these NICs!
device          miibus     # MII bus support
```

Ç õðïóôÞñéîç äéáýëïõ MII áðáéôåßôáé ãéá êÜðïéåò êÜñôåò äéêôýïõ Ethernet PCI 10/100, åéäéêÜ ãéá áõôÝò ðïõ ÷ñçóéìïðïéïýí ðïìðïäÝêôåò óõìâáôïýò ìå MII Þ Ý÷ïõí äéåðáöÞ åëÝã÷ïõ ðïõ ëåéôïõñãåß ðáñüìïéá ìå ôïí MII. ÐñïóèÝôïíôáò `device miibus` óôï áñ÷åßï ñýèìéóçò ôïõ ðõñÞíá, èá Ý÷åôå õðïóôÞñéîç ãéá ôï ãåíéêü API ôïõ miibus êáé ãéá üëïõò ôïõò ïäçãïýò PHY, óõìðåñéëáìâáíïìÝíïõ êáé åíüò ãåíéêïý ãéá PHYs ðïõ äåí õðïóôçñßæïíôáé áðü êÜðïéï óõãêåêñéìÝíï ïäçãü.

```
device          bce        # Broadcom BCM5706/BCM5708 Gigabit Ethernet
device          bfe        # Broadcom BCM440x 10/100 Ethernet
device          bge        # Broadcom BCM570xx Gigabit Ethernet
device          dc         # DEC/Intel 21143 and various workalikes
device          fxp        # Intel EtherExpress PRO/100B (82557, 82558)
device          lge        # Level 1 LXT1001 gigabit ethernet
device          msk        # Marvell/SysKonnect Yukon II Gigabit Ethernet
device          nge        # NatSemi DP83820 gigabit ethernet
device          nve        # nVidia nForce MCP on-board Ethernet Networking
device          pcn        # AMD Am79C97x PCI 10/100 (precedence over ’lnc’)
device          re         # RealTek 8139C+/8169/8169S/8110S
device          rl         # RealTek 8129/8139
device          sf         # Adaptec AIC-6915 (“Starfire”)
device          sis        # Silicon Integrated Systems SiS 900/SiS 7016
device          sk         # SysKonnect SK-984x & SK-982x gigabit Ethernet
device          ste        # Sundance ST201 (D-Link DFE-550TX)
device          stge       # Sundance/Tamarack TC9021 gigabit Ethernet
device          ti         # Alteon Networks Tigon I/II gigabit Ethernet
device          tl         # Texas Instruments ThunderLAN
device          tx         # SMC EtherPower II (83c170 “EPIC”)
device          vge        # VIA VT612x gigabit ethernet
device          vr         # VIA Rhine, Rhine II
device          wb         # Winbond W89C840F
device          xl         # 3Com 3c90x (“Boomerang”, “Cyclone”)
```

ÐñïãñÜììáôá ïäÞãçóçò ðïõ ÷ñçóéìïðïéïýí ôïí êþäéêá ôïõ äéáýëïõ åëÝã÷ïõ MII.

```
# ISA Ethernet NICs.  pccard NICs included.
device          cs         # Crystal Semiconductor CS89x0 NIC
# ’device ed’ requires ’device miibus’
device          ed         # NE[12]000, SMC Ultra, 3c503, DS8390 cards
device          ex         # Intel EtherExpress Pro/10 and Pro/10+
device          ep         # Etherlink III based cards
device          fe         # Fujitsu MB8696x based cards
device          ie         # EtherExpress 8/16, 3C507, StarLAN 10 etc.
device          lnc        # NE2100, NE32-VL Lance Ethernet cards
device          sn         # SMC’s 9000 series of Ethernet chips
device          xe         # Xircom pccard Ethernet

# ISA devices that use the old ISA shims
#device         le
```

ÐñïãñÜììáôá ïäÞãçóçò êáñôþí Ethernet ôýðïõ ISA. Äåßôå ôï áñ÷åßï `/usr/src/sys/i386/conf/NOTES` ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôï ðïéåò êÜñôåò õðïóôçñßæïíôáé áðü ðïéïí ïäçãü.

```
# Wireless NIC cards
device          wlan            # 802.11 support
```

Ãåíéêü õðïóôÞñéîç ôïõ 802.11. Ç ãñáììÞ áõôÞ áðáéôåßôáé ãéá áóýñìáôç äéêôýùóç.

```
device          wlan_wep        # 802.11 WEP support
device          wlan_ccmp       # 802.11 CCMP support
device          wlan_tkip       # 802.11 TKIP support
```

ÕðïóôÞñéîç êñõðôïãñÜöçóçò ãéá óõóêåõÝò 802.11. Ïé ãñáììÝò áõôÝò ÷ñåéÜæïíôáé áí óêïðåýåôå íá ÷ñçóéìïðïéÞóåôå êñõðôïãñÜöçóç êáé ðñùôüêïëëá áóöáëåßáò 802.11i.

```
device          an         # Aironet 4500/4800 802.11 wireless NICs.
device          ath             # Atheros pci/cardbus NIC’s
device          ath_hal         # Atheros HAL (Hardware Access Layer)
device          ath_rate_sample # SampleRate tx rate control for ath
device          awi        # BayStack 660 and others
device          ral        # Ralink Technology RT2500 wireless NICs.
device          wi         # WaveLAN/Intersil/Symbol 802.11 wireless NICs.
```

```
#device         wl         # Older non 802.11 Wavelan wireless NIC.
```

ÕðïóôÞñéîç ãéá äéÜöïñåò áóýñìáôåò êÜñôåò.

```
# Pseudo devices
device   loop          # Network loopback
```

Ðñüêåéôáé ãéá ôç ãåíéêÞ óõóêåõÞ åóùôåñéêïý äéêôýïõ (loopback) ôïõ TCP/IP. Ç óýíäåóç ìÝóù telnet Þ FTP óôï `localhost` (ãíùóôü åðßóçò êáé ùò `127.0.0.1`) ðñáãìáôïðïéåßôáé ìÝóù áõôÞò ôçò óõóêåõÞò. Ç ýðáñîç áõôÞò ôçò óõóêåõÞò åßíáé *õðï÷ñåùôéêÞ*.

```
device   random        # Entropy device
```

ÊñõðôïãñáöéêÜ áóöáëÞò ãåííÞôñéá ôõ÷áßùí áñéèìþí.

```
device   ether         # Ethernet support
```

Ç ãñáììÞ `ether` áðáéôåßôáé ìüíï áí Ý÷åôå êÜñôá äéêôýïõ Ethernet. ÐåñéÝ÷åé ãåíéêü êþäéêá ãéá ôï ðñùôüêïëëï Ethernet.

```
device   sl            # Kernel SLIP
```

Ç ãñáììÞ `sl` ðáñÝ÷åé õðïóôÞñéîç SLIP. Ç õðïóôÞñéîç áõôÞ Ý÷åé ó÷åäüí ïëïêëçñùôéêÜ îåðåñáóôåß áðü ôï PPP, ôï ïðïßï åßíáé åõêïëüôåñï óôç ñýèìéóç, õðïóôçñßæåé êáëýôåñá ôéò óõíäÝóåéò ìÝóù ìüíôåì, êáé ðáñÝ÷åé êáëýôåñåò äõíáôüôçôåò.

```
device   ppp           # Kernel PPP
```

Ç ãñáììÞ áõôÞ åßíáé ãéá õðïóôÞñéîç PPP ìÝóù ôïõ ðõñÞíá ãéá åðéëïãéêÝò (dial-up) óõíäÝóåéò. ÕðÜñ÷åé åðßóçò ìéá Ýêäïóç PPP ç ïðïßá õëïðïéåßôáé ùò åöáñìïãÞ ÷ñÞóôç (userland), ÷ñçóéìïðïéåß ôï `tun` êáé ðñïóöÝñåé ðåñéóóüôåñç åõåëéîßá êáé ëåéôïõñãßåò üðùò êëÞóç êáôÜ áðáßôçóç (demand dialing).

```
device   tun           # Packet tunnel.
```

Ç óõóêåõÞ áõôÞ ÷ñçóéìïðïéåßôáé áðü ôï ðñüãñáììá PPP ÷ñÞóôç (userland). Äåßôå ôï ôìÞìá PPP áõôïý ôïõ âéâëßïõ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

```
device   pty           # Pseudo-ttys (telnet etc)
```

Ðñüêåéôáé ãéá óõóêåõÞ “øåõäü-ôåñìáôéêïý” Þ ðñïóïìïßùóçò èýñáò login. ×ñçóéìïðïéåßôáé ãéá åéóåñ÷üìåíåò óõíäÝóåéò `telnet` êáé `rlogin`, áðü ôï **xterm**, êáé áðü êÜðïéåò Üëëåò åöáñìïãÝò üðùò ôï **Emacs**.

```
device   md            # Memory “disks”
```

Øåõäü-óõóêåõÝò äßóêïõ ìå ÷ñÞóç ìíÞìçò (ramdrives).

```
device   gif           # IPv6 and IPv4 tunneling
```

Ç óõóêåõÞ áõôÞ õëïðïéåß IPv6 óå IPv4 tunneling, IPv4 óå IPv6 tunneling, IPv4 óå IPv4 tunneling, êáé IPv6 óå IPv6 tunneling. Ç óõóêåõÞ `gif` “áõôü-êëùíïðïéåßôáé”, êáé äçìéïõñãåß ôá áíôßóôïé÷á áñ÷åßá óõóêåõþí üðùò áðáéôïýíôáé.

```
device   faith         # IPv6-to-IPv4 relaying (translation)
```

ÁõôÞ ç øåýäï-óõóêåõÞ óõëëáìâÜíåé ðáêÝôá ðïõ óôÝëíïíôáé ðñïò áõôÞí êáé ôá áíáêáôåõèýíåé ðñïò ôï äáßìïíá ìåôÜöñáóçò ôïõ IPv4/IPv6.

```
# The ‘bpf’ device enables the Berkeley Packet Filter.
# Be aware of the administrative consequences of enabling this!
# Note that ’bpf’ is required for DHCP.
device   bpf           # Berkeley packet filter
```

Ðñüêåéôáé ãéá ôï ößëôñï ðáêÝôùí Berkeley. ÁõôÞ ç øåýäï-óõóêåõÞ åðéôñÝðåé óå êÜñôåò äéêôýïõ íá ëåéôïõñãïýí óå êáôÜóôáóç promiscuous (ðëÞñïõò áêñüáóçò), óõëëáìâÜíïíôáò ìå áõôü ôïí ôñüðï êÜèå ðáêÝôï åíüò äéêôýïõ (ð.÷. Ethernet). Ôá ðáêÝôá áõôÜ ìðïñåß íá áðïèçêåõôïýíôáé óôï äßóêï Þ íá åîåôÜæïíôáé ìå ôç âïÞèåéá ôïõ ðñïãñÜììáôïò tcpdump(1).

> **Óçìåßùóç:** Ç óõóêåõÞ bpf(4) ÷ñçóéìïðïéåßôáé åðßóçò áðü ôï dhclient(8) ãéá ôçí áíÜêôçóç ôçò äéåýèõíóçò IP ôçò ðñïåðéëåãìÝíçò ðýëçò ê.ï.ê. Áí ÷ñçóéìïðïéåßôå DHCP, áöÞóôå áõôÞ ôçí åðéëïãÞ åíåñãïðïéçìÝíç.

```
# USB support
device          uhci          # UHCI PCI->USB interface
device          ohci          # OHCI PCI->USB interface
device          ehci          # EHCI PCI->USB interface (USB 2.0)
device          usb           # USB Bus (required)
#device         udbp          # USB Double Bulk Pipe devices
device          ugen          # Generic
device          uhid          # “Human Interface Devices”
device          ukbd          # Keyboard
device          ulpt          # Printer
device          umass         # Disks/Mass storage - Requires scbus and da
device          ums           # Mouse
device          ural          # Ralink Technology RT2500USB wireless NICs
device          urio          # Diamond Rio 500 MP3 player
device          uscanner      # Scanners
# USB Ethernet, requires mii
device          aue           # ADMtek USB Ethernet
device          axe           # ASIX Electronics USB Ethernet
device          cdce          # Generic USB over Ethernet
device          cue           # CATC USB Ethernet
device          kue           # Kawasaki LSI USB Ethernet
device          rue           # RealTek RTL8150 USB Ethernet
```

ÕðïóôÞñéîç ãéá äéÜöïñåò óõóêåõÝò USB.

```
# FireWire support
device          firewire      # FireWire bus code
device          sbp           # SCSI over FireWire (Requires scbus and da)
device          fwe           # Ethernet over FireWire (non-standard!)
```

ÕðïóôÞñéîç ãéá äéÜöïñåò óõóêåõÝò Firewire.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò êáé åðéðëÝïí óõóêåõÝò ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD, äåßôå ôï áñ÷åßï `/usr/src/sys/i386/conf/NOTES` .

9.6.1 Ëåéôïõñãßá ìå ÌåãÜëç Ðïóüôçôá ÌíÞìçò (PAE)

Ìç÷áíÞìáôá ìå ìåãÜëç ðïóüôçôá ìíÞìçò, ÷ñåéÜæïíôáé ðñüóâáóç óå ìíÞìç ðïõ õðåñâáßíåé ôï üñéï ôùí 4 gigabytes ôùí Åéêïíéêþí Äéåõèýíóåùí ×ñÞóôç+ÐõñÞíá (User+Kernel Virtual Address, KVA). Åîáéôßáò áõôïý ôïõ ðåñéïñéóìïý, ç Intel ðñüóèåóå õðïóôÞñéîç ãéá 36bit öõóéêþí äéåõèýíóåùí, áðü ôïí åðåîåñãáóôÞ Pentium Pro êáé ìåôÜ.

Ç äõíáôüôçôá ÅðÝêôáóçò Öõóéêþí Äéåõèýíóåùí, (Physical Address Extension, PAE) ôùí Intel Pentium Pro êáé ìåôáãåíÝóôåñùí CPU, åðéôñÝðåé ÷ñÞóç ìíÞìçò ùò 64 gigabytes. To FreeBSD ðáñÝ÷åé õðïóôÞñéîç ãéá ôç äõíáôüôçôá áõôÞ ìÝóù ôçò ñýèìéóçò ðõñÞíá PAE, ç ïðïßá äéáôßèåôáé ãéá üëåò ôéò ôñÝ÷ïõóåò óôáèåñÝò åêäüóåéò ôïõ FreeBSD. Ëüãù ðåñéïñéóìþí óôçí áñ÷éôåêôïíéêÞ ôïõ óõóôÞìáôïò ìíÞìçò ôçò Intel, äåí ãßíåôáé äéÜêñéóç ãéá ôç ìíÞìç ðïõ âñßóêåôáé ðÜíù Þ êÜôù áðü ôá 4 gigabytes. Ç ìíÞìç ðïõ åê÷ùñåßôáé ðÜíù áðü ôá 4 gigabytes, áðëþò ðñïóôßèåôáé óôï ìÝãåèïò ôçò äéáèÝóéìçò ìíÞìçò.

Ãéá íá åíåñãïðïéÞóåôå ôçí õðïóôÞñéîç PAE óôïí ðõñÞíá, áðëþò ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï ôùí ñõèìßóåùí óáò:

```
options             PAE
```

Óçìåßùóç: Ç õðïóôÞñéîç PAE óôï FreeBSD åßíáé äéáèÝóéìç ìüíï ãéá åðåîåñãáóôÝò áñ÷éôåêôïíéêÞò Intel IA-32. Èá ðñÝðåé åðßóçò íá óçìåéþóïõìå üôé ç õðïóôÞñéîç PAE óôï FreeBSD äåí Ý÷åé äïêéìáóôåß åêôåôáìÝíá, êáé èá ðñÝðåé íá èåùñåßôáé ðïéüôçôáò beta óå ó÷Ýóç ìå ôá Üëëá óôáèåñÜ ÷áñáêôçñéóôéêÜ ôïõ FreeBSD.

Ç õðïóôÞñéîç PAE óôï FreeBSD õðüêåéôáé óå êÜðïéïõò ðåñéïñéóìïýò:

- Ìéá äéåñãáóßá äåí Ý÷åé ðñüóâáóç óå ðåñéóóüôåñá áðü 4 gigabytes ÷þñïõ VM.
- Ïäçãïß óõóêåõþí ðïõ äåí ÷ñçóéìïðïéïýí ôç äéåðáöÞ bus_dma(9) ßóùò ðñïêáëÝóïõí êáôáóôñïöÞ äåäïìÝíùí óå Ýíá PAE ðõñÞíá êáé ãéá ôï ëüãï áõôü äåí óõíßóôáôáé ç ÷ñÞóç ôïõò. Óôï FreeBSD ðáñÝ÷åôáé Ýíá áñ÷åßï ñõèìßóåùí PAE óôï ïðïßï Ý÷ïõí åîáéñåèåß üëá ôá ðñïãñÜììáôá ïäÞãçóçò ðïõ åßíáé ãíùóôü üôé äåí äïõëåýïõí óå ðõñÞíá ôýðïõ PAE.
- ÊÜðïéåò ìåôáâëçôÝò óõóôÞìáôïò (system tunables) åîáêñéâþíïõí ôç ÷ñÞóç ôçò ìíÞìçò, âëÝðïíôáò ôï ðïóü ôçò äéáèÝóéìçò öõóéêÞò ìíÞìçò. ÁõôÝò ïé ìåôáâëçôÝò ìðïñåß íá ÷ñçóéìïðïéÞóïõí áäéêáéïëüãçôá ìåãÜëç ðïóüôçôá ìíÞìçò, ëüãù ôçò öýóçò ôïõ óõóôÞìáôïò PAE. ¸á ôÝôïéï ðáñÜäåéãìá åßíáé ç ñýèìéóç sysctl `kern.maxvnodes` ç ïðïßá åëÝã÷åé ôï ìÝãéóôï áñéèìü vnodes ðïõ åðéôñÝðïíôáé óôïí ðõñÞíá. Åßíáé óêüðéìï íá ñõèìßóåôå áõôÞ êáé Üëëåò ðáñüìïéåò ðáñáìÝôñïõò óå ëïãéêÝò ôéìÝò.
- ºóùò ÷ñåéáóôåß íá ñõèìßóåôå ôéò åéêïíéêÝò äéåõèýíóåéò ôïõ ðõñÞíá (KVA) Þ íá ìåéþóåôå ôçí ðïóüôçôá êÜðïéïõ óõãêåêñéìÝíïõ ðüñïõ ðïõ Ý÷åé ìåãÜëç ÷ñÞóç (äåßôå ðáñáðÜíù) ãéá íá áðïöýãåôå ôçí åîÜíôëçóç ôïõ KVA. Ìðïñåßôå íá áõîÞóåôå ôï ìÝãåèïò ôïõ KVA ìÝóù ôçò åðéëïãÞò `KVA_PAGES`.

Ãéá ëüãïõò óôáèåñüôçôáò êáé áðüäïóçò, óáò óõìâïõëåýïõìå íá äéáâÜóåôå ôç óåëßäá manual tuning(7). Åðßóçò ç óåëßäá pae(4) ðåñéÝ÷åé åíçìåñùìÝíåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí õðïóôÞñéîç PAE óôï FreeBSD.

9.7 Áí ÊÜôé ÐÜåé ËÜèïò

ÕðÜñ÷ïõí ôÝóóåñéò êáôçãïñßåò ðñïâëçìÜôùí ðïõ ìðïñïýí íá ðáñïõóéáóôïýí üôáí äçìéïõñãåßôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá:

Áðïôõ÷ßá ôçò åíôïëÞò `config`:

Áí ç åíôïëÞ config(8) áðïôõã÷Üíåé üôáí ôçò äßíåôå ôçí ðåñéãñáöÞ ôïõ ðõñÞíá óáò, Ý÷åôå êáôÜ ðÜóá ðéèáíüôçôá, êÜíåé êÜðïéï áðëü ëÜèïò. Åõôõ÷þò, ç config(8) èá óáò äåßîåé ôïí áñéèìü ãñáììÞò óôïí ïðïßï óõíÜíôçóå ôï ðñüâëçìá, êáé Ýôóé èá ìðïñÝóåôå åýêïëá íá ôï åíôïðßóåôå. Ãéá ðáñÜäåéãìá, áí äåßôå:

```
config: line 17: syntax error
```

Âåâáéùèåßôå üôé ç ëÝîç-êëåéäß óôç ãñáììÞ áõôÞ åßíáé óùóôÞ, óõãêñßíïíôáò ôç ìå ôçí áíôßóôïé÷ç óôï áñ÷åßï `GENERIC` Þ óå Üëëï áñ÷åßï áíáöïñÜò.

Áðïôõ÷ßá ôçò åíôïëÞò `make`:

Áí áðïôõã÷Üíåé ç åíôïëÞ `make`, óõíÞèùò áõôü óçìáßíåé êÜðïéï ëÜèïò óôï áñ÷åßï ñõèìßóåùí ôï ïðïßï äåí åßíáé áñêåôÜ óïâáñü ãéá íá ôï êáôáëÜâåé ç config(8). Êïéôܾôå îáíÜ ôï áñ÷åßï ñõèìßóåùí óáò êáé áí áêüìá äåí ìðïñåßôå íá åíôïðßóåôå ôï ðñüâëçìá, óôåßëôå ôï ìáæß ìå ôï áñ÷åßï ìå mail óôçí çëåêôñïíéêÞ ëßóôá ãåíéêþí åñùôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions) êáé èá åíôïðéóôåß ðïëý ãñÞãïñá.

Ï ðõñÞíáò äåí åêêéíåß:

Áí ï íÝïò óáò ðõñÞíáò äåí åêêéíåß Þ áðïôõã÷Üíåé íá áíáãíùñßóåé ôéò óõóêåõÝò óáò, ìçí ðáíéêïâÜëëåóôå! Åõôõ÷þò, ôï FreeBSD Ý÷åé Ýíá åîáéñåôéêü ìç÷áíéóìü ãéá íá åðáíÝëèåôå áðü ìç-óõìâáôïýò ðõñÞíåò. Áðëþò åðéëÝîôå ôïí ðõñÞíá áðü ôïí ïðïßï èÝëåôå íá îåêéíÞóåôå ìÝóù ôïõ óõóôÞìáôïò åêêßíçóçò (boot loader) ôïõ FreeBSD. ¸÷åôå ðñüóâáóç óå áõôü, ôçí þñá ðïõ åìöáíßæåôáé ôï ìåíïý åðéëïãþí åêêßíçóçò. ÅðéëÝîôå “Escape to a loader prompt”, áñéèìüò Ýîé. Óôçí ðñïôñïðÞ ðïõ åìöáíßæåôáé, ãñÜøôå ôçí åíôïëÞ `boot` *`kernel.old`* Þ ôï üíïìá áñ÷åßïõ åíüò Üëëïõ ðõñÞíá ðïõ îåêéíÜåé êáíïíéêÜ. ¼ôáí öôéÜ÷íåôå Ýíá íÝï ðõñÞíá, åßíáé ðÜíôá êáëÞ éäÝá íá Ý÷åôå ðñü÷åéñï Ýíá ðõñÞíá ðïõ îÝñåôå üôé äïõëåýåé.

Áöïý åêêéíÞóåôå ìå Ýíá êáëü ðõñÞíá, ìðïñåßôå íá åëÝãîåôå ôï áñ÷åßï ñõèìßóåùí óáò áðü ôçí áñ÷Þ, êáé íá ðñïóðáèÞóåôå îáíÜ. Ìéá ÷ñÞóéìç ðçãÞ ðëçñïöïñéþí åßíáé ôï áñ÷åßï `/var/log/messages` ôï ïðïßï ìåôáîý Üëëùí êáôáãñÜöåé üëá ôá ìçíýìáôá ôïõ ðõñÞíá áðü êÜèå åðéôõ÷çìÝíç åêêßíçóç. Åðßóçò ç åíôïëÞ dmesg(8) èá óáò äåßîåé üëá ôá ìçíýìáôá ôïõ ðõñÞíá ôçò ôñÝ÷ïõóáò åêêßíçóçò.

> **Óçìåßùóç:** Áí Ý÷åôå ðñüâëçìá óôç äçìéïõñãßá ðõñÞíá, âåâáéùèåßôå üôé Ý÷åôå êñáôÞóåé Ýíá ðõñÞíá `GENERIC`, Þ êÜðïéï Üëëï ðïõ ãíùñßæåôå üôé ëåéôïõñãåß, ÷ñçóéìïðïéþíôáò Ýíá äéáöïñåôéêü üíïìá þóôå íá ìç äéáãñáöåß óôçí åðüìåíç ìåôáãëþôôéóç. Äåí ìðïñåßôå íá âáóéóôåßôå óôïí ðõñÞíá `kernel.old`, ãéáôß êÜèå öïñÜ ðïõ åãêáèéóôÜôå íÝï ðõñÞíá, ôï `kernel.old` áíôéêáèßóôáôáé ìå ôïí ôåëåõôáßï åãêáôåóôçìÝíï ðõñÞíá, ï ïðïßïò ìðïñåß íá ìçí ëåéôïõñãåß. Åðßóçò, üóï ôï äõíáôüí ðéï óýíôïìá, ìåôáêéíÞóôå ôïí ðõñÞíá ðïõ ëåéôïõñãåß óôçí óùóôÞ èÝóç, `/boot/kernel`, äéáöïñåôéêÜ åíôïëÝò üðùò ç ps(1) ßóùò íá ìç ëåéôïõñãïýí óùóôÜ. Ãéá íá ôï êÜíåôå áõôü, áðëþò ìåôïíïìÜóôå ôïí êáôÜëïãï ðïõ ðåñéÝ÷åé ôïí êáëü ðõñÞíá, ð.÷:
>
> ```
> # mv /boot/kernel /boot/kernel.bad
> # mv /boot/kernel.good /boot/kernel
> ```

Ï íÝïò ðõñÞíáò ëåéôïõñãåß, áëëÜ ç ps(1) äåí ëåéôïõñãåß ðëÝïí:

Áí åãêáôáóôÞóåôå ðõñÞíá äéáöïñåôéêÞò Ýêäïóçò áðü áõôÞí ìå ôïí ïðïßï Ý÷ïõí öôéá÷ôåß ôá åñãáëåßá óõóôÞìáôïò, ãéá ðáñÜäåéãìá åÜí âÜëåôå Ýíá ðõñÞíá ôçò óåéñÜò -CURRENT óå Ýíá óýóôçìá -RELEASE, ðïëëÝò áðü ôéò åíôïëÝò ðïõ ó÷åôßæïíôáé ìå ôçí êáôÜóôáóç ôïõ óõóôÞìáôïò üðùò Þ ps(1) êáé ç vmstat(8) äåí èá ëåéôïõñãïýí ðëÝïí. Èá ðñÝðåé íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå üëï ôï âáóéêü óýóôçìá (world) ÷ñçóéìïðïéþíôáò ßäéá Ýêäïóç ôïõ ðçãáßïõ êþäéêá ìå áõôÞ ôïõ ðõñÞíá óáò. Áõôüò åßíáé êáé Ýíáò ëüãïò ãéá ôïí ïðïßï äåí åßíáé óõíÞèùò êáëÞ éäÝá íá ÷ñçóéìïðïéåßôå äéáöïñåôéêÞ Ýêäïóç ðõñÞíá áðü ôï õðüëïéðï ôïõ ëåéôïõñãéêïý óõóôÞìáôïò.

ÊåöÜëáéï 10 Åêôõðþóåéò

ÓõíåéóöïñÜ áðü ôïí Sean Kelly. ÁíáäïìÞèçêå êáé áíáíåþèçêå áðü ôïí Jim Mock.

10.1 Óýíïøç

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï FreeBSD ãéá íá êÜíåôå åêôõðþóåéò óå äéÜöïñïõò ôýðïõò åêôõðùôþí, áðü ôïí ðáëáéüôåñï êñïõóôéêü ùò ôïí ðéï óýã÷ñïíï laser åêôõðùôÞ, êáèþò êáé ïðïéáóäÞðïôå Üëëçò ôå÷íïëïãßáò áíÜìåóá ôïõò, êáé íá äçìéïõñãÞóåôå åêôõðþóåéò õøçëÞò ðïéüôçôáò ìå ôéò åöáñìïãÝò ðïõ åêôåëåßôå.

Ôï FreeBSD ìðïñåß åðßóçò íá ñõèìéóôåß þóôå íá ëåéôïõñãåß ùò åîõðçñåôçôÞò åêôõðþóåùí äéêôýïõ. Ìå áõôÞ ôç äõíáôüôçôá ôï FreeBSD ìðïñåß íá ëáìâÜíåé åñãáóßåò åêôýðùóçò áðü äéÜöïñïõò Üëëïõò õðïëïãéóôÝò, óõìðåñéëáìâáíïìÝíùí õðïëïãéóôþí FreeBSD, Windows êáé Mac OS. Ôï FreeBSD ìðïñåß íá åîáóöáëßæåé üôé ìüíï ìéá åñãáóßá èá ôõðþíåôáé êÜèå ÷ñïíéêÞ óôéãìÞ êáé ìðïñåß íá ôçñåß óôáôéóôéêÜ ãéá ôïõò ÷ñÞóôåò êáé ôá ìç÷áíÞìáôá ðïõ èá êÜíïõí ôéò ðåñéóóüôåñåò åêôõðþóåéò, íá ðáñÜãåé óåëßäåò “banner” ðïõ íá äåß÷íïõí óå ðïéüí áíÞêåé ç êÜèå åêôýðùóç, êáé ðïëëÜ Üëëá.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï èá îÝñåôå:

- Ðùò íá ñõèìßóåôå ôçí ïõñÜ åêôõðþóåùí (print spooler) ôïõ FreeBSD.
- Ðùò íá åãêáèéóôÜôåößëôñá åêôýðùóçò, íá ÷åéñßæåóôå åéäéêÝò åñãáóßåò åêôýðùóçò (ð.÷. ôç ìåôáôñïðÞ åéóåñ÷üìåíùí êåéìÝíùí óå ìïñöÝò åêôýðùóçò ðïõ åßíáé êáôáíïçôÝò áðü ôïõò åêôõðùôÝò óáò).
- Ðùò íá åíåñãïðïéÞóåôå óåëßäåò ôýðïõ êåöáëßäáò Þ banner óôéò åêôõðþóåéò óáò.
- Ðùò íá åêôõðþíåôå óå åêôõðùôÝò ðïõ åßíáé óõíäåäåìÝíïé óå Üëëïõò õðïëïãéóôÝò.
- Ðùò íá åêôõðþíåôå óå åêôõðùôÝò ðïõ åßíáé óõíäåäåìÝíïé áðåõèåßáò óôï äßêôõï.
- Ðùò íá åëÝã÷åôå ôïõò ðåñéïñéóìïýò åêôýðùóçò, óõìðåñéëáìâáíïìÝíùí ôùí ðåñéïñéóìþí ìåãÝèïõò ôùí åñãáóéþí åêôýðùóçò, êáé ðùò íá ðáñåìðïäßæåôå ôçí äõíáôüôçôá åêôýðùóçò óå óõãêåêñéìÝíïõò ÷ñÞóôåò.
- Ðùò íá êñáôÞóåôå óôáôéóôéêÜ ãéá ôïí åêôõðùôÞ, êáé êáôáãñáöÞ ãéá ôç ÷ñÞóç ôïõ åêôõðùôÞ áðü êÜèå ÷ñÞóôç.
- Ðùò íá áíôéìåôùðßóåôå ðñïâëÞìáôá óôéò åêôõðþóåéò.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá ãíùñßæåôå ðùò íá ñõèìßóåôå êáé íá åãêáôáóôÞóåôå Ýíá íÝï ðõñÞíá (ÊåöÜëáéï 9).

10.2 ÅéóáãùãÞ

Ãéá íá ÷ñçóéìïðïéÞóåôå åêôõðùôÝò óôï FreeBSD, èá ÷ñåéáóôåß íá ñõèìßóåôå ôç ëåéôïõñãßá ôïõò ìå ôï óýóôçìá ðáñï÷Ýôåõóçò (spooling) åêôõðùôþí ãñáììÞò ôïõ Berkeley, ãíùóôü åðßóçò êáé ùò óýóôçìá ðáñï÷Ýôåõóçò **LPD**, Þ áðëÜ **LPD**. Áõôü åßíáé ôï ðñïêáèïñéóìÝíï óýóôçìá åëÝã÷ïõ åêôõðùôþí óôï FreeBSD. Ôï êåöÜëáéï áõôü åßíáé ìéá åéóáãùãÞ óôï **LPD** êáé èá óáò êáèïäçãÞóåé óôéò ñõèìßóåéò ôïõ.

ÅÜí óáò åßíáé ïéêåßï ôï **LPD** Þ êÜðïéï Üëëï óýóôçìá ðáñï÷Ýôåõóçò åêôõðùôþí, ôüôå ìðïñåßôå íá ìåôáðçäÞóåôå óôçí åíüôçôá ÂáóéêÞ ÅãêáôÜóôáóç.

Ôï **LPD** ìðïñåß íá åëÝã÷åé åî’ ïëïêëÞñïõ üëåò ôéò ëåéôïõñãßåò ôùí åêôõðùôþí åíüò õðïëïãéóôÞ. Åßíáé êõñßùò õðåýèõíï ãéá Ýíá ðëÞèïò ëåéôïõñãéþí:

- ÅëÝã÷åé ôçí ðñüóâáóç óå áðåõèåßáò óõíäåìÝíïõò åêôõðùôÝò êáé åêôõðùôÝò ðñïóáñôçìÝíïõò óå Üëëïõò êüìâïõò óôï äßêôõï.
- ÅðéôñÝðåé óå ÷ñÞóôåò íá óôÝëíïõí áñ÷åßá ðñïò åêôýðùóç. Ïé áðïóôïëÝò áõôÝò åßíáé ãíùóôÝò ùò *åñãáóßåò (jobs)*.
- Äéáôçñåß *ïõñÜ áíáìïíÞò (queue)* ãéá êÜèå åêôõðùôÞ, þóôå íá ðñïëáìâÜíåé ôçí ôáõôü÷ñïíç ðñüóâáóç áðü ðïëëïýò ÷ñÞóôåò.
- Ìðïñåß íá åêôõðþíåé *óåëßäåò êåöáëßäáò* (ãíùóôÝò åðßóçò ùò *banner* Þ *óåëßäåò burst*) þóôå ïé ÷ñÞóôåò íá ìðïñïýí åýêïëá íá îå÷ùñßóïõí ôéò åñãáóßåò ôïõò ìÝóá óôçí óôïßâá åêôõðþóåùí.
- Öñïíôßæåé ãéá ôçí ïñèüôçôá ôùí ðáñáìÝôñùí åðéêïéíùíßáò ôùí åêôõðùôþí ðïõ åßíáé óõíäåäåìÝíïé óå óåéñéáêÝò èýñåò.
- Ìðïñåß ìÝóù ôïõ äéêôýïõ íá óôåßëåé åñãáóßåò óå óýóôçìá ðáñï÷Ýôåõóçò **LPD** äéáöïñåôéêïý õðïëïãéóôÞ.
- Ìðïñåß íá åêôåëÝóåé äéÜöïñáößëôñá ãéá íá ðñïóáñìüóåé åñãáóßåò þóôå íá åßíáé äõíáôÞ ç åêôýðùóç ôïõò óå åêôõðùôÝò ðïõ ÷ñçóéìïðïéïýí äéáöïñåôéêÝò ãëþóóåò Þ Ý÷ïõí äéáöïñåôéêÝò äõíáôüôçôåò.
- Ìðïñåß íá êÜíåé êáôáìÝôñçóç ÷ñÞóçò ôïõ åêôõðùôÞ.

ÌÝóù ôïõ áñ÷åßïõ ñýèìéóçò (`/etc/printcap`), êáé ìå ôç âïÞèåéá åéäéêþí ðñïãñáììÜôùí ößëôñùí, ìðïñåßôå íá åíåñãïðïéÞóåôå ôï óýóôçìá **LPD** íá êÜíåé üëåò Þ êÜðïéåò áðü ôéò ðáñáðÜíù åñãáóßåò óå ìéá ìåãÜëç ãêÜìá óõóêåõþí åêôýðùóçò.

10.2.1 Ãéáôß èá ðñÝðåé íá ÷ñçóéìïðïéåßôå ôïí Spooler

Áí åßóôå ï ìïíáäéêüò ÷ñÞóôçò ôïõ óõóôÞìáôïò, èá áíáñùôéÝóôå ãéáôß èá Ýðñåðå íá åíäéáöåñèåßôå ãéá ôïí spooler áöïý äåí ÷ñåéÜæåóôå Ýëåã÷ï ðñüóâáóçò, óåëßäåò êåöáëßäáò, Þ áíáöïñÝò åêôýðùóçò. Áí êáé ìðïñåßôå íá åíåñãïðïéÞóåôå ôçí Üìåóç ðñüóâáóç óôïí åêôõðùôÞ, åßíáé êáëýôåñá íá ÷ñçóéìïðïéåßôå ôïí spooler ãéá ôïõò ðáñáêÜôù ëüãïõò:

- ôï **LPD** åêôõðþíåé ôéò åñãáóßåò óôï ðáñáóêÞíéï, äåí ÷ñåéÜæåôáé íá ðåñéìÝíåôå íá áíôéãñáöïýí ôá äåäïìÝíá óôïí åêôõðùôÞ.
- Ôï **LPD** ìðïñåß Üíåôá íá åêôåëåß ìéá åñãáóßá åêôýðùóçò äéáìÝóïõößëôñùí êáé íá ðñïóèÝôåé êåöáëßäåò çìåñïìçíßáò/þñáò Þ íá ìåôáôñÝðåé êÜðïéï åéäéêü ôýðï áñ÷åßïõ (üðùò Ýíá áñ÷åßï TeX DVI) óå Ýíá ôýðï êáôáíïçôü áðü ôïí åêôõðùôÞ óáò. ÁõôÝò ïé äéáäéêáóßåò äåí ÷ñåéÜæåôáé íá ãßíïíôáé ÷åéñïêßíçôá.
- ÐïëëÜ áðü ôá åëåýèåñá êáé åìðïñéêÜ äéáèÝóéìá ðñïãñÜììáôá ðïõ ðáñÝ÷ïõí äéåõêïëýíóåéò óôçí åêôýðùóç, óõíÞèùò åðéæçôïýí íá åðéêïéíùíÞóïõí ìå ôïí spooler ôïõ óõóôÞìáôïò óáò. Ñõèìßæïíôáò ôï óýóôçìá ðáñï÷Ýôåõóçò, èá ìðïñåßôå åõêïëüôåñá íá õðïóôçñßæåôå ëïãéóìéêü ôñßôùí, ðïõ ìðïñåß Þäç íá Ý÷åôå Þ ðïõ ðñüêåéôáé íá åãêáôáóôÞóåôå óôï ìÝëëïí.

10.3 ÂáóéêÞ ÅãêáôÜóôáóç

> **Ðñïåéäïðïßçóç:** Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ãéá ôéò óåéñéáêÝò èýñåò ìåôïíïìÜóôçêáí áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ôåêìçñßùóç ðïõ áêïëïõèåß ìå âÜóç áõôÝò ôéò áëëáãÝò.

Ãéá íá ÷ñçóéìïðïéÞóåôå åêôõðùôÝò ìå ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD**, èá ðñÝðåé íá åãêáôáóôÞóåôå ôüóï ôï hardware ôïõ åêôõðùôÞ óáò üóï êáé ôï ëïãéóìéêü **LPD**. Áõôü ôï Ýããñáöï ðåñéãñÜöåé ôçí åãêáôÜóôáóç óå äýï óôÜäéá:

- Äåßôå ôçí åíüôçôá ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí ãéá íá ìÜèåôå ðùò ãßíåôáé ç óýíäåóç åêôõðùôþí, ìå ðïéï ôñüðï åðéêïéíùíåß ôï **LPD** ìå ôïõò åêôõðùôÝò, êáé ðùò íá åêôõðþíåôå áðëÜ áñ÷åßá êåéìÝíïõ.
- Äåßôå ôçí åíüôçôá Ñõèìßóåéò Åêôõðùôþí ãéá Ðñï÷ùñçìÝíïõò ãéá íá ìÜèåôå ðùò íá åêôõðþíåôå áñ÷åßá åéäéêÞò ìïñöÞò äéáöüñùí ôýðùí, ðùò íá åêôõðþíåôå óåëßäåò êåöáëßäáò, ðùò íá åêôõðþíåôå óå Ýíá äßêôõï, ðùò íá åëÝã÷åôå ôçí ðñüóâáóç óôïõò åêôõðùôÝò, êáé ðùò íá ÷ñçóéìïðïéåßôå ôçí êáôáãñáöÞ åêôõðþóåùí.

10.3.1 ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí

ÁõôÞ ç åíüôçôá ðåñéãñÜöåé ðùò íá ñõèìßóåôå ôï hardware ôïõ åêôõðùôÞ êáé ôï ëïãéóìéêü **LPD**. ÐáñÝ÷åé âáóéêÝò ãíþóåéò ãéá ôá åîÞò èÝìáôá:

- Ç Åíüôçôá Ñõèìßóåéò Hardware õðïäåéêíýåé ðùò íá óõíäÝóåôå ôïí åêôõðùôÞ óå ìéá èýñá ôïõ õðïëïãéóôÞ óáò.
- Ç Åíüôçôá Ñõèìßóåéò Ëïãéóìéêïý õðïäåéêíýåé ðùò íá åãêáôáóôÞóåôå ôï áñ÷åßï ñýèìéóçò ôïõ óõóôÞìáôïò ðáñï÷Ýôåõóçò **LPD**: ôï áñ÷åßï `/etc/printcap`.

Áí ðñïóðáèåßôå íá åãêáôáóôÞóåôå Ýíáí åêôõðùôÞ ðïõ äÝ÷åôáé äåäïìÝíá ìÝóù ðñùôïêüëëïõ äéêôýïõ êáé ü÷é ìÝóù äéáóýíäåóçò ôïðéêÞò èýñáò, ôüôå äåßôå ôçí åíüôçôá ÅêôõðùôÝò Ìå ÓõíäÝóåéò Äéêôýïõ.

Áí êáé áõôÞ ç åíüôçôá ïíïìÜæåôáé “ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí”, óôçí ðñáãìáôéêüôçôá åßíáé áñêåôÜ ðåñßðëïêç. Ôï äõóêïëüôåñï óôÜäéï óôçí åãêáôÜóôáóç åßíáé ç åðéôõ÷Þò ëåéôïõñãßá óôçí åðéêïéíùíßá ôïõ åêôõðùôÞ ìå ôïí õðïëïãéóôÞ óáò êáé ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD**. Ïé åðéëïãÝò ãéá ðñï÷ùñçìÝíïõò, üðùò ïé óåëßäåò êåöáëßäáò êáé áíáöïñÜò åßíáé ó÷åôéêÜ åýêïëåò íá åðéôåõ÷èïýí, ìåôÜ ôçí åðéôõ÷Þ ñýèìéóç ôçò âáóéêÞò ëåéôïõñãßáò åêôýðùóçò.

10.3.1.1 Ñõèìßóåéò Hardware

ÁõôÞ ç åíüôçôá åîçãåß ôïõò äéÜöïñïõò ôñüðïõò óýíäåóçò ôïõ åêôõðùôÞ ìå ôïí õðïëïãéóôÞ óáò. ÐåñéãñÜöåé ôïõò äéÜöïñïõò ôýðïõò èõñþí êáé êáëùäßùí, êáé ôéò ñõèìßóåéò ðïõ ðñÝðåé íá êÜíåôå óôïí ðõñÞíá ãéá íá åíåñãïðïéÞóåôå ôçí åðéêïéíùíßá ìåôáîý FreeBSD êáé åêôõðùôÞ.

Áí Þäç Ý÷åôå êáôáöÝñåé íá óõíäÝóåôå ôïí åêôõðùôÞ óáò êáé Ý÷åôå åêôõðþóåé åðéôõ÷þò óå Üëëï ëåéôïõñãéêü óýóôçìá, ôüôå ìðïñåßôå íá ìåôáâåßôå êáôåõèåßáí óôçí åíüôçôá Ñõèìßóåéò Ëïãéóìéêïý.

10.3.1.1.1 Èýñåò êáé Êáëþäéá

Ïé åêôõðùôÝò ðïõ äéáôßèåíôáé óÞìåñá ãéá ÷ñÞóç ìå Ç/Õ ðáñÝ÷ïíôáé ìå ìßá Þ ðåñéóóüôåñåò åê ôùí áêïëïýèùí ôñéþí äéáóõíäÝóåùí:

- Ïé *ÓåéñéáêÝò* äéáóõíäÝóåéò, ãíùóôÝò êáé ùò RS-232 Þ èýñåò COM, ÷ñçóéìïðïéïýí ôçí óåéñéáêÞ èýñá ôïõ õðïëïãéóôÞ óáò ãéá íá óôåßëïõí äåäïìÝíá óôïí åêôõðùôÞ. Ïé óåéñéáêÝò äéáóõíäÝóåéò åßíáé óõíÞèåéò óôçí âéïìç÷áíßá êáôáóêåõÞò Ç/Õ êáé ôá êáëþäéá åßíáé åêôåíþò äéáäåäïìÝíá êáé åðßóçò åýêïëá íá êáôáóêåõáóôïýí. Ïé óåéñéáêÝò äéáóõíäÝóåéò ìåñéêÝò öïñÝò ÷ñåéÜæïíôáé åéäéêÜ êáëþäéá êáé ìðïñåß íá óáò æçôçèïýí ðïëýðëïêåò åðéêïéíùíéáêÝò ñõèìßóåéò. Ïé ðåñéóóüôåñåò óåéñéáêÝò èýñåò ôùí Ç/Õ Ý÷ïõí ìÝãéóôç ôá÷ýôçôá ìåôÜäïóçò 115200 bps, êÜíïíôáò äýóêïëç ôçí åêôýðùóç ãñáöéêþí ìåãÜëùí äéáóôÜóåùí.
- Ïé *ÐáñÜëëçëåò* äéáóõíäÝóåéò ÷ñçóéìïðïéïýí ôçí ðáñÜëëçëç èýñá ôïõ õðïëïãéóôÞ óáò ãéá íá óôÝëíïõí äåäïìÝíá óôïí åêôõðùôÞ. Ïé ðáñÜëëçëåò äéáóõíäÝóåéò åßíáé ãñçãïñüôåñåò áðü ôéò óåéñéáêÝò RS-232. Ôá êáëþäéá äéáôßèåíôáé Ýôïéìá, áëëÜ åßíáé äõóêïëüôåñï íá êáôáóêåõáóôïýí ÷åéñùíáêôéêÜ. Ìå ôéò ðáñÜëëçëåò äéáóõíäÝóåéò äåí ðñïâëÝðïíôáé åðéëïãÝò ñýèìéóçò åðéêïéíùíßáò, êÜíïíôáò ôçí ñýèìéóç ôïõò åîáéñåôéêÜ áðëÞ.

  Ïé ðáñÜëëçëåò äéáóõíäÝóåéò åßíáé ãíùóôÝò êáé ùò äéáóõíäÝóåéò “Centronics”, ïíïìáóßá ðñïåñ÷üìåíç áðü ôïí ôýðï ôïõ áêñïäÝêôç ôïõ åêôõðùôÞ.
- Ïé äéáóõíäÝóåéò USB, óõíôïìïãñáößá áðü ôï Universal Serial Bus, äïõëåýïõí óå áêüìç ìåãáëýôåñåò ôá÷ýôçôåò áðü ôçí ðáñÜëëçëç êáé ôçí RS-232 óåéñéáêÞ äéáóýíäåóç. Ôá êáëþäéá ôïõò åßíáé áðëÜ êáé öôçíÜ. Ç USB åßíáé áíþôåñç áðü ôçí ÓåéñéáêÞ RS-232 êáé áðü ôçí ÐáñÜëëçëç óôçí åêôýðùóç, áëëÜ äõóôõ÷þò äåí õðïóôçñßæåôáé êáëÜ áðü ôá óõóôÞìáôá UNIX. ¸íáò ôñüðïò ãéá íá áðïöýãåôå áõôü ôï ðñüâëçìá åßíáé íá áãïñÜóåôå åêôõðùôÞ ðïõ öÝñåé äéáóýíäåóç USB êáé ÐáñÜëëçëç, üðùò óõìâáßíåé ìå ðïëëïýò åêôõðùôÝò.

ÃåíéêÜ, ïé ÐáñÜëëçëåò äéáóõíäÝóåéò ðñïóöÝñïõí óõíÞèùò ìßáò êáôåýèõíóçò åðéêïéíùíßá (áðü ôïí õðïëïãéóôÞ óôïí åêôõðùôÞ) åíþ ç óåéñéáêÞ êáé ç USB äßíïõí áìößäñïìç. Óôï FreeBSD ïé ðéï ðñüóöáôåò ðáñÜëëçëåò èýñåò (EPP êáé ECP) êáôáöÝñíïõí áìößäñïìç åðéêïéíùíßá ìå ôïõò åêôõðùôÝò, üôáí ÷ñçóéìïðïéïýíôáé êáëþäéá ðïõ óõììïñöþíïíôáé ìå ôï ðñüôõðï IEEE-1284.

Ç áìößäñïìç åðéêïéíùíßá ìå åêôõðùôÝò äéáìÝóïõ ðáñÜëëçëçò èýñáò ìðïñåß íá åðéôåõ÷èåß ãåíéêÜ ìå äýï ôñüðïõò. Ï ðñþôïò ôñüðïò ÷ñçóéìïðïéåß Ýíá ðñïóáñìïóìÝíï ðñüãñáììá ïäÞãçóçò åêôõðùôÞ, þóôå íá ìðïñåß ôï FreeBSD íá óõíïìéëåß óôçí ãëþóóá ôïõ åêôõðùôÞ. Áõôü åßíáé óýíçèåò ìå åêôõðùôÝò inkjet êáé ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ãéá áíáöïñÝò äéáèÝóéìçò ðïóüôçôáò ìåëáíéïý êáé ãéá Üëëåò ðëçñïöïñßåò ëåéôïõñãßáò. Ç äåýôåñç ìÝèïäïò ÷ñçóéìïðïéåßôáé üôáí ï åêôõðùôÞò Ý÷åé äõíáôüôçôá õðïóôÞñéîçò PostScript.

Ïé åñãáóßåò PostScript åßíáé óôçí ðñáãìáôéêüôçôá ðñïãñÜììáôá ðïõ áðïóôÝëëïíôáé óôïí åêôõðùôÞ, äåí åßíáé áðáñáßôçôï íá ðáñÜãïõí åêôõðþóåéò, åíþ ìðïñïýí íá åðéóôñÝøïõí ôï áðïôÝëåóìá ôïõò áðåõèåßáò óôïí õðïëïãéóôÞ. Ôï PostScript ÷ñçóéìïðïéåß áìößäñïìç åðéêïéíùíßá ãéá íá åíçìåñþóåé ôïí õðïëïãéóôÞ ãéá ôõ÷üí ðñïâëÞìáôá, üðùò óöÜëìáôá óôï ðñüãñáììá PostScript Þ ìðëïêÜñéóìá ôñïöïäïóßáò ÷áñôéïý. Ïé ÷ñÞóôåò óáò, èá óáò åßíáé åõãíþìïíåò ãéá áõôÝò ôéò ðëçñïöïñßåò. ÅðéðëÝïí, ï êáëýôåñïò ôñüðïò ãéá íá êÜíåôå óùóôÞ êáôáìÝôñçóç ìå Ýíá áìößäñïìï åêôõðùôÞ PostScript åßíáé: íá ñùôÞóåôå ôïí åêôõðùôÞ ãéá ôçí óõíïëéêÞ êáôáìÝôñçóç ôùí óåëßäùí ôïõ (ðüóåò óåëßäåò åêôýðùóå óå üëç ôç äéÜñêåéá æùÞò ôïõ), ìåôÜ íá áðïóôåßëåôå ôçí åñãáóßá ôïõ ÷ñÞóôç, êáé Ýðåéôá íá îáíáñùôÞóåôå ãéá ôçí êáôáìÝôñçóç ôùí óåëßäùí ôïõ. ÁöáéñÝóôå ôéò äýï ôéìÝò êáé èá ãíùñßæåôå ðüóåò óåëßäåò íá ÷ñåþóåôå óôïí ÷ñÞóôç.

10.3.1.1.2 ÐáñÜëëçëåò Èýñåò

Ãéá íá óõíäÝóåôå Ýíáí åêôõðùôÞ óå ðáñÜëëçëç èýñá, óõíäÝóôå ôï êáëþäéï Centronics ìåôáîý åêôõðùôÞ êáé õðïëïãéóôÞ. Ïé ïäçãßåò ðïõ óõíïäåýïõí ôïí åêôõðùôÞ êáé ôïí õðïëïãéóôÞ èá óáò êáèïäçãÞóïõí íá ïëïêëçñþóåôå ôçí óýíäåóç.

Èõìçèåßôå ðïéá ðáñÜëëçëç èýñá ÷ñçóéìïðïéåßôå óôïí õðïëïãéóôÞ. Ç ðñþôç ðáñÜëëçëç èýñá óôï FreeBSD åßíáé ç `ppc0`, ç äåýôåñç åßíáé ç `ppc1`, êáé ïýôù êáèåîÞò. Ôï üíïìá óõóêåõÞò ôïõ åêôõðùôÞ ÷ñçóéìïðïéåß ôçí ßäéá áñßèìçóç: `/dev/lpt0` ãéá ôïí åêôõðùôÞ óôçí ðñþôç ðáñÜëëçëç èýñá ê.ô.ë.

10.3.1.1.3 ÓåéñéáêÝò Èýñåò

Ãéá íá óõíäÝóåôå Ýíáí åêôõðùôÞ ÷ñçóéìïðïéþíôáò óåéñéáêÞ äéáóýíäåóç, óõíäÝóôå ôï êáôÜëëçëï óåéñéáêü êáëþäéï ìåôáîý åêôõðùôÞ êáé õðïëïãéóôÞ. Ïé ïäçãßåò ðïõ óõíïäåýïõí ôïí åêôõðùôÞ êáé ôïí õðïëïãéóôÞ óáò, èá óáò êáèïäçãÞóïõí íá ïëïêëçñþóåôå ôçí óýíäåóç.

Áí äåí åßóôå óßãïõñïé ðïéï åßíáé ôï “êáôÜëëçëï óåéñéáêü êáëþäéï”, ìðïñåßôå íá äïêéìÜóåôå ìßá áðü ôéò áêüëïõèåò åíáëëáêôéêÝò:

- ¸íá êáëþäéï *modem* åíþíåé êÜèå pin ôïõ áêñïäÝêôç áðü ôç ìéá ðëåõñÜ ôïõ êáëùäßïõ êáôåõèåßáí ìå ôï áíôßóôïé÷ï pin ôïõ áêñïäÝêôç óôï Üëëï Üêñï. Áõôüò ï ôýðïò êáëùäßïõ åßíáé ãíùóôüò êáé ùò êáëþäéï “DTE-to-DCE”.
- ¸íá êáëþäéï *null-modem* åíþíåé êáôåõèåßáí ìåñéêÜ pins, áíôáëëÜóóåé ìåñéêÜ Üëëá (ãéá ðáñÜäåéãìá, ôá pins áðïóôïëÞò êáé ëÞøçò), åíþ âñá÷õêõêëþíåé ìåñéêÜ Üëëá, åóùôåñéêÜ, óôï ðñïóôáôåõôéêü êÜëõììá êÜèå áêñïäÝêôç. Áõôüò ï ôýðïò êáëùäßïõ åßíáé ãíùóôüò êáé ùò êáëþäéï “DTE-to-DTE”.
- ¸íá êáëþäéï *óåéñéáêïý åêôõðùôÞ*, ðïõ áðáéôåßôáé áðü êÜðïéïõò ëéãüôåñï óõíçèéóìÝíïõò åêôõðùôÝò, åßíáé óáí ôï êáëþäéï null-modem, áëëÜ óôÝëíåé éóïäýíáìá óÞìáôá êáé óôá äýï Üêñá áíôß íá ôá âñá÷õêõêëþíåé åóùôåñéêÜ.

Èá ðñÝðåé åðßóçò íá ñõèìßóåôå ôéò ðáñáìÝôñïõò åðéêïéíùíßáò ôïõ åêôõðùôÞ, óõíÞèùò áðü ôïí ìðñïóôéíü ðßíáêá åëÝã÷ïõ Þ áðü ôïõò DIP äéáêüðôåò ôïõ. ÅðéëÝîôå ôçí ìÝãéóôç ôéìÞ `bps` (bits per second = bits áíÜ äåõôåñüëåðôï, áíáöÝñåôáé êáé ùò *ñõèìüò baud*) ðïõ õðïóôçñßæåôáé ï õðïëïãéóôÞò êáé ï åêôõðùôÞò óáò. ÅðéëÝîôå 7 Þ 8 data bits, none, even, Þ odd parity, êáé 1 Þ 2 stop bits. Åðßóçò åðéëÝîôå Ýíá ðñùôüêïëëï åëÝã÷ïõ ñïÞò: åßôå none, Þ XON/XOFF (áíáöÝñåôáé êáé ùò Ýëåã÷ïò ñïÞò “in-band” Þ “software”). Íá èõìÜóôå áõôÝò ôéò ñõèìßóåéò, ãéá ôï óôÜäéï ñýèìéóçò ëïãéóìéêïý ðïõ áêïëïõèåß.

10.3.1.2 Ñõèìßóåéò Ëïãéóìéêïý

Áõôü ç åíüôçôá ðåñéãñÜöåé ôéò áíáãêáßåò ñõèìßóåéò ðïõ ðñÝðåé íá ãßíïõí óôï ëïãéóìéêü ãéá íá ìðïñåßôå íá åêôõðþíåôå ìå ôï óýóôçìá ðáñï÷Ýôåõóçò åêôõðùôþí **LPD** óôï FreeBSD.

Ìéá ãåíéêÞ Üðïøç ôùí åíåñãåéþí ðïõ ðñÝðåé íá áêïëïõèÞóåôå åßíáé:

1. Ñõèìßóôå ôïí ðõñÞíá óáò, áí åßíáé áíáãêáßï, ãéá ôçí èýñá ðïõ ÷ñçóéìïðïéåßôå ãéá ôïí åêôõðùôÞ óáò. Ïé áðáñáßôçôåò ñõèìßóåéò ðåñéãñÜöïíôáé óôçí åíüôçôá Ñõèìßóåéò ÐõñÞíá.
2. Ñõèìßóôå ôçí êáôÜóôáóç åðéêïéíùíßáò ãéá ôçí ðáñÜëëçëç èýñá, áí ðñüêåéôáé íá ôçí ÷ñçóéìïðïéÞóåôå. Ç åíüôçôá Ñõèìßóåéò ÊáôÜóôáóçò Åðéêïéíùíßáò ãéá ôçí ÐáñÜëëçëç Èýñá ðåñéÝ÷åé ëåðôïìÝñåéåò.
3. ÅëÝãîôå áí ôï ëåéôïõñãéêü óýóôçìá ìðïñåß íá óôåßëåé äåäïìÝíá óôïí åêôõðùôÞ. Ç åíüôçôá ¸ëåã÷ïò Åðéêïéíùíßáò ôïõ ÅêôõðùôÞ ðáñÝ÷åé ìåñéêÝò õðïäåßîåéò ãéá ôï ðùò èá ìðïñïýóå íá ãßíåé ï Ýëåã÷ïò.
4. Ñõèìßóôå ôï **LPD** ãéá ôïí åêôõðùôÞ óáò, ôñïðïðïéþíôáò ôï áñ÷åßï `/etc/printcap`. Èá âñåßôå ïäçãßåò ãéá áõôÝò ôéò ñõèìßóåéò óå åðüìåíï ôìÞìá áõôïý ôïõ êåöáëáßïõ.

10.3.1.2.1 Ñõèìßóåéò ÐõñÞíá

Ï ðõñÞíáò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò Ý÷åé ìåôáãëùôôéóôåß Ýôóé þóôå íá äïõëåýåé ìå Ýíá óõãêåêñéìÝíï óýíïëï óõóêåõþí. Ç óåéñéáêÞ êáé ç ðáñÜëëçëç äéáóýíäåóç ôïõ åêôõðùôÞ óáò åßíáé ìÝñïò áõôïý ôïõ óõíüëïõ. ÅðïìÝíùò, ßóùò íá åßíáé áíáãêáßï íá ðñïóèÝóåôå õðïóôÞñéîç ãéá êÜðïéá ðñüóèåôç óåéñéáêÞ Þ ðáñÜëëçëç èýñá, áí äåí åßíáé Þäç ñõèìéóìÝíç óôïí ðõñÞíá óáò.

Ãéá íá åëÝãîåôå áí ï ðõñÞíáò óáò ìðïñåß íá õðïóôçñßîåé ìéá óåéñéáêÞ äéáóýíäåóç, ðëçêôñïëïãÞóôå:

```
# grep sioN /var/run/dmesg.boot
```

¼ðïõ *N* åßíáé ï áñéèìüò ôçò óåéñéáêÞò èýñáò, îåêéíþíôáò áðü ôï ìçäÝí. Áí äåßôå óôçí Ýîïäï ôïõ ôåñìáôéêïý óáò êÜôé ðáñüìïéï ìå:

```
sio2 at port 0x3e8-0x3ef irq 5 on isa
sio2: type 16550A
```

ôüôå ï ðõñÞíáò õðïóôçñßæåé áõôÞ ôç èýñá.

Ãéá íá åëÝãîåôå áí ï ðõñÞíáò óáò õðïóôçñßæåé ðáñÜëëçëåò äéáóõíäÝóåéò, ðëçêôñïëïãÞóôå:

```
# grep ppcN /var/run/dmesg.boot
```

¼ðïõ *N* åßíáé ï áñéèìüò ôçò ðáñÜëëçëçò èýñáò, îåêéíþíôáò áðü ôï ìçäÝí. Áí äåßôå óôçí Ýîïäï ôïõ ôåñìáôéêïý óáò êÜôé ðáñüìïéï ìå:

```
ppc0: <Parallel port> at port 0x378-0x37f irq 7 on isa0
ppc0: SMC-like chipset (ECP/EPP/PS2/NIBBLE) in COMPATIBLE mode
ppc0: FIFO with 16/16/8 bytes threshold
```

ôüôå ï ðõñÞíáò õðïóôçñßæåé áõôÞ ôç èýñá.

Ãéá íá ìðïñåß ôï ëåéôïõñãéêü óýóôçìá íá áíáãíùñßæåé êáé íá ÷ñçóéìïðïéåß ôçí èýñá (ðáñÜëëçëç Þ óåéñéáêÞ) ãéá ôïí åêôõðùôÞ óáò, ßóùò ÷ñåéáóôåß íá åðáíáðñïóáñìüóåôå ôïí ðõñÞíá óáò.

Ãéá ôçí õðïóôÞñéîç óåéñéáêÞò èýñáò, äåßôå ôçí åíüôçôá óôéò ñõèìßóåéò ôïõ ðõñÞíá. Ãéá ôçí õðïóôÞñéîç ðáñÜëëçëçò èýñáò, äåßôå ôçí ßäéá åíüôçôá *êáé* ôçí åíüôçôá ðïõ áêïëïõèåß.

10.3.1.3 Ñõèìßóåéò ÊáôÜóôáóçò Åðéêïéíùíßáò ãéá ôçí ÐáñÜëëçëç Èýñá

¼ôáí ÷ñçóéìïðïéåßôå ôçí ðáñÜëëçëç äéáóýíäåóç, ìðïñåßôå íá åðéëÝîåôå áí ç åðéêïéíùíßá ôïõ FreeBSD ìå ôïí åêôõðùôÞ èá åßíáé ôýðïõ interrupt-driven Þ polled. Ï ãåíéêüò ïäçãüò óõóêåõÞò ôïõ åêôõðùôÞ (lpt(4)) óôï FreeBSD ÷ñçóéìïðïéåß ôï óýóôçìá ppbus(4), ôï ïðïßï åëÝã÷åé ôçí èýñá ôïõ chipset ìå ôïí ïäçãü ppc(4).

- Ç ìÝèïäïò *interrupt-driven* åßíáé ðñïåðéëåãìÝíç óôïí ðõñÞíá GENERIC. Ìå áõôÞ ôç ìÝèïäï, ôï ëåéôïõñãéêü óýóôçìá ÷ñçóéìïðïéåß Ýíá óÞìá IRQ ãéá íá ðñïóäéïñßóåé áí ï åêôõðùôÞò åßíáé Ýôïéìïò ãéá äåäïìÝíá.
- Ç ìÝèïäïò *polled* ïäçãåß ôï ëåéôïõñãéêü óýóôçìá íá æçôÜ êáôÜ åðáíÜëçøç áðü ôïí åêôõðùôÞ áí åßíáé Ýôïéìïò ãéá ðñüóèåôá äåäïìÝíá. ¼ôáí áðáíôÞóåé èåôéêÜ, ï ðõñÞíáò óôÝëíåé ðñüóèåôá äåäïìÝíá.

Ç ìÝèïäïò interrupt-driven åßíáé óõíÞèùò êÜðùò ãñçãïñüôåñç áëëÜ ÷ñçóéìïðïéåß ìéá ðïëýôéìç ãñáììÞ IRQ. ¸÷åé ðáñáôçñçèåß ðùò êÜðïéïé óýã÷ñïíïé åêôõðùôÝò HP äå äïõëåýïõí óùóôÜ óå êáôÜóôáóç interrupt, ðéèáíþò ëüãù êÜðïéùí (ü÷é áðüëõôá åîáêñéâùìÝíùí) ðñïâëçìÜôùí óõã÷ñïíéóìïý. Áõôïß ïé åêôõðùôÝò ÷ñåéÜæïíôáé ôçí ìÝèïäï polled. Èá ðñÝðåé íá ÷ñçóéìïðïéåßôå ôçí áðïôåëåóìáôéêüôåñç êáôÜóôáóç ëåéôïõñãßáò. ÊÜðïéïé åêôõðùôÝò äïõëåýïõí êáé óôéò äõï êáôáóôÜóåéò, áëëÜ åßíáé ïäõíçñÜ áñãïß óôçí êáôÜóôáóç ëåéôïõñãßáò interrupt.

Ìðïñåßôå íá ñõèìßóåôå ôçí êáôÜóôáóç åðéêïéíùíßáò ìå äýï ôñüðïõò: ñõèìßæïíôáò ôïí ðõñÞíá Þ ÷ñçóéìïðïéþíôáò ôï ðñüãñáììá lptcontrol(8).

Ãéá íá èÝóåôå ôçí êáôÜóôáóç åðéêïéíùíßáò ñõèìßæïíôáò ôïí ðõñÞíá:

1. Åðåîåñãáóôåßôå ôï áñ÷åßï ñýèìéóçò ôïõ ðõñÞíá. Äåßôå ôçí êáôá÷þñéóç `ppc0`. Áí åãêáèéóôÜôå ôçí äåýôåñç ðáñÜëëçëç èýñá, ôüôå ÷ñçóéìïðïéåßóôå `ppc1`. Ãéá ôçí ôñßôç èýñá `ppc2` êáé ïýôù êáèåîÞò.
   - Áí åðéèõìåßôå êáôÜóôáóç ëåéôïõñãßáò interrupt-driven, åðåîåñãáóôåßôå ôçí áêüëïõèç ãñáììÞ:

     ```
     hint.ppc.0.irq="N"
     ```

     óôï áñ÷åßï `/boot/device.hints` êáé áíôéêáôáóôÞóôå ôï *`N`* ìå ôïí óùóôü áñéèìü IRQ. Ôï áñ÷åßï ñýèìéóçò ôïõ ðõñÞíá ðñÝðåé åðßóçò íá ðåñéÝ÷åé ôïí ïäçãü ppc(4):

     ```
     device ppc
     ```

   - Áí åðéèõìåßôå êáôÜóôáóç ëåéôïõñãßáò polled, äéáãñÜøôå áðü ôï áñ÷åßï `/boot/device.hints`, ôçí áêüëïõèç ãñáììÞ:

     ```
     hint.ppc.0.irq="N"
     ```

     Óå ìåñéêÝò ðåñéðôþóåéò, ôï ðáñáðÜíù äåí åßíáé áñêåôü ãéá íá èÝóåôå ôçí èýñá óå êáôÜóôáóç polled. Ôéò ðåñéóóüôåñåò öïñÝò ôï ðñüâëçìá ðñïÝñ÷åôáé áðü ôïí ïäçãü acpi(4), ï ïðïßïò Ý÷åé ôçí äõ÷Ýñåéá íá åîåôÜæåé êáé íá ðñïóáñôÜ óõóêåõÝò, êáé åðïìÝíùò, íá åëÝã÷åé ôïí ôñüðï ðñüóâáóçò óôçí èýñá ôïõ åêôõðùôÞ. Èá ðñÝðåé íá åëÝãîåôå ôéò ñõèìßóåéò ôïõ acpi(4) ãéá íá äéïñèþóåôå áõôü ôï ðñüâëçìá.
2. Áðïèçêåýóôå ôï áñ÷åßï. Ñõèìßóôå, ìåôáãëùôôßóôå, êáé åãêáôáóôÞóôå ôïí ðõñÞíá, êáé Ýðåéôá êÜíôå åðáíåêêßíçóç. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äåßôå ôéò ñõèìßóåéò ôïõ ðõñÞíá.

Ãéá íá èÝóåôå ôçí êáôÜóôáóç åðéêïéíùíßáò ìå ôï lptcontrol(8):

1. ÐëçêôñïëïãÞóôå:

   ```
   # lptcontrol -i -d /dev/lptN
   ```

   ãéá íá èÝóåôå ôçí êáôÜóôáóç ëåéôïõñãßáò interrupt-driven ãéá ôï `lptN`.
2. ÐëçêôñïëïãÞóôå:

   ```
   # lptcontrol -p -d /dev/lptN
   ```

   ãéá íá èÝóåôå ôçí êáôÜóôáóç ëåéôïõñãßáò polled ãéá ôï `lptN`.

Èá ìðïñïýóáôå íá êáôá÷ùñßóåôå áõôÝò ôéò åíôïëÝò óôï äéêü óáò áñ÷åßï `/etc/rc.local`. ¸ôóé èá åêôåëïýíôáé áõôüìáôá êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò óáò. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò äåßôå ôï lptcontrol(8).

10.3.1.4 ¸ëåã÷ïò Åðéêïéíùíßáò ôïõ ÅêôõðùôÞ

Ðñéí óõíå÷ßóïõìå íá ñõèìßæïõìå ôï óýóôçìá ðáñï÷Ýôåõóçò, èá ðñÝðåé íá âåâáéùèåßôå üôé ôï ëåéôïõñãéêü óýóôçìá ìðïñåß íá óôåßëåé åðéôõ÷þò äåäïìÝíá óôïí åêôõðùôÞ óáò. Åßíáé åõêïëüôåñï íá êÜíïõìå îå÷ùñéóôÜ ôçí áðïóöáëìÜôùóç åðéêïéíùíßáò ôïõ åêôõðùôÞ êáé ôçí áðïóöáëìÜôùóç ôïõ óõóôÞìáôïò ðáñï÷Ýôåõóçò.

Èá åëÝãîïõìå ôïí åêôõðùôÞ óôÝëíïíôáò ìåñéêÜ äåäïìÝíá êåéìÝíïõ. Ãéá åêôõðùôÝò ðïõ ìðïñïýí íá åêôõðþíïõí Üìåóá ôïõò ÷áñáêôÞñåò ðïõ Ý÷ïõí áðïóôáëåß, ôï ðñüãñáììá lptest(1) åßíáé ôÝëåéï: ÐáñÜãåé üëïõò ôïõò åêôõðþóéìïõò ÷áñáêôÞñåò (96) ASCII óå 96 ãñáììÝò.

Ãéá åêôõðùôÝò PostScript (Þ ðïõ âáóßæïíôáé óå Üëëç ãëþóóá), èá ÷ñåéáóôåß íá êÜíïõìå Ýíá ðéï ðïëýðëïêï ôåóô. ¸íá ìéêñü ðñüãñáììá PostScript, üðùò áõôü ðïõ áêïëïõèåß, åðáñêåß:

```
%!PS
100 100 moveto 300 300 lineto stroke
310 310 moveto /Helvetica findfont 12 scalefont setfont
```

```
(Is this thing working?) show
showpage
```

Ï ðáñáðÜíù êþäéêáò PostScript ìðïñåß íá ôïðïèåôçèåß óå Ýíá áñ÷åßï êáé íá ÷ñçóéìïðïéçèåß üðùò õðïäåéêíýïõí ôá ðáñáäåßãìáôá óôéò áêüëïõèåò åíüôçôåò.

> **Óçìåßùóç:** ¼ôáí áõôü ôï Ýããñáöï áíáöÝñåôáé óå ìéá ãëþóóá åêôõðùôÞ, åííïåßôáé ìéá ãëþóóá üðùò ç PostScript, áëëÜ ü÷é ç PCL ôçò Hewlett Packard — ç PCL åßíáé ìéá ãëþóóá åõñåßáò ëåéôïõñãéêüôçôáò ç ïðïßá åðéôñÝðåé ôçí áíÜìéîç áðëïý êåéìÝíïõ ìå áêïëïõèßåò äéáöõãÞò. Ç PostScript äåí ìðïñåß íá åêôõðþóåé Üìåóá áðëü êåßìåíï, êáé áõôüò åßíáé áêñéâþò ï ôýðïò ôçò ãëþóóáò åêôõðùôÞ ðïõ èá ðñÝðåé íá äéåõèåôÞóïõìå êáôÜëëçëá.

10.3.1.4.1 ¸ëåã÷ïò ÐáñÜëëçëïõ ÅêôõðùôÞ

ÁõôÞ ç åíüôçôá õðïäåéêíýåé ðùò íá åëÝãîåôå áí ôï FreeBSD ìðïñåß íá åðéêïéíùíÞóåé ìå Ýíáí åêôõðùôÞ óõíäåäåìÝíï óå ðáñÜëëçëç èýñá.

Ãéá íá åëÝãîåôå Ýíáí åêôõðùôÞ óå ðáñÜëëçëç èýñá:

1. Ãßíåôå `root` ìå su(1).
2. Óôåßëôå äåäïìÝíá óôïí åêôõðùôÞ.
   - Áí ï åêôõðùôÞò ìðïñåß íá åêôõðþóåé áðëü êåßìåíï, ôüôå ÷ñçóéìïðïéÞóôå ôï lptest(1). ÐëçêôñïëïãÞóôå:

     ```
     # lptest > /dev/lptN
     ```

     ¼ðïõ *N* åßíáé ï áñéèìüò ôçò ðáñÜëëçëçò èýñáò, îåêéíþíôáò áðü ôï ìçäÝí.
   - ÅÜí ï åêôõðùôÞò êáôáëáâáßíåé PostScript Þ êÜðïéá Üëëç ãëþóóá åêôõðùôþí, ôüôå óôåßëôå Ýíá ìéêñü ðñüãñáììá óôïí åêôõðùôÞ. ÐëçêôñïëïãÞóôå:

     ```
     # cat > /dev/lptN
     ```

     ¸ðåéôá ðëçêôñïëïãÞóôå ôï ðñüãñáììá ìßá ðñïò ìßá ãñáììÞ, *ðñïóåêôéêÜ*, ãéáôß äåí ìðïñåßôå íá åðåîåñãáóôåßôå ìéá ãñáììÞ áöüôïõ Ý÷åôå ðéÝóåé ôï ðëÞêôñï `RETURN` Þ `ENTER`. Áöïý ôåëåéþóåôå ìå ôçí êáôá÷þñéóç ôïõ ðñïãñÜììáôïò, ðéÝóôå `CONTROL+D`, Þ üëëï ðëÞêôñï ôåñìáôéóìïý áñ÷åßïõ.

     ÅíáëëáêôéêÜ, ìðïñåßôå íá ôïðïèåôÞóåôå ôï ðñüãñáììá óå Ýíá áñ÷åßï êáé íá ðëçêôñïëïãÞóåôå:

     ```
     # cat file > /dev/lptN
     ```

     ¼ðïõ *`file`* åßíáé ôï üíïìá ôïõ áñ÷åßïõ ðïõ ðåñéÝ÷åé ôï ðñüãñáììá ðïõ èÝëåôå íá óôåßëåôå óôïí åêôõðùôÞ.

Èá äåßôå êÜôé íá åêôõðþíåôáé. Ìçí áíçóõ÷åßôå áí ôï êåßìåíï äåí öáßíåôáé óùóôü. Èá ôï äéïñèþóïõìå áñãüôåñá.

10.3.1.4.2 ¸ëåã÷ïò Óåéñéáêïý ÅêôõðùôÞ

ÁõôÞ ç åíüôçôá õðïäåéêíýåé ðùò íá åëÝãîåôå áí ôï FreeBSD ìðïñåß íá åðéêïéíùíÞóåé ìå Ýíáí åêôõðùôÞ óõíäåäåìÝíï óå óåéñéáêÞ èýñá.

Ãéá íá åëÝãîåôå Ýíáí åêôõðùôÞ óå óåéñéáêÞ èýñá:

1. Ãßíåôå `root` ìå su(1).

2. Åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/remote`. ÐñïóèÝóôå ôçí áêüëïõèç êáôá÷þñéóç:

   ```
   printer:dv=/dev/port:br#bps-rate:pa=parity
   ```

   ¼ðïõ *`port`* åßíáé ç êáôá÷þñéóç óõóêåõÞò ãéá ôçí óåéñéáêÞ ðüñôá (`ttyu0`, `ttyu1`, êôë.), *`bps-rate`* åßíáé ç ôá÷ýôçôá bits-per-second åðéêïéíùíßáò ìå ôïí åêôõðùôÞ, êáé *`parity`* ç éóïôéìßá ðïõ áðáéôåßôáé áðü ôïí åêôõðùôÞ (`even`, `odd`, `none`, Þ `zero`).

   ÐáñáêÜôù öáßíåôáé Ýíá õðüäåéãìá êáôá÷þñéóçò, ãéá Ýíáí åêôõðùôÞ óõíäåäåìÝíï ìÝóù óåéñéáêÞò ãñáììÞò óôçí ôñßôç óåéñéáêÞ èýñá ìå ôá÷ýôçôá 19200 bps êáé ÷ùñßò parity:

   ```
   printer:dv=/dev/ttyu2:br#19200:pa=none
   ```

3. Óõíäåèåßôå óôïí åêôõðùôÞ ìå tip(1). ÐëçêôñïëïãÞóôå:

   ```
   # tip printer
   ```

   Áí áõôü ôï óôÜäéï äåí äïõëÝøåé, åðåîåñãáóôåßôå ðÜëé ôï áñ÷åßï `/etc/remote` êáé ðñïóðáèÞóôå ôï ÷ñçóéìïðïéþíôáò `/dev/cuaaN` áíôß ãéá `/dev/ttyuN`.

4. Óôåßëôå äåäïìÝíá óôïí åêôõðùôÞ.

   - Áí ï åêôõðùôÞò ìðïñåß íá åêôõðþóåé áðëü êåßìåíï, ÷ñçóéìïðïéÞóôå lptest(1). ÃñÜøôå:

     ```
     % $lptest
     ```

   - ÅÜí ï åêôõðùôÞò êáôáëáâáßíåé PostScript Þ êÜðïéá Üëëç ãëþóóá åêôõðùôþí, ôüôå óôåßëôå Ýíá ìéêñü ðñüãñáììá óôïí åêôõðùôÞ. ÐëçêôñïëïãÞóôå ôï ðñüãñáììá, ìßá ðñïò ìßá ãñáììÞ, *ðïëý ðñïóåêôéêÜ*, êáèþò ï åêôõðùôÞò ìðïñåß íá åñìçíåýåé äéáöïñåôéêÜ ôçí ÷ñÞóç ÷áñáêôÞñùí üðùò ôï backspace Þ Üëëùí ðïõ ðáñÜãïíôáé áðü äéÜöïñá ðëÞêôñá åðåîåñãáóßáò. Ìðïñåß åðßóçò íá ÷ñåéáóôåß íá ðëçêôñïëïãÞóåôå êÜðïéï åéäéêü ðëÞêôñï ôåñìáôéóìïý áñ÷åßïõ ãéá ôïí åêôõðùôÞ þóôå íá ãíùñßæåé ðüôå ïëïêëçñþíåôáé ôï ðñüãñáììá. Ãéá åêôõðùôÝò PostScript, ðéÝóôå `CONTROL+D`.

     Åíáëëáêôéêü, ìðïñåßôå íá ôïðïèåôÞóåôå ôï ðñüãñáììá óå Ýíá áñ÷åßï êáé íá ðëçêôñïëïãÞóåôå:

     ```
     % >file
     ```

     ¼ðïõ *`file`* åßíáé ôï üíïìá ôïõ áñ÷åßïõ ðïõ ðåñéÝ÷åé ôï ðñüãñáììá. Áöïý ôï tip(1) óôåßëåé ôï áñ÷åßï, ðéÝóôå ôï êáôÜëëçëï ðëÞêôñï ôåñìáôéóìïý áñ÷åßïõ, áí áðáéôåßôáé.

Èá äåßôå êÜôé íá åêôõðþíåôáé. Ìçí áíçóõ÷åßôå áí ôï êåßìåíï äåí öáßíåôáé óùóôü. Èá ôï äéïñèþóïõìå áñãüôåñá.

10.3.1.5 Åíåñãïðïßçóç ôïõ Spooler: ôï Áñ÷åßï `/etc/printcap`

Óå áõôü ôï óçìåßï, ï åêôõðùôÞò óáò èá ðñÝðåé íá åßíáé óõíäåìÝíïò, ï ðõñÞíáò óáò ñõèìéóìÝíïò íá åðéêïéíùíåß ìáæß ôïõ (áí ÷ñåéÜæåôáé), êáé Ý÷åôå ðåôý÷åé íá óôåßëåôå êÜðïéá äïêéìáóôéêÜ äåäïìÝíá óôïí åêôõðùôÞ. Åßóôå ôþñá Ýôïéìïé íá ñõèìßóåôå ôï **LPD** ãéá íá åëÝã÷åôå ôçí ðñüóâáóç óôïí åêôõðùôÞ óáò.

Ìðïñåßôå íá ñõèìßóåôå ôï **LPD** ìå åðåîåñãáóßá ôïõ áñ÷åßïõ `/etc/printcap`. Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** äéáâÜæåé áõôü ôï áñ÷åßï êÜèå öïñÜ ðïõ ÷ñçóéìïðïéåßôáé ï spooler, åðïìÝíùò ðéèáíÝò áíáâáèìßóåéò ôïõ ìðáßíïõí Üìåóá óå åöáñìïãÞ.

Åßíáé åýêïëï íá êáôáíïÞóåôå ôçí ìïñöÞ ôïõ áñ÷åßïõ printcap(5). ×ñçóéìïðïéÞóôå ôïí êåéìåíïãñÜöï ðïõ ðñïôéìÜôå ãéá íá êÜíåôå áëëáãÝò óôï `/etc/printcap`. Ç ìïñöÞ ôïõ åßíáé ðáñüìïéá ìå Üëëá áñ÷åßá ðåñéãñáöÞò äõíáôïôÞôùí, üðùò ôá `/usr/share/misc/termcap` êáé `/etc/remote`. Äåßôå ôçí cgetent(3) ãéá ëåðôïìåñåßò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ìïñöÞ ôïõ áñ÷åßïõ.

Ç ðéï áðëÞ ñýèìéóç ôïõ spooler áðïôåëåßôáé áðü ôá áêüëïõèá âÞìáôá:

1. ÅðéëÝîôå Ýíá üíïìá (êáé ëßãá âïëéêÜ ðáñùíýìéá) ãéá ôïí åêôõðùôÞ, êáé ôïðïèåôÞóôå ôá óôï áñ÷åßï `/etc/printcap`. Äåßôå ôçí åíüôçôá Ïíïìáôïäüôçóç ÅêôõðùôÞ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ïíïìáóßá ôùí åêôõðùôþí.
2. ÁðåíåñãïðïéÞóôå ôéò óåëßäåò êåöáëßäáò (åßíáé åíåñãÝò áðü ðñïåðéëïãÞ) åéóÜãïíôáò ôçí éêáíüôçôá `sh`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò äåßôå ôçí åíüôçôá Ðáñåìðüäéóç Óåëßäùí Êåöáëßäáò.
3. ÄçìéïõñãÞóôå Ýíá êáôÜëïãï ðáñï÷Ýôåõóçò, êáé êáèïñßóôå ôçí ôïðïèåóßá ôïõ ìå ôçí éêáíüôçôá `sd`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò äåßôå ôçí åíüôçôá Äçìéïõñãßá Êáôáëüãïõ Ðáñï÷Ýôåõóçò.
4. Êáèïñßóôå ôçí êáôÜëëçëç êáôá÷þñéóç `/dev` ãéá ôïí åêôõðùôÞ, êáé óçìåéþóôå ôç óôï `/etc/printcap` ìå ôçí éêáíüôçôá `lp`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôçí åíüôçôá Áíáãíþñéóç ôçò ÓõóêåõÞò Åêôýðùóçò. Åðßóçò, áí ï åêôõðùôÞò åßíáé óå óåéñéáêÞ èýñá, åãêáôáóôÞóôå ôéò ðáñáìÝôñïõò åðéêïéíùíßáò ìå ôçí éêáíüôçôá `ms#` ç ïðïßá áíáëýåôáé óôçí åíüôçôá Ñõèìßóåéò ÐáñáìÝôñùí Åðéêïéíùíßáò ôïõ Spooler.
5. ÅãêáôáóôÞóôå ößëôñá åéóüäïõ áðëïý êåéìÝíïõ. Äåßôå ôçí åíüôçôá ÅãêáôÜóôáóçÖßëôñïõ ÊåéìÝíïõ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.
6. ÅëÝãîôå ôçí åãêáôÜóôáóç åêôõðþíïíôáò ïôéäÞðïôå ìå ôçí åíôïëÞ lpr(1). Ðåñéóóüôåñåò ðëçñïöïñßåò åßíáé äéáèÝóéìåò óôéò åíüôçôåò ÄïêéìÞ ôïõ Spooler êáé Åíôïðéóìüò Âëáâþí.

> **Óçìåßùóç:** ÅêôõðùôÝò ðïõ âáóßæïíôáé óå ãëþóóåò åêôýðùóçò, üðùò ïé åêôõðùôÝò PostScript, äåí ìðïñïýí íá åêôõðþóïõí Üìåóá áðëü êåßìåíï. Ï áðëüò ôñüðïò ñýèìéóçò ðïõ äåßîáìå ðáñáðÜíù êáé ðïõ èá ðåñéãñÜøïõìå åêôåíÝóôåñá óôéò åðüìåíåò åíüôçôåò, ðñïûðïèÝôåé ðùò áí ñõèìßæåôå Ýíáí ôÝôïéï åêôõðùôÞ èá ìðïñåßôå íá åêôõðþóåôå ìüíï áñ÷åßá ãñáììÝíá óôç ãëþóóá ôïõ.

Ïé ÷ñÞóôåò óõíÞèùò íïìßæïõí ðùò ìðïñïýí íá åêôõðþóïõí áðëü êåßìåíï óå üëïõò ôïõò åêôõðùôÝò ðïõ åßíáé åãêáôåóôçìÝíïé óôï óýóôçìá ôïõò. Ôá ðñïãñÜììáôá ðïõ ÷ñçóéìïðïéïýí ôï **LPD** ãéá íá åêôõðþóïõí, êÜíïõí áêñéâþò ôçí ßäéá õðüèåóç. Áí ðñïóðáèåßôå íá åãêáôáóôÞóåôå Ýíáí ôÝôïéï åêôõðùôÞ êáé èÝëåôå íá ìðïñåßôå íá ôõðþíåôå åñãáóßåò óôçí ãëþóóá ôïõ åêôõðùôÞ áëëÜ *êáé* óå áðëü êåßìåíï, óáò óõíéóôïýìå íá ðñïóèÝóåôå Ýíá åðéðëÝïí âÞìá óôçí äéáäéêáóßá åãêáôÜóôáóçò ðïõ ðåñéãñÜøáìå ðáñáðÜíù: ÅãêáôáóôÞóôå Ýíá ðñüãñáììá áõôüìáôçò ìåôáôñïðÞò áðü áðëü êåßìåíï óå PostScript (Þ óå Üëëç ãëþóóá åêôõðùôÞ). Ç åíüôçôá Óõìâáôüôçôá Åñãáóéþí Áðëïý ÊåéìÝíïõ óå åêôõðùôÝò PostScript åîçãåß ðùò íá åíåñãÞóåôå.

10.3.1.5.1 Ïíïìáôïäüôçóç ÅêôõðùôÞ

Ôï ðñþôï (åýêïëï) âÞìá åßíáé íá åðéëÝîåôå üíïìá ãéá ôïí åêôõðùôÞ óáò. Äåí Ý÷åé óçìáóßá áí èá ðñïôéìÞóåôå Ýíá ëåéôïõñãéêü Þ êÜðïéï åîùôéêü üíïìá áöïý ìðïñåßôå åðßóçò íá ðñïóèÝóåôå êáé ìåñéêÜ ðáñùíýìéá (aliases) ãéá ôïí ßäéï åêôõðùôÞ.

ÔïõëÜ÷éóôïí Ýíáò áðü ôïõò åêôõðùôÝò ðïõ áíáöÝñïíôáé óôï `/etc/printcap` èá ðñÝðåé íá Ý÷åé ôï ðáñùíýìéï `lp`. ÁõôÞ åßíáé ç ïíïìáóßá ôïõ ðñïåðéëåãìÝíïõ åêôõðùôÞ. ÅÜí ïé ÷ñÞóôåò äåí Ý÷ïõí ôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `PRINTER` êáé äåí áíáöÝñïõí êÜðïéï üíïìá åêôõðùôÞ óôçí ãñáììÞ åíôïëþí ìå ïðïéáäÞðïôå åíôïëÞ **LPD**, ôüôå ï `lp` èá åßíáé ï ðñïåðéëåãìÝíïò åêôõðùôÞò ãéá ôéò åêôõðþóåéò ôïõò.

Åðßóçò, åßíáé êïéíÞ ðñáêôéêÞ ôï ôåëåõôáßï alias ôïõ åêôõðùôÞ íá åßíáé ìéá ðëÞñçò ðåñéãñáöÞ ôïõ åêôõðùôÞ, ðïõ íá ðåñéëáìâÜíåé ôïí êáôáóêåõáóôÞ êáé ôï ìïíôÝëï.

Áöïý åðéëÝîåôå ìéá ïíïìáóßá êáé ìåñéêÜ óõíÞèç ðáñùíýìéá, êáôá÷ùñßóôå ôá óôï áñ÷åßï `/etc/printcap`. Ôï üíïìá ôïõ åêôõðùôÞ èá ðñÝðåé íá áíáöÝñåôáé ðñþôï óôï áñéóôåñü Üêñï. Äéá÷ùñßóôå êÜèå ðáñùíýìéï ìå ìéá êÜèåôç ìðÜñá êáé ôïðïèåôÞóôå ìéá Üíù-êÜôù ôåëåßá ìåôÜ ôï ôåëåõôáßï ðáñùíýìéï.

Óôï áêüëïõèï ðáñÜäåéãìá, îåêéíÜìå ìå Ýíá åíôåëþò âáóéêü `/etc/printcap` ðïõ ïñßæåé äýï åêôõðùôÝò (Ýíáí åêôõðùôÞ ãñáììÞò Diablo 630 êáé Ýíáí åêôõðùôÞ PostScript laser Panasonic KX-P4455):

```
#
#  /etc/printcap for host rose
#
rattan|line|diablo|lp|Diablo 630 Line Printer:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:
```

Óå áõôü ôï ðáñÜäåéãìá, ï ðñþôïò åêôõðùôÞò ïíïìÜæåôáé `rattan` êáé Ý÷åé ùò ðáñùíýìéá ôá `line`, `diablo`, `lp`, êáé `Diablo 630 Line Printer`. Áðü ôç óôéãìÞ ðïõ Ý÷åé ôï ðáñùíýìéï `lp`, åßíáé êáé ï ðñïåðéëåãìÝíïò åêôõðùôÞò. Ï äåýôåñïò ïíïìÜæåôáé `bamboo`, êáé Ý÷åé ùò ðáñùíýìéá ôá `ps`, `PS`, `S`, `panasonic`, êáé `Panasonic KX-P4455 PostScript v51.4`.

10.3.1.5.2 Ðáñåìðüäéóç Óåëßäùí Êåöáëßäáò

Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD**, áðü ðñïåðéëïãÞ, åêôõðþíåé ìéá *óåëßäá êåöáëßäáò* ãéá êÜèå åñãáóßá. Ç óåëßäá êåöáëßäáò ðåñéëáìâÜíåé ôï üíïìá ÷ñÞóôç ðïõ áéôÞèçêå ôçí åñãáóßá, ôïí õðïëïãéóôÞ áðü ôïí ïðïßïí ðñïÞëèå ç åñãáóßá, êáé ôï üíïìá ôçò åñãáóßáò, ìå ìåãÜëïõò ùìïñöïõò ÷áñáêôÞñåò. Äõóôõ÷þò áõôü ôï ðñüóèåôï êåßìåíï áêïëïõèåß ôçí äéáäéêáóßá áðïóöáëìÜôùóçò ôçò åãêáôÜóôáóçò åíüò áðëïý åêôõðùôÞ, åðïìÝíùò èá ðáñåìðïäßóïõìå ôéò óåëßäåò êåöáëßäáò.

Ãéá ôçí ðáñåìðüäéóç ôùí óåëßäùí êåöáëßäáò, ðñïóèÝóôå ôçí éêáíüôçôá `sh` óôçí êáôá÷þñéóç ãéá ôïí åêôõðùôÞ óôï áñ÷åßï `/etc/printcap`. Åäþ âëÝðåôå Ýíá ðáñÜäåéãìá ôïõ `/etc/printcap` ìå ðñïóèÞêç ôçò `sh`:

```
#
#  /etc/printcap for host rose - no header pages anywhere
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:
```

ÐáñáôçñÞóôå ðùò ÷åéñéóôÞêáìå óùóôÜ ôç ìïñöÞ: ç ðñþôç ãñáììÞ îåêéíÜ óôçí áñéóôåñÞ óôÞëç, êáé ïé áêüëïõèåò ãñáììÝò åßíáé óôïé÷éóìÝíåò (indented). ÊÜèå ãñáììÞ êáôá÷þñéóçò (åêôüò áðü ôçí ôåëåõôáßá) ôåëåéþíåé ìå ìéá áñéóôåñüóôñïöç êÜèåôï.

10.3.1.5.3 Äçìéïõñãßá Êáôáëüãïõ Ðáñï÷Ýôåõóçò

Ôï åðüìåíï âÞìá óôçí áðëü ôñüðï åãêáôÜóôáóçò åßíáé ç äçìéïõñãßá åíüò *êáôáëüãïõ ðáñï÷Ýôåõóçò (spool)*, üðïõ èá öéëïîåíïýíôáé ïé åñãáóßåò åêôýðùóçò Ýùò üôïõ íá åêôõðùèïýí êáé üðïõ åðßóçò öõëÜóóïíôáé êáé êÜðïéá Üëëá âïçèçôéêÜ áñ÷åßá ôïõ óõóôÞìáôïò åêôýðùóçò.

Ëüãù ôçò ìåôáâáëëüìåíçò öýóçò ôùí êáôáëüãùí ðáñï÷Ýôåõóçò, óõíçèßæåôáé íá ôïðïèåôïýíôáé êÜôù áðü ôïí êáôÜëïãï `/var/spool`. Äåí åßíáé áíáãêáßï íá ðáßñíåôå áíôßãñáöá áóöáëåßáò ôùí êáôáëüãùí ðáñï÷Ýôåõóçò. Ç åðáíáäçìéïõñãßá ôïõò åßíáé ôüóï áðëÞ üóï íá ôñÝîïõìå ôçí åíôïëÞ mkdir(1).

Åßíáé åðßóçò óõíçèéóìÝíï íá ïíïìÜæåôáé ï êáôÜëïãïò ìå ôï ßäéï üíïìá ìå ôïí åêôõðùôÞ, üðùò öáßíåôáé ðáñáêÜôù:

```
# mkdir /var/spool/printer-name
```

Ùóôüóï, áí Ý÷åôå áñêåôïýò åêôõðùôÝò óôï äßêôõï, ßóùò åðéèõìåßôå íá ôïðïèåôÞóåôå ôïõò êáôáëüãïõò ðáñï÷Ýôåõóçò êÜôù áðü Ýíá ìïíáäéêü êáôÜëïãï ðïõ èá ÷ñçóéìïðïéåßôáé áðïêëåéóôéêÜ ãéá åêôõðþóåéò ìå ôï **LPD**. Èá êÜíïõìå áêñéâþò áõôü ãéá ôá ðáñáäåßãìáôá ìáò ìå ôïõò åêôõðùôÝò `rattan` êáé `bamboo`:

```
# mkdir /var/spool/lpd
# mkdir /var/spool/lpd/rattan
# mkdir /var/spool/lpd/bamboo
```

> **Óçìåßùóç:** ÅÜí ïé åñãáóßåò ôùí ÷ñçóôþí ðåñéÝ÷ïõí ðñïóùðéêÜ äåäïìÝíá, ìðïñåß íá èÝëåôå íá ðñïóôáôÝøåôå ôïí êáôÜëïãï ðáñï÷Ýôåõóçò ìå êÜðïéï ôñüðï, þóôå íá ìçí åßíáé äçìüóéá ðñïóâÜóéìïò. Ïé êáôÜëïãïé ðáñï÷Ýôåõóçò èá ðñÝðåé íá áíÞêïõí êáé íá åßíáé áíáãíþóéìïé, åããñÜøéìïé êáé ìå äõíáôüôçôá áíáæÞôçóçò áðü ôïí ÷ñÞóôç daemon êáé áðü ôçí ïìÜäá daemon, áðü êáíÝíáí Üëëï. Ãéá ôïõò åêôõðùôÝò ôïõ ðáñáäåßãìáôïò:
>
> ```
> # chown daemon:daemon /var/spool/lpd/rattan
> # chown daemon:daemon /var/spool/lpd/bamboo
> # chmod 770 /var/spool/lpd/rattan
> # chmod 770 /var/spool/lpd/bamboo
> ```

ÔÝëïò, ðñÝðåé íá åíçìåñþóåôå ôï **LPD** ãéá áõôïýò ôïõò êáôáëüãïõò ÷ñçóéìïðïéþíôáò ôï áñ÷åßï `/etc/printcap`. Ðñïóäéïñßóôå ôçí äéáäñïìÞ ôïõ êáôáëüãïõ ðáñï÷Ýôåõóçò ìå ôçí éêáíüôçôá `sd`:

```
#
#  /etc/printcap for host rose - added spooling directories
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:
```

Óçìåéþóôå ðùò ôï üíïìá ôïõ åêôõðùôÞ îåêéíÜ óôçí ðñþôç óôÞëç, åíþ üëåò ïé Üëëåò êáôá÷ùñßóåéò ôïõ ðåñéãñÜöïõí ôïí åêôõðùôÞ èá ðñÝðåé íá åßíáé óôïé÷éóìÝíåò êáé êÜèå ôÝëïò ãñáììÞò íá öñÜæåé ÷áñáêôÞñá äéáöõãÞò ìå áñéóôåñüóôñïöç êÜèåôï.

ÅÜí äåí ðñïóäéïñßóåôå ôïí êáôÜëïãï ðáñï÷Ýôåõóçò ìÝóù ôïõ `sd`, ôüôå ôï óýóôçìá ðáñï÷Ýôåõóçò èá ÷ñçóéìïðïéÞóåé ôïí ðñïåðéëåãìÝíï `/var/spool/lpd`.

10.3.1.5.4 Áíáãíþñéóç ôçò ÓõóêåõÞò Åêôýðùóçò

Óôçí åíüôçôá Ñõèìßóåéò Hardware áíáãíùñßóáìå ôç èýñá, êáé êáôÜ óõíÝðåéá ôçí êáôá÷þñéóç ôïõ êáôáëüãïõ `/dev` ðïõ èá ÷ñçóéìïðïéÞóåé ôï FreeBSD ãéá íá åðéêïéíùíÞóåé ìå ôïí åêôõðùôÞ. Ôþñá, èá äþóïõìå óôï **LPD** áõôÞ ôçí ðëçñïöïñßá. ¼ôáí ôï óýóôçìá ðáñï÷Ýôåõóçò Ý÷åé ìéá åñãáóßá ãéá åêôõðþóåé, èá áíïßîåé áõôÞ ôçí åéäéêÞ óõóêåõÞ ãéá ëïãáñéáóìü ôïõ ðñïãñÜììáôïò ößëôñïõ (ðïõ åßíáé õðåýèõíï ãéá ôï ðÝñáóìá ôùí äåäïìÝíùí óôïí åêôõðùôÞ).

Ðñïóäéïñßóôå ôçí äéáäñïìÞ ôçò êáôá÷þñéóçò `/dev` óôï áñ÷åßï `/etc/printcap` ÷ñçóéìïðïéþíôáò ôçí éêáíüôçôá `lp`.

Óôï ôñÝ÷ïí ðáñÜäåéãìá ìáò, áò õðïèÝóïõìå üôé ï `rattan` åßíáé óôçí ðñþôç ðáñÜëëçëç èýñá, êáé ï `bamboo` åßíáé óôçí Ýêôç óåéñéáêÞ èýñá. Ïé íÝåò êáôá÷ùñßóåéò óôï `/etc/printcap` èá åßíáé:

```
#
#  /etc/printcap for host rose - identified what devices to use
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:\
        :lp=/dev/ttyu5:
```

Áí äåí êáèïñßóåôå óå êÜðïéï åêôõðùôÞ ôçí éêáíüôçôá `lp` óôï áñ÷åßï `/etc/printcap`, ôï **LPD** ÷ñçóéìïðïéåß áðü ðñïåðéëïãÞ ôï `/dev/lp`. Ôï `/dev/lp` äåí õðÜñ÷åé ôçí äåäïìÝíç óôéãìÞ óôï FreeBSD.

ÅÜí ï åêôõðùôÞò ðïõ åãêáèéóôÜôå åßíáé óõíäåäåìÝíïò óå ðáñÜëëçëç èýñá, äéáâÜóôå áðåõèåßáò ôçí åíüôçôá ìå ôßôëï ÅãêáôÜóôáóç Ößëôñïõ ÊåéìÝíïõ. ÄéáöïñåôéêÜ, áêïëïõèÞóôå ðñïóåêôéêÜ ôéò ïäçãßåò ðïõ áêïëïõèïýí óôçí åðüìåíç åíüôçôá.

10.3.1.5.5 Ñõèìßóåéò ÐáñáìÝôñùí Åðéêïéíùíßáò ôïõ Spooler

Ãéá åêôõðùôÝò óå óåéñéáêÞ èýñá, ôï **LPD** ìðïñåß íá ñõèìßóåé ôçí ôá÷ýôçôá óå bps, ôï parity, êáé Üëëåò ðáñáìÝôñïõò óåéñéáêÞò åðéêïéíùíßáò ãéá ëïãáñéáóìü ôïõ ðñïãñÜììáôïò ößëôñïõ ðïõ óôÝëíåé äåäïìÝíá óôïí åêôõðùôÞ. Áõôü åßíáé ðëåïíÝêôçìá ãéáôß:

- Óáò åðéôñÝðåé íá äïêéìÜóåôå äéÜöïñåò ðáñáìÝôñïõò åðéêïéíùíßáò ðñïóèÝôïíôáò ôéò áðëÜ ìå åðåîåñãáóßá ôïõ áñ÷åßïõ `/etc/printcap`. Äåí ÷ñåéÜæåôáé íá åðáíáìåôáãëùôôßóåôå ôï ðñüãñáììá ößëôñïõ.
- ÅðéôñÝðåé óôï óýóôçìá ðáñï÷Ýôåõóçò íá ÷ñçóéìïðïéåß ôï ßäéï ðñüãñáììá ãéá ðïëëáðëïýò åêôõðùôÝò, ïé ïðïßïé ìðïñåß íá Ý÷ïõí äéáöïñåôéêÝò óåéñéáêÝò ñõèìßóåéò åðéêïéíùíßáò.

Ïé áêüëïõèåò éêáíüôçôåò ôïõ `/etc/printcap` åëÝã÷ïõí ôéò ðáñáìÝôñïõò óåéñéáêÞò åðéêïéíùíßáò ôçò óõóêåõÞò ðïõ áíáöÝñïíôáé óôçí éêáíüôçôá `lp`:

`br#`*`bps-rate`*

Ïñßæåé ôçí ôá÷ýôçôá åðéêïéíùíßáò ôçò óõóêåõÞò óå *`bps-rate`*, üðïõ ôï *`bps-rate`* ìðïñåß íá åßíáé 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, Þ 115200 bits-per-second.

`ms#`*`stty-mode`*

Ïñßæåé ôéò åðéëïãÝò ôçò óõóêåõÞò ôåñìáôéêïý ìåôÜ ôï Üíïéãìá ôçò óõóêåõÞò. Ç stty(1) åîçãåß ôéò äéáèÝóéìåò åðéëïãÝò.

¼ôáí ôï **LPD** áíïßãåé ôçí óõóêåõÞ ðïõ ïñßæåôáé áðü ôçí éêáíüôçôá `lp`, ñõèìßæåé ôá ÷áñáêôçñéóôéêÜ ôçò óõóêåõÞò ìå éêáíüôçôá `ms#`. ¸÷ïõí éäéáßôåñï åíäéáöÝñïí ïé êáôáóôÜóåéò ëåéôïõñãßáò `parenb`, `parodd`, `cs5`, `cs6`, `cs7`, `cs8`, `cstopb`, `crtscts`, êáé `ixon`, ðïõ åîçãïýíôáé óôçí óåëßäá âïçèåßáò stty(1).

Áò ðñïóèÝóïõìå óôï ðáñÜäåéãìá ìáò Ýíáí åêôõðùôÞ óôçí Ýêôç óåéñéáêÞ èýñá. Èá èÝóïõìå ôçí ôá÷ýôçôá bps óå 38400. Ãéá ôçí êáôÜóôáóç ëåéôïõñãßáò èá èÝóïõìå , no parity ìå `-parenb`, ÷áñáêôÞñåò 8-bit ìå `cs8`, no modem control ìå `clocal` êáé Ýëåã÷ï ñïÞò ìÝóù hardware ìå `crtscts`:

```
bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:
```

10.3.1.5.6 ÅãêáôÜóôáóç Ößëôñïõ ÊåéìÝíïõ

Ôþñá åßìáóôå Ýôïéìïé íá ðïýìå óôï **LPD** ðïéï ößëôñï êåéìÝíïõ íá ÷ñçóéìïðïéÞóåé ãéá íá óôåßëåé åñãáóßåò óôïí åêôõðùôÞ. Ôï ößëôñï êåéìÝíïõ, ãíùóôü êáé ùò *ößëôñï åéóüäïõ*, åßíáé Ýíá ðñüãñáììá ðïõ åêôåëåß ôï **LPD** üôáí õðÜñ÷åé åñãáóßá ðñïò åêôýðùóç. ¼ôáí ôï **LPD** åêôåëåß ôï ößëôñï êåéìÝíïõ ãéá êÜðïéïí åêôõðùôÞ, èÝôåé ôçí standard input ôïõ ößëôñïõ óôçí åñãáóßá åêôýðùóçò, êáé ôçí standard output óôçí óõóêåõÞ ôïõ åêôõðùôÞ ðïõ ïñßæåôáé ìå ôçí éêáíüôçôá `lp`. Ôï ößëôñï áíáìÝíåôáé íá áíáãíþóåé ôçí åñãáóßá áðü ôçí standard input, íá åêôåëÝóåé üëåò ôéò áðáñáßôçôåò ìåôáãëùôôßóåéò ãéá ôïí åêôõðùôÞ, êáé íá ãñÜøåé ôï áðïôÝëåóìá óôçí standard output, ôï ïðïßï êáé èá åêôõðùèåß. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôá ößëôñá êåéìÝíïõ, äåßôå ôçí åíüôçôá Ößëôñá.

Ãéá ôçí áðëÞ åãêáôÜóôáóç ôùí åêôõðùôþí ìáò, ôï ößëôñï êåéìÝíïõ ìðïñåß íá åßíáé Ýíá ìéêñü shell script ðïõ áðëÜ èá åêôåëåß ôçí åíôïëÞ `/bin/cat` ãéá íá óôÝëíåé åñãáóßåò óôïí åêôõðùôÞ. Ôï FreeBSD Ýñ÷åôáé ìå Üëëï Ýíá ößëôñï, ôï `lpf` ðïõ ÷åéñßæåôáé äõíáôüôçôåò backspacing êáé õðïãñÜììéóçò ãéá åêôõðùôÝò ðïõ ßóùò íá ìçí ÷åéñßæïíôáé óùóôÜ áõôÝò ôéò ëåéôïõñãßåò. Êáé öõóéêÜ, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ïðïéïäÞðïôå Üëëï ðñüãñáììá ößëôñïõ åðéèõìåßôå. Ôï ößëôñï `lpf` ðåñéãñÜöåôáé ëåðôïìåñþò óôçí åíüôçôá lpf: Ýíá Ößëôñï ÊåéìÝíïõ.

Èá îåêéíÞóïõìå äçìéïõñãþíôáò ôï shell script `/usr/local/libexec/if-simple` óáí Ýíá áðëü ößëôñï êåéìÝíïõ. Ôïðïèåôåßóôå ôï áêüëïõèï êåßìåíï óôï áñ÷åßï ÷ñçóéìïðïéþíôáò ôïí êåéìåíïãñÜöï ðïõ ðñïôéìÜôå:

```
#!/bin/sh
#
# if-simple - Simple text input filter for lpd
# Installed in /usr/local/libexec/if-simple
#
# Simply copies stdin to stdout.  Ignores all filter arguments.

/bin/cat && exit 0
exit 2
```

ÊÜíôå ôï áñ÷åßï åêôåëÝóéìï:

```
# chmod 555 /usr/local/libexec/if-simple
```

Êáé åíçìåñþóôå ôï LPD íá ôï ÷ñçóéìïðïéÞóåé, ïñßæïíôáò ôï ìå ôçí éêáíüôçôá `if` óôï áñ÷åßï `/etc/printcap`. Èá ôï ðñïóèÝóïõìå óôïõò äýï åêôõðùôÝò áðü ôï ðñïçãïýìåíï ðáñÜäåéãìá óôï `/etc/printcap`:

```
#
#  /etc/printcap for host rose - added text filter
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:
```

```
bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:\
        :if=/usr/local/libexec/if-simple:
```

Óçìåßùóç: Ìðïñåßôå íá âñåßôå Ýíá áíôßãñáöï ôïõ script `if-simple` óôïí êáôÜëïãï `/usr/share/examples/printing`.

*10.3.1.5.7 Åíåñãïðïßçóç ôïõ **LPD***

Ôï lpd(8) åêôåëåßôáé áðü ôï `/etc/rc`, êáé åëÝã÷åôáé áðü ôçí ìåôáâëçôÞ `lpd_enable`. Ç ìåôáâëçôÞ áõôÞ Ý÷åé ðñïåðéëåãìÝíç ôéìÞ `NO`. Áí äåí ôï Ý÷åôå êÜíåé Þäç, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ:

```
lpd_enable="YES"
```

óôï áñ÷åßï `/etc/rc.conf`, êáé åðáíåêêéíÞóôå ôï óýóôçìá óáò, Þ áðëÜ åêôåëÝóôå ôï lpd(8).

```
# lpd
```

10.3.1.5.8 ÄïêéìÞ ôïõ Spooler

ÖôÜóáôå óôï ôÝëïò ôçò áðëÞò åãêáôÜóôáóçò ôïõ **LPD**. Èá áöÞóïõìå ãéá áñãüôåñá ôá óõã÷áñçôÞñéá, áöïý áêüìç èá ðñÝðåé íá åëÝãîïõìå ôçí åãêáôÜóôáóç êáé íá äéïñèþóïõìå ïðïéïäÞðïôå ðñüâëçìá Ý÷åé ðñïêýøåé. Ãéá íá åëÝãîåôå ôçí åãêáôÜóôáóç ðñïóðáèÞóôå íá åêôõðþóåôå êÜôé. Ãéá íá åêôõðþóåôå ìå ôï óýóôçìá **LPD**, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ lpr(1), ç ïðïßá áðïóôÝëëåé ìßá åñãáóßá ðñïò åêôýðùóç.

Ìðïñåßôå íá óõíäõÜóåôå ôçí lpr(1) ìå ôï ðñüãñáììá lptest(1), ãéá ôï ïðïßï êÜíáìå ìéá åéóáãùãÞ óôçí åíüôçôá ¸ëåã÷ïò Åðéêïéíùíßáò ôïõ ÅêôõðùôÞ, ãéá ôçí Ýëåã÷ï êåéìÝíïõ.

*Ãéá ôçí Ýëåã÷ï ìéáò áðëÞò åãêáôÜóôáóçò **LPD**:*

ÐëçêôñïëïãÞóôå:

```
# lptest 20 5 | lpr -Pprinter-name
```

¼ðïõ *`printer-name`* åßíáé ôï üíïìá åíüò åêôõðùôÞ (Þ ôï alias) ðïõ áíáöÝñåôáé óôï `/etc/printcap`. Ãéá íá åëÝãîåôå ôïí ðñïåðéëåãìÝíï åêôõðùôÞ, ðëçêôñïëïãÞóôå lpr(1) ÷ùñßò ôï ðñüèåìá `-P`. Áí ï åêôõðùôÞò óáò ÷ñçóéìïðïéåß PostScript, ðñÝðåé íá óôåßëåôå Ýíá ðñüãñáììá PostScript, áíôß íá ÷ñçóéìïðïéÞóåôå ôï lptest(1). Ãéá íá ôï êáôáöÝñåôå, ôïðïèåôÞóôå ôï ðñüãñáììá óå Ýíá áñ÷åßï êáé ðëçêôñïëïãÞóôå `lpr file`.

Óå Ýíáí åêôõðùôÞ PostScript, ç åêôýðùóç èá åßíáé ôï áðïôÝëåóìá ôïõ ðñïãñÜììáôïò ðïõ óôåßëáôå. Áí ÷ñçóéìïðïéåßôå ôï lptest(1), ôüôå ôï áðïôÝëåóìá èá ìïéÜæåé ìå ôï áêüëïõèï:

```
!"#$%&'()*+,-./01234
"#$%&'()*+,-./012345
#$%&'()*+,-./0123456
$%&'()*+,-./01234567
%&'()*+,-./012345678
```

Ãéá ðåñáéôÝñù Ýëåã÷ï ôïõ åêôõðùôÞ, äïêéìÜóôå íá êáôåâÜóåôå ìåãáëýôåñá ðñïãñÜììáôá (ãéá åêôõðùôÝò ðïõ ÷ñçóéìïðïéïýí ãëþóóá ðñïãñáììáôéóìïý) Þ ôñÝîôå ôï lptest(1) ìå äéáöïñåôéêÜ ðñïèÝìáôá. Ãéá ðáñÜäåéãìá, ç åíôïëÞ `lptest 80 60` èá ðáñÜãåé 60 ãñáììÝò ôùí 80 ÷áñáêôÞñùí ç êáèåìßá.

Áí ï åêôõðùôÞò äåí äïõëåýåé, äåßôå ôçí åíüôçôá Åíôïðéóìüò Âëáâþí.

10.4 Ñõèìßóåéò Åêôõðùôþí ãéá Ðñï÷ùñçìÝíïõò

> **Ðñïåéäïðïßçóç:** Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ãéá ôéò óåéñéáêÝò èýñåò ìåôïíïìÜóôçêáí áðü `/dev/ttyd`*N* óå `/dev/ttyu`*N*. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ôåêìçñßùóç ðïõ áêïëïõèåß ìå âÜóç áõôÝò ôéò áëëáãÝò.

ÁõôÞ ç åíüôçôá ðåñéãñÜöåéößëôñá ãéá ôçí åêôýðùóç åéäéêÞò ìïñöÞò áñ÷åßùí, óåëßäùí êåöáëßäáò, ãéá åêôõðþóåéò ìÝóù äéêôýïõ, êáèþò êáé ãéá ôïí Ýëåã÷ï ðñüóâáóçò êáé ôçí êáôáìÝôñçóç ÷ñÞóçò ôùí åêôõðùôþí.

10.4.1 Ößëôñá

Áí êáé ôï **LPD** ìðïñåß íá ÷åéñéóôåß ðñùôüêïëëá äéêôýùí, ëßóôåò áíáìïíÞò, Ýëåã÷ï ðñüóâáóçò, êáé Üëëåò ðáñáìÝôñïõò ôùí åêôõðþóåùí, ôï êýñéï ìÝñïò ôçò *ðñáãìáôéêÞò* åñãáóßáò ãßíåôáé ìå ôá *ößëôñá*. Ôá ößëôñá åßíáé ðñïãñÜììáôá ðïõ åðéêïéíùíïýí ìå ôïí åêôõðùôÞ êáé ÷åéñßæïíôáé ôéò åîáñôÞóåéò ôçò óõóêåõÞò êáé Üëëåò åéäéêÝò áðáéôÞóåéò ôçò. Óôçí áðëÞ åãêáôÜóôáóç åêôõðùôÞ, åãêáôáóôÞóáìå Ýíá ößëôñï áðëïý êåéìÝíïõ éäéáßôåñá áðëÞò ìïñöÞò, ðïõ èá ðñÝðåé íá äïõëåýåé ìå ôïõò ðåñéóóüôåñïõò åêôõðùôÝò (åíüôçôá ÅãêáôÜóôáóç Ößëôñïõ ÊåéìÝíïõ).

Ùóôüóï, ãéá íá ìðïñÝóåôå íá åêìåôáëëåõôåßôå ôéò äõíáôüôçôåò ìåôáôñïðþí ìïñöÞò, åëÝã÷ïõ ðñüóâáóçò êáé êáôáìÝôñçóçò, êáé ôõ÷üí åéäéêÝò äõíáôüôçôåò ôïõ åêôõðùôÞ óáò, èá ðñÝðåé íá êáôáëÜâåôå ðùò äïõëåýïõí ôá ößëôñá. Óå ôåëéêÞ áíÜëõóç, èá åßíáé åõèýíç ôùí ößëôñùí íá ÷åéñßæïíôáé üëåò áõôÝò ôéò ðáñáìÝôñïõò. Ôá êáêÜ íÝá åßíáé ðùò ôéò ðåñéóóüôåñåò öïñÝò èá ðñÝðåé íá ðáñÝ÷åôå *åóåßò ïé ßäéïé* ôá ößëôñá óáò. Ôá êáëÜ íÝá åßíáé ðùò ãåíéêþò õðÜñ÷ïõí áñêåôÜ äéáèÝóéìá, êáé áí äåí õðÜñ÷ïõí, åßíáé ó÷åôéêÜ åýêïëï íá ôá ãñÜøåôå.

Åðßóçò, ôï FreeBSD äéáôßèåôáé ìå Ýíá ößëôñï, ôï `/usr/libexec/lpr/lpf`, ðïõ äïõëåýåé ìå ðïëëïýò åêôõðùôÝò ðïõ ìðïñïýí íá åêôõðþóïõí áðëü êåßìåíï. (×åéñßæåôáé backspacing êáé tabs óôï áñ÷åßï, êáé êÜíåé êáôáìÝôñçóç, áëëÜ ôßðïôá ðåñéóóüôåñï.) ÕðÜñ÷ïõí, åðßóçò, äéÜöïñá Üëëá ößëôñá êáé óõóôáôéêÜ ôïõò óôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD.

Óå áõôÞ ôçí åíüôçôá èá âñåßôå: :

- Ç åíüôçôá Ðùò äïõëåýïõí ôá Ößëôñá, ðñïóðáèåß íá äþóåé ìéá ãåíéêÞ Üðïøç ãéá ôéò áñìïäéüôçôåò ôùí ößëôñùí óôéò äéåñãáóßåò åêôýðùóçò. Èá ðñÝðåé íá äéáâÜóåôå áõôÞ ôçí åíüôçôá ãéá íá ìðïñåßôå íá êáôáëÜâåôå ôé "ðñáãìáôéêÜ" óõìâáßíåé üôáí ôï **LPD** ÷ñçóéìïðïéåß ößëôñá. ÁõôÝò ïé ãíþóåéò èá óáò âïçèÞóïõí íá ðñïëáìâÜíåôå êáé íá áðïóöáëìáôþíåôå ðñïâëÞìáôá ðïõ ìðïñïýí íá óõìâïýí êáèþò åãêáèéóôÜôå üëï êáé ðåñéóóüôåñá ößëôñá óå êÜèå åêôõðùôÞ óáò.
- Ôï **LPD** áíáìÝíåé ðùò êÜèå åêôõðùôÞò åßíáé éêáíüò, áðü ðñïåðéëïãÞ, íá åêôõðþóåé áðëü êåßìåíï. Áõôü üìùò åßíáé ðñüâëçìá ãéá åêôõðùôÝò PostScript (Þ Üëëïõò ðïõ âáóßæïíôáé óå ãëþóóåò ðñïãñáììáôéóìïý) ïé ïðïßïé äåí ìðïñïýí íá åêôõðþóïõí Üìåóá áðëü êåßìåíï. Ç åíüôçôá Óõìâáôüôçôá Åñãáóéþí Áðëïý ÊåéìÝíïõ óå åêôõðùôÝò PostScript óáò

åîçãåß ôé èá ðñÝðåé íá êÜíåôå ãéá íá ìåðåñÜóåôå áõôü ôï ðñüâëçìá. Èá ðñÝðåé íá äéáâÜóåôå áõôÞ ôçí åíüôçôá áí Ý÷åôå åêôõðùôÞ PostScript.

- Ôï PostScript åßíáé äçìïöéëÞò ìïñöÞ åîüäïõ ãéá ðïëëÜ ðñïãñÜììáôá. Ìåñéêïß Üíèñùðïé ðñïôéìïýí êáé íá ãñÜöïõí êáôåõèåßáí óå êþäéêá PostScript. Äõóôõ÷þò, ïé åêôõðùôÝò PostScript Ý÷ïõí ìåãÜëï êüóôïò. Ç åíüôçôá Ðñïóïìïßùóç PostScript ãéá åêôõðùôÝò ðïõ äåí ôï õðïóôçñßæïõí åîçãåß ëåðôïìåñþò ðùò íá ìåôáôñÝøåôå Ýíá ößëôñï êåéìÝíïõ ãéá åêôõðùôÝò þóôå íá äÝ÷ïíôáé êáé íá ôõðþíïõí äåäïìÝíá PostScript óå åêôõðùôÝò ðïõ *äåí åßíáé PostScript*. Èá ðñÝðåé íá äéáâÜóåôå áõôÞí ôçí åíüôçôá áí åßóôå êÜôï÷ïò åêôõðùôÞ ðïõ äåí õðïóôçñßæåé PostScript.
- Ç åíüôçôá Ößëôñá ÌåôáôñïðÞò ðåñéãñÜöåé ìéá áõôïìáôïðïéçìÝíç äéáäéêáóßá ãéá ôçí ìåôáôñïðÞ áñ÷åßùí äéáöïñåôéêÞò ìïñöÞò, üðùò äåäïìÝíá ãñáöéêþí Þ óôïé÷åéïèåóßáò, óå ìéá ìïñöÞ êáôáíïçôÞ áðü ôïí åêôõðùôÞ óáò. ÌåôÜ ôçí áíÜãíùóç áõôÞò ôçò åíüôçôáò, èá ðñÝðåé íá åßóôå óå èÝóç íá ñõèìßóåôå ôïõò åêôõðùôÝò óáò ìå ôÝôïéï ôñüðï þóôå ðëçêôñïëïãþíôáò `lpr -t` ïé ÷ñÞóôåò óáò íá ìðïñïýí íá åêôõðþóïõí äåäïìÝíá troff, Þ ìå `lpr -d` äåäïìÝíá TEX DVI, Þ ìå `lpr -v` íá åêôõðþíïõí åéêüíåò äåäïìÝíùí ñÜóôåñ, êáé ïýôù êáèåîÞò. Óáò óõìâïõëåýïõìå íá äéáâÜóåôå áõôÞ ôçí åíüôçôá.
- Ç åíüôçôá Ößëôñá Åîüäïõ ðåñéãñÜöåé Ýíá ÷áñáêôçñéóôéêü ôïõ **LPD** ðïõ äåí ÷ñçóéìïðïéåßôáé óõ÷íÜ: ôá ößëôñá åîüäïõ. Ìðïñåßôå íá ðñïóðåñÜóåôå áõôÞ ôçí åíüôçôá, åêôüò áí ôõðþíåôå óåëßäåò êåöáëßäáò (äåßôå ôéò Óåëßäåò Êåöáëßäáò).
- Ç åíüôçôá lpf: Ýíá Ößëôñï ÊåéìÝíïõ ðåñéãñÜöåé ôï `lpf`, Ýíá ðñáãìáôéêÜ ðëÞñåò, áí êáé áðëü, ößëôñï êåéìÝíïõ ãéá åêôõðùôÝò ãñáììÞò (êáé åêôõðùôÝò laser ðïõ ìðïñïýí íá ëåéôïõñãÞóïõí êáé ùò åêôõðùôÝò ãñáììÞò) ðïõ ðåñéÝ÷åôáé óôï FreeBSD. Áí ÷ñåéÜæåóôå Ýíá ãñÞãïñï ôñüðï ãéá íá êÜíåôå ôçí êáôáìÝôñçóç óåëßäùí íá äïõëåýåé óå áðëü êåßìåíï, Þ áí Ý÷åôå êÜðïéïí åêôõðùôÞ ðïõ âãÜæåé êáðíïýò üôáí âëÝðåé ÷áñáêôÞñåò backspace, èá ðñÝðåé ïðùóäÞðïôå íá åîåôÜóåôå ôçí ðåñßðôùóç ôïõ `lpf`.

Óçìåßùóç: Ìðïñåßôå íá âñåßôå áíôßãñáöï ôùí äéÜöïñùí scripts ðïõ áíáöÝñïíôáé ðáñáêÜôù, óôïí êáôÜëïãï `/usr/share/examples/printing`.

10.4.1.1 Ðùò Äïõëåýïõí ôá Ößëôñá

¼ðùò áíáöÝñáìå ðñïçãïõìÝíùò, ößëôñï åßíáé Ýíá åêôåëÝóéìï ðñüãñáììá ðïõ åêêéíåßôáé áðü ôï **LPD** ãéá íá ÷åéñßæåôáé ôï ôìÞìá ôçò åðéêïéíùíßáò ìå ôïí åêôõðùôÞ ðïõ åîáñôÜôáé áðü ôïí ôýðï ôçò ßäéáò ôçò óõóêåõÞò.

¼ôáí ôï **LPD** èÝëåé íá åêôõðþóåé Ýíá áñ÷åßï ìéáò åñãáóßáò, îåêéíÜ Ýíá ðñüãñáììá ôïõ ößëôñïõ. ÈÝôåé ùò standard input ôïõ ößëôñïõ ôï áñ÷åßï ðïõ ðñÝðåé íá åêôõðùèåß, ùò standard output ôïí ßäéï ôïí åêôõðùôÞ êáé ùò standard error ôï áñ÷åßï áíáöïñÜò óöáëìÜôùí (áíáöÝñåôáé óôçí éäéüôçôá `lf` ôïõ `/etc/printcap`, Þ áðü ðñïåðéëïãÞ ôï `/dev/console`).

Ôï ößëôñï ðïõ èá îåêéíÞóåé ôï **LPD** êáèþò êáé ïé ðáñÜìåôñïé ôïõ ößëôñïõ, åîáñôþíôáé áðü ôï ôé Ý÷åôå äçëþóåé óôï áñ÷åßï `/etc/printcap` êáé áðü ôï ôé ðáñáìÝôñïõò Ý÷åé êáèïñßóåé ï ÷ñÞóôçò ãéá ôçí åñãáóßá ìå ôçí ãñáììÞ åíôïëÞò lpr(1). Ãéá ðáñÜäåéãìá, áí ï ÷ñÞóôçò ðëçêôñïëïãÞóåé `lpr -t`, ôï **LPD** èá îåêéíÞóåé ôï ößëôñï troff, ðïõ õðïäçëþíåôáé ìå ôçí éäéüôçôá `tf` ãéá ôïí åêôõðùôÞ ðñïïñéóìïý. Áí ï ÷ñÞóôçò åðéèõìåß íá åêôõðþóåé áðëü êåßìåíï, èá îåêéíÞóåé ôï ößëôñï `if` (áõôü ðñÜãìáôé éó÷ýåé ôéò ðåñéóóüôåñåò öïñÝò: äåßôå ôá Ößëôñá Åîüäïõ ãéá ëåðôïìÝñåéåò).

ÕðÜñ÷ïõí ôñåéò ôýðïé ößëôñùí ðïõ ìðïñåßôå íá ðñïóäéïñßóåôå óôï `/etc/printcap`:

- Ôï *ößëôñï êåéìÝíïõ*, åðïíïìáæüìåíï êáé ùò *ößëôñï åéóüäïõ* óôçí ôåêìçñßùóç ôïõ **LPD**, ÷åéñßæåôáé åêôõðþóåéò êáíïíéêïý êåéìÝíïõ. ÈåùñÞóôå ôï ùò ôï ðñïåðéëåãìÝíï ößëôñï. Ôï **LPD** áíáìÝíåé ðùò üëïé ïé åêôõðùôÝò, áðü ðñïåðéëïãÞ, åßíáé óå èÝóç íá åêôõðþóïõí áðëü êåßìåíï, êáé åßíáé äïõëåéÜ ôïõ ößëôñïõ êåéìÝíïõ íá âåâáéùèåß üôé ôá backspaces, ôá tabs, êáé üëïé ïé Üëëïé åéäéêïß ÷áñáêôÞñåò äåí ðñüêåéôáé íá ðñïâëçìáôßóïõí ôïí åêôõðùôÞ. ÅÜí âñßóêåóôå óå Ýíá ðåñéâÜëëïí üðïõ èá ðñÝðåé íá êáôáìåôñÞóåôå ôçí ÷ñÞóç ôùí åêôõðùôþí, ôï ößëôñï êåéìÝíïõ èá ðñÝðåé åðßóçò íá êáôáìåôñÞóåé ôéò åêôõðùìÝíåò óåëßäåò, óõíÞèùò ìåôñþíôáò ôïí áñéèìü ôùí åêôõðùìÝíùí ãñáììþí êáé óõãêñßíïíôáò ôïí ìå ôïí áñéèìü ôùí ãñáììþí ðïõ õðïóôçñßæåé ï åêôõðùôÞò áíÜ óåëßäá. Ôï ößëôñï êåéìÝíïõ îåêéíÜ ìå ôçí áêüëïõèç ëßóôá ðáñáìÝôñùí:

```
filter-name [-c] -wwidth -llength -iindent -n login -h host acct-file
```

üðïõ

`-c`

åìöáíßæåôáé áí ç åñãáóßá Ý÷åé áðïóôáëåß ìå `lpr -l`

`width`

åßíáé ç ôéìÞ áðü ôçí éêáíüôçôá `pw` (ðëÜôïò óåëßäáò - page width) üðùò ðñïóäéïñßæåôáé óôï `/etc/printcap`, ìå ðñïåðéëåãìÝíç ôéìÞ ôï 132

`length`

åßíáé ç ôéìÞ áðü ôçí éêáíüôçôá `pl` (ìÞêïò óåëßäáò - page length), ìå ðñïåðéëåãìÝíç ôéìÞ ôï 66

`indent`

åßíáé ôï ìÝãåèïò ôçò åóï÷Þò (indentation) áðü ôï `lpr -i`, ìå ðñïåðéëåãìÝíç ôéìÞ 0

`login`

åßíáé ôï êáôá÷ùñçìÝíï üíïìá ÷ñÞóôç ðïõ åêôõðþíåé ôï áñ÷åßï

`host`

åßíáé ôï üíïìá ôïõ õðïëïãéóôÞ áðü ôïí ïðïßï óôÜëèçêå ç åñãáóßá

`acct-file`

åßíáé ôï üíïìá ôïõ áñ÷åßïõ êáôáìÝôñçóçò áðü ôçí éêáíüôçôá `af`.

- ¸íá *ößëôñï ìåôáôñïðÞò* ìåôáôñÝðåé Ýíá áñ÷åßï åéäéêÞò ìïñöÞò óå Ýíá ôýðï áñ÷åßïõ êáôÜëëçëï ãéá åêôýðùóç áðü ôïí óõãêåêñéìÝíï åêôõðùôÞ. Ãéá ðáñÜäåéãìá, ôá äåäïìÝíá óôïé÷åéïèåóßáò ditroff äåí ìðïñïýí íá åêôõðùèïýí êáôåõèåßáí, áëëÜ ìðïñåßôå íá åãêáôáóôÞóåôå Ýíá ößëôñï ìåôáôñïðÞò áñ÷åßùí ditroff, þóôå íá ìåôáôñÝøåôå ôá äåäïìÝíá ditroff óå ìéá ìïñöÞ ðïõ ï åêôõðùôÞò íá ìðïñåß íá áöïìïéþóåé êáé íá ôõðþóåé. Èá ìÜèåôå ðåñéóóüôåñá óôçí åíüôçôá Ößëôñá ÌåôáôñïðÞò. Ôá ößëôñá ìåôáôñïðÞò åðßóçò ÷ñåéÜæïíôáé ãéá íá êÜíåôå áñßèìçóç/êáôáìÝôñçóç, áí ÷ñåéÜæåóôå êáôáìÝôñçóç ôùí åêôõðþóåùí óáò. Ôá ößëôñá ìåôáôñïðÞò îåêéíïýí ìå ôéò áêüëïõèåò ðáñáìÝôñïõò:

```
filter-name -xpixel-width -ypixel-height -n login -h host acct-file
```

üðïõ *`pixel-width`* åßíáé ç ôéìÞ áðü ôçí éêáíüôçôá `px` (ðñïåðéëåãìÝíç ôéìÞ 0) êáé *`pixel-height`* åßíáé ç ôéìÞ áðü ôçí éêáíüôçôá `py` (ðñïåðéëåãìÝíç ôéìÞ 0).

- Ôï *ößëôñï åîüäïõ* ÷ñçóéìïðïéåßôáé ìüíï áí äåí õðÜñ÷åé ößëôñï êåéìÝíïõ, Þ áí åßíáé åíåñãïðïéçìÝíåò ïé óåëßäåò êåöáëßäáò. ÄéáâÜóôå ôç ó÷åôéêÞ åíüôçôá Ößëôñá Åîüäïõ, áí êáé áðü ôçí åìðåéñßá ìáò ìðïñïýìå íá óáò ðïýìå üôé ÷ñçóéìïðïéïýíôáé óðÜíéá. ÕðÜñ÷ïõí ìüíï äýï ðáñÜìåôñïé ãéá ôá ößëôñá åîüäïõ:

`filter-name` -w*`width`* -l*`length`*

ïé ïðïßåò åßíáé ðáíïìïéüôõðåò ìå ôéò ðáñáìÝôñïõò `-w` êáé `-l` ôùí ößëôñùí êåéìÝíïõ.

Ôá ößëôñá èá ðñÝðåé åðßóçò íá *ôåñìáôßæïõí* ìå êÜðïéá áðü ôéò áêüëïõèåò êáôáóôÜóåéò åîüäïõ:

exit 0

Áí ôï ößëôñï ôýðùóå åðéôõ÷þò ôï áñ÷åßï.

exit 1

Áí ôï ößëôñï áðÝôõ÷å íá ôõðþóåé ôï áñ÷åßï, áëëÜ èÝëåé ôï **LPD** íá ðñïóðáèÞóåé íá åêôõðþóåé ôï áñ÷åßï îáíÜ. Ôï **LPD** èá îåêéíÞóåé îáíÜ ôï ößëôñï áí ãßíåé Ýîïäïò ìå áõôÞ ôçí êáôÜóôáóç.

exit 2

Áí ôï ößëôñï áðÝôõ÷å íá åêôõðþóåé ôï áñ÷åßï êáé äåí èÝëåé ôï **LPD** íá ðñïóðáèÞóåé îáíÜ. Ôï **LPD** èá áðïññßøåé ôï áñ÷åßï.

Ôï ößëôñï êåéìÝíïõ ðïõ Ýñ÷åôáé ìå ôçí êáíïíéêÞ Ýêäïóç ôïõ FreeBSD, `/usr/libexec/lpr/lpf`, åêìåôáëëåýåôáé ôéò ðáñáìÝôñïõò ðëÜôïõò êáé ìÞêïõò óåëßäáò ãéá íá ðñïóäéïñßóåé ðüôå íá áðïóôåßëåé ôï form feed êáé ðùò íá êÜíåé êáôáìÝôñçóç. ×ñçóéìïðïéåß ôéò ðáñáìÝôñïõò ãéá login, host, êáé áñ÷åßïõ êáôáìÝôñçóçò ãéá íá äçìéïõñãÞóåé ôéò ó÷åôéêÝò åããñáöÝò êáôáìÝôñçóçò.

Áí åßóôå óôç äéáäéêáóßá åðéëïãÞò ößëôñùí, åëÝãîôå áí åßíáé óõìâáôÜ ìå ôï **LPD**. Áí åßíáé óõìâáôÜ, ôüôå ðñÝðåé íá õðïóôçñßæïõí ôçí ëßóôá ðáñáìÝôñùí ðïõ ðåñéãñÜøáìå ðñïçãïõìÝíùò. Áí ó÷åäéÜæåôå íá ãñÜøåôå ôá äéêÜ óáò ößëôñá ãåíéêÞò ÷ñÞóçò, ôüôå ðñÝðåé íá ôá êÜíåôå íá õðïóôçñßæïõí ôçí ßäéá ëßóôá ðáñáìÝôñùí êáé êùäéêþí åîüäïõ.

10.4.1.2 Óõìâáôüôçôá Åñãáóéþí Áðëïý ÊåéìÝíïõ óå ÅêôõðùôÝò PostScript®

Áí åßóôå ï ìïíáäéêüò ÷ñÞóôçò ôïõ Ç/Õ óáò êáé ôïõ åêôõðùôÞ PostScript (Þ Üëëçò ãëþóóáò åêôõðùôþí), êáé åßóôå óßãïõñïé ðùò äåí ðñüêåéôáé íá óôåßëåôå ðïôÝ åêôõðþóåéò áðëïý êåéìÝíïõ óôïí åêôõðùôÞ óáò êáé ðùò äåí èá ÷ñçóéìïðïéÞóåôå ôéò õðçñåóßåò ôùí äéáöüñùí ðñïãñáììÜôùí óáò ðïõ èá èåëÞóïõí íá óôåßëïõí áðëü êåßìåíï óôïí åêôõðùôÞ óáò, ôüôå äåí ÷ñåéÜæåôáé íá áó÷ïëçèåßôå êáèüëïõ ìå áõôÞ ôçí åíüôçôá.

ÁëëÜ, áí èÝëåôå íá óôÝëíåôå ôüóï åñãáóßåò PostScript üóï êáé áðëïý êåéìÝíïõ óôïí åêôõðùôÞ óáò, ôüôå óáò ðñïôñÝðïõìå íá ðñïóèÝóåôå êÜðïéåò ñõèìßóåéò óôçí åãêáôÜóôáóç óáò. Ãéá íá ãßíåé áõôü, èá ðñÝðåé ôï ößëôñï êåéìÝíïõ íá áíé÷íåýåé áí ç ôñÝ÷ïõóá åñãáóßá åßíáé áðëü êåßìåíï Þ PostScript. ¼ëåò ïé åñãáóßåò PostScript ðñÝðåé íá îåêéíïýí ìå `%!` (áí ï åêôõðùôÞò óáò ÷ñçóéìïðïéåß Üëëç ãëþóóá, óõìâïõëåõèåßôå ôçí ôåêìçñßùóç ôïõ). Áí åßíáé áõôïß ïé ðñþôïé äýï ÷áñáêôÞñåò, ôüôå Ý÷ïõìå PostScript, êáé ç õðüëïéðç åñãáóßá ìðïñåß íá óôáëåß áðåõèåßáò óôïí åêôõðùôÞ. Áí äåí åßíáé áõôïß ïé ðñþôïé äýï ÷áñáêôÞñåò, ôüôå ôï ößëôñï èá ìåôáôñÝøåé ôï êåßìåíï óå PostScript êáé èá ôõðþóåé ôï áðïôÝëåóìá.

Ðùò ãßíåôáé áõôü;

Áí åßóôå êÜôï÷ïò óåéñéáêïý åêôõðùôÞ, Ýíáò êáëüò ôñüðïò ãéá íá ãßíåé áõôü åýêïëá åßíáé íá åãêáôáóôÞóåôå ôï `lprps`. Ôï `lprps` åßíáé Ýíá ößëôñï åêôýðùóçò PostScript ðïõ åðéêïéíùíåß áìößäñïìá ìå ôïí åêôõðùôÞ. Åíçìåñþíåé ôï áñ÷åßï êáôÜóôáóçò ôïõ åêôõðùôÞ ìå áíáëõôéêÝò ðëçñïöïñßåò, þóôå ïé ÷ñÞóôåò êáé ïé äéá÷åéñéóôÝò íá ìðïñïýí íá äïõí åðáêñéâþò ðïéá åßíáé ç êáôÜóôáóç ôïõ åêôõðùôÞ (üðùò `÷áìçëÞ óôÜèìç toner` Þ ðñüâëçìá `÷áñôéïý`).

Áêüìç ðéï óçìáíôéêü åßíáé ðùò ðåñéÝ÷åé ôï ðñüãñáììá `psif` ðïõ áíé÷íåýåé áí ç åéóåñ÷üìåíç åñãáóßá åßíáé áðëïý êåéìÝíïõ êáé êáëåß ôï `textps` (Ýíá Üëëï ðñüãñáììá ðïõ ðåñéÝ÷åôáé óôï `lprps`) íá ôï ìåôáôñÝøåé óå PostScript. ÔÝëïò ÷ñçóéìïðïéåßôáé ôï `lprps` ãéá íá áðïóôåßëåé ôçí åñãáóßá óôïí åêôõðùôÞ.

Ôï `lprps` åßíáé ìÝñïò ôçò ÓõëëïãÞò ôùí Ports ôïõ FreeBSD (äåßôå Ç ÓõëëïãÞ ôùí Ports). Öõóéêü, ìðïñåßôå íá ôï êáôåâÜóåôå, íá ôï ìåôáãëùôôßóåôå êáé íá ôï åãêáôáóôÞóåôå ìüíïé óáò. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ `lprps`, áðëÜ ðñïóäéïñßóôå ôç äéáäñïìÞ ðñïò ôï ðñüãñáììá `psif` ðïõ åßíáé ìÝñïò ôïõ `lprps`. Áí åãêáôáóôÞóáôå ôï `lprps` áðü ôçí ÓõëëïãÞ ôùí Ports, ôüôå ãéá ôïí óåéñéáêü óáò åêôõðùôÞ PostScript ÷ñçóéìïðïéÞóôå ôçí áêüëïõèç êáôá÷þñéóç óôï áñ÷åßï `/etc/printcap`:

```
:if=/usr/local/libexec/psif:
```

Èá ðñÝðåé åðßóçò íá êáèïñßóåôå ôçí éêáíüôçôá `rw` ç ïðïßá ïñßæåé üôé ôï **LPD** èá ÷åéñßæåôáé ôïí åêôõðùôÞ óå êáôÜóôáóç áíÜãíùóçò êáé åããñáöÞò.

Áí Ý÷åôå ðáñÜëëçëï åêôõðùôÞ PostScript (êáé ãéá ôï ëüãï áõôü äåí ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áìößäñïìç åðéêïéíùíßá ìå ôïí åêôõðùôÞ, üðùò áðáéôåßôáé áðü ôï `lprps`), ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï áêüëïõèï shell script ùòößëôñï êåéìÝíïõ:

```
#!/bin/sh
#
#  psif - Print PostScript or plain text on a PostScript printer
#  Script version; NOT the version that comes with lprps
#  Installed in /usr/local/libexec/psif
#

IFS="" read -r first_line
first_two_chars=‘expr "$first_line" : ’\(..\)’‘

if [ "$first_two_chars" = "%!" ]; then
    #
    #  PostScript job, print it.
    #
    echo "$first_line" && cat && printf "\004" && exit 0
    exit 2
else
    #
    #  Plain text, convert it, then print it.
    #
    ( echo "$first_line"; cat ) | /usr/local/bin/textps && printf "\004" && exit 0
    exit 2
fi
```

Óôï ðáñáðÜíù script, ôï `textps` åßíáé Ýíá ðñüãñáììá ðïõ åãêáôáóôÞóáìå îå÷ùñéóôÜ ãéá íá ìåôáôñÝðïõìå áðëü êåßìåíï óå PostScript. Ìðïñåßôå íá ÷ñçóéìïðïéåßôå ïðïéïäÞðïôå ðñüãñáììá ìåôáôñïðÞò áðü êåßìåíï- óå-PostScript. Ç ÓõëëïãÞ ôùí Ports (äåßôå Ç ÓõëëïãÞ ôùí Ports) ðåñéÝ÷åé åðßóçò Ýíá ðëÞñåò ðñüãñáììá ìåôáôñïðÞò áðü êåßìåíï óå PostScript, ôï `a2ps` ðïõ ßóùò åðéèõìåßôå íá äéåñåõíÞóåôå.

10.4.1.3 Ðñïóïìïßùóç PostScript ãéá ÅêôõðùôÝò ðïõ äåí ôï Õðïóôçñßæïõí

Ôï PostScript åßíáé ôï *de facto* ðñüôõðï ãéá óôïé÷åéïèåóßá êáé åêôýðùóç õøçëÞò ðïéüôçôáò. Ùóôüóï, ôï PostScript åßíáé êÜðùò *äáðáíçñü* ðñüôõðï. Åõôõ÷þò, ç Aladdin Enterprises ðáñÝ÷åé Ýíá ðáñåìöåñÝò åëåýèåñï PostScript ðïõ ïíïìÜæåôáé **Ghostscript** êáé äéáíÝìåôáé Üøïãá óôï FreeBSD. Ôï Ghostscript äéáâÜæåé ôá ðåñéóóüôåñá áñ÷åßá PostScript êáé ìðïñåß íá áðïäþóåé ôéò óåëßäåò ôïõò óå ìåãÜëç ãêÜìá óõóêåõþí, óõìðåñéëáìâÜíïíôáò ðïëëïýò ôýðïõò åêôõðùôþí ðïõ äåí õðïóôçñßæïõí PostScript. Åãêáèéóôþíôáò ôï **Ghostscript** êáé ÷ñçóéìïðïéþíôáò Ýíá åéäéêü ößëôñï êåéìÝíïõ ãéá ôïí åêôõðùôÞ óáò, ìðïñåßôå íá êÜíåôå ôïí êïéíü åêôõðùôÞ óáò íá ëåéôïõñãåß óáí Ýíáò ðñáãìáôéêüò åêôõðùôÞò PostScript.

Ôï **Ghostscript** âñßóêåôáé óôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD, êáé ìÜëéóôá óå ðïëëÝò åêäüóåéò. Ç ðéï äéáäåäïìÝíç åßíáé ôï `print/ghostscript-gpl`.

Ãéá íá êÜíåôå ðñïóïìïßùóç PostScript, ðñÝðåé ôï ößëôñï êåéìÝíïõ íá áíé÷íåýóåé áí åêôõðþíåôå áñ÷åßï PostScript. ÅÜí ü÷é, ôüôå ôï ößëôñï èá ðåñÜóåé ôï áñ÷åßï êáôåõèåßáí óôïí åêôõðùôÞ. Äéáöïñåôéêá, èá ÷ñçóéìïðïéÞóåé ôï **Ghostscript** ãéá íá ìåôáôñÝøåé áñ÷éêÜ ôï áñ÷åßï óå Ýíá ôýðï ðïõ èá êáôáëáâáßíåé ï åêôõðùôÞò.

Éäïý Ýíá ðáñÜäåéãìá: ôï áêüëïõèï script åßíáé Ýíá ößëôñï êåéìÝíïõ ãéá åêôõðùôÝò Hewlett Packard DeskJet 500. Ãéá Üëëïõò åêôõðùôÝò, áíôéêáôáóôÞóôå ôï üñéóìá `-sDEVICE` óôçí åíôïëÞ `gs` (**Ghostscript**). (ÐëçêôñïëïãÞóôå `gs -h` ãéá íá äåßôå ôçí ëßóôá óõóêåõþí ðïõ õðïóôçñßæåé ç ôñÝ÷ïõóá åãêáôÜóôáóç ôïõ **Ghostscript.**)

```
#!/bin/sh
#
#  ifhp - Print Ghostscript-simulated PostScript on a DeskJet 500
#  Installed in /usr/local/libexec/ifhp

#
#  Treat LF as CR+LF (to avoid the "staircase effect" on HP/PCL
#  printers):
#
printf "\033&k2G" || exit 2

#
#  Read first two characters of the file
#
IFS="" read -r first_line
first_two_chars=‘expr "$first_line" : ’\(..\)’‘

if [ "$first_two_chars" = "%!" ]; then
    #
    #  It is PostScript; use Ghostscript to scan-convert and print it.
    #
    /usr/local/bin/gs -dSAFER -dNOPAUSE -q -sDEVICE=djet500 \
      -sOutputFile=- - && exit 0
else
    #
    #  Plain text or HP/PCL, so just print it directly; print a form feed
    #  at the end to eject the last page.
    #
    echo "$first_line" && cat && printf "\033&l0H" &&
exit 0
fi

exit 2
```

ÔÝëïò, ÷ñåéÜæåôáé íá åíçìåñþóåôå ôï **LPD** ãéá ôï ößëôñï ìå ôçí éêáíüôçôá `if`:

```
:if=/usr/local/libexec/ifhp:
```

Áõôü åßíáé üëï. Ìðïñåßôå íá ðëçêôñïëïãÞóåôå `lpr` *plain.text* êáé `lpr` *whatever.ps* êáé ôá äýï èá åêôõðùèïýí åðéôõ÷þò.

10.4.1.4 Ößëôñá ÌåôáôñïðÞò

Ôï åðüìåíï âÞìá ìåôÜ ôçí ïëïêëÞñùóç ôçò áðëÞò åãêáôÜóôáóçò ðïõ ðåñéãñÜøáìå óôéò ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí, åßíáé ç åãêáôÜóôáóç ößëôñùí ìåôáôñïðÞò ãéá ôïõò ôýðïõò áñ÷åßùí ðïõ ðñïôéìÜôå (åêôüò áðü áðëü êåßìåíï ASCII).

10.4.1.4.1 Ãéáôß íá åãêáôáóôÞóåôå Ößëôñá ÌåôáôñïðÞò;

Ôá ößëôñá ìåôáôñïðÞò êÜíïõí ôçí åêôýðùóç äéáöüñùí ôýðùí áñ÷åßùí åýêïëç õðüèåóç. Ãéá ðáñÜäåéãìá, áò õðïèÝóïõìå üôé Ý÷ïõìå íá êÜíïõìå áñêåôÞ åñãáóßá ìå ôï óýóôçìá óôïé÷åéïèåóßáò TeX, êáé üôé Ý÷ïõìå åêôõðùôÞ PostScript. ÊÜèå öïñÜ ðïõ äçìéïõñãïýìå Ýíá áñ÷åßï DVI ìå ôï TeX, äåí ìðïñïýìå íá åêôõðþóïõìå êáôåõèåßáí Ýùò üôïõ íá ìåôáôñÝøïõìå ôï áñ÷åßï DVI óå PostScript. Ç áêïëïõèßá åíôïëþí ðïõ ðñÝðåé íá áêïëïõèÞóïõìå åßíáé:

```
% dvips seaweed-analysis.dvi
% lpr seaweed-analysis.ps
```

Ìå ôçí ÷ñÞóç åíüò ößëôñïõ ìåôáôñïðÞò ãéá áñ÷åßá DVI, ìðïñïýìå íá áðïöýãïõìå ôçí ìåôáôñïðÞ ðïõ ðñÝðåé íá êÜíïõìå êÜèå öïñÜ ÷åéñïêßíçôá, êáëþíôáò ôï **LPD** íá êÜíåé ôç äïõëåéÜ ãéá ìáò. Ôþñá, êÜèå öïñÜ ðïõ Ý÷ïõìå Ýíá áñ÷åßï DVI, ãéá íá ôï ôõðþóïõìå ÷ñåéÜæåôáé ìüíï Ýíá âÞìá:

```
% lpr -d seaweed-analysis.dvi
```

¸÷ïõìå áíáèÝóåé óôï **LPD** íá êÜíåé ôç ìåôáôñïðÞ ôïõ áñ÷åßïõ DVI ðñïóèÝôïíôáò ôïõ ôçí åðéëïãÞ `-d`. Ç åíüôçôá ÅðéëïãÝò Ìïñöïðïßçóçò êáé ÌåôáôñïðÞò ðåñéÝ÷åé ôïõò ðßíáêåò åðéëïãÞò ìåôáôñïðþí.

Ãéá êÜèå åðéëïãÞ ìåôáôñïðÞò ðïõ èÝëåôå íá õðïóôçñßæåôå áðü Ýíá åêôõðùôÞ, ðñÝðåé íá åãêáôáóôÞóåôå Ýíá *ößëôñï ìåôáôñïðÞò* êáé íá ïñßóåôå ôçí äéáäñïìÞ ôïõ óôï áñ÷åßï `/etc/printcap`. ¸íá ößëôñï ìåôáôñïðÞò åßíáé óáí ôï ößëôñï êåéìÝíïõ óôçí áðëÞ åãêáôÜóôáóç åêôõðùôÞ (äåßôå ôçí åíüôçôá ÅãêáôÜóôáóç Ößëôñïõ ÊåéìÝíïõ) ìå ìüíç äéáöïñÜ ðùò áíôß ôï ößëôñï íá åêôõðþíåé áðëü êåßìåíï, ìåôáôñÝðåé ôï áñ÷åßï óå ìéá äéáöïñåôéêÞ ìïñöÞ þóôå íá åßíáé êáôáíïçôü áðü ôïí åêôõðùôÞ.

10.4.1.4.2 Ðïéï Ößëôñï ÌåôáôñïðÞò èá ÐñÝðåé íá ÅãêáôáóôÞóù;

Èá ðñÝðåé íá åãêáèéóôÜôå ôá ößëôñá ìåôáôñïðÞò ðïõ íïìßæåôå ðùò èá ÷ñçóéìïðïéÞóåôå. Áí åêôõðþíåôå áñêåôÜ äåäïìÝíá DVI, ôüôå åßíáé ëïãéêü íá óõìðåñéëÜâåôå Ýíá ößëôñï ìåôáôñïðÞò DVI. Áí åêôõðþíåôå óõ÷íÜ äåäïìÝíá troff, èá èÝëåôå íá åãêáôáóôÞóåôå Ýíá ößëôñï troff.

Ï áêüëïõèïò ðßíáêáò óõíïøßæåé ôá ößëôñá ìå ôá ïðïßá óõíåñãÜæåôáé ôï **LPD**, ôéò êáôá÷ùñßóåéò ôçò áíôßóôïé÷çò éêáíüôçôáò óôï áñ÷åßï `/etc/printcap`, êáé ðùò íá ôéò êáëÝóåôå ìÝóù ôçò åíôïëÞò `lpr`:

Ôýðïò áñ÷åßïõ	Éêáíüôçôá `/etc/printcap`	ÐáñÜìåôñïò åíôïëÞò `lpr`
cifplot	`cf`	`-c`
DVI	`df`	`-d`
plot	`gf`	`-g`
ditroff	`nf`	`-n`
FORTRAN text	`rf`	`-f`

Ôýðïò áñ÷åßïõ	**Éêáíüôçôá `/etc/printcap`**	**ÐáñÜìåôñïò åíôïëÞò `lpr`**
troff	`tf`	`-f`
raster	`vf`	`-v`
plain text	`if`	none, `-p`, or `-l`

Óôï ðáñÜäåéãìá ìáò, áí ÷ñçóéìïðïéÞóïõìå `lpr -d` óçìáßíåé üôé ï åêôõðùôÞò ÷ñåéÜæåôáé ôçí éêáíüôçôá `df` óôçí êáôá÷þñéóç ôïõ óôï `/etc/printcap`.

Áí êáé êÜðïéïé ìðïñåß íá éó÷õñéóôïýí ôï áíôßèåôï, ìåñéêïß ôýðïé áñ÷åßùí üðùò åßíáé ôá êåßìåíá êáé ãñáöéêÜ FORTRAN åßíáé îåðåñáóìÝíá. Ìðïñåßôå íá äþóåôå íÝá ðíïÞ óå áñ÷åßá áõôïý ôïõ ôýðïõ (Þ êáé ïðïéáóäÞðïôå Üëëçò ìïñöÞò åîüäïõ), åãêáèéóôþíôáò ðñïóáñìïóìÝíá ößëôñá. Ãéá ðáñÜäåéãìá, áò õðïèÝóïõìå üôé èá èÝëáôå íá åêôõðþóåôå êáôåõèåßáí áñ÷åßá Printerleaf (áñ÷åßá ðñïåñ÷üìåíá áðü ôï ðñüãñáììá åðéôñáðÝæéáò ôõðïãñáößáò Interleaf), áëëÜ äåí èá åêôõðþóåôå ðïôÝ äéáãñÜììáôá (plots). Èá ìðïñïýóáôå íá åãêáôáóôÞóåôå Ýíá ößëôñï ìåôáôñïðÞò áñ÷åßùí Printerleaf õðü ôçí éêáíüôçôá `gf` êáé íá åêðáéäåýóåôå ôïõò ÷ñÞóôåò óáò üôé ç åíôïëÞ `lpr -g` óçìáßíåé “ôýðùóå áñ÷åßá Printerleaf.”

10.4.1.4.3 ÅãêáôÜóôáóç Ößëôñùí Ìåôáôñïðþí

Áðü ôç óôéãìÞ ðïõ ôá ößëôñá ìåôáôñïðÞò åßíáé ðñïãñÜììáôá ðïõ äåí áíÞêïõí óôï âáóéêü óýóôçìá åãêáôÜóôáóçò ôïõ FreeBSD, åßíáé ðéï óùóôü íá åãêáôáóôáèïýí óôïí êáôÜëïãï `/usr/local`. ¿áò óõíÞèçò ðñïïñéóìüò ôùí ðñïãñáììÜôùí áõôþí åßíáé ï êáôÜëïãïò `/usr/local/libexec`, ìéá ðïõ ðñüêåéôáé ãéá åîåéäéêåõìÝíá ðñïãñÜììáôá ðïõ åêôåëïýíôáé ìüíï áðü ôï **LPD**. Ïé áðëïß ÷ñÞóôåò äåí èá ÷ñåéáóôåß ðïôÝ íá ôá åêôåëÝóïõí.

Ãéá íá åíåñãïðïéÞóåôå Ýíá ößëôñï ìåôáôñïðÞò, ðñïóèÝóôå ôç äéáäñïìÞ ôïõ óôï áñ÷åßï `/etc/printcap`, áëëÜæïíôáò ôçí êáôÜëëçëç éêáíüôçôá óôçí åêôõðùôÞ ðïõ åðéèõìåßôå íá ôï ÷ñçóéìïðïéÞóåôå.

Óôï ðáñÜäåéãìá ìáò, èá ðñïóèÝóïõìå ôï ößëôñï ìåôáôñïðÞò DVI óôçí êáôá÷þñéóç ìáò ãéá ôïí åêôõðùôÞ ìå ôï üíïìá `bamboo`. Áêïëïõèåß, ëïéðüí, ôï ðáñÜäåéãìá ãéá ôï áñ÷åßï `/etc/printcap`, ìå ôçí íÝá éêáíüôçôá `df` ãéá ôïí åêôõðùôÞ `bamboo`:

```
#
#  /etc/printcap for host rose - added df filter for bamboo
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:rw:\
        :if=/usr/local/libexec/psif:\
        :df=/usr/local/libexec/psdf:
```

Ôï ößëôñï DVI åßíáé Ýíá shell script ðïõ ïíïìÜæåôáé `/usr/local/libexec/psdf`, ôï ïðïßï êáé ðáñáèÝôïõìå ðáñáêÜôù:

```
#!/bin/sh
#
#  psdf - DVI to PostScript printer filter
#  Installed in /usr/local/libexec/psdf
```

```
#
# Invoked by lpd when user runs lpr -d
#
exec /usr/local/bin/dvips -f | /usr/local/libexec/lprps "$@"
```

Áõôü ôï script ôñÝ÷åé ôï `dvips` óå êáôÜóôáóç ößëôñïõ (ìå ôçí ðáñÜìåôñï `-f`) óôçí standard input, áðü üðïõ êáé ëáìâÜíåé ôçí åñãáóßá ðñïò åêôýðùóç. Áõôü îåêéíÜ ôï ößëôñï åêôýðùóçò PostScript `lprps` (äåßôå ôçí åíüôçôá Óõìâáôüôçôá Åñãáóéþí Áðëïý ÊåéìÝíïõ óå åêôõðùôÝò PostScript) äßíïíôáò ôïõ êáé ôéò ðáñáìÝôñïõò ðïõ ðÝñáóå ôï **LPD** óôï ðáñáðÜíù script. Ôï `lprps` èá ÷ñçóéìïðïéÞóåé áõôÝò ôéò ðáñáìÝôñïõò ãéá ôçí êáôáìÝôñçóç ôùí åêôõðùìÝíùí óåëßäùí.

10.4.1.4.4 Áêüìá ìåñéêÜ Ðáñáäåßãìáôá Ößëôñùí ÌåôáôñïðÞò

Áðü ôç óôéãìÞ ðïõ äåí õðÜñ÷åé áõôïìáôïðïéçìÝíç ìÝèïäïò ãéá ôçí åãêáôÜóôáóç ôùí ößëôñùí ìåôáôñïðÞò, áò ìáò åðéôñáðåß íá ðáñÝ÷ïõìå ìåñéêÜ áêüìç ðáñáäåßãìáôá. Ìðïñåßôå íá ôá ÷ñçóéìïðïéÞóåôå óáí ïäçãü ãéá ôçí äçìéïõñãßá ôùí äéêþí óáò ößëôñùí. Áí íïìßæåôå ðùò åßíáé êáôÜëëçëá ãéá ôçí ðåñßðôùóç óáò ìðïñåßôå íá ôá ÷ñçóéìïðïéÞóåôå êáé êáôåõèåßáí.

Áõôü ôï ðáñÜäåéãìá script åßíáé Ýíá ößëôñï ìåôáôñïðÞò ñÜóôåñ (áñ÷åßïõ GIF ãéá ôçí áêñßâåéá) ãéá Ýíáí åêôõðùôÞ Hewlett Packard LaserJet III-Si:

```
#!/bin/sh
#
#  hpvf - Convert GIF files into HP/PCL, then print
#  Installed in /usr/local/libexec/hpvf

PATH=/usr/X11R6/bin:$PATH; export PATH
giftopnm | ppmtopgm | pgmtopbm | pbmtolj -resolution 300 \
    && exit 0 \
    || exit 2
```

Äïõëåýåé ùò åîÞò: ìåôáôñÝðåé ôï áñ÷åßï GIF óå Ýíá ãåíéêü öïñçôü ôýðï anymap, åí óõíå÷åßá ôï ìåôáôñÝðåé óå Ýíá öïñçôü ôýðï graymap, Ýðåéôá óå Ýíá öïñçôü ôýðï bitmap, êáé ôÝëïò ôï ìåôáôñÝðåé óå äåäïìÝíá óõìâáôÜ ìå PCL ãéá ôïí LaserJet.

Åäþ åßíáé ôï áñ÷åßï `/etc/printcap` ìå ìéá êáôá÷þñéóç ãéá Ýíáí åêôõðùôÞ ðïõ ÷ñçóéìïðïéåß ôï ðáñáðÜíù ößëôñï:

```
#
#  /etc/printcap for host orchid
#
teak|hp|laserjet|Hewlett Packard LaserJet 3Si:\
        :lp=/dev/lpt0:sh:sd=/var/spool/lpd/teak:mx#0:\
        :if=/usr/local/libexec/hpif:\
        :vf=/usr/local/libexec/hpvf:
```

Ôï áêüëïõèï script åßíáé Ýíá ößëôñï ìåôáôñïðÞò äåäïìÝíùí troff áðü ôï óýóôçìá óôïé÷åéïèåóßáò groff ãéá ôïí åêôõðùôÞ PostScript ìå üíïìá bamboo:

```
#!/bin/sh
#
#  pstf - Convert groff’s troff data into PS, then print.
#  Installed in /usr/local/libexec/pstf
```

```
#
exec grops | /usr/local/libexec/lprps "$@"
```

Ôï ðáñáðÜíù script ÷ñçóéìïðïéåß ðÜëé ôï `lprps` ãéá íá ÷åéñéóôåß ôçí åðéêïéíùíßá ìå ôïí åêôõðùôÞ. Áí ï åêôõðùôÞò Þôáí óå ðáñÜëëçëç ðüñôá ôüôå èá åß÷áìå, áíôéèÝôùò, ÷ñçóéìïðïéÞóåé ôï áêüëïõèï script:

```
#!/bin/sh
#
#  pstf - Convert groff’s troff data into PS, then print.
#  Installed in /usr/local/libexec/pstf
#
exec grops
```

Åäþ åßíáé ç êáôá÷þñéóç ðïõ ÷ñåéÜæåôáé íá ðñïóèÝóïõìå óôï `/etc/printcap` ãéá íá åíåñãïðïéÞóïõìå ôï ößëôñï:

```
:tf=/usr/local/libexec/pstf:
```

Åäþ åßíáé Ýíá ðáñÜäåéãìá ðïõ ìáò åðéôñÝðåé íá åêôõðþóïõìå ðáëáéü êþäéêá ôçò FORTRAN. Åßíáé Ýíá ößëôñï êåéìÝíïõ ãéá FORTRAN ãéá ïðïéïíäÞðïôå åêôõðùôÞ ìðïñåß íá åêôõðþóåé êáôåõèåßáí áðëü êåßìåíï. Èá ôï åãêáôáóôÞóïõìå ãéá Ýíáí åêôõðùôÞ ðïõ ïíïìÜæåôáé `teak`:

```
#!/bin/sh
#
# hprf - FORTRAN text filter for LaserJet 3si:
# Installed in /usr/local/libexec/hprf
#

printf "\033&k2G" && fpr && printf "\033&l0H" &&
 exit 0
exit 2
```

Êáé èá ðñïóèÝóïõìå áõôÞ ôç ãñáììÞ óôï `/etc/printcap` ãéá íá åíåñãïðïéÞóïõìå ôï ößëôñï ãéá ôïí åêôõðùôÞ `teak`:

```
:rf=/usr/local/libexec/hprf:
```

Êáé Ýíá ôåëåõôáßï êÜðùò ðåñßðëïêï ðáñÜäåéãìá: Èá ðñïóèÝóïõìå Ýíá ößëôñï DVI óôïí åêôõðùôÞ LaserJet `teak` ðïõ áíáöÝñáìå ðñïçãïýìåíá. Êáôáñ÷Þí ôï åýêïëï ìÝñïò: áíáâáèìßæïõìå ôï `/etc/printcap` ìå ôçí ôïðïèåóßá üðïõ âñßóêåôáé ôï ößëôñï DVI:

```
:df=/usr/local/libexec/hpdf:
```

Ôþñá, ôï äýóêïëï ìÝñïò: ç êáôáóêåõÞ ôïõ ößëôñïõ. Èá ÷ñåéáóôïýìå Ýíá ðñüãñáììá ìåôáôñïðÞò áðü DVI-óå-LaserJet/PCL. Óôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD (äåßôå ÓõëëïãÞ ôùí Ports) õðÜñ÷åé Ýíá ôÝôïéï ðñüãñáììá: Ôï üíïìá ôïõ ðáêÝôïõ åßíáé `dvi2xx`. Ç åãêáôÜóôáóç ôïõ ðáêÝôïõ, ìáò ðáñÝ÷åé áêñéâþò ôï ðñüãñáììá ðïõ ÷ñåéáæüìáóôå, ôï `dvilj2p`, ôï ïðïßï ìåôáôñÝðåé ôïí êþäéêá DVI óå êþäéêá óõìâáôü ìå LaserJet IIp, LaserJet III, êáé LaserJet 2000.

Ôï `dvilj2p` êÜíåé ôï ößëôñï `hpdf` áñêåôÜ ðåñßðëïêï áðü ôç óôéãìÞ ðïõ ôï `dvilj2p` äå ìðïñåß íá äéáâÜóåé áðü ôï standard input. ×ñåéÜæåôáé íá äïõëÝøåé ìå êÜðïéï üíïìá áñ÷åßïõ. Áêüìç ÷åéñüôåñá, ôï üíïìá ôïõ áñ÷åßïõ ðñÝðåé íá ôåëåéþíåé óå `.dvi` êé åðïìÝíùò ç ÷ñÞóç ôïõ `/dev/fd/0` ùò standard input åßíáé ðñïâëçìáôéêÞ. Èá ìðïñïýóáìå íá áíôéìåôùðßóïõìå ôï ðñüâëçìá äçìéïõñãþíôáò (óõìâïëéêïýò) äåóìïýò ìå êÜðïéï ðñïóùñéíü üíïìá áñ÷åßïõ (ðïõ íá ôåëåéþíåé óå `.dvi`) ãéá ôï `/dev/fd/0`, êáé ìå áõôü ôïí ôñüðï íá åîáíáãêÜóïõìå ôï `dvilj2p` íá äéáâÜæåé áðü ôï standard input.

Áêüìç Ýíá ðñüâëçìá ðïõ ðñïêýðôåé åßíáé ôï ãåãïíüò ðùò äåí ìðïñïýìå íá ÷ñçóéìïðïéÞóïõìå ôï `/tmp` ãéá ôïí ðñïóùñéíü äåóìü. Ïé óõìâïëéêïß äåóìïß áíÞêïõí óôïí ÷ñÞóôç êáé óôçí ïìÜäá `bin`, åíþ ôï ößëôñï ôñÝ÷åé óáí ÷ñÞóôçò `daemon`. Åðßóçò óôïí êáôÜëïãï `/tmp` åßíáé åíåñãü ôï sticky bit. Ôï ößëôñï ìðïñåß íá äçìéïõñãÞóåé ôï äåóìü, áëëÜ äåí èá åßíáé éêáíü íá ôïí åîáëåßøåé êáé íá ôïí áöáéñÝóåé áðü ôç óôéãìÞ ðïõ áõôüò èá áíÞêåé óå äéáöïñåôéêü ÷ñÞóôç.

Áíôßèåôá, ôï ößëôñï èá öôéÜîåé ôï óõìâïëéêü link óôïí ôñÝ÷ïíôá êáôÜëïãï, ðïõ åßíáé ï êáôÜëïãïò ðáñï÷Ýôåõóçò (spooling) (êáé ðïõ ðñïóäéïñßæåôáé áðü ôçí éêáíüôçôá `sd` óôï `/etc/printcap`). Áõôü åßíáé ôï ôÝëåéï ìÝñïò ãéá íá äïõëåýïõí ôá ößëôñá, åéäéêÜ ëüãù ôïõ üôé (ìåñéêÝò öïñÝò) õðÜñ÷åé ðåñéóóüôåñåò åëåýèåñïò ÷þñïò óôï äßóêï óôïí êáôÜëïãï ðáñï÷Ýôåõóçò (spool) áðü üôé óôï `/tmp`.

Êáé ôåëéêÜ, éäïý ôï ößëôñï:

```
#!/bin/sh
#
#  hpdf - Print DVI data on HP/PCL printer
#  Installed in /usr/local/libexec/hpdf

PATH=/usr/local/bin:$PATH; export PATH

#
#  Define a function to clean up our temporary files.  These exist
#  in the current directory, which will be the spooling directory
#  for the printer.
#
cleanup() {
   rm -f hpdf$$.dvi
}

#
#  Define a function to handle fatal errors: print the given message
#  and exit 2.  Exiting with 2 tells LPD to do not try to reprint the
#  job.
#
fatal() {
    echo "$@" 1>&2
    cleanup
    exit 2
}

#
#  If user removes the job, LPD will send SIGINT, so trap SIGINT
#  (and a few other signals) to clean up after ourselves.
#
trap cleanup 1 2 15

#
#  Make sure we are not colliding with any existing files.
#
cleanup

#
#  Link the DVI input file to standard input (the file to print).
#
```

```
ln -s /dev/fd/0 hpdf$$.dvi || fatal "Cannot symlink /dev/fd/0"

#
#  Make LF = CR+LF
#
printf "\033&k2G" || fatal "Cannot initialize printer"

#
#  Convert and print.  Return value from dvilj2p does not seem to be
#  reliable, so we ignore it.
#
dvilj2p -M1 -q -e- dfhp$$.dvi

#
#  Clean up and exit
#
cleanup
exit 0
```

10.4.1.4.5 ÁõôïìáôïðïéçìÝíåò ÌåôáôñïðÝò: Ìßá ÅíáëëáêôéêÞ óôá Ößëôñá ÌåôáôñïðÞò

¼ëá ôá ößëôñá ìåôáôñïðÞò ìðïñåß íá ðëçñïýí ôï ðåñéâÜëëïí åêôõðþóåùí óáò, áëëÜ õðï÷ñåþíïõí ôïí ÷ñÞóôç íá ðñïóäéïñßæåé (óôçí ãñáììÞ åíôïëþí ôïõ lpr(1)) ðïéü áðü áõôÜ èá ÷ñçóéìïðïéçèåß. Áí ïé ÷ñÞóôåò óáò äåí åßíáé éäéáßôåñá åîïéêåéùìÝíïé ìå ôïõò Ç/Õ, ôï íá ðñÝðåé íá áíáöÝñïõí êÜèå öïñÜ Ýíá ößëôñï ðéèáíþò íá åßíáé åíï÷ëçôéêü. Åßíáé áêüìá ÷åéñüôåñï ùóôüóï íá ãßíåé ëáíèáóìÝíç åðéëïãÞ ößëôñïõ, ôï ïðïßï èá åêôåëåóôåß óå áêáôÜëëçëï ãéá áõôü ôýðï áñ÷åßïõ, êáé èá ðñïêáëÝóåé ôçí óðáôÜëç åêáôïíôÜäùí óåëßäùí ÷áñôéïý.

Áíôß íá åãêáôáóôÞóåôå ïðïéïäÞðïôå ößëôñï ìåôáôñïðÞò, ìðïñåß íá èÝëåôå íá äïêéìÜóåôå íá Ý÷åôå Ýíá ößëôñï êåéìÝíïõ (áöïý åßíáé ôï ðñïåðéëåãìÝíï ößëôñï) ðïõ íá áíé÷íåýåé ôïí ôýðï ôïõ áñ÷åßïõ ðïõ Ý÷åé æçôçèåß íá åêôõðùèåß êáé íá åêôåëåß áõôüìáôá ôï êáôÜëëçëï ößëôñï ìåôáôñïðÞò. Åñãáëåßá óáí ôï `file` ìðïñïýí íá óáò âïçèÞóïõí. Ìðïñåß íá åßíáé äýóêïëï íá ðñïóäéïñßóïõìå ïé äéáöïñÝò ìåôáîý *êÜðïéùí* ôýðùí áñ÷åßùí—áëëÜ, öõóéêÜ, ìðïñåßôå ðÜíôá íá ðáñÝ÷åôå ößëôñá ìåôáôñïðÞò åéäéêÜ ãéá áõôÝò ôéò ðåñéðôþóåéò.

Ç ÓõëëïãÞ ôùí Ports ôïõ FreeBSD Ý÷åé Ýíá ößëôñï êåéìÝíïõ ðïõ åêôåëåß áõôüìáôåò ìåôáôñïðÝò êáé ïíïìÜæåôáé `apsfilter`. Ìðïñåß íá áíé÷íåýåé áðëü êåßìåíï, PostScript, DVI êáé ó÷åäüí ïðïéïäÞðïôå ôýðï áñ÷åßïõ, íá åêôåëåß ôçí êáôÜëëçëç ìåôáôñïðÞ, êáé íá åêôõðþíåé.

10.4.1.5 Ößëôñá Åîüäïõ

Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** õðïóôçñßæåé Ýíáí áêüìç ôýðï ößëôñïõ ðïõ ßóùò íá ìçí Ý÷åôå åîåñåõíÞóåé áêüìá: ôï ößëôñï åîüäïõ. Ôï ößëôñï åîüäïõ ðñïïñßæåôáé ìüíï ãéá åêôýðùóç áðëïý êåéìÝíïõ, üðùò ôï ößëôñï êåéìÝíïõ, áëëÜ ìå ðïëëÝò áðëïðïéÞóåéò. ÅÜí ÷ñçóéìïðïéåßôå ößëôñï åîüäïõ áëëÜ ü÷é ößëôñï êåéìÝíïõ, ôüôå:

- Ôï **LPD** îåêéíÜ Ýíá ößëôñï åîüäïõ ìüíï ìéá öïñÜ ãéá üëç ôçí åñãáóßá, áíôß Ýíá ÷ùñéóôü ãéá êÜèå áñ÷åßï ôçò åñãáóßáò.
- Ôï **LPD** äåí öñïíôßæåé íá áíáãíùñßóåé ôçí áñ÷Þ Þ ôï ôÝëïò ôùí áñ÷åßùí ìÝóá óôçí ßäéá ôçí åñãáóßá üôáí ÷ñçóéìïðïéåßôáé ôï ößëôñï åîüäïõ.

- Ôï **LPD** äåí ðåñíÜåé óôï ößëôñï ôá äåäïìÝíá åéóüäïõ ôïõ ÷ñÞóôç Þ ôï üíïìá ôïõ ìç÷áíÞìáôïò, åðïìÝíùò äåí ðñïïñßæåôáé ãéá êáôáìÝôñçóç åêôõðùìÝíùí óåëßäùí. Ôï ößëôñï åîüäïõ äÝ÷åôáé ìüíï äýï ðáñáìÝôñïõò:

  ```
  filter-name -wwidth -llength
  ```

  ¼ðïõ ôï `width` åßíáé áðü ôçí éêáíüôçôá `pw` êáé ôï `length` åßíáé áðü ôçí éêáíüôçôá `pl` ãéá ôïí óõãêåêñéìÝíï åêôõðùôÞ.

Ìçí ðáñáóýñåóôå áðü ôçí áðëüôçôá ôïõ ößëôñïõ åîüäïõ. Áí åðéèõìåßôå êÜèå áñ÷åßï ìéáò åñãáóßáò íá îåêéíÜ óå ìéá íÝá óåëßäá, ôï ößëôñï åîüäïõ *äåí èá ëåéôïõñãÞóåé*. ×ñçóéìïðïéÞóôå Ýíá ößëôñï êåéìÝíïõ (ãíùóôü êáé ùò ößëôñï åéóüäïõ). Äåßôå ôçí åíüôçôá ÅãêáôÜóôáóç Ößëôñïõ ÊåéìÝíïõ. ÅðéðëÝïí, Ýíá ößëôñï åîüäïõ åßíáé óôçí ðñáãìáôéêüôçôá *ðéï ðåñßðëïêï* áöïý ðñÝðåé íá åîåôÜæåé ôçí ñïÞ ôùí byte ðïõ áðïóôÝëëïíôáé ðñïò áõôü ãéá åéäéêïýò ÷áñáêôÞñåò flag êáé ðñÝðåé íá óôÝëíåé óÞìáôá óôïí åáõôü ôïõ ãéá ëïãáñéáóìü ôïõ **LPD**.

Ùóôüóï, Ýíá ößëôñï åîüäïõ åßíáé *áíáãêáßï* áí èÝëåôå óåëßäåò êåöáëßäáò êáé ÷ñåéÜæåôáé íá óôÝëíåôå áêïëïõèßåò äéáöõãÞò Þ Üëëåò áêïëïõèßåò áñ÷éêïðïßçóçò ðñïêåéìÝíïõ íá ôéò åêôõðþóåôå. (ÁëëÜ åßíáé åðßóçò *ìÜôáéï* áí èÝëåôå íá ÷ñåþíåôå óåëßäåò êåöáëßäáò óôïí ëïãáñéáóìü ôïõ áéôïýíôïò ÷ñÞóôç, áðü ôç óôéãìÞ ðïõ ôï **LPD** äåí óôÝëíåé êáìéÜ ðëçñïöïñßá ãéá ôïí ÷ñÞóôç Þ ôïí õðïëïãéóôÞ óôï ößëôñï åîüäïõ.)

Ôï **LPD** åðéôñÝðåé ôçí óõíýðáñîç åíüò ößëôñïõ åîüäïõ êáé Üëëùí ößëôñùí (êåéìÝíïõ Þ äéáöïñåôéêïý ôýðïõ) óôïí ßäéï åêôõðùôÞ. Óå áõôÝò ôéò ðåñéðôþóåéò, ôï **LPD** èá îåêéíÜ ôï ößëôñï åîüäïõ ìüíï ãéá ôçí åêôýðùóç ôçò óåëßäáò êåöáëßäáò (äåßôå ôçí åíüôçôá Óåëßäåò Êåöáëßäáò). Ôï **LPD** èá áíáìÝíåé ôï ößëôñï åîüäïõ íá *óôáìáôÞóåé áðü ìüíï ôïõ* üôáí ôïõ óôåßëåé äýï bytes: Ýíá ASCII 031 áêïëïõèïýìåíï áðü Ýíá ASCII 001. ¼ôáí Ýíá ößëôñï åîüäïõ âëÝðåé áõôÜ ôá äýï bytes (031, 001), èá ðñÝðåé íá óôáìáôÜ óôÝëíïíôáò óÞìá `SIGSTOP` óôïí åáõôü ôïõ. ¼ôáí ôï **LPD** ïëïêëçñþóåé ôçí åêôÝëåóç êáé ôùí õðïëïßðùí ößëôñùí, èá åðáíåêêéíÞóåé ôï ößëôñï åîüäïõ óôÝëíïíôáò ôïõ ôï óÞìá `SIGCONT`.

Áí õðÜñ÷åé ößëôñï åîüäïõ, áëëÜ *äåí õðÜñ÷åé* ößëôñï êåéìÝíïõ êáé ôï **LPD** äïõëåýåé óå åñãáóßá áðëïý êåéìÝíïõ, ôï **LPD** ÷ñçóéìïðïéåß ôï ößëôñï åîüäïõ ãéá ôçí åêôÝëåóç ôçò åñãáóßáò. ¼ðùò áíáöÝñáìå êáé ðáñáðÜíù, ôï ößëôñï åîüäïõ èá åêôõðþóåé êÜèå áñ÷åßï åñãáóßáò óôç óåéñÜ, äß÷ùò äõíáôüôçôá ðáñåìâïëÞò êáíÞò óåëßäáò Þ Üëëùí ñõèìßóåùí óôçí ôñïöïäïóßá ÷áñôéïý, êáé ðéèáíþò áõôü íá *ìçí* åßíáé åðéèõìçôü. Ó÷åäüí óå üëåò ôéò ðåñéðôþóåéò, èá ÷ñåéáóôåßôå Ýíá ößëôñï êåéìÝíïõ.

Ôï ðñüãñáììá `lpf`, ðïõ áíáöÝñáìå íùñßôåñá óáí ößëôñï êåéìÝíïõ, ìðïñåß íá ôñÝîåé êáé óáí ößëôñï åîüäïõ. Áí ÷ñåéÜæåóôå Ýíá ãñÞãïñï ößëôñï åîüäïõ áëëÜ äåí èÝëåôå íá ãñÜøåôå ôïí êþäéêá áíß÷íåõóçò ôùí byte êáé ôïí êþäéêá áðïóôïëÞò óçìÜôùí, äïêéìÜóôå ôï `lpf`. Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôï `lpf` ìÝóá áðü Ýíá shell script ôï ïðïßï èá ÷åéñßæåôáé ôïõò êùäéêïýò áñ÷éêïðïßçóçò ðïõ ßóùò íá ÷ñåéÜæåôáé ï åêôõðùôÞò.

10.4.1.6 `lpf`: Ýíá Ößëôñï ÊåéìÝíïõ

Ôï ðñüãñáììá `/usr/libexec/lpr/lpf` ðïõ ðáñÝ÷åôáé ìå ôç äéáíïìÞ åêôåëÝóéìùí ôïõ FreeBSD åßíáé Ýíá ößëôñï êåéìÝíïõ (ößëôñï åéóüäïõ) ðïõ ìðïñåß íá ðáñáãñáöïðïéåß ôçí Ýîïäï (åñãáóßåò ðïõ Ý÷ïõí óôáëåß ìå `lpr -i`), íá åðéôñÝðåé ôçí äéÝëåõóç literal ÷áñáêôÞñùí (åñãáóßåò ðïõ Ý÷ïõí óôáëåß ìå `lpr -l`), íá ñõèìßæåé ôçí èÝóç åêôýðùóçò ìå ôç ÷ñÞóç ÷áñáêôÞñùí backspace êáé tab óôçí åñãáóßá, êáé íá êÜíåé êáôáìÝôñçóç ôùí åêôõðùìÝíùí óåëßäùí. Åðßóçò ìðïñåß íá åíåñãåß êáé óáí ößëôñï åîüäïõ.

Ôï `lpf` åßíáé êáôÜëëçëï ãéá äéÜöïñá ðåñéâÜëëïíôá åêôýðùóçò. Áí êáé äåí Ý÷åé äõíáôüôçôá áðïóôïëÞò áêïëïõèéþí áñ÷éêïðïßçóçò óôïí åêôõðùôÞ, åßíáé åýêïëï íá ãñÜøåôå Ýíá shell script ãéá íá êÜíåôå ôçí áðáñáßôçôç áñ÷éêïðïßçóç êáé íá åêôåëÝóåôå Ýðåéôá ôï `lpf`.

Ãéá íá êÜíåé óùóôÜ êáôáìÝôñçóç óåëßäùí, ôï `lpf` ÷ñåéÜæåôáé êáôÜëëçëåò ôéìÝò ãéá ôéò éêáíüôçôåò `pw` êáé `pl` óôï áñ÷åßï `/etc/printcap`. ×ñçóéìïðïéåß áõôÝò ôéò ôéìÝò ãéá íá ðñïóäéïñßóåé ðüóï êåßìåíï ìðïñåß íá ÷ùñÝóåé óå ìßá óåëßäá êáé áðü ðüóåò óåëßäåò áðïôåëåßôáé ç åñãáóßá ôïõ ÷ñÞóôç. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí êáôáìÝôñçóç óåëßäùí, óõìâïõëåõôåßôå ôçí ÊáôáìÝôñçóç ×ñÞóçò Åêôõðùôþí.

10.4.2 Óåëßäåò Êåöáëßäáò

Áí Ý÷åôå *áñêåôïýò* ÷ñÞóôåò, êáé üëïé ôïõò ÷ñçóéìïðïéïýí äéÜöïñïõò åêôõðùôÝò, ôüôå ðéèáíþò íá èåùñåßôå ôéò *óåëßäåò êåöáëßäáò* ùò áíáãêáßï êáêü.

Ïé óåëßäåò êåöáëßäáò, ãíùóôÝò åðßóçò êáé ùò *banner* Þ *óåëßäåò burst* áíáãíùñßæïõí óå ðïéïí áíÞêïõí ïé åñãáóßåò ìåôÜ ôçí åêôýðùóç ôïõò. ÓõíÞèùò ôõðþíïíôáé ìå ìåãÜëá, Ýíôïíá ãñÜììáôá, êáé ßóùò ìå äéáêïóìçôéêÜ ðåñéãñÜììáôá, þóôå óå ìéá óôïßâá åêôõðþóåùí íá îå÷ùñßæïõí áðü ôá ðñáãìáôéêÜ Ýããñáöá åñãáóéþí ôùí ÷ñçóôþí. ÅðéôñÝðïõí Ýôóé óôïõò ÷ñÞóôåò íá âñßóêïõí ãñÞãïñá ôéò åñãáóßåò ôïõò. Ôï ðñïöáíÝò ìåéïíÝêôçìá óå ìéá óåëßäá êåöáëßäáò åßíáé ðùò ðñüêåéôáé íá åêôõðùèåß ìéá áêüìá óåëßäá ãéá êÜèå ìßá åñãáóßá. Ç åöÞìåñç ÷ñçóéìüôçôá ôïõò äéáñêåß ëßãá ëåðôÜ, êáé ï ðñïïñéóìüò ôïõò åßíáé ï êÜäïò á÷ñÞóôùí/áíáêýêëùóçò. (ÐáñáôçñÞóôå ðùò ïé óåëßäåò êåöáëßäáò åßíáé áíÜ åñãáóßá, êáé ü÷é áíÜ áñ÷åßï óå ìéá åñãáóßá, åðïìÝíùò ôï á÷ñçóôåõìÝíï ÷áñôß ßóùò íá ìçí åßíáé ôüóï ðïëý).

Ôï óýóôçìá **LPD** ìðïñåß íá ðáñÝ÷åé áõôüìáôá óåëßäåò êåöáëßäáò ãéá ôéò åêôõðþóåéò óáò, *áí* ï åêôõðùôÞò óáò ìðïñåß íá åêôõðþóåé Üìåóá áðëü êåßìåíï. Áí Ý÷åôå åêôõðùôÞ PostScript, èá ÷ñåéáóôåßôå Ýíá åîùôåñéêü ðñüãñáììá ãéá íá äçìéïõñãÞóåôå ôçí óåëßäá êåöáëßäáò. Äåßôå ôï Óåëßäåò Êåöáëßäáò óå ÅêôõðùôÝò PostScript.

10.4.2.1 Åíåñãïðïßçóç Óåëßäùí Êåöáëßäáò

Óôçí åíüôçôá ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí, áðåíåñãïðïéÞóáìå ôéò óåëßäåò êåöáëßäáò ìå ôçí êáôá÷þñéóç `sh` (óçìáßíåé “suppress header”) óôï áñ÷åßï `/etc/printcap`. Ãéá íá åíåñãïðïéÞóåôå ôéò óåëßäåò êåöáëßäáò ãéá êÜðïéï åêôõðùôÞ, áðëÜ äéáãñÜøôå ôçí éêáíüôçôá `sh`.

Áêïýãåôáé åýêïëï, äåí íïìßæåôå;

¸ôóé åßíáé. º*óùò* ÷ñåéáóôåß íá ðáñÝ÷åôå Ýíá ößëôñï åîüäïõ ãéá íá óôåßëåôå åíôïëÝò áñ÷éêïðïßçóçò óôïí åêôõðùôÞ. Åäþ åßíáé Ýíá ðáñÜäåéãìá ößëôñïõ åîüäïõ ãéá åêôõðùôÝò óõìâáôïýò ìå ôïí ôýðï PCL ôçò Hewlett Packard:

```
#!/bin/sh
#
#  hpof - Output filter for Hewlett Packard PCL-compatible printers
#  Installed in /usr/local/libexec/hpof

printf "\033&k2G" || exit 2
exec /usr/libexec/lpr/lpf
```

Ðñïóäéïñßóôå ôçí äéáäñïìÞ ðñïò ôï ößëôñï åîüäïõ óôçí éêáíüôçôá `of`. Äåßôå ôçí åíüôçôá Ößëôñá Åîüäïõ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Åäþ åßíáé Ýíá ðáñÜäåéãìá áñ÷åßïõ `/etc/printcap` ãéá ôïí åêôõðùôÞ `teak` áðü ôï ðñïçãïýìåíï ðáñÜäåéãìá. Åíåñãïðïéïýíôáé ïé óåëßäåò êåöáëßäáò êáé ðñïóèÝóáìå ôï ðáñáðÜíù ößëôñï åîüäïõ:

```
#
#  /etc/printcap for host orchid
#
teak|hp|laserjet|Hewlett Packard LaserJet 3Si:\
        :lp=/dev/lpt0:sd=/var/spool/lpd/teak:mx#0:\
        :if=/usr/local/libexec/hpif:\
        :vf=/usr/local/libexec/hpvf:\
:of=/usr/local/libexec/hpof:
```

Ôþñá, üôáí ïé ÷ñÞóôåò åêôõðþíïõí åñãáóßåò óôïí `teak`, èá ðáßñíïõí êáé ìßá óåëßäá êåöáëßäáò áíÜ åñãáóßá. Áí ïé ÷ñÞóôåò èÝëïõí íá îïäåýïõí ÷ñüíï øÜ÷íïíôáò ãéá ôéò åêôõðþóåéò ôïõò, ìðïñïýí íá ðáñåìðïäßóïõí ôéò óåëßäåò êåöáëßäáò áðïóôÝëëïíôáò ôéò åñãáóßåò ôïõò ìå `lpr -h`. Äåßôå ôçí åíüôçôá ÅðéëïãÝò Óåëßäùí Êåöáëßäáò ãéá ðåñéóóüôåñåò åðéëïãÝò ôïõ lpr(1).

Óçìåßùóç: Ôï **LPD** óôÝëíåé ôï ÷áñáêôÞñá áëëáãÞò óåëßäáò (form feed) áìÝóùò ìåôÜ ôç óåëßäá êåöáëßäáò. Áí ï åêôõðùôÞò óáò ÷ñçóéìïðïéåß äéáöïñåôéêü ÷áñáêôÞñá Þ áêïëïõèßá ÷áñáêôÞñùí ãéá ôçí áëëáãÞ óåëßäáò, ðñïóäéïñßóôå ôá ìå ôçí éêáíüôçôá `ff` óôï áñ÷åßï `/etc/printcap`.

10.4.2.2 ¸ëåã÷ïò Óåëßäùí Êåöáëßäáò

ÌåôÜ ôçí åíåñãïðïßçóç ôùí óåëßäùí êåöáëßäáò, ôï **LPD** èá ðáñÜãåé ìßá *åðéìÞêç êåöáëßäá*, ìßá ïëüêëçñç óåëßäá ìå ìåãÜëá ãñÜììáôá ðïõ ðñïóäéïñßæåé ôïí ÷ñÞóôç, ôïí õðïëïãéóôÞ (host), êáé ôçí åñãáóßá. Åäþ åßíáé Ýíá ðáñÜäåéãìá (ç `kelly` åêôýðùóå ôçí åñãáóßá ìå üíïìá “outline” áðü ôïí õðïëïãéóôÞ `rose`):

```
k                   ll       ll
k                    l        l
k                    l        l
k   k     eeee       l        l     y    y
k  k     e    e      l        l     y    y
k k      eeeeee      l        l     y    y
kk k     e           l        l     y    y
k   k    e    e      l        l     y   yy
k    k    eeee      lll      lll     yyy y
                                         y
                                    y    y
                                     yyyy


                             ll
                    t         l        i
                    t         l
 oooo    u    u   ttttt       l       ii     n nnn     eeee
o    o   u    u     t         l        i     nn   n   e    e
o    o   u    u     t         l        i     n    n   eeeeee
o    o   u    u     t         l        i     n    n   e
o    o   u   uu     t  t      l        i     n    n   e    e
 oooo     uuu u      tt      lll      iii    n    n    eeee









r rrr     oooo     ssss     eeee
```

```
rr   r   o    o   s    s   e    e
r        o    o    ss      eeeeee
r        o    o      ss    e
r        o    o   s    s   e    e
r         oooo     ssss     eeee





                                        Job:  outline
                                        Date: Sun Sep 17 11:04:58 1995
```

Ôï **LPD** ðñïóèÝôåé ìéá åíôïëÞ áëëáãÞò óåëßäáò (form feed) ìåôÜ áðü áõôü ôï êåßìåíï Ýôóé þóôå ç åñãáóßá íá îåêéíÞóåé óå íÝá óåëßäá (åêôüò áí Ý÷åôå ðñïóäéïñßóåé ôçí éäéüôçôá `sf` (suppress form feeds) ãéá ôïí åêôõðùôÞ óôï áñ÷åßï `/etc/printcap`).

Áí ðñïôéìÜôå, ôï **LPD** ìðïñåß íá öôéÜîåé ìéá *ìéêñüôåñïõ ìÞêïõò êåöáëßäá*. Ðñïóäéïñßóôå `sb` (short banner) óôï áñ÷åßï `/etc/printcap`. Ç óåëßäá êåöáëßäáò èá ìïéÜæåé óáí áõôÞ:

```
rose:kelly  Job: outline  Date: Sun Sep 17 11:07:51 1995
```

Ôï **LPD** ôõðþíåé (áðü ðñïåðéëïãÞ) ðñþôá ôçí óåëßäá êåöáëßäáò, êáé ìåôÜ ôçí åñãáóßá. Ãéá íá áíôéóôñÝøåôå ôçí óåéñÜ, ÷ñçóéìïðïéÞóôå ôçí éäéüôçôá `hl` (header last) óôï áñ÷åßï `/etc/printcap`.

10.4.2.3 ÊáôáìÝôñçóç ìå Óåëßäåò Êåöáëßäáò

Ç ÷ñÞóç ôùí ðñïåãêáôåóôçìÝíùí óåëßäùí êåöáëßäáò ôïõ **LPD** ïõóéáóôéêÜ õðï÷ñåþíïõ ôçí ôÞñçóç ôïõ ðáñáêÜôù êáíüíá üôáí êÜíïõìå êáôáìÝôñçóç ÷ñÞóçò ôïõ åêôõðùôÞ: Ïé óåëßäåò êåöáëßäáò ðñÝðåé íá äéáôßèåíôáé *åëåýèåñá (äß÷ùò ÷ñÝùóç)*.

Ãéáôß;

Äéüôé ôï ößëôñï åîüäïõ åßíáé ôï ìïíáäéêü åîùôåñéêü ðñüãñáììá ðïõ Ý÷åé ôïí Ýëåã÷ï óôçí åêôýðùóç ôçò êåöáëßäáò êáé èá ìðïñïýóå íá êÜíåé êáôáìÝôñçóç, áëëÜ ùóôüóï äåí ðáñÝ÷åé êáìßá ðëçñïöïñßá ãéá *ôïí ÷ñÞóôç Þ ôïí õðïëïãéóôÞ* Þ êÜðïéï Üëëï áñ÷åßï êáôáìÝôñçóçò, åðïìÝíùò äåí ãíùñßæåé óå ðïéüí íá áðïäþóåé ôçí ÷ñÞóç ôïõ åêôõðùôÞ. Äåí áñêåß áðëÜ íá “ðñïóèÝóåôå ìßá áêüìç óåëßäá óôçí êáôáìÝôñçóç” ôñïðïðïéþíôáò ôï ößëôñï êåéìÝíïõ Þ ïðïéïäÞðïôå Üëëï ößëôñï ìåôáôñïðÞò (ôï ïðïßï äéáèÝôåé ôéò ðëçñïöïñßåò ÷ñÞóôç êáé õðïëïãéóôÞ), áðü ôç óôéãìÞ ðïõ ïé ÷ñÞóôåò Ý÷ïõí ôçí äõíáôüôçôá íá ðáñåìðïäßóïõí ôéò óåëßäåò êåöáëßäáò ìå `lpr -h`. Èá ìðïñïýóáí ðÜëé íá ÷ñåùèïýí ãéá óåëßäåò êåöáëßäáò ðïõ äåí åêôýðùóáí. ÂáóéêÜ, ç `lpr -h` èá åßíáé ç ðñïôéìþìåíç åðéëïãÞ óå Ýíá ðåñéâÜëëïí ðïõ ïé ÷ñÞóôåò Ý÷ïõí ïéêïëïãéêÞ óõíåßäçóç, áëëÜ äåí ìðïñåßôå ðñáãìáôéêÜ íá ðáñïôñýíåôå ïðïéïíäÞðïôå íá ôç ÷ñçóéìïðïéÞóåé.

Äåí åßíáé áñêåôü áðëÜ êÜèå ößëôñï óáò íá äçìéïõñãåß ôç äéêéÜ ôïõ óåëßäá êåöáëßäáò (Ýôóé þóôå íá ìðïñåß íá ÷ñåþíåé ìå áõôü ôïí ôñüðï). Áí ïé ÷ñÞóôåò åðéèõìïýí ôçí åðéëïãÞ ðáñåìðüäéóçò ôùí óåëßäùí êåöáëßäáò ìå `lpr -h`, èá óõíå÷ßóïõí íá ôéò ðáñáëáìâÜíïõí - êáé íá ÷ñåþíïíôáé ãéá áõôÝò - áöïý ôï **LPD** äåí Ý÷åé äõíáôüôçôá íá ðåñÜóåé óå ïðïéïäÞðïôå ößëôñï ôçí åðéëïãÞ `-h`.

ÅðïìÝíùò, ðïéåò åðéëïãÝò Ý÷åôå;

Ìðïñåßôå:

- Íá áðïäå÷èåßôå ôçí õðüäåéîç ôïõ **LPD** êáé íá ðáñÝ÷åôå ôéò óåëßäåò êåöáëßäáò åëåýèåñá.
- Íá åãêáôáóôÞóåôå åíáëëáêôéêÝò ëýóåéò áíôß ôïõ **LPD**, üðùò ôï **LPRng**. Ç åíüôçôá ÅíáëëáêôéêÝò Ëýóåéò ãéá ôïí ÓôÜíôáñ Spooler äßíåé ðåñéóóüôåñåò ðëçñïöïñßåò ãéá Üëëåò åöáñìïãÝò ðáñï÷Ýôåõóçò ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áíôß ãéá ôï **LPD**.
- Íá ãñÜøåôå Ýíá *Ýîõðíï* ößëôñï åîüäïõ. Õðü êáíïíéêÝò óõíèÞêåò, Ýíá "ößëôñï åîüäïõ" äåí êÜíåé ôßðïôå ðáñáðÜíù áðü ôçí áñ÷éêïðïßçóç åíüò åêôõðùôÞ Þ ìåñéêÝò áðëÝò ìåôáôñïðÝò ÷áñáêôÞñùí. Åßíáé êáôÜëëçëï ãéá óåëßäåò êåöáëßäáò êáé ãéá åñãáóßåò áðëïý êåéìÝíïõ (üôáí äåí õðÜñ÷åé ößëôñï (åéóüäïõ) êåéìÝíïõ). ÁëëÜ áí õðÜñ÷åé ößëôñï êåéìÝíïõ ãéá åñãáóßåò áðëïý êåéìÝíïõ, ôüôå ôï **LPD** èá åíåñãïðïéåß ôï ößëôñï åîüäïõ ìüíï ãéá ôéò óåëßäåò êåöáëßäáò. Êáé ôï ößëôñï åîüäïõ ìðïñåß íá áíáëýóåé ôï êåßìåíï ôçò óåëßäáò êåöáëßäáò ðïõ äçìéïõñãåß ôï **LPD** ãéá íá ðñïóäéïñßæåé ôïí ÷ñÞóôç êáé ôïí õðïëïãéóôÞ, þóôå íá ÷ñåþíåé ôéò óåëßäåò êåöáëßäáò. Ôï ìüíï åðéðëÝïí ðñüâëçìá ìå áõôÞ ôç ìÝèïäï åßíáé ðùò ôï ößëôñï åîüäïõ åîáêïëïõèåß íá ìç ãíùñßæåé ðïéü áñ÷åßï êáôáìÝôñçóçò íá ÷ñçóéìïðïéÞóåé (äåí ôïõ Ý÷åé äïèåß ôï üíïìá ôïõ áñ÷åßïõ áðü ôçí éêáíüôçôá `af`), áëëÜ áí ôï üíïìá ôïõ áñ÷åßïõ óáò åßíáé ãíùóôü, ìðïñåßôå íá ôï åíóùìáôþóåôå áðåõèåßáò óôïí êþäéêá ôïõ ößëôñïõ åîüäïõ. Ãéá íá äéåõêïëýíåôå ôçí äéáäéêáóßá áíÜëõóçò, ÷ñçóéìïðïéÞóôå ôçí éêáíüôçôá `sh` (short header) óôï `/etc/printcap`. ºóùò ðÜëé üëá áõôÜ íá åßíáé õðåñâïëéêÜ êïðéáóôéêÜ, åíþ åßíáé óßãïõñï ðùò ïé ÷ñÞóôåò èá åêôéìÞóïõí ôïí ãåííáéüäùñï äéá÷åéñéóôÞ óõóôÞìáôïò ðïõ åðéôñÝðåé åëåýèåñá ôéò óåëßäåò êåöáëßäáò.

10.4.2.4 Óåëßäåò Êåöáëßäáò óå ÅêôõðùôÝò PostScript

¼ðùò ðåñéãñÜøáìå ðáñáðÜíù, ôï **LPD** ìðïñåß íá äçìéïõñãÞóåé ìßá óåëßäá êåöáëßäáò áðëïý êåéìÝíïõ, êáôÜëëçëç ãéá ðïëëïýò åêôõðùôÝò. Ïé åêôõðùôÝò PostScript, öõóéêÜ, äåí ìðïñïýí íá ôõðþóïõí êåßìåíï áðåõèåßáò, Üñá ç äõíáôüôçôá ôïõ **LPD** ãéá ôéò óåëßäåò êåöáëßäáò åßíáé Ü÷ñçóôç óå áõôÞ ôçí ðåñßðôùóç.

¸íáò ðñïöáíÞò ôñüðïò íá ðáñÝ÷ïíôáé óåëßäåò êåöáëßäáò åßíáé íá äçìéïõñãïýíôáé áðü êÜèå ößëôñï ìåôáôñïðÞò êáé ôï ößëôñï êåéìÝíïõ. Ôá ößëôñá èá ðñÝðåé íá äÝ÷ïíôáé ùò ðáñáìÝôñïõò ôï üíïìá ôïõ ÷ñÞóôç êáé ôïõ õðïëïãéóôÞ þóôå íá äçìéïõñãïýí ôçí êáôÜëëçëç óåëßäá êåöáëßäáò. Ôï ìåéïíÝêôçìá áõôÞò ôçò ìåèüäïõ åßíáé ðùò ïé ÷ñÞóôåò èá åêôõðþíïõí ðÜíôá óåëßäá êåöáëßäáò, áêüìç êé áí áðïóôÝëëïõí ôçí åñãáóßá ôïõò ìå `lpr -h`.

ÅðéôñÝøôå ìáò íá åîåñåõíÞóïõìå áõôÞ ôç ìÝèïäï. Ôï áêüëïõèï script äÝ÷åôáé ôñåéò ðáñáìÝôñïõò (ôï üíïìá ÷ñÞóôç - login name, ôï üíïìá ôïõ õðïëïãéóôÞ - host name, êáé ôï üíïìá åñãáóßáò) êáé äçìéïõñãåß ìßá áðëÞ óåëßäá êåöáëßäáò PostScript:

```
#!/bin/sh
#
#  make-ps-header - make a PostScript header page on stdout
#  Installed in /usr/local/libexec/make-ps-header
#

#
#  These are PostScript units (72 to the inch).  Modify for A4 or
#  whatever size paper you are using:
#
page_width=612
page_height=792
border=72

#
#  Check arguments
#
if [ $# -ne 3 ]; then
```

```
    echo "Usage: ‘basename $0‘ <user> <host> <job>" 1>&2
    exit 1
fi

#
#  Save these, mostly for readability in the PostScript, below.
#
user=$1
host=$2
job=$3
date=‘date‘

#
#  Send the PostScript code to stdout.
#
exec cat <<EOF
%!PS

%
%  Make sure we do not interfere with user’s job that will follow
%
save

%
%  Make a thick, unpleasant border around the edge of the paper.
%
$border $border moveto
$page_width $border 2 mul sub 0 rlineto
0 $page_height $border 2 mul sub rlineto
currentscreen 3 -1 roll pop 100 3 1 roll setscreen
$border 2 mul $page_width sub 0 rlineto closepath
0.8 setgray 10 setlinewidth stroke 0 setgray

%
%  Display user’s login name, nice and large and prominent
%
/Helvetica-Bold findfont 64 scalefont setfont
$page_width ($user) stringwidth pop sub 2 div $page_height 200 sub moveto
($user) show

%
%  Now show the boring particulars
%
/Helvetica findfont 14 scalefont setfont
/y 200 def
[ (Job:) (Host:) (Date:) ] {
200 y moveto show /y y 18 sub def }
forall

/Helvetica-Bold findfont 14 scalefont setfont
/y 200 def
[ ($job) ($host) ($date) ] {
        270 y moveto show /y y 18 sub def
} forall

%
% That is it
%
restore
showpage
EOF
```

Ôþñá, êáèÝíá áðü ôá ößëôñá ìåôáôñïðÞò êáé ôï ößëôñï êåéìÝíïõ ìðïñïýí íá êáëÝóïõí ôï script, ðñþôá ãéá íá äçìéïõñãÞóïõí ôç óåëßäá êåöáëßäáò, êáé Ýðåéôá ãéá íá åêôõðþóïõí ôçí åñãáóßá ôïõ ÷ñÞóôç. Áêïëïõèåß ôï ößëôñï ìåôáôñïðÞò DVI ðïõ äåßîáìå íùñßôåñá, åéäéêÜ äéáìïñöùìÝíï ãéá íá öôéÜîïõìå ìéá óåëßäá êåöáëßäáò:

```
#!/bin/sh
#
#  psdf - DVI to PostScript printer filter
#  Installed in /usr/local/libexec/psdf
#
#  Invoked by lpd when user runs lpr -d
#

orig_args="$@"

fail() {
    echo "$@" 1>&2
    exit 2
}

while getopts "x:y:n:h:" option; do
    case $option in
        x|y)  ;; # Ignore
        n)    login=$OPTARG ;;
        h)    host=$OPTARG ;;
        *)    echo "LPD started ‘basename $0‘ wrong." 1>&2
              exit 2
              ;;
    esac
done

[ "$login" ] || fail "No login name"
[ "$host" ] || fail "No host name"

( /usr/local/libexec/make-ps-header $login $host "DVI File"
  /usr/local/bin/dvips -f ) | eval /usr/local/libexec/lprps $orig_args
```

ÐáñáôçñÞóôå ðùò ôï ößëôñï ðñÝðåé íá áíáëýóåé ôçí ëßóôá ðáñáìÝôñùí ãéá íá ðñïóäéïñßóåé ôï üíïìá ÷ñÞóôç êáé õðïëïãéóôÞ. Ç ìÝèïäïò áíÜëõóçò åßíáé ðáñüìïéá êáé ãéá ôá õðüëïéðá ößëôñá ìåôáôñïðÞò. Ôï ößëôñï êåéìÝíïõ ðáßñíåé Ýíá åëáöñþò äéáöïñåôéêü óåô ðáñáìÝôñùí, (äåßôå ôçí åíüôçôá Ðùò äïõëåýïõí ôá Ößëôñá).

¼ðùò áíáöÝñáìå ðñïçãïõìÝíùò, ï ðáñáðÜíù ó÷åäéáóìüò, áí êáé ðñáãìáôéêÜ áðëüò, áðåíåñãïðïéåß ôçí åðéëïãÞ “ðáñáìðüëéóçò óåëßäáò êåöáëßäáò” (ôçí åðéëïãÞ `-h`) ôïõ `lpr`. Áí ïé ÷ñÞóôåò åðéèõìïýí íá óþóïõí Ýíá äÝíôñï (Þ ëßãá ÷ñÞìáôá, áí ÷ñåþíåôå ôéò óåëßäåò êåöáëßäáò), äåí èá õðÜñ÷åé ôñüðïò ãéá íá ãßíåé áõôü, áöïý ôç óôéãìÞ ðïõ êÜèå åêôýðùóç ìÝóù ôùí ößëôñùí èá óõíïäåýåôáé êáé áðü ìéá óåëßäá êåöáëßäáò ãéá êÜèå åñãáóßá.

Ãéá íá åðéôñÝøåôå óôïõò ÷ñÞóôåò íá áðåíåñãïðïéïýí ôéò óåëßäåò êåöáëßäáò áíÜ åñãáóßá, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï ôÝ÷íáóìá ðïõ ðáñïõóéÜóáìå óôçí åíüôçôá ÊáôáìÝôñçóç ìå Óåëßäåò Êåöáëßäáò: äçëáäÞ íá ãñÜøåôå Ýíá ößëôñï åîüäïõ ðïõ íá áíáëýåé ôçí óåëßäá êåöáëßäáò ðïõ äçìéïõñãåßôáé áðü ôï **LPD** êáé íá êáôáóêåõÜæåé ìéá PostScript Ýêäïóç. Áí ï ÷ñÞóôçò óôåßëåé ìéá åñãáóßá ìå `lpr -h`, ôüôå ïýôå ôï **LPD**, ïýôå ôï ößëôñï åîüäïõ èá öôéÜîïõí óåëßäá êåöáëßäáò. Óå üëåò ôéò Üëëåò ðåñéðôþóåéò, ôï ößëôñï åîüäïõ èá äéáâÜæåé ôï êåßìåíï áðü ôï **LPD** êáé èá óôÝëíåé ôïí êáôÜëëçëï êþäéêá PostScript óôïí åêôõðùôÞ þóôå íá åêôõðþíåôáé ç óåëßäá êåöáëßäáò.

Áí Ý÷åôå åêôõðùôÞ PostScript ìå óåéñéáêÞ óýíäåóç, ìðïñåßôå íá êÜíåôå ÷ñÞóç ôçò `lprps`, ç ïðïßá óõíïäåýåôáé áðü Ýíá ößëôñï åîüäïõ, ôï `psof`, ôï ïðïßï êÜíåé ôá ðáñáðÜíù. Óçìåéþóôå ðùò ôï `psof` äåí ÷ñåþíåé ãéá ôéò óåëßäåò êåöáëßäáò.

10.4.3 Åêôõðþóåéò ìÝóù Äéêôýïõ

Ôï FreeBSD õðïóôçñßæåé ôéò åêôõðþóåéò ìÝóù äéêôýïõ: ìðïñåß íá óôåßëåé åñãáóßåò óå áðïìáêñõóìÝíïõò åêôõðùôÝò. Ç Ýííïéá ôçò äéêôõáêÞò åêôýðùóçò áíáöÝñåôáé ãåíéêÜ óå äýï äéáöïñåôéêÜ ðñÜãìáôá:

- Ðñüóâáóç óå åêôõðùôÞ óõíäåäåìÝíï óå áðïìáêñõóìÝíï õðïëïãéóôÞ (host). ÅãêáèéóôÜôå Ýíáí åêôõðùôÞ ìå óõìâáôéêÞ óåéñéáêÞ Þ ðáñÜëëçëç óýíäåóç óå Ýíá õðïëïãéóôÞ. ¸ðåéôá, ñõèìßæåôå ôï **LPD** ãéá íá åíåñãïðïéçèåß ç ðñüóâáóç óôïí åêôõðùôÞ áðü Üëëïõò õðïëïãéóôÝò ôïõ äéêôýïõ. Ç åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò åîçãåß ôéò áðáñáßôçôåò åíÝñãåéåò.
- Ðñüóâáóç óå åêôõðùôÞ óõíäåäåìÝíï êáôåõèåßáí óôï äßêôõï. Åêôüò (Þ áíôß) ôçò óõìâáôéêÞò óåéñéáêÞò Þ ðáñÜëëçëçò èýñáò, ï åêôõðùôÞò ðñÝðåé íá Ý÷åé åðéðñüóèåôá ìéá äéêôõáêÞ äéáóýíäåóç. ¿áò ôÝôïéïò åêôõðùôÞò ìðïñåß íá ëåéôïõñãÞóåé ìå ôïõò åîÞò:
  - Ìðïñåß íá êáôáëáâáßíåé ôï ðñùôüêïëëï **LPD** êáé íá äçìéïõñãåß ïõñÜ áíáìïíÞò ãéá ôéò åñãáóßåò ðïõ ðñïÝñ÷ïíôáé áðü áðïìáêñõóìÝíïõò õðïëïãéóôÝò. Óå áõôÞ ôçí ðåñßðôùóç, åíåñãåß óáí Ýíáò êáíïíéêüò õðïëïãéóôÞò ðïõ åêôåëåß ôï **LPD**. Áêïëïõèåßóôå ôçí ßäéá äéáäéêáóßá ìå ôçí åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò ãéá íá åãêáôáóôÞóåôå áõôüí ôïí åêôõðùôÞ.
  - Ìðïñåß íá õðïóôçñßæåé óýíäåóç äéêôõáêÞò ñïÞò äåäïìÝíùí (data stream). Óå áõôÞ ôçí ðåñßðôùóç, "óõíäÝåôå" ôïí åêôõðùôÞ óå Ýíáí õðïëïãéóôÞ óõíäåäåìÝíï óôï äßêôõï, ï ïðïßïò èá åßíáé õðåýèõíïò ãéá ôçí ðáñï÷Ýôåõóç ôùí åñãáóéþí êáé ôçí áðïóôïëÞ ôïõò óôïí åêôõðùôÞ. Ç åíüôçôá ÅêôõðùôÝò Ìå ÓõíäÝóåéò Äéêôýïõ äßíåé ìåñéêÝò óõìâïõëÝò ãéá ôçí åãêáôÜóôáóç åêôõðùôþí áõôïý ôïõ ôýðïõ.

10.4.3.1 ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò

Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** Ý÷åé åíóùìáôùìÝíç õðïóôÞñéîç ãéá ôçí áðïóôïëÞ åñãáóéþí óå Üëëïõò õðïëïãéóôÝò ðïõ åêôåëïýí ôï **LPD** (Þ ðïõ åßíáé óõìâáôïß ìå ôï **LPD**). Áõôü ôï ÷áñáêôçñéóôéêü óáò åðéôñÝðåé íá åãêáôáóôÞóåôå Ýíáí åêôõðùôÞ óå Ýíá õðïëïãéóôÞ êáé íá Ý÷åôå ðñüóâáóç óå áõôüí áðü Üëëïõò. Åðßóçò äïõëåýåé êáé ìå åêôõðùôÝò ðïõ Ý÷ïõí äéêôõáêÝò äéáóõíäÝóåéò ðïõ êáôáëáâáßíïõí ôï ðñùôüêïëëï **LPD**.

Ãéá íá åíåñãïðïéÞóåôå áõôüí ôïí ôýðï áðïìáêñõóìÝíçò åêôýðùóçò, åãêáôáóôÞóôå ðñþôá Ýíáí åêôõðùôÞ óå Ýíá õðïëïãéóôÞ, ôïí *õðïëïãéóôÞ åêôýðùóçò (printer host)*, ÷ñçóéìïðïéþíôáò ôçí áðëÞ åãêáôÜóôáóç åêôõðùôÞ ðïõ ðåñéãñÜöåôáé óôçí åíüôçôá ÂáóéêÝò Ñõèìßóåéò Åêôõðùôþí. ÊÜíôå üóåò ðñï÷ùñçìÝíåò ñõèìßóåéò ÷ñåéÜæåóôå üðùò áíáöÝñåôáé óôéò Ñõèìßóåéò Åêôõðùôþí ãéá Ðñï÷ùñçìÝíïõò. ÅëÝãîôå ôïí åêôõðùôÞ êáé äåßôå áí äïõëåýåé ìå ôá ÷áñáêôçñéóôéêÜ ôïõ **LPD** ðïõ Ý÷åôå åíåñãïðïéÞóåé. Åðßóçò âåâáéùèåßôå ðùò ï *ôïðéêüò õðïëïãéóôÞò (local* *host)* åßíáé åîõðçñåôïýìåíá ìÝóù ìéáò õðçñåóßáò ôïõ **LPD** óôïí *áðïìáêñõóìÝíï õðïëïãéóôÞ (remote host)* (äåßôå Ðáñåìðüäéóç Åñãáóéþí áðü ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò).

ÅÜí ÷ñçóéìïðïéåßôå åêôõðùôÞ ìå äéêôõáêÞ äéáóýíäåóç ðïõ åßíáé óõìâáôüò ìå ôï **LPD**, ôüôå ï *ï õðïëïãéóôÞò åêôýðùóçò (printer host)* åßíáé ï åí ëüãù åêôõðùôÞò, êáé ôï *üíïìá ôïõ åêôõðùôÞ* åßíáé ôï üíïìá ðïõ Ý÷åôå ïñßóåé ãéá ôïí åêôõðùôÞ. Äåßôå ôçí ôåêìçñßùóç ðïõ óõíïäåýåé ôïí åêôõðùôÞ óáò êáé/Þ ôçí êÜñôá äéêôýïõ ôïõ.

> **Õðüäåéîç:** Áí ÷ñçóéìïðïéåßôå Hewlett Packard Laserjet ìå üíïìá åêôõðùôÞ `text` èá ãßíïíôáé áõôüìáôá ïé ìåôáôñïðÝò áðü LF óå CRLF, åðïìÝíùò äåí ÷ñåéÜæåôáé íá ôñÝîåôå ôï script `hpif`.

ÅðïìÝíùò, óôïõò õðüëïéðïõò õðïëïãéóôÝò üðïõ åðéèõìåßôå íá Ý÷åôå ðñüóâáóç óôïí åêôõðùôÞ, áðëÜ êÜíôå ìéá êáôá÷þñéóç óôï áñ÷åßï `/etc/printcap` ìå ôá áêüëïõèá óôïé÷åßá:

1. ÏíïìÜóôå ôçí êáôá÷þñéóç üðùò åðéèõìåßôå: Ãéá äéêÞ óáò åõêïëßá ðéèáíþò íá èÝëåôå íá ÷ñçóéìïðïéÞóåôå ôï ßäéï üíïìá êáé ôá ßäéá ðáñùíýìéá ìå áõôÜ ôïõ õðïëïãéóôÞ åêôýðùóçò.
2. ÁöÞóôå ôçí éêáíüôçôá `lp` êåíÞ, ãéá ôçí áêñßâåéá (`:lp=:`).
3. ÄçìéïõñãÞóôå Ýíá êáôÜëïãï spooling êáé ðñïóäéïñßóôå ôçí ôïðïèåóßá ôïõ ìå ôçí éêáíüôçôá `sd`. Ôï **LPD** èá áðïèçêåýåé åäþ ôéò åñãáóßåò ðñéí ôçí áðïóôïëÞ ôïõò óôïí õðïëïãéóôÞ åêôýðùóçò.
4. ÔïðïèåôÞóôå ôï üíïìá ôïõ õðïëïãéóôÞ åêôýðùóçò óôçí éêáíüôçôá `rm`.
5. ÔïðïèåôÞóôå ôï üíïìá ôïõ åêôõðùôÞ óôçí éêáíüôçôá `rp`, óôïí *õðïëïãéóôÞ åêôýðùóçò*.

Áõôü åßíáé üëï. Äåí ÷ñåéÜæåôáé íá äçìéïõñãÞóåôå ëßóôá ößëôñùí ìåôáôñïðÞò, äéáóôÜóåéò óåëßäáò, Þ ïôéäÞðïôå Üëëï óôï áñ÷åßï`/etc/printcap`.

Åäþ åßíáé Ýíá ðáñÜäåéãìá. Ï õðïëïãéóôÞò `rose` Ý÷åé äýï åêôõðùôÝò, ôïí `bamboo` êáé ôïí `rattan`. ÈÝëïõìå íá åíåñãïðïéÞóïõìå ôéò åêôõðþóåéò óå áõôïýò ôïõò åêôõðùôÝò ãéá ôïõò ÷ñÞóôåò ôïõ áðïìáêñõóìÝíïõ õðïëïãéóôÞ `orchid`. Åäþ åßíáé ôï áñ÷åßï `/etc/printcap` ôïõ õðïëïãéóôÞ `orchid` (äåßôå ðéï ðßóù óôçí åíüôçôá Åíåñãïðïßçóç Óåëßäùí Êåöáëßäáò). ¹äç Ý÷åé ìéá êáôá÷þñéóç ãéá ôïí åêôõðùôÞ `teak`. Åäþ ðñïóèÝóáìå ôéò áðáñáßôçôåò êáôá÷ùñßóåéò ãéá ôïõò äýï åêôõðùôÝò ôïõ õðïëïãéóôÞ `rose`:

```
#
#  /etc/printcap for host orchid - added (remote) printers on rose
#

#
#  teak is local; it is connected directly to orchid:
#
teak|hp|laserjet|Hewlett Packard LaserJet 3Si:\
        :lp=/dev/lpt0:sd=/var/spool/lpd/teak:mx#0:\
        :if=/usr/local/libexec/ifhp:\
        :vf=/usr/local/libexec/vfhp:\
        :of=/usr/local/libexec/ofhp:

#
#  rattan is connected to rose; send jobs for rattan to rose:
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :lp=:rm=rose:rp=rattan:sd=/var/spool/lpd/rattan:
```

```
#
#  bamboo is connected to rose as well:
#
bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :lp=:rm=rose:rp=bamboo:sd=/var/spool/lpd/bamboo:
```

Ôï ìüíï ðïõ áðïìÝíåé åßíáé íá äçìéïõñãÞóïõìå ôïõò êáôáëüãïõò spooling óôïí êüìâï `orchid`:

```
# mkdir -p /var/spool/lpd/rattan /var/spool/lpd/bamboo
# chmod 770 /var/spool/lpd/rattan /var/spool/lpd/bamboo
# chown daemon:daemon /var/spool/lpd/rattan /var/spool/lpd/bamboo
```

Ôþñá, ïé ÷ñÞóôåò ôïõ `orchid` ìðïñïýí íá åêôõðþíïõí óôïí `rattan` êáé óôïí `bamboo`. Áí, ãéá ðáñÜäåéãìá, Ýíáò ÷ñÞóôçò ôïõ `orchid` ðëçêôñïëïãÞóåé:

```
% lpr -P bamboo -d sushi-review.dvi
```

ôï óýóôçìá **LPD** óôïí `orchid` èá áíôéãñÜøåé ôçí åñãáóßá óôïí êáôÜëïãï spooling `/var/spool/lpd/bamboo` êáé èá óçìåéþóåé ðùò ðñüêåéôáé ãéá åñãáóßá DVI. Ìüëéò ï õðïëïãéóôÞò `rose` Ý÷åé äéáèÝóéìï ÷þñï óôïí êáôÜëïãï spooling ôïõ `bamboo`, ôá äýï **LPDs** èá ìåôáöÝñïõí ôï áñ÷åßï óôïí `rose`. Ôï áñ÷åßï èá ìðåé óå ïõñÜ áíáìïíÞò óôïí õðïëïãéóôÞ `rose` Ýùò üôïõ åêôõðùèåß. Èá ìåôáôñáðåß áðü DVI óå PostScript (áöïý ï `bamboo` åßíáé åêôõðùôÞò PostScript) óôïí õðïëïãéóôÞ `rose`.

10.4.3.2 ÅêôõðùôÝò ìå ÓõíäÝóåéò Äéêôýïõ

Óõ÷íÜ, üôáí áãïñÜæåôå êÜñôá äéêôýïõ ãéá åêôõðùôÞ, Ý÷åôå ôç äõíáôüôçôá åðéëïãÞò äýï åêäüóåùí: ç ìßá åßíáé ðñïóïìïßùóç ôïõ spooler (ç ðéï áêñéâÞ Ýêäïóç) åíþ ç Üëëç áðëÜ óáò åðéôñÝðåé íá óôÝëíåôå äåäïìÝíá ìÝóù áõôÞò óáí íá ÷ñçóéìïðïéïýóáôå ìéá óåéñéáêÞ Þ ðáñÜëëçëç èýñá (ç öôçíÞ Ýêäïóç). ÁõôÞ ç åíüôçôá ðåñéãñÜöåé ðùò íá ÷ñçóéìïðïéåßôå ôçí öôçíÞ Ýêäïóç. Ãéá ôçí ðéï áêñéâÞ Ýêäïóç ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò óôçí ðñïçãïýìåíç åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò.

Ç ìïñöÞ ôïõ áñ÷åßïõ `/etc/printcap` óáò åðéôñÝðåé íá ïñßóåôå ôç äéáóýíäåóç - óåéñéáêÞ Þ ðáñÜëëçëç - ðïõ èá ÷ñçóéìïðïéÞóåôå, êáé (áí ÷ñçóéìïðïéåßôå óåéñéáêÞ äéáóýíäåóç) ôïí ñõèìü baud, ðéèáíüò åëÝã÷ïõò ñïÞò, êáèõóôåñÞóåéò ãéá tabs, ìåôáôñïðÝò ãéá ÷áñáêôÞñåò íÝáò ãñáììÞò, êáé Üëëá. ÁëëÜ äåí õðÜñ÷åé ôñüðïò íá ïñßóåôå ìéá óýíäåóç óå åêôõðùôÞ ðïõ áêïýåé óå èýñá TCP/IP Þ Üëëï ôýðï äéêôýïõ.

Ãéá íá óôåßëåôå äåäïìÝíá óå Ýíá äéêôõáêü åêôõðùôÞ, ÷ñåéÜæåôáé íá áíáðôýîåôå ðñïãñÜììáôá åðéêïéíùíßáò ðïõ íá êáëïýíôáé áðüößëôñá êåéìÝíïõ êáé ößëôñá ìåôáôñïðÞò. Åäþ Ý÷ïõìå Ýíá ôÝôïéï ðáñÜäåéãìá: ôï script `netprint` ðáßñíåé üëá ôá äåäïìÝíá áðü ôï standard input êáé ôá óôÝëíåé óå Ýíáí åêôõðùôÞ óõíäåäåìÝíï óôï äßêôõï. Ïñßæïõìå óôï `netprint` ôï üíïìá ôïõ åêôõðùôÞ ùò ðñþôç ðáñÜìåôñï, êáé ôïí áñéèìü èýñáò óôçí ïðïßá óõíäÝåôáé ùò äåýôåñç. Óçìåéþóôå ðùò áõôü ï ôñüðïò õðïóôçñßæåé ìüíï åðéêïéíùíßá ìéáò êáôåýèõíóçò (áðü ôï FreeBSD óôïí åêôõðùôÞ). Ðïëëïß äéêôõáêïß åêôõðùôÝò õðïóôçñßæïõí áìößäñïìç åðéêïéíùíßá, êáé åßíáé ðïëý ðéèáíü íá åðéèõìåßôå íá åêìåôáëëåõôåßôå ôá ðñïôåñÞìáôá ôïõò (ãéá íá åëÝã÷åôå ôçí êáôÜóôáóç ôïõ åêôõðùôÞ, ãéá êáôáìÝôñçóç åêôõðþóåùí, êëð.).

```
#!/usr/bin/perl
#
#  netprint - Text filter for printer attached to network
#  Installed in /usr/local/libexec/netprint
#
$#ARGV eq 1 || die "Usage: $0 <printer-hostname> <port-number>";
```

```
$printer_host = $ARGV[0];
$printer_port = $ARGV[1];

require 'sys/socket.ph';

($ignore, $ignore, $protocol) = getprotobyname('tcp');
($ignore, $ignore, $ignore, $ignore, $address)
    = gethostbyname($printer_host);

$sockaddr = pack('S n a4 x8', &AF_INET, $printer_port, $address);

socket(PRINTER, &PF_INET, &SOCK_STREAM, $protocol)
    || die "Can't create TCP/IP stream socket: $!";
connect(PRINTER, $sockaddr) || die "Can't contact $printer_host: $!";
while (<STDIN>) { print PRINTER; }
exit 0;
```

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áõôü ôï script óå äéÜöïñá ößëôñá. Áò õðïèÝóïõìå ðùò Ý÷ïõìå Ýíáí åêôõðùôÞ ãñáììÞò Diablo 750-N óõíäåäåìÝíï óôï äßêôõï. Ï åêôõðùôÞò äÝ÷åôáé äåäïìÝíá ðñïò åêôýðùóç óôçí èýñá 5100. Ôï üíïìá ôïõ åêôõðùôÞ óôï äßêôõï åßíáé `scrivener`. Åäþ åßíáé ôï ößëôñï êåéìÝíïõ ãéá ôïí åêôõðùôÞ:

```
#!/bin/sh
#
#  diablo-if-net - Text filter for Diablo printer 'scrivener' listening
#  on port 5100.   Installed in /usr/local/libexec/diablo-if-net
#
exec /usr/libexec/lpr/lpf "$@" | /usr/local/libexec/netprint scrivener 5100
```

10.4.4 ¸ëåã÷ïò Ðñüóâáóçò êáé Ðåñéïñéóìïß óôç ×ñÞóç ôùí Åêôõðùôþí

ÁõôÞ ç åíüôçôá äßíåé ðëçñïöïñßåò ãéá ôïí Ýëåã÷ï ðñüóâáóçò êáé ôïí ðåñéïñéóìü ÷ñÞóçò ôùí åêôõðùôþí. Ôï óýóôçìá **LPD** óáò åðéôñÝðåé íá åëÝã÷åôå ðïéüò ìðïñåß íá Ý÷åé ðñüóâáóç óå êÜèå åêôõðùôÞ, ôüóï ôïðéêÜ üóï êáé áðïìáêñõóìÝíá, êáé åðßóçò áí ìðïñïýí ïé ÷ñÞóôåò íá åêôõðþíïõí ðïëëáðëÜ áíôßãñáöá, ðüóï ìåãÜëåò ìðïñïýí íá åßíáé ïé åñãáóßåò ôïõò, êáé ðüóï ìåãÜëåò ìðïñïýí íá ãßíïõí ïé ïõñÝò áíáìïíÞò (print queues).

10.4.4.1 Ðåñéïñéóìüò Åêôýðùóçò Ðïëëáðëþí ÁíôéãñÜöùí

Ôï óýóôçìá **LPD** äéåõêïëýíåé ôïõò ÷ñÞóôåò íá åêôõðþóïõí ðïëëáðëÜ áíôßãñáöá åíüò áñ÷åßïõ. Ïé ÷ñÞóôåò ìðïñïýí íá åêôõðþíïõí åñãáóßåò ìå `lpr -#5` (ãéá ðáñÜäåéãìá) êáé íá ðáßñíïõí ðÝíôå áíôßãñáöá êÜèå áñ÷åßïõ ôçò åñãáóßáò åêôýðùóçò. Ôï áí áõôü åßíáé êáëü, åîáñôÜôáé áðü åóÜò.

Áí ðéóôåýåôå ðùò ôá ðïëëáðëÜ áíôßãñáöá äçìéïõñãïýí Üóêïðç êáôáðüíçóç ôùí åêôõðùôþí óáò, ìðïñåßôå íá áðåíåñãïðïéÞóåôå ôçí åðéëïãÞ `-#` óôï lpr(1) ðñïóèÝôïíôáò ôçí éêáíüôçôá `sc` óôï áñ÷åßï `/etc/printcap`. ¼ôáí ïé ÷ñÞóôåò áðïóôÝëëïõí åñãáóßåò ìå ôçí åðéëïãÞ `-#`, èá âëÝðïõí:

```
lpr: multiple copies are not allowed
```

Óçìåéþóôå ðùò áí Ý÷åôå ñõèìßóåé ðñüóâáóç óå Ýíáí åêôõðùôÞ áðïìáêñõóìÝíá (äåßôå ôçí åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò), èá ÷ñåéáóôåß íá ðñïóèÝóåôå ôçí éêáíüôçôá `sc` óå üëá ôá áðïìáêñõóìÝíá áñ÷åßá `/etc/printcap`, äéáöïñåôéêÜ ïé ÷ñÞóôåò èá Ý÷ïõí áêüìç ôçí äõíáôüôçôá íá áðïóôÝëëïõí åñãáóßåò ðïëëáðëþí áíôéãñÜöùí ÷ñçóéìïðïéþíôáò äéáöïñåôéêü êüìâï.

Åäþ åßíáé Ýíá ðáñÜäåéãìá. Áõôü åßíáé ôï áñ÷åßï `/etc/printcap` ãéá ôïí êüìâï `rose`. Ï åêôõðùôÞò `rattan` åßíáé äõíáôü ìç÷Üíçìá êáé åðéôñÝðåé ôçí åêôýðùóç ðïëëáðëþí áíôéãñÜöùí, áëëÜ ï åêôõðùôÞò laser `bamboo` åßíáé ðéï åõáßóèçôï, åðïìÝíùò èá áðåíåñãïðïéÞóïõìå ôç äõíáôüôçôá ðïëëáðëþí áíôéãñÜöùí ðñïóèÝôïíôáò ôçí éêáíüôçôá `sc`:

```
#
#  /etc/printcap for host rose - restrict multiple copies on bamboo
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:sc:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:rw:\
        :if=/usr/local/libexec/psif:\
        :df=/usr/local/libexec/psdf:
```

Ôþñá, èá ÷ñåéáóôåß íá ðñïóèÝóïõìå åðßóçò ôçí éêáíüôçôá `sc` óôï áñ÷åßï `/etc/printcap` ôïõ êüìâïõ `orchid` (êáé åíþ âñéóêüìáóôå óå áõôü, åðéôñÝøôå ìáò íá áðåíåñãïðïéÞóïõìå ôá ðïëëáðëÜ áíôßãñáöá ãéá ôïí åêôõðùôÞ `teak`):

```
#
#  /etc/printcap for host orchid - no multiple copies for local
#  printer teak or remote printer bamboo
teak|hp|laserjet|Hewlett Packard LaserJet 3Si:\
        :lp=/dev/lpt0:sd=/var/spool/lpd/teak:mx#0:sc:\
        :if=/usr/local/libexec/ifhp:\
        :vf=/usr/local/libexec/vfhp:\
        :of=/usr/local/libexec/ofhp:

rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :lp=:rm=rose:rp=rattan:sd=/var/spool/lpd/rattan:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :lp=:rm=rose:rp=bamboo:sd=/var/spool/lpd/bamboo:sc:
```

×ñçóéìïðïéþíôáò ôçí éêáíüôçôá `sc`, ðñïëáìâÜíïõìå ôçí ÷ñÞóç ôùí åíôïëþí `lpr -#`, áëëÜ äåí Ý÷ïõìå áêüìç ôçí äõíáôüôçôá íá ðáñåìðïäßóïõìå ôïõò ÷ñÞóôåò íá ôñÝîïõí ôçí åíôïëÞ lpr(1) ðïëëÝò öïñÝò, Þ íá áðïóôåßëïõí ôï ßäéï áñ÷åßï ðïëëÝò öïñÝò óå ìßá ìïíáäéêÞ åñãáóßá, üðùò åäþ:

```
% lpr forsale.sign forsale.sign forsale.sign forsale.sign forsale.sign
```

ÕðÜñ÷ïõí ðïëëïß ôñüðïé ðñüëçøçò áõôþí ôùí åíåñãåéþí (óõìðåñéëáìâÜíïíôáò êáé ôçí ðåñßðôùóç íá ôï áãíïÞóåôå) ðïõ åßóôå åëåýèåñïé íá åîåñåõíÞóåôå.

10.4.4.2 Ðåñéïñßæïíôáò ôçí Ðñüóâáóç óå ÅêôõðùôÝò

Ìðïñåßôå íá åëÝã÷åôå ðïéüò ìðïñåß íá åêôõðþíåé óå ðïéüí åêôõðùôÞ ÷ñçóéìïðïéþíôáò ôïõò ìç÷áíéóìïýò ïìÜäùí (groups) ôïõ UNIX êáé ôçí éêáíüôçôá `rg` óôï `/etc/printcap`. ÁðëÜ ôïðïèåôÞóôå ôïõò ÷ñÞóôåò ðïõ èÝëåôå íá Ý÷ïõí ðñüóâáóç óå êÜðïéïí åêôõðùôÞ óå ìéá óõãêåêñéìÝíç ïìÜäá (÷ñçóôþí), êáé äçëþóôå áõôÞ ôçí ïìÜäá óôçí éêáíüôçôá `rg`.

¼ëïé ïé ÷ñÞóôåò ðïõ äåí áíÞêïõí óôçí ïìÜäá (óõìðåñéëáìâáíïìÝíïõ êáé ôïõ `root`) èá äÝ÷ïíôáé ôï áêüëïõèï ìÞíõìá: `lpr: Not a member of the restricted group` üôáí ðñïóðáèïýí íá åêôõðþóïõí óôïí åëåã÷üìåíï åêôõðùôÞ.

¼ðùò êáé ìå ôçí éêáíüôçôá `sc` (ðåñéïñéóìüò ðïëëáðëþí áíôéãñÜöùí), èá ÷ñåéáóôåß íá ðñïóäéïñßóåôå ôçí `rg` óôïõò áðïìáêñõóìÝíïõò êüìâïõò ðïõ èá Ý÷ïõí ðñüóâáóç óôïõò åêôõðùôÝò óáò, áí íïìßæåôå ðùò áõôü åßíáé óùóôü (äåßôå ôçí åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò).

Ãéá ðáñÜäåéãìá, èá áöÞóïõìå ãéá üëïõò åëåýèåñç ôçí ðñüóâáóç óôïí åêôõðùôÞ `rattan`, áëëÜ ìüíï ïé ÷ñÞóôåò ôçò ïìÜäáò `artists` èá ìðïñïýí íá ÷ñçóéìïðïéÞóïõí ôïí bamboo. Åäþ åßíáé ôï ãíùóôü ìáò `/etc/printcap` ãéá ôïí êüìâï `rose`:

```
#
#  /etc/printcap for host rose - restricted group for bamboo
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:

bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:sc:rg=artists:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:rw:\
        :if=/usr/local/libexec/psif:\
        :df=/usr/local/libexec/psdf:
```

ÅðéôñÝøôå ìáò íá ìçí áëëÜîïõìå ôï áñ÷åßï `/etc/printcap` áðü ôï Üëëï ðáñÜäåéãìá (ãéá ôïí õðïëïãéóôÞ `orchid`). Öõóéêü, ïðïéïóäÞðïôå ÷ñÞóôçò ôïõ `orchid` ìðïñåß íá åêôõðþóåé óôïí `bamboo`. ºóùò üìùò íá åðéôñÝðïõìå ìüíï óå óõãêåêñéìÝíïõò ÷ñÞóôåò ôçí ðñüóâáóç óôïí õðïëïãéóôÞ `orchid`, êáé èÝëïõìå áõôïß ïé ÷ñÞóôåò íá Ý÷ïõí ðñüóâáóç óôïí åêôõðùôÞ.[1] ßóùò ðÜëé, êáé ü÷é.

Óçìåßùóç: ÅðéôñÝðåôáé ìüíï ìéá ðåñéïñéóìÝíç ïìÜäá áíÜ åêôõðùôÞ.

10.4.4.3 ¸ëåã÷ïò ÌåãÝèïõò ôùí ÁðåóôáëìÝíùí Åñãáóéþí

Áí ðïëëïß ÷ñÞóôåò Ý÷ïõí ðñüóâáóç óôïõò åêôõðùôÝò óáò, ðéèáíþò íá ÷ñåéÜæåôáé íá èÝóåôå Ýíá áíþôáôï üñéï óôï ìÝãåèïò áñ÷åßùí ðïõ ìðïñïýí íá áðïóôåßëïõí ïé ÷ñÞóôåò ãéá åêôýðùóç. Áöïý êáé áí õðÜñ÷åé áñêåôü ÷þñïò óôï óýóôçìá áñ÷åßùí ðïõ öéëïîåíåß ôïõò êáôáëüãïõò spool, èá ðñÝðåé óßãïõñá íá âåâáéùèåßôå üôé õðÜñ÷åé ÷þñïò ãéá ôéò åñãáóßåò üëùí ôùí ÷ñçóôþí.

Ôï **LPD** óáò åðéôñÝðåé íá ïñéèåôÞóåôå ôï ìÝãéóôï áñéèìü bytes ðïõ ðåñéÝ÷åé ìéá åñãáóßá, ìå ôçí éêáíüôçôá `mx`. Ç ìïíÜäá ìÝôñçóçò åßíáé óå `BUFSIZ` blocks, ôá ïðïßá åßíáé 1024 bytes. Áí èÝóåôå ìçäÝí óå áõôÞ ôçí éêáíüôçôá, äåí èá õðÜñ÷ïõí üñéá óôï ìÝãåèïò ôùí áñ÷åßùí. Ùóôüóï, áí äåí Ý÷åé ïñéóôåß ç éêáíüôçôá `mx`, ôüôå èá ÷ñçóéìïðïéåßôáé ç ðñïåðéëåãìÝíç ôéìÞ ôùí 1000 blocks.

Óçìåßùóç: Ôï üñéï åöáñìüæåôáé óôá *áñ÷åßá* ìéáò åñãáóßáò, êáé *ü÷é* óôï óõíïëéêü ìÝãåèïò ôçò åñãáóßáò.

Ôï **LPD** äåí èá áðïññßøåé Ýíá áñ÷åßï ðïõ îåðåñíÜ ôï üñéï ìåãÝèïõò ðïõ Ý÷åôå èÝóåé. ÁíôéèÝôùò, èá ôï ôïðïèåôÞóåé óôçí ïõñÜ áíáìïíÞò ìå ìÝãåèïò ßóï ìå ôï ìÝãéóôï åðéôñåðôü, ôï ïðïßï êáé èá åêôõðþóåé ôåëéêÜ. Ôï õðüëïéðï áñ÷åßï áðïññßðôåôáé. Áí áõôü åßíáé óùóôü Þ ëáíèáóìÝíï ôñüðï áíôéìåôþðéóçò ãéá ôçí õðÝñâáóç ôïõ ïñßïõ, åßíáé èÝìá ðñïò óõæÞôçóç.

Áò ïñéèåôÞóïõìå óôï ðáñÜäåéãìá ìáò ôïõò åêôõðùôÝò `rattan` êáé `bamboo`. ÅðåéäÞ ôá áñ÷åßá PostScript ôùí `artists` ôåßíïõí ðñïò ìåãÜëá ìåãÝèç, èá èÝóïõìå Ýíá üñéï ðÝíôå megabytes. Äåí èá èÝóïõìå üñéá ãéá ôïí åêôõðùôÞ ãñáììÞò áðëïý êåéìÝíïõ:

```
#
#  /etc/printcap for host rose
#

#
#  No limit on job size:
#
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:mx#0:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:

#
#  Limit of five megabytes:
#
bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:sc:rg=artists:mx#5000:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:rw:\
        :if=/usr/local/libexec/psif:\
        :df=/usr/local/libexec/psdf:
```

Êáé ðÜëé, ôá üñéá åöáñìüæïíôáé ìüíï ãéá ôïõò ôïðéêïýò ÷ñÞóôåò. Áí Ý÷åôå åíåñãïðïéÞóåé áðïìáêñõóìÝíç ðñüóâáóç ãéá ôïõò åêôõðùôÝò óáò, ôá üñéá áõôÜ äåí éó÷ýïõí ãéá ôïõò áðïìáêñõóìÝíïõò ÷ñÞóôåò. Èá ÷ñåéáóôåß íá ðñïóäéïñßóåôå ìå ôçí éêáíüôçôá `mx` êáé ôá áðïìáêñõóìÝíá áñ÷åßá `/etc/printcap`. Äåßôå ôçí åíüôçôá ÅêôõðùôÝò ÅãêáôåóôçìÝíïé óå ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò åêôõðþóåéò áðü áðïìáêñõóìÝíïõò õðïëïãéóôÝò.

ÕðÜñ÷åé êáé Üëëïò åîåéäéêåõìÝíïò ôñüðïò ðåñéïñéóìïý ôïõ ìåãÝèïõò åñãáóéþí ãéá áðïìáêñõóìÝíïõò åêôõðùôÝò. Äåßôå ôçí åíüôçôá Ðåñéïñéóìüò Åñãáóéþí áðü ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò.

10.4.4.4 Ðåñéïñéóìüò Åñãáóéþí áðü ÁðïìáêñõóìÝíïõò ÕðïëïãéóôÝò

Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** ðáñÝ÷åé äéÜöïñïõò ôñüðïõò ðåñéïñéóìïý ôùí åñãáóéþí áðü áðïìáêñõóìÝíïõò õðïëïãéóôÝò:

Ðåñéïñéóìüò õðïëïãéóôþí

Ìðïñåßôå íá åëÝã÷åôå áðü ðïéïõò áðïìáêñõóìÝíïõò õðïëïãéóôÝò èá äÝ÷åôáé áéôÞóåéò åêôýðùóçò ôï ôïðéêü **LPD**, ÷ñçóéìïðïéþíôáò ôá áñ÷åßá `/etc/hosts.equiv` êáé `/etc/hosts.lpd`. Ôï **LPD** åëÝã÷åé íá äåé áí ç åéóåñ÷üìåíç áßôçóç ðñïÝñ÷åôáé áðü Ýíáí õðïëïãéóôÞ ðïõ áíáöÝñåôáé óå êÜðïéï áðü ôá äýï áñ÷åßá. Áí ü÷é, ôï **LPD** áðïññßðôåé ôçí áßôçóç.

Ç ìïñöÞ áõôþí ôùí áñ÷åßùí åßíáé áðëÞ: Ýíá üíïìá õðïëïãéóôÞ áíÜ ãñáììÞ. ÐáñáôçñÞóôå ðùò ôï áñ÷åßï `/etc/hosts.equiv` ÷ñçóéìïðïéåßôáé êáé áðü ôï ðñùôüêïëëï ruserok(3), êáé åðçñåÜæåé ðñïãñÜììáôá üðùò ôï rsh(1) êáé ôï rcp(1), åðïìÝíùò íá åßóôå ðñïóåêôéêïß.

Ãéá ðáñÜäåéãìá, åäþ åßíáé ôï áñ÷åßï `/etc/hosts.lpd` óôïí õðïëïãéóôÞ `rose`:

```
orchid
violet
madrigal.fishbaum.de
```

Áõôü óçìáßíåé ðùò ï `rose` äÝ÷åôáé áéôÞóåéò áðü ôïõò õðïëïãéóôÝò `orchid`, `violet`, êáé `madrigal.fishbaum.de`. Áí êÜðïéïò Üëëïò õðïëïãéóôÞò ðñïóðáèÞóåé íá áðïêôÞóåé ðñüóâáóç óôï **LPD** ôïõ `rose`, ç åñãáóßá èá áðïññéöèåß.

Ðåñéïñéóìüò óôï ÌÝãåèïò

Ìðïñåßôå íá åëÝã÷åôå ðüóïò åëåýèåñïò ÷þñïò ðñÝðåé íá áðïìÝíåé óôï óýóôçìá áñ÷åßùí üðïõ âñßóêåôáé ï êáôÜëïãïò spool. ÄçìéïõñãÞóôå Ýíá áñ÷åßï ìå üíïìá `minfree` óôïí êáôÜëïãï spool ãéá ôïí ôïðéêü åêôõðùôÞ. ÅéóÜãåôå óå áõôü ôï áñ÷åßï Ýíáí áñéèìü ðïõ áíôéðñïóùðåýåé ðüóá blocks äßóêïõ (512 bytes) åëåýèåñïõ ÷þñïõ ðñÝðåé íá õðÜñ÷ïõí ãéá íá åßíáé äåêôÞ ìéá áðïìáêñõóìÝíç åñãáóßá.

Áõôü óáò åðéôñÝðåé íá åßóôå âÝâáéïé ðùò ïé áðïìáêñõóìÝíïé ÷ñÞóôåò äåí èá ãåìßóïõí ôï óýóôçìá áñ÷åßùí óáò. Ìðïñåßôå åðßóçò íá ôï ÷ñçóéìïðïéÞóåôå ãéá íá äþóåôå ìéêñÞ ðñïôåñáéüôçôá óôïõò ôïðéêïýò ÷ñÞóôåò: ïé ôïðéêïß ÷ñÞóôåò èá ìðïñïýí íá óôÝëíïõí åñãáóßåò óôçí ïõñÜ áíáìïíÞò áêüìç êáé üôáí ï åëåýèåñïò ÷þñïò ôïõ äßóêïõ Ý÷åé ðÝóåé êÜôù áðü ôïí áñéèìü ðïõ áíáöÝñåôáé óôï áñ÷åßï `minfree`.

Ãéá ðáñÜäåéãìá, áò ðñïóèÝóïõìå Ýíá áñ÷åßï `minfree` ãéá ôïí åêôõðùôÞ `bamboo`. ÅîåôÜæïõìå ôï `/etc/printcap` ãéá íá âñïýìå ôïí êáôÜëïãï spool ãéá áõôüí ôïí åêôõðùôÞ. Åäþ åßíáé ç êáôá÷þñéóç ãéá ôïí `bamboo`:

```
bamboo|ps|PS|S|panasonic|Panasonic KX-P4455 PostScript v51.4:\
        :sh:sd=/var/spool/lpd/bamboo:sc:rg=artists:mx#5000:\
        :lp=/dev/ttyu5:ms#-parenb cs8 clocal crtscts:rw:mx#5000:\
        :if=/usr/local/libexec/psif:\
        :df=/usr/local/libexec/psdf:
```

Ï êáôÜëïãïò spool êáèïñßæåôáé óôçí éêáíüôçôá `sd`. Èá èÝóïõìå ôñßá megabytes (éóïäõíáìåß ìå 6144 disk blocks) ùò ôï ìÝãåèïò ôïõ åëåýèåñïõ ÷þñïõ ðïõ ðñÝðåé íá õðÜñ÷åé óôï óýóôçìá áñ÷åßùí, þóôå ôï **LPD** íá äÝ÷åôáé áðïìáêñõóìÝíåò åñãáóßåò:

```
# echo 6144 > /var/spool/lpd/bamboo/minfree
```

Ðåñéïñéóìüò ÷ñçóôþí

Ìðïñåßôå íá åëÝã÷åôå ðïéüò áðïìáêñõóìÝíïò ÷ñÞóôçò ìðïñåß íá åêôõðþíåé óôïõò ôïðéêïýò åêôõðùôÝò ïñßæïíôáò ôçí éêáíüôçôá `rs` óôï `/etc/printcap`. ¼ôáí åìöáíßæåôáé ç `rs` óå ìéá êáôá÷þñéóç êÜðïéïõ ôïðéêÜ óõíäåäåìÝíïõ åêôõðùôÞ, ôï **LPD** èá äå÷èåß åñãáóßåò áðü áðïìáêñõóìÝíïõò õðïëïãéóôÝò *áí* ï ÷ñÞóôçò ðïõ áðïóôÝëëåé ôçí åñãáóßá Ý÷åé ëïãáñéáóìü óôïí ôïðéêü õðïëïãéóôÞ êáé ìå ôï ßäéï üíïìá ÷ñÞóôç. ÄéáöïñåôéêÜ, ôï **LPD** èá áðïññßøåé ôçí åñãáóßá.

ÁõôÞ ç éêáíüôçôá åßíáé éäéáßôåñá ÷ñÞóéìç óå ðåñéâÜëëïíôá üðïõ õðÜñ÷ïõí (ãéá ðáñÜäåéãìá) äéáöïñåôéêÜ ôìÞìáôá ðïõ ìïéñÜæïíôáé ôï äßêôõï, êáé êÜðïéïé ÷ñÞóôåò ðñÝðåé íá õðåñâáßíïõí ôá óýíïñá ôïõ ôìÞìáôïò. Äçìéïõñãþíôáò ëïãáñéáóìïýò óôá óõóôÞìáôá óáò, èá ìðïñïýí íá ÷ñçóéìïðïéïýí ôïõò åêôõðùôÝò óáò áðü ôï äéêü ôïõò ôìÞìá ôçò åðé÷åßñçóçò. Áí åðéèõìåßôå íá ôïõò åðéôñÝðåôå íá ÷ñçóéìïðïéïýí *ìüíï* ôïõò åêôõðùôÝò êáé ü÷é ôá ìç÷áíÞìáôá óáò, ôüôå ìðïñåßôå íá äçìéïõñãÞóåôå ëïãáñéáóìïýò “token”, äß÷ùò ðñïóùðéêïýò êáôáëüãïõò êáé ìå êÝëõöïò ðïõ äåí ìðïñåß íá ÷ñçóéìïðïéçèåß, üðùò ôï `/usr/bin/false`.

10.4.5 ÊáôáìÝôñçóç ×ñÞóçò Åêôõðùôþí

Áðïöáóßóáôå üôé ÷ñåéÜæåôáé íá ÷ñåþíåôå ãéá ôéò åêôõðþóåéò óáò. Êáé ãéáôß ü÷é; Ôï ÷áñôß êáé ôï ìåëÜíé êïóôßæïõí ÷ñÞìáôá. Êáé åðéðëÝïí õðÜñ÷åé êüóôïò óõíôÞñçóçò — ïé åêôõðùôÝò áðïôåëïýíôáé áðü êéíçôÜ ìÝñç êáé Ý÷ïõí ôçí ôÜóç íá ÷áëÜíå. ¸÷åôå åîåôÜóåé ôïõò åêôõðùôÝò óáò, ôïí ôñüðï ðïõ ÷ñçóéìïðïéïýíôáé, êáé ôï êüóôïò óõíôÞñçóçò êáé Ý÷åôå õðïëïãßóåé ìéá ÷ñÝùóç áíÜ óåëßäá (Þ áíÜ ìÝôñï, áíÜ ðüäé, Þ Üëëç ìïíÜäá ìÝôñçóçò). Ôï èÝìá åßíáé ôþñá ðùò ìðïñåßôå ðñáãìáôéêÜ íá îåêéíÞóåôå íá êáôáìåôñÜôå ôéò åêôõðþóåéò óáò.

Ôá Üó÷çìá íÝá åßíáé ðùò ôï óýóôçìá ðáñï÷Ýôåõóçò ôïõ **LPD** äåí ðáñÝ÷åé ðïëý âïÞèåéá óå áõôü ôïí ôïìÝá. Ç êáôáìÝôñçóç åîáñôÜôáé óå ìåãÜëï âáèìü áðü ôïí ôýðï ôïõ åêôõðùôÞ ðïõ ÷ñçóéìïðïéåßôå, ôïõò ôýðïõò áñ÷åßùí ðïõ åêôõðþíåôå, êáé ôéò *äéêÝò óáò* áðáéôÞóåéò ãéá ôçí ÷ñÝùóç ôùí åêôõðþóåùí.

Ãéá ôçí êáôáìÝôñçóç, èá ðñÝðåé íá ìåôáôñÝøåôå ôï ößëôñï êåéìÝíïõ (ãéá ôç ÷ñÝùóç åñãáóéþí áðëïý êåéìÝíïõ) ôïõ åêôõðùôÞ êáé ôá ößëôñá ìåôáôñïðÞò (ãéá ôç ÷ñÝùóç üëùí ôùí Üëëùí ôýðùí áñ÷åßùí) þóôå íá ìåôñïýí óåëßäåò Þ íá æçôïýí íá ìÜèïõí áðü ôïí åêôõðùôÞ ôïí áñéèìü ôùí åêôõðùìÝíùí óåëßäùí. Äåí èá óáò âïçèÞóåé éäéáßôåñá ç ÷ñÞóç ößëôñïõ åîüäïõ, áðü ôç óôéãìÞ ðïõ äåí ìðïñåß íá êÜíåé êáôáìÝôñçóç. Äåßôå ôçí åíüôçôá Ößëôñá.

ÃåíéêÜ, õðÜñ÷ïõí äýï ôñüðïé ãéá íá êÜíåôå êáôáìÝôñçóç:

- Ç *ÐåñéïäéêÞ êáôáìÝôñçóç* åßíáé ï ðéï óõíçèéóìÝíïò ôñüðïò, ðéèáíþò ãéáôß åßíáé ï åõêïëüôåñïò. ÊÜèå öïñÜ ðïõ êÜðïéïò åêôõðþíåé ìéá åñãáóßá, ôï ößëôñï äçìéïõñãåß Ýíá áñ÷åßï êáôáãñáöÞò üðïõ áíáöÝñåé ôïí ÷ñÞóôç, ôïí õðïëïãéóôÞ, êáé ôïí áñéèìü ôùí óåëßäùí. ÊÜèå ìÞíá, åîÜìçíï, ÷ñüíï, Þ Üëëç ÷ñïíéêÞ ðåñßïäï ôçò áñåóêåßáò óáò, óõëëÝãåôå ôá áñ÷åßá êáôáãñáöÞò ãéá ôïõò äéÜöïñïõò åêôõðùôÝò, ëïãáñéÜæåôå ôéò óåëßäåò ðïõ áíáëïãïýí óôïõò ÷ñÞóôåò, êáé ÷ñåþíåôå áíáëüãùò. ¸ðåéôá óâÞíåôå ôá óôïé÷åßá áðü ôá áñ÷åßá êáôáãñáöÞò, îåêéíþíôáò áðü êáèáñÞ êáôÜóôáóç ãéá ôçí åðüìåíç ðåñßïäï.
- Ç *ÊáôáìÝôñçóç êáôÜ ôç ÷ñÞóç* åßíáé ëéãüôåñï ãíùóôÞ, ßóùò åðåéäÞ åßíáé ðéï äýóêïëïò ôñüðïò. Óå áõôÞ ôç ìÝèïäï ôá ößëôñá ÷ñåþíïõí ôïõò ÷ñÞóôåò ãéá ôéò åêôõðþóåéò ôïõò áìÝóùò ìüëéò áõôÝò ðñáãìáôïðïéçèïýí. ¼ðùò êáé ìå ôçí êáôáãñáöÞ ÷ñÞóçò äßóêïõ (disk quotas), ç êáôáìÝôñçóç åßíáé Üìåóç. Ìðïñåßôå íá ðñïëáìâÜíåôå ôçí ÷ñÞóç åêôõðùôþí áðü ÷ñÞóôåò ðïõ Ý÷ïõí ÷ôõðÞóåé êüêêéíï, êáé ìðïñåßôå íá ðáñÝ÷åôå óôïõò ÷ñÞóôåò Ýíá ôñüðï ãéá íá åëÝã÷ïõí êáé íá ñõèìßæïõí ôïí “üãêï åêôõðþóåùí (print quotas).” ÁëëÜ áõôÞ ç ìÝèïäïò ðñïûðïèÝôåé ëßãï êþäéêá âÜóåùí äåäïìÝíùí ãéá ôçí êáôáãñáöÞ ÷ñçóôþí êáé ôùí åí ëüãù ìåãåèþí.

Ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** õðïóôçñßæåé åýêïëá êáé ôéò äýï ìåèüäïõò: áðü ôç óôéãìÞ ðïõ ðñÝðåé åóåßò íá ðáñÝ÷åôå ôá ößëôñá (ôéò ðåñéóóüôåñåò öïñÝò), èá ðñÝðåé åðßóçò íá ðáñÝ÷åôå êáé ôïí êþäéêá êáôáìÝôñçóçò. ÁëëÜ õðÜñ÷åé êáé Ýíá êáëü óå áõôÞ ôçí õðüèåóç: Ý÷åôå áðåñéüñéóôç åõåëéîßá óôéò ìåèüäïõò êáôáìÝôñçóçò. Ãéá ðáñÜäåéãìá, ìðïñåßôå íá åðéëÝîåôå ðåñéïäéêÞ Þ êáôÜ ôç ÷ñÞóç êáôáìÝôñçóç. Ìðïñåßôå íá åðéëÝîåôå ôéò ðëçñïöïñßåò ðïõ èá êáôáãñÜöïíôáé: ïíüìáôá ÷ñçóôþí, ïíüìáôá õðïëïãéóôþí, ôýðïõò åñãáóéþí, ôõðùìÝíåò óåëßäåò, ôåôñáãùíéêÜ ìÝôñá ÷áñôéïý ðïõ ÷ñçóéìïðïéÞèçêå, ðüóïò ÷ñüíïò ÷ñåéÜóôçêå ãéá íá ãßíåé ç åêôýðùóç, êáé ðïëëÜ áêüìá. Êáé üëá áõôÜ ãßíïíôáé ìåôáôñÝðïíôáò ôá ößëôñá ãéá íá áðïèçêåýïõí áõôÝò ôéò ðëçñïöïñßåò.

10.4.5.1 ÃñÞãïñç êáé Ðñü÷åéñç ÊáôáìÝôñçóç Åêôõðþóåùí

Ôï FreeBSD äéáôßèåôáé ìå äýï ðñïãñÜììáôá ðïõ ìðïñïýí íá ðáñÝ÷ïõí Üìåóá áðëÞ ðåñéïäéêÞ êáôáìÝôñçóç. Åßíáé ôï ößëôñï êåéìÝíïõ `lpf`, ðïõ ðåñéãñÜöåôáé óôçí åíüôçôá lpf: Ýíá Ößëôñï ÊåéìÝíïõ, êáé ôï pac(8), Ýíá ðñüãñáììá ðïõ óõëëÝãåé êáé áèñïßæåé êáôá÷ùñßóåéò áðü áñ÷åßá êáôáìåôñÞóåùí.

¼ðùò áíáöÝñáìå óôçí åíüôçôá ôùí ößëôñùí (Ößëôñá), ôï **LPD** îåêéíÜ ôá ößëôñá êåéìÝíïõ êáé ìåôáôñïðÞò ðåñíþíôáò óôçí ãñáììÞ åíôïëþí ôïõ ößëôñïõ êáé ôï üíïìá ôïõ áñ÷åßïõ êáôáãñáöÞò. Ôá ößëôñá ìðïñïýí íá ÷ñçóéìïðïéÞóïõí áõôÞ ôçí ðáñÜìåôñï ãéá íá îÝñïõí ðïõ íá ãñÜøïõí ôéò êáôá÷ùñßóåéò êáôáìÝôñçóçò. Ôï üíïìá ôïõ áñ÷åßïõ êáôáìÝôñçóçò öáßíåôáé óôçí éêáíüôçôá `af` óôï `/etc/printcap`, êáé áí äåí ïñßæåôáé ç ðëÞñçò äéáäñïìÞ ôïõ, ÷ñçóéìïðïéåßôáé ç ó÷åôéêÞ äéáäñïìÞ ùò ðñïò ôïí êáôÜëïãï spool.

Ôï **LPD** îåêéíÜ ôï `lpf` ìå ðáñáìÝôñïõò ðëÜôïõò êáé ìÞêïõò óåëßäáò (áðü ôéò éêáíüôçôåò `pw` êáé `pl`). Ôï `lpf` ÷ñçóéìïðïéåß áõôÝò ôéò ðáñáìÝôñïõò ãéá íá ðñïóäéïñßóåé ôçí ðïóüôçôá ÷áñôéïý ðïõ ÷ñçóéìïðïéÞèçêå. ÌåôÜ ôçí áðïóôïëÞ ôïõ áñ÷åßïõ óôïí åêôõðùôÞ, ãñÜöåé ìéá êáôá÷þñéóç êáôáìÝôñçóçò óôï áñ÷åßï êáôáãñáöÞò. Ïé êáôá÷ùñßóåéò ìïéÜæïõí ìå ôéò ðáñáêÜôù:

```
2.00 rose:andy
3.00 rose:kelly
3.00 orchid:mary
5.00 orchid:mary
2.00 orchid:zhang
```

Èá ðñÝðåé íá ÷ñçóéìïðïéåßôå îå÷ùñéóôü áñ÷åßï êáôáãñáöÞò ãéá êÜèå åêôõðùôÞ, áöïý ôï `lpf` äåí Ý÷åé åíóùìáôùìÝíç äõíáôüôçôá êëåéäþìáôïò áñ÷åßïõ (file locking), êáé äýï `lpf` ìðïñïýí íá êáôáóôñÝøïõí ôï Ýíá ôçí êáôá÷þñéóç ôïõ Üëëïõ áí ðñüêåéôáé íá ãñÜøïõí ôáõôü÷ñïíá óôï ßäéï áñ÷åßï. ¸íáò åýêïëïò ôñüðïò ãéá íá âåâáéùèåßôå ôçí ìïíáäéêüôçôá áñ÷åßïõ êáôáãñáöÞò áíÜ åêôõðùôÞ åßíáé íá ÷ñçóéìïðïéÞóåôå ôçí éêáíüôçôá `af=acct` óôï `/etc/printcap`. ¸ôóé, êÜèå áñ÷åßï êáôáãñáöÞò èá âñßóêåôáé óôïí êáôÜëïãï spool ôïõ áíôßóôïé÷ïõ åêôõðùôÞ, óå Ýíá áñ÷åßï ìå üíïìá `acct`.

¼ôáí åßóôå Ýôïéìïé íá ÷ñåþóåôå ôïõò ÷ñÞóôåò ãéá ôéò åêôõðþóåéò, åêôåëÝóôå ôï ðñüãñáììá pac(8). ÁðëÜ ìåôáâåßôå óôïí êáôÜëïãï spool ãéá ôïí åêôõðùôÞ ðïõ êÜíáôå êáôáìÝôñçóç êáé ðëçêôñïëïãÞóôå `pac`. Èá åìöáíéóôåß Ýíáò áðïëïãéóìüò ìå ÷ñåþóåéò óå äïëÜñéá, üðùò âëÝðåôå óôç óõíÝ÷åéá:

```
  Login               pages/feet   runs    price
orchid:kelly                5.00    1   $  0.10
orchid:mary                31.00    3   $  0.62
orchid:zhang                9.00    1   $  0.18
rose:andy                   2.00    1   $  0.04
rose:kelly                177.00  104   $  3.54
rose:mary                  87.00   32   $  1.74
rose:root                  26.00   12   $  0.52

total                     337.00  154   $  6.74
```

ÐáñáêÜôù åßíáé ïé ðáñÜìåôñïé ðïõ äÝ÷åôáé ôï pac(8):

`-P`*`printer`*

Ãéá ðïéü *`printer`* íá êÜíåé áðïëïãéóìü. ÁõôÞ ç åðéëïãÞ äïõëåýåé ìüíï áí õðÜñ÷åé ç ðëÞñçò äéáäñïìÞ óôçí éêáíüôçôá `af` óôï `/etc/printcap`.

`-c`

Ôáîéíïìåß ôï áðïôÝëåóìá áíÜ êüóôïò áíôß ôçò áëöáâçôéêÞò ôáîéíüìçóçò ôùí ÷ñçóôþí.

`-m`

Áãíïåß ôï üíïìá ôïõ õðïëïãéóôÞ óôá áñ÷åßá êáôáãñáöÞò. Ìå áõôÞ ôçí åðéëïãÞ, ï ÷ñÞóôçò `smith` óôïí õðïëïãéóôÞ `alpha` åßíáé ï ßäéïò ÷ñÞóôçò ìå ôïí `smith` óôïí õðïëïãéóôÞ `gamma`. ×ùñßò ôçí åðéëïãÞ áõôÞ, åßíáé äéáöïñåôéêïß ÷ñÞóôåò.

`-p`*`price`*

Õðïëïãßæåé ôéò ÷ñåþóåéò ìå *`price`* (ôéìÞ) óå äïëÜñéá áíÜ óåëßäá Þ áíÜ ðüäé áíôß ãéá ôçí ôéìÞ áðü ôçí éêáíüôçôá `pc` óôï `/etc/printcap`, Þ áëëéþò äýï óåíôò (áðü ðñïåðéëïãÞ). Ìðïñåßôå íá ïñßóåôå ùò *`price`* ìéá ôéìÞ ìå äåêáäéêÜ øçößá (floating point).

`-r`

ÁíôéóôñÝöåé ôçí óåéñÜ ôáîéíüìçóçò.

`-s`

Äçìéïõñãåß Ýíá áñ÷åßï áðïëïãéóìïý ôùí êáôáìåôñÞóåùí êáé êáèáñßæåé ôá ðåñéå÷üìåíá ôùí áñ÷åßùí êáôáãñáöÞò.

`name ...`

Ôõðþíåé ðëçñïöïñßåò áíáöïñÜò ìüíï ãéá ôá óõãêåêñéìÝíá *`name`* (ïíüìáôá) ÷ñçóôþí.

Óôïí ðñïåðéëåãìÝíï áðïëïãéóìü ðïõ ðáñÜãåé ôï pac(8), âëÝðåôå ôïí áñéèìü ôùí ôõðùìÝíùí óåëßäùí áíÜ ÷ñÞóôç áðü ôïõò äéÜöïñïõò õðïëïãéóôÝò. Áí, óôï ÷þñï óáò, ï õðïëïãéóôÞò äåí Ý÷åé óçìáóßá (ãéáôß ïé ÷ñÞóôåò ìðïñïýí íá ÷ñçóéìïðïéïýí ïðïéïíäÞðïôå èÝëïõí), åêôåëÝóôå ôçí åíôïëÞ `pac -m`, ãéá íá äçìéïõñãÞóåôå ôïí áêüëïõèï áðïëïãéóìü:

```
  Login               pages/feet   runs     price
andy                        2.00      1   $  0.04
kelly                     182.00    105   $  3.64
mary                      118.00     35   $  2.36
root                       26.00     12   $  0.52
zhang                       9.00      1   $  0.18

total                     337.00    154   $  6.74
```

Ãéá ôïí ïñéóìü ðïóïóôïý ÷ñÝùóçò óå äïëÜñéá, ôï pac(8) ÷ñçóéìïðïéåß ôçí éêáíüôçôá `pc` óôï áñ÷åßï `/etc/printcap` (ðñïåðéëåãìÝíç ôéìÞ 200, Þ 2 óåíô áíÜ óåëßäá). Ðñïóäéïñßóôå óå áõôÞí ôçí éêáíüôçôá, óå åêáôïóôÜ ôïõ óåíô, ôçí ôéìÞ áíÜ óåëßäá Þ áíÜ ðüäé ðïõ èÝëåôå íá ÷ñåþíåôå ãéá ôéò åêôõðþóåéò. Ìðïñåßôå íá ðñïóðåñÜóåôå áõôÞ ôçí ôéìÞ üôáí ôñÝ÷åôå ôï pac(8) ìå ôçí åðéëïãÞ `-p`. H ìïíÜäá ìÝôñçóçò ãéá ôçí åðéëïãÞ `-p` åßíáé óå äïëÜñéá, ü÷é óå åêáôïóôÜ ôïõ óåíô. Ãéá ðáñÜäåéãìá,

```
# pac -p1.50
```

ïñßæåé êüóôïò êÜèå óåëßäáò Ýíá äïëÜñéï êáé ðåíÞíôá óåíôò. Ìðïñåßôå ðñáãìáôéêÜ íá Ý÷åôå ðïëëÜ Ýóïäá ÷ñçóéìïðïéþíôáò áõôÝò ôéò ÷ñåþóåéò.

ÔÝëïò, åêôåëþíôáò `pac -s` èá áðïèçêåýóåôå ôéò ðëçñïöïñßåò ôïõ áðïëïãéóìïý óå Ýíá áñ÷åßï êáôáãñáöÞò áðïëïãéóìïý, ðïõ èá Ý÷åé ôï ßäéï üíïìá ìå ôï áñ÷åßï êáôáãñáöÞò ôïõ åêôõðùôÞ, áëëÜ ìå êáôÜëçîç `_sum`. ¸ðåéôá êáèáñßæåôáé ôï áñ÷åßï êáôáãñáöÞò. ¼ôáí åêôåëÝóåôå ðÜëé ôï pac(8), èá îáíáäéáâÜóåé ôï áñ÷åßï áðïëïãéóìïý, ãéá íá ðÜñåé ôá áñ÷éêÜ óýíïëá, êáé èá ðñïóèÝóåé ôéò ðëçñïöïñßåò áðü ôï êáíïíéêü áñ÷åßï êáôáãñáöÞò.

10.4.5.2 Ðùò Ìðïñåßôå íá ÌåôñÞóåôå ôéò ÔõðùìÝíåò Óåëßäåò;

Ãéá íá ìåôñÞóåôå ôéò ôõðùìÝíåò óåëßäåò ìå Ýóôù óôïé÷åéþäç ëåðôïìÝñåéá, èá ðñÝðåé íá ðñïóäéïñßóåôå ðüóï ÷áñôß ÷ñåéÜæåôáé ìéá åñãáóßá. Áõôü åßíáé ôï ïõóéáóôéêüôåñï ðñüâëçìá óôçí êáôáìÝôñçóç åêôõðþóåùí.

Ãéá åñãáóßåò áðëïý êåéìÝíïõ, ôï ðñüâëçìá äåí åßíáé äýóêïëï íá ëõèåß: ÌåôñÜôå ðüóåò ãñáììÝò õðÜñ÷ïõí óå ìéá åñãáóßá êáé ôéò óõãêñßíåôå ìå ðüóåò ãñáììÝò ìðïñåß íá ôõðþóåé ï åêôõðùôÞò óáò óå ìéá óåëßäá. Ìçí îå÷Üóåôå íá óõìðåñéëÜâåôå ôá backspaces ðïõ ðñïêáëïýí õðåñôýðùóç, Þ åðéìÞêçò ãñáììÝò ðïõ áíáäéðëþíïíôáé óå ðåñéóóüôåñåò áðü ìßá öõóéêÝò ãñáììÝò.

Ôï ößëôñï êåéìÝíïõ `lpf` (ðïõ ðáñïõóéÜóáìå óôï lpf: Ýíá Ößëôñï ÊåéìÝíïõ) ëáìâÜíåé õðüøéí ôïõ áõôÜ ôá óôïé÷åßá üôáí êÜíåé êáôáìÝôñçóç. Áí ãñÜöåôå êÜðïéï ößëôñï êåéìÝíïõ ðïõ ÷ñåéÜæåôáé íá êÜíåé êáôáìÝôñçóç, ßóùò íá èÝëåôå íá åëÝãîåôå ôïí ðçãáßï êþäéêá ôïõ `lpf`.

Ðùò ÷åéñßæåóôå üìùò ôïõò õðüëïéðïõò ôýðïõò áñ÷åßùí;

Ãéá ôéò ìåôáôñïðÝò áðü DVI-óå-LaserJet Þ áðü DVI-óå-PostScript, ìðïñåßôå íá êÜíåôå ôï ößëôñï óáò íá áíáëýåé ôçí Ýîïäï ôïõ `dvilj` Þ ôïõ `dvips` êáé íá åëÝã÷åé ðüóåò óåëßäåò äçìéïõñãÞèçêáí áðü ôç ìåôáôñïðÞ. ºóùò ìðïñÝóåôå íá êÜíåôå êÜôé ðáñüìïéï êáé ìå äéáöïñåôéêïýò ôýðïõò áñ÷åßùí êáé ðñïãñÜììáôá ìåôáôñïðÞò

Ùóôüóï, üëåò áõôÝò ïé ìÝèïäïé Ý÷ïõí ôï ìåéïíÝêôçìá ðùò ï åêôõðùôÞò ðéèáíþò óôçí ðñáãìáôéêüôçôá íá ìçí åêôõðþóåé üëåò ôéò óåëßäåò. Ãéá ðáñÜäåéãìá, èá ìðïñïýóå íá ìðëïêáñéóôåß ôï ÷áñôß, Þ íá ôåëåéþóåé ôï ôüíåñ, Þ áêüìç íá óõìâåß êáé Ýêñçîç —åíþ ï ÷ñÞóôçò èá óõíå÷ßóåé íá ÷ñåþíåôáé.

Ôé èá ìðïñïýóáôå íá êÜíåôå;

ÕðÜñ÷åé ìüíï Ýíáò *óßãïõñïò* ôñüðïò ãéá íá êÜíåôå êáôáìÝôñçóç *áêñéâåßáò*. Íá ðÜñåôå Ýíáí åêôõðùôÞ ðïõ íá ìðïñåß íá óáò ðåé ðüóï ÷áñôß ÷ñçóéìïðïéåß, êáé íá ôïí óõíäÝóåôå ìÝóù óåéñéáêÞò èýñáò Þ ìÝóù äéêôýïõ. Ó÷åäüí üëïé ïé åêôõðùôÝò PostScript õðïóôçñßæïõí áõôÞ ôçí äõíáôüôçôá. Èá âñåßôå êáé Üëëïõò ôýðïõò êáé êáôáóêåõáóôÝò ðïõ êÜíïõí åðßóçò ôï ßäéï (ãéá ðáñÜäåéãìá, ïé laser åêôõðùôÝò äéêôýïõ ôçò Imagen). ÌåôáôñÝøôå ôá ößëôñá ãéá áõôïýò ôïõò åêôõðùôÝò þóôå íá êáôáãñÜöïõí ôéò ôõðùìÝíåò óåëßäåò ìåôÜ ôçí ïëïêëÞñùóç ôçò åêÜóôïôå åñãáóßáò åêôýðùóçò, êáé ñõèìßóôå ôïõò íá êñáôïýí áñ÷åßá êáôáãñáöÞò ìå *ìüíï* áõôÞ ôçí ðëçñïöïñßá. Äåí ÷ñåéÜæåôáé êáôáìÝôñçóç ãñáììþí ïýôå áíáöïñÜ óöáëìÜôùí.

ÖõóéêÜ, ðÜíôá Ý÷åôå ôç äõíáôüôçôá íá öáíåßôå ãåííáéüäùñïò êáé íá ðáñÝ÷åôå ôéò åêôõðþóåéò óáò äùñåÜí.

10.5 ×ñÞóç Åêôõðùôþí

ÁõôÞ ç åíüôçôá ðåñéãñÜöåé ðùò íá ÷ñçóéìïðïéåßôå ôïõò åêôõðùôÝò ðïõ Ý÷åôå åãêáôáóôÞóåé óôï FreeBSD. Ïé âáóéêÝò åíôïëÝò ãéá ôïí ôåëéêü ÷ñÞóôç åßíáé ïé áêüëïõèåò:

lpr(1)

Åêôýðùóç åñãáóéþí

lpq(1)

¸ëåã÷ïò ïõñÜò áíáìïíÞò (print queue) ôïõ åêôõðùôÞ

lprm(1)

ÄéáãñáöÞ åñãáóéþí áðü ôçí ïõñÜ áíáìïíÞò

ÕðÜñ÷åé åðßóçò ìéá åíôïëÞ ãéá ôïõò äéá÷åéñéóôÝò, ç lpc(8), ðïõ ðåñéãñÜöåôáé óôçí åíüôçôá Äéá÷åßñéóç Åêôõðùôþí, êáé ÷ñçóéìïðïéåßôáé ãéá íá åëÝã÷åé ôïõò åêôõðùôÝò êáé ôéò ïõñÝò áíáìïíÞò.

Êáé ïé ôñåéò åíôïëÝò lpr(1), lprm(1), êáé lpq(1) äÝ÷ïíôáé ôçí åðéëïãÞ `-P printer-name` ìå ôçí ïðïßá êáèïñßæåôáé óå ðïéï åêôõðùôÞ Þ ïõñÜ áíáìïíÞò èá åíåñãÞóïõí, üðùò áíáöÝñåôáé óôï áñ÷åßï `/etc/printcap`. Áõôü óáò åðéôñÝðåé íá áðïóôåßëåôå, íá äéáãñÜøåôå, êáé íá åëÝãîåôå åñãáóßåò óå äéÜöïñïõò åêôõðùôÝò. Áí äåí ÷ñçóéìïðïéåßôå ôçí åðéëïãÞ `-P`, ôüôå ïé åíôïëÝò ÷ñçóéìïðïéïýí ôïí åêôõðùôÞ ðïõ áíáöÝñåôáé óôç ìåôáâëçôÞ ðåñéâÜëëïíôïò `PRINTER`. ÔÝëïò, áí äåí Ý÷åôå èÝóåé ìéá ìåôáâëçôÞ ðåñéâÜëëïíôïò `PRINTER`, ïé åíôïëÝò åêôåëïýíôáé ìå ôïí ðñïåðéëåãìÝíï åêôõðùôÞ ðïõ ïíïìÜæåôáé `lp`.

Áðü äù êáé óôï åîÞò, ìå ôçí ïñïëïãßá *ðñïåðéëåãìÝíïò åêôõðùôÞò* èá åííïïýìå ôïí åêôõðùôÞ ðïõ áíáöÝñåôáé óôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `PRINTER`, Þ áí äåí õðÜñ÷åé, ôïí åêôõðùôÞ ìå ôï üíïìá `lp`.

10.5.1 Åêôýðùóç Åñãáóéþí

Ãéá íá åêôõðþóåôå áñ÷åßá, ðëçêôñïëïãÞóôå:

```
% lpr filename ...
```

Èá åêôõðùèïýí üëá ôá áíáöåñüìåíá áñ÷åßá óôïí ðñïåðéëåãìÝíï åêôõðùôÞ. Áí äåí áíáöÝñåôå áñ÷åßá, ôï lpr(1) äéáâÜæåé äåäïìÝíá áðü ôï standard input. Ãéá ðáñÜäåéãìá, áõôÞ ç åíôïëÞ èá åêôõðþóåé ìåñéêÜ óçìáíôéêÜ áñ÷åßá ôïõ óõóôÞìáôïò:

```
% lpr /etc/host.conf /etc/hosts.equiv
```

Ãéá íá åðéëÝîåôå Ýíá óõãêåêñéìÝíï åêôõðùôÞ, ðëçêôñïëïãÞóôå:

```
% lpr -P printer-name filename ...
```

Óôï ðáñÜäåéãìá ìáò èá åêôõðùèåß ìéá ìåãÜëç ëßóôá áñ÷åßùí ôïõ ôñÝ÷ïíôïò êáôáëüãïõ óôïí åêôõðùôÞ ðïõ ïíïìÜæåôáé `rattan`:

```
% ls -l | lpr -P rattan
```

Áöïý äåí áíáöÝñïíôáé ïíüìáôá áñ÷åßùí óôçí åíôïëÞ lpr(1), ôï `lpr` äéáâÜæåé ôá äåäïìÝíá ðïõ èá åêôõðþóåé áðü ôï standard input, ôá ïðïßá åßíáé ç Ýîïäïò ôçò åíôïëÞò `ls -l`.

Ç åíôïëÞ lpr(1) ìðïñåß íá äå÷èåß Ýíá ìåãÜëï áñéèìü åðéëïãþí ãéá íá åëÝã÷åé ôçí ìïñöïðïßçóç, íá ìåôáôñÝðåé áñ÷åßá, íá äçìéïõñãåß ðïëëáðëÜ áíôßãñáöá, ê.ë.ð. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôçí åíüôçôá ÅðéëïãÝò Åêôýðùóçò.

10.5.2 ¸ëåã÷ïò Åñãáóéþí

¼ôáí åêôõðþíåôå ìå ôï lpr(1), ôá äåäïìÝíá ðïõ èÝëåôå íá åêôõðþóåôå ôïðïèåôïýíôáé óå Ýíá ðáêÝôï (package) ðïõ ïíïìÜæåôáé “åñãáóßá åêôýðùóçò (print job)”, ç ïðïßá áðïóôÝëëåôáé óôï óýóôçìá ðáñï÷Ýôåõóçò **LPD**. ÊÜèå åêôõðùôÞò Ý÷åé ìéá ïõñÜ áíáìïíÞò åñãáóéþí, êáé ç åñãáóßá óáò áíáìÝíåé ìáæß ìå Üëëåò äéêÝò óáò êáé Üëëùí ÷ñçóôþí. Ï åêôõðùôÞò ôéò åêôõðþíåé ìå ôçí óåéñÜ Üöéîçò óôçí ïõñÜ áíáìïíÞò.

Ãéá íá åìöáíßóåôå ôçí ïõñÜ áíáìïíÞò ãéá ôïí ðñïåðéëåãìÝíï åêôõðùôÞ, ðëçêôñïëïãÞóôå lpq(1). Ãéá êÜðïéïí óõãêåêñéìÝíï åêôõðùôÞ, ÷ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-P`. Ãéá ðáñÜäåéãìá, ç åíôïëÞ:

```
% lpq -P bamboo
```

åìöáíßæåé ôçí ïõñÜ áíáìïíÞò ãéá ôïí åêôõðùôÞ ìå ôï üíïìá `bamboo`. Áêïëïõèåß Ýíá ðáñÜäåéãìá åîüäïõ ôçò åíôïëÞò `lpq`:

```
bamboo is ready and printing
Rank   Owner    Job  Files                              Total Size
active kelly    9    /etc/host.conf, /etc/hosts.equiv   88 bytes
2nd    kelly    10   (standard input)                   1635 bytes
3rd    mary     11   ...                                78519 bytes
```

Åìöáíßæïíôáé ôñåéò åñãáóßåò óôç ëßóôá áíáìïíÞò ãéá ôïí `bamboo`. Óôçí ðñþôç åñãáóßá, ðïõ Ý÷åé óôáëåß áðü ôïí ÷ñÞóôç kelly, Ý÷åé áðïäïèåß ï “áñéèìüò åñãáóßáò (job number)” 9. ÊÜèå åñãáóßá åíüò åêôõðùôÞ ÷áñáêôçñßæåôáé áðü Ýíá ìïíáäéêü ôÝôïéï áñéèìü. Ôéò ðåñéóóüôåñåò öïñÝò ìðïñåßôå íá ôïí áãíïÞóåôå, áëëÜ èá ôïí ÷ñåéáóôåßôå áí èÝëåôå íá äéáãñÜøåôå êÜðïéá åñãáóßá. Äåßôå ôçí åíüôçôá ÄéáãñáöÞ Åñãáóéþí ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ç åñãáóßá ìå ôï íïýìåñï åííÝá áðïôåëåßôáé áðü äýï áñ÷åßá. Ôá ðïëëáðëÜ áñ÷åßá ðïõ äüèçêáí óôç ãñáììÞ åíôïëþí ôïõ lpr(1) èåùñïýíôáé ìÝñïò ìßáò ìüíï åñãáóßáò. ÁõôÞ åßíáé êáé ç ôñÝ÷ïõóá åíåñãÞ åñãáóßá (ðáñáôçñÞóôå ôç ëÝîç `active` ôçò óôÞëçò “Rank”), ðïõ óçìáßíåé ðùò ç åñãáóßá åêôõðþíåôáé áõôÞ ôç óôéãìÞ. Ç äåýôåñç åñãáóßá áðïôåëåßôáé áðü äåäïìÝíá ðïõ Ý÷ïõí ðåñÜóåé óôçí standard input ôçò åíôïëÞò lpr(1). Ç ôñßôç åñãáóßá ðñïÞñ÷åôáé áðü ôïí ÷ñÞóôç `mary`, êáé ðñüêåéôáé ãéá ìéá ðïëý ìåãÜëç åñãáóßá. Ôï üíïìá äéáäñïìÞò ôïõ áñ÷åßïõ ðïõ ðñüêåéôáé íá åêôõðùèåß åßíáé ðïëý ìåãÜëï ãéá íá ÷ùñÝóåé óôç óôÞëç, êáé ãéá áõôü ç åíôïëÞ lpq(1) áðëÜ ôï óõìâïëßæåé ìå ôñåéò ôåëåßåò.

Ç ðñþôç ãñáììÞ ôçò åîüäïõ áðü ôçí lpq(1) åßíáé åðßóçò ðïëý ÷ñÞóéìç: ìáò åíçìåñþíåé ãéá ôï ôé êÜíåé ôçí ðáñïýóá óôéãìÞ ï åêôõðùôÞò (Þ ôïõëÜ÷éóôïí ãéá ôï ôé ðéóôåýåé ôï **LPD** ðùò êÜíåé ï åêôõðùôÞò áõôÞ ôç óôéãìÞ).

Ç åíôïëÞ lpq(1) åðßóçò õðïóôçñßæåé ôçí åðéëïãÞ `-l` ãéá íá äçìéïõñãÞóåé ìéá ìåãÜëç, ëåðôïìåñÞ ëßóôá. Áêïëïõèåß Ýíá ðáñÜäåéãìá ôïõ `lpq -l`:

```
waiting for bamboo to become ready (offline ?)
kelly: 1st                             [job 009rose]
       /etc/host.conf                  73 bytes
       /etc/hosts.equiv                15 bytes

kelly: 2nd                             [job 010rose]
       (standard input)                1635 bytes

mary: 3rd                              [job 011rose]
      /home/orchid/mary/research/venus/alpha-regio/mapping 78519 bytes
```

10.5.3 Áöáßñåóç Åñãáóéþí

Áí áëëÜîåôå ãíþìç ãéá ìéá åñãáóßá ðïõ åß÷áôå áðïóôåßëåé ðñïò åêôýðùóç, ìðïñåßôå íá ôçí áöáéñÝóåôå áðü ôçí ëßóôá áíáìïíÞò ìå ôçí åíôïëÞ lprm(1). Ìðïñåßôå áêüìç íá ÷ñçóéìïðïéÞóåôå ôçí lprm(1) ãéá íá áöáéñÝóåôå ìéá åíåñãÞ åñãáóßá, áëëÜ ðéèáíüí êÜðïéï ìÝñïò ôçò íá åêôõðùèåß Ýôóé êáé áëëéþò.

Ãéá íá áöáéñÝóåôå ìéá åñãáóßá áðü ôïí ðñïåðéëåãìÝíï åêôõðùôÞ, ÷ñçóéìïðïéÞóôå ðñþôá ôçí lpq(1) ãéá íá âñåßôå ôïí áñéèìü ôçò. ¸ðåéôá ðëçêôñïëïãÞóôå:

```
% lprm job-number
```

Ãéá íá áöáéñÝóåôå ìéá åñãáóßá áðü êÜðïéïí óõãêåêñéìÝíï åêôõðùôÞ, ðñïóèÝóôå ôçí åðéëïãÞ `-P`. Ç áêüëïõèç åíôïëÞ áöáéñåß ôçí åñãáóßá ìå áñéèìü 10 áðü ôçí ïõñÜ áíáìïíÞò ãéá ôïí åêôõðùôÞ `bamboo`:

```
% lprm -P bamboo 10
```

Ç åíôïëÞ lprm(1) Ý÷åé ìåñéêÝò óõíôïìåýóåéò:

lprm -

Áöáéñåß üëåò ôéò åñãáóßåò (ãéá ôïí ðñïåðéëåãìÝíï åêôõðùôÞ) ðïõ áíÞêïõí óå åóÜò.

lprm *`user`*

Áöáéñåß üëåò ôéò åñãáóßåò (ãéá ôïí ðñïåðéëåãìÝíï åêôõðùôÞ) ðïõ áíÞêïõí óôïí *`÷ñÞóôç (user)`*. Ï õðåñ÷ñÞóôçò (superuser) ìðïñåß íá áöáéñÝóåé åñãáóßåò Üëëùí ÷ñçóôþí, åóåßò ìðïñåßôå íá áöáéñÝóåôå ìüíï ôéò äéêÝò óáò.

lprm

Ç åíôïëÞ lprm(1) ÷ùñßò áñéèìü åñãáóßáò, üíïìá ÷ñÞóôç, Þ `-` ðïõ åìöáíßæåôáé óôçí ãñáììÞ åíôïëþí, áöáéñåß ôçí ôñÝ÷ïõóá åíåñãÞ åñãáóßá óôïí ðñïåðéëåãìÝíï åêôõðùôÞ, áí áíÞêåé óå óÜò. Ï õðåñ÷ñÞóôçò (superuser) ìðïñåß íá áöáéñÝóåé ïðïéáäÞðïôå åíåñãÞ åñãáóßá.

Ãéá íá äïõëÝøåôå óå êÜðïéïí óõãêåêñéìÝíï åêôõðùôÞ áíôß ôïõ ðñïåðéëåãìÝíïõ, áðëÜ ÷ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-P` ìå ôéò ðáñáðÜíù óõíôïìåýóåéò. Ãéá ðáñÜäåéãìá, ç áêüëïõèç åíôïëÞ áöáéñåß üëåò ôéò åñãáóßåò ôïõ ôñÝ÷ïíôïò ÷ñÞóôç áðü ôçí ïõñÜ áíáìïíÞò ôïõ åêôõðùôÞ `rattan`:

```
% lprm -P rattan -
```

Óçìåßùóç: Áí åñãÜæåóôå óå ðåñéâÜëëïí äéêôýïõ, ç lprm(1) èá óáò åðéôñÝøåé íá áöáéñÝóåôå åñãáóßåò ìüíï áðü ôïí õðïëïãéóôÞ ðïõ ôéò Ý÷åôå óôåßëåé, áíåîÜñôçôá áí ï åêôõðùôÞò åßíáé ðñïóâÜóéìïò êáé áðü Üëëïõò õðïëïãéóôÝò. Ç áêüëïõèç åíôïëÞ åðéäåéêíýåé áêñéâþò áõôü ôï ÷áñáêôçñéóôéêü:

```
% lpr -P rattan myfile
% rlogin orchid
% lpq -P rattan
Rank   Owner      Job  Files                            Total Size
active seeyan     12    ...                             49123 bytes
2nd    kelly      13   myfile                           12 bytes
% lprm -P rattan 13
rose: Permission denied
% logout
% lprm -P rattan 13
dfA013rose dequeued
cfA013rose dequeued
```

10.5.4 ÐÝñá áðü ôï Áðëü Êåßìåíï: Ðåñéóóüôåñåò ÅðéëïãÝò Åêôýðùóçò

Ç åíôïëÞ lpr(1) õðïóôçñßæåé ìéá ãêÜìá åðéëïãþí ãéá ôïí Ýëåã÷ï ìïñöïðïßçóçò êåéìÝíïõ, ìåôáôñïðÞò ãñáöéêþí êáé Üëëùí ìïñöþí áñ÷åßùí, ðáñáãùãÞò ðïëëáðëþí áíôéãñÜöùí, ÷åéñéóìïý åñãáóéþí, êáé Üëëá. Ïé åðéëïãÝò áõôÝò ðåñéãñÜöïíôáé óôçí ðáñïýóá åíüôçôá.

10.5.4.1 ÅðéëïãÝò Ìïñöïðïßçóçò êáé ÌåôáôñïðÞò

Ïé áêüëïõèåò åðéëïãÝò ôçò lpr(1) åëÝã÷ïõí ôçí ìïñöïðïßçóç ôùí áñ÷åßùí ôçò åêôýðùóçò. ×ñçóéìïðïéÞóôå ôéò áí ç åñãáóßá óáò äåí ðåñéÝ÷åé áðëü êåßìåíï Þ áí åðéèõìåßôå íá ìïñöïðïéÞóåôå áðëü êåßìåíï äéáìÝóïõ ôïõ åñãáëåßïõ pr(1).

Ãéá ðáñÜäåéãìá, ç áêüëïõèç åíôïëÞ ôõðþíåé Ýíá áñ÷åßï DVI (áðü ôï óýóôçìá óôïé÷åéïèåóßáò TeX) ìå üíïìá *`fish-report.dvi`* óôïí åêôõðùôÞ ìå üíïìá `bamboo`:

```
% lpr -P bamboo -d fish-report.dvi
```

ÁõôÝò ïé åðéëïãÝò åöáñìüæïíôáé óå êÜèå áñ÷åßï ôçò åñãáóßáò, êáé Ýôóé äåí ìðïñåßôå íá áíáìßîåôå (áò ðïýìå) áñ÷åßá DVI êáé ditroff ìáæß óôçí ßäéá åñãáóßá. Áðëþò óôåßëôå ôá áñ÷åßá óáí äéáöïñåôéêÝò åñãáóßåò, ÷ñçóéìïðïéþíôáò äéáöïñåôéêÝò åðéëïãÝò ìåôáôñïðÞò ãéá êÜèå åñãáóßá.

> **Óçìåßùóç:** ¼ëåò áõôÝò ïé åðéëïãÝò åêôüò ôçò `-p` êáé ôçò `-T` áðáéôïýí åãêáôåóôçìÝíá ößëôñá ìåôáôñïðÞò ãéá ôïí åêôõðùôÞ ðñïïñéóìïý. Ãéá ðáñÜäåéãìá, ç åðéëïãÞ `-d` áðáéôåß ôï ößëôñï ìåôáôñïðÞò DVI. Ç åíüôçôáÖßëôñá ÌåôáôñïðÞò äßíåé ðåñéóóüôåñåò ëåðôïìÝñåéåò.

`-c`

Åêôõðþíåé áñ÷åßá cifplot.

`-d`

Åêôõðþíåé áñ÷åßá DVI.

`-f`

Åêôõðþíåé áñ÷åßá êåéìÝíïõ FORTRAN.

`-g`

Åêôõðþíåé äåäïìÝíá ó÷åäßáóçò (plot).

`-i` *`number`*

Åêôõðþíåé ôçí Ýîïäï ìå åóï÷Þ *`number`* óôçëþí. Áí ðáñáëåßøåôå ôï *`number`*, ç åóï÷Þ èá åßíáé 8 óôÞëåò. ÁõôÞ ç åðéëïãÞ äïõëåýåé ìüíï ìå ïñéóìÝíá ößëôñá ìåôáôñïðÞò.

> **Óçìåßùóç:** Ìçí ôïðïèåôåßôå êåíü äéÜóôçìá ìåôáîý ôïõ `-i` êáé ôïõ áñéèìïý.

`-l`

Åêôõðþíåé äåäïìÝíá êåéìÝíïõ êáôÜ ãñÜììá (literal), óõìðåñéëáìâÜíïíôáò êáé ôïõò ÷áñáêôÞñåò åëÝã÷ïõ.

`-n`

Åêôõðþíåé äåäïìÝíá ditroff (äåäïìÝíá troff áíåîÜñôçôá áðü ôç óõóêåõÞ).

-p

Ìïñöïðïéåß ôï áðëü êåßìåíï ìå ôçí pr(1) ðñéí íá ôï åêôõðþóåé. Äåßôå ôçí pr(1) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

`-T` *`title`*

×ñçóéìïðïéåß ôï *`title`* óôçí êåöáëßäá ôïõ pr(1) áíôß ãéá ôï üíïìá áñ÷åßïõ. ÁõôÞ ç åðéëïãÞ åðéäñÜ ìüíï üôáí ÷ñçóéìïðïéåßôáé ìå ôçí åðéëïãÞ `-p`

`-t`

Åêôõðþíåé äåäïìÝíá troff.

`-v`

Åêôõðþíåé äåäïìÝíá ñÜóôåñ.

Åäþ åßíáé Ýíá ðáñÜäåéãìá: áõôÞ ç åíôïëÞ åêôõðþíåé ìéá êïìøÜ ìïñöïðïéçìÝíç Ýêäïóç ôçò óåëßäáò âïçèåßáò ls(1) óôïí ðñïåðéëåãìÝíï åêôõðùôÞ:

```
% zcat /usr/share/man/man1/ls.1.gz | troff -t -man | lpr -t
```

Ç åíôïëÞ zcat(1) áðïóõìðéÝæåé ôïí ðçãáßï êþäéêá ôçò óåëßäáò âïçèåßáò ls(1) êáé ôïí ðåñíÜåé óôçí åíôïëÞ troff(1), ç ïðïßá ôïí ìïñöïðïéåß êáé äçìéïõñãåß óôçí Ýîïäï ôçò äåäïìÝíá GNU troff, ôá áðïóôÝëëåé óôçí lpr(1), ç ïðïßá ìå ôç óåéñÜ ôçò áðïóôÝëëåé ôçí åñãáóßá óôï **LPD**. ÅðåéäÞ ÷ñçóéìïðïéÞóáìå ôçí åðéëïãÞ `-t` óôï lpr(1), ï spooler, êáôÜ ôç äéÜñêåéá ôçò åêôýðùóçò, èá ìåôáôñÝøåé ôçí Ýîïäï GNU troff óå Ýíá ôýðï äåäïìÝíùí êáôáíïçôü áðü ôïí ðñïåðéëåãìÝíï åêôõðùôÞ.

10.5.4.2 ÅðéëïãÝò ×åéñéóìïý Åñãáóéþí

Ïé áêüëïõèåò åðéëïãÝò ôïõ lpr(1) ïäçãïýí ôï **LPD** íá ÷åéñéóôåß ôéò åñãáóßåò ìå åéäéêü ôñüðï:

-# *`copies`*

Äçìéïõñãåß Ýíáí áñéèìü *`copies`* (áíôéãñÜöùí) ãéá êÜèå áñ÷åßï ôçò åñãáóßáò áíôß ãéá Ýíá ìüíï áíôßãñáöï. Ï äéá÷åéñéóôÞò ìðïñåß íá áðåíåñãïðïéÞóåé áõôÞ ôçí åðéëïãÞ ãéá íá ìåéþóåé ôçí êáôáðüíçóç ôùí åêôõðùôþí êáé íá åíèáññýíåé ôçí ÷ñÞóç öùôïôõðéêþí ìç÷áíçìÜôùí. Äåßôå ôçí åíüôçôá
Ðåñéïñéóìüò Åêôýðùóçò Ðïëëáðëþí ÁíôéãñÜöùí.

Óå áõôü ôï ðáñÜäåéãìá, åêôõðþíïõìå óôïí ðñïåðéëåãìÝíï åêôõðùôÞ ôñßá áíôßãñáöá ôïõ *`parser.c`* êáé ôñßá áíôßãñáöá ôïõ *`parser.h`*:

```
% lpr -#3 parser.c parser.h
```

-m

ÁðïóôïëÞ mail ìåôÜ ôçí ïëïêëÞñùóç åêôýðùóçò ôçò åñãáóßáò. Ìå áõôÞ ôçí åðéëïãÞ, ôï óýóôçìá **LPD** óôÝëíåé mail óôï ëïãáñéáóìü óáò ìüëéò ïëïêëçñùèåß ï ÷åéñéóìüò åêôýðùóçò ôçò åñãáóßáò óáò. Óôï ìÞíõìá ôïõ, èá óáò åíçìåñþóåé áí ç åñãáóßá ïëïêëçñþèçêå åðéôõ÷þò Þ áí ðáñïõóéÜóôçêå óöÜëìá êáé (óõ÷íÜ) ðïéü Þôáí ôï óöÜëìá.

-s

Äåí áíôéãñÜöåé ôá áñ÷åßá óôïí êáôÜëïãï spool, áëëÜ áíôß ãéá áõôü, äçìéïõñãåß óõìâïëéêÝò óõíôïìåýóåéò (symbolic links) ðñïò áõôÜ.

Áí åêôõðþíåôå ìéá ìåãÜëç åñãáóßá, ßóùò èÝëåôå íá ÷ñçóéìïðïéÞóåôå áõôÞ ôçí åðéëïãÞ. Èá óáò ãëõôþóåé ÷þñï óôïí êáôÜëïãï spool (ßóùò ç åñãáóßá óáò íá õðåñâáßíåé ôïí åëåýèåñï ÷þñï ôïõ óõóôÞìáôïò áñ÷åßùí ðïõ ðåñéÝ÷åé ôïí êáôÜëïãï spool). Åðßóçò èá êåñäßóåôå ÷ñüíï áöïý ôï **LPD** äåí èá ÷ñåéáóôåß íá áíôéãñÜøåé üëç ôçí åñãáóßá óáò óôïí êáôÜëïãï spool.

Áõôü, ùóôüóï, Ý÷åé êáé Ýíá ìåéïíÝêôçìá: áðü ôç óôéãìÞ ðïõ ôï **LPD** èá êÜíåé áíáöïñÜ êáôåõèåßáí óôï ðñùôüôõðï áñ÷åßï, äåí èá Ý÷åôå äõíáôüôçôá íá ìåôáôñÝøåôå Þ íá äéáãñÜøåôå ôï áñ÷åßï Ýùò üôïõ åêôõðùèåß.

Óçìåßùóç: Áí åêôõðþíåôå óå Ýíá áðïìáêñõóìÝíï åêôõðùôÞ, ôï **LPD** ðéèáíþò èá ÷ñåéáóôåß ôåëéêÜ íá áíôéãñÜøåé ôá áñ÷åßá áðü ôïí ôïðéêü õðïëïãéóôÞ óôïí áðïìáêñõóìÝíï, åðïìÝíùò ç åðéëïãÞ `-s` óå áõôÞ ôçí ðåñßðôùóç åîïéêïíïìåß ÷þñï óôïí ôïðéêü êáôÜëïãï spool, áëëÜ ü÷é óôïí áðïìáêñõóìÝíï. Åîáêïëïõèåß ùóôüóï íá åßíáé éäéáßôåñá ÷ñÞóéìç.

-r

Áðïìáêñýíåé ôá áñ÷åßá ôçò åñãáóßáò ìåôÜ ôçí áíôéãñáöÞ ôïõò óôïí êáôÜëïãï spool, Þ ìåôÜ ôçí åêôýðùóç ôïõò ìå ôçí åðéëïãÞ `-s`. Íá åßóôå ðñïóåêôéêïß ìå áõôÞ ôçí åðéëïãÞ!

10.5.4.3 ÅðéëïãÝò Óåëßäùí Êåöáëßäáò

ÁõôÝò ïé åðéëïãÝò ôïõ lpr(1) ñõèìßæïõí ôï êåßìåíï ðïõ êáíïíéêÜ åìöáíßæåôáé óôçí óåëßäá êåöáëßäáò ôçò åñãáóßáò. Áí ïé óåëßäåò êåöáëßäáò ðáñåìðïäßæïíôáé ãéá ôïí óõãêåêñéìÝíï åêôõðùôÞ, áõôÝò ïé åðéëïãÝò äåí Ý÷ïõí êáìßá åðßäñáóç. Äåßôå ôçí åíüôçôá Óåëßäåò Êåöáëßäáò ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ñõèìßóåéò ôùí óåëßäùí êåöáëßäáò.

-C *`text`*

Áíôéêáèéóôü ôï üíïìá õðïëïãéóôÞ óôç óåëßäá êåöáëßäáò ìå *`text`*. Ôï üíïìá õðïëïãéóôÞ ðïõ åìöáíßæåôáé åßíáé, áðü ðñïåðéëïãÞ, ôï üíïìá ôïõ õðïëïãéóôÞ áðü ôïí ïðïßï Ýãéíå ç áðïóôïëÞ ôçò åñãáóßáò.

-J *`text`*

Áíôéêáèéóôü ôï üíïìá åñãáóßáò óôç óåëßäá êåöáëßäáò ìå *`text`*. Ôï üíïìá åñãáóßáò ðïõ åìöáíßæåôáé áðü ðñïåðéëïãÞ, åßíáé ôï üíïìá ôïõ ðñþôïõ áñ÷åßïõ ôçò åñãáóßáò, Þ `stdin` áí ç åêôýðùóç ãßíåôáé áðü ôï standard input.

-h

Äåí åêôõðþíåé óåëßäá êåöáëßäáò.

Óçìåßùóç: ÁíÜëïãá ìå ôéò ñõèìßóåéò, áõôÞ ç åðéëïãÞ ßóùò íá ìçí Ý÷åé åðßäñáóç ëüãù ôïõ ôñüðïõ ìå ôïí ïðïßï äçìéïõñãïýíôáé ïé óåëßäåò êåöáëßäáò. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äåßôå ôçí åíüôçôá Óåëßäåò Êåöáëßäáò.

10.5.5 Äéá÷åßñéóç Åêôõðùôþí

Ìò äéá÷åéñéóôÞò, ÷ñåéÜæåóôå íá åãêáôáóôÞóåôå, íá ñõèìßóåôå êáé íá äïêéìÜóåôå ôïõò åêôõðùôÝò óáò. ×ñçóéìïðïéþíôáò ôçí åíôïëÞ lpc(8), ìðïñåßôå íá åðéêïéíùíÞóåôå ìå ôïõò åêôõðùôÝò óáò ìå áêüìç ðåñéóóüôåñïõò ôñüðïõò. Ìå ôçí lpc(8), ìðïñåßôå:

- Íá åêêéíåßôå êáé íá óôáìáôÜôå ôïõò åêôõðùôÝò
- Íá åíåñãïðïéåßôå êáé íá áðåíåñãïðïéåßôå ôéò ïõñÝò áíáìïíÞò
- Íá áíáêáôáôÜóóåôå ôçí óåéñÜ åñãáóéþí óå êÜèå ïõñÜ áíáìïíÞò.

Êáôáñ÷Þí, ìßá óçìåßùóç ó÷åôéêÜ ìå ôçí ïñïëïãßá: áí Ýíáò åêôõðùôÞò åßíáé *óôáìáôçìÝíïò (stopped)*, äåí èá åêôõðþóåé ôßðïôå áðü ôçí ïõñÜ áíáìïíÞò åñãáóéþí. Ïé ÷ñÞóôåò ìðïñïýí áêüìç íá óôÝëíïõí åñãáóßåò, ïé ïðïßåò ìðáßíïõí óôçí ïõñÜ áíáìïíÞò Ýùò üôïõ ï åêôõðùôÞò *îåêéíÞóåé* Þ êáèáñéóôåß ç ïõñÜ áíáìïíÞò.

Áí Ý÷åé *áðåíåñãïðïéçèåß* ç ïõñÜ áíáìïíÞò, êáíåßò ÷ñÞóôçò (åêôüò ôïõ `root`) äåí ìðïñåß íá áðïóôåßëåé åñãáóßåò óôïí åêôõðùôÞ. Ìéá *åíåñãÞ* ïõñÜ áíáìïíÞò åðéôñÝðåé íá áðïóôáëïýí åñãáóßåò óôïí åêôõðùôÞ. ¸áò åêôõðùôÞò ìðïñåß íá *îåêéíÞóåé* ìå ïõñÜ áíáìïíÞò áðåíåñãïðïéçìÝíç, êáé óå áõôÞ ôçí ðåñßðôùóç èá óõíå÷ßóåé íá åêôõðþíåé ôéò åñãáóßåò ôçò ïõñÜò Ýùò üôïõ áõôÞ áäåéÜóåé.

ÃåíéêÜ, ðñÝðåé íá Ý÷åôå ðñïíüìéá `root` ãéá íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ lpc(8). Ïé êáíïíéêïß ÷ñÞóôåò ìðïñïýí íá ÷ñçóéìïðïéïýí ôçí åíôïëÞ lpc(8) ìüíï ãéá íá âëÝðïõí ôçí êáôÜóôáóç ôïõ åêôõðùôÞ êáé íá åðáíåêêéíïýí ôïí åêôõðùôÞ óå ðåñßðôùóç ìðëïêáñßóìáôïò.

ÐáñáêÜôù èá âñåßôå ìéá ëßóôá åíôïëþí ôïõ lpc(8). Ïé ðåñéóóüôåñåò áðü ôéò åíôïëÝò ðáßñíïõí ùò ðáñÜìåôñï ôï *`printer-name`* ãéá ôç ñýèìéóç ôïõ óõãêåêñéìÝíïõ åêôõðùôÞ. Ìðïñåßôå íá ÷ñçóéìïðïéåßôå `all` óôç èÝóç ôïõ *`printer-name`* ãéá íá áíáöåñèåßôå óå üëïõò ôïõò åêôõðùôÝò ðïõ åßíáé êáôá÷ùñéóìÝíïé óôï `/etc/printcap`.

`abort` *`printer-name`*

> ÄéáãñÜöåé ôçí ôñÝ÷ïõóá åñãáóßá êáé óôáìáôÜåé ôïí åêôõðùôÞ. Ïé ÷ñÞóôåò ìðïñïýí áêüìç íá áðïóôåßëïõí åñãáóßåò áí ç ïõñÜ áíáìïíÞò åßíáé áêüìç åíåñãÞ.

`clean` *`printer-name`*

> ÄéáãñÜöåé ôá ðáëéÜ áñ÷åßá áðü ôïí êáôÜëïãï spool ôïõ åêôõðùôÞ. Óå êÜðïéåò ðåñéðôþóåéò, ôá áñ÷åßá áðü ôá ïðïßá áðïôåëåßôáé êÜðïéá åñãáóßá äåí áöáéñïýíôáé êáíïíéêÜ áðü ôï **LPD**, åéäéêÜ áí õðÞñîáí óöÜëìáôá êáôÜ ôçí åêôýðùóç Þ êÜðïéåò åíÝñãåéåò áðü ôïí äéá÷åéñéóôÞ. ÁõôÞ ç åíôïëÞ âñßóêåé áñ÷åßá ðïõ äåí áíÞêïõí óôïí êáôÜëïãï spool êáé ôá áöáéñåß.

`disable` *`printer-name`*

> Áðåíåñãïðïéåß ôçí ïõñÜ áíáìïíÞò ãéá íÝåò åñãáóßåò. Áí ï åêôõðùôÞò äïõëåýåé, èá óõíå÷ßóåé íá åêôõðþíåé ôéò åíáðïìåßíáíôåò åñãáóßåò óôçí ïõñÜ áíáìïíÞò. Ï superuser (`root`) ìðïñåß ðÜíôá íá óôÝëíåé åñãáóßåò, áêüìç êáé óå áðåíåñãïðïéçìÝíç óåéñÜ áíáìïíÞò.
>
> ÁõôÞ ç åíôïëÞ åßíáé ÷ñÞóéìç, üôáí åëÝã÷åôå Ýíá íÝï åêôõðùôÞ Þ üôáí åãêáèéóôÜôå Ýíá ößëôñï: áðåíåñãïðïéÞóôå ôçí ïõñÜ áíáìïíÞò êáé óôåßëôå åñãáóßåò óáí `root`. Ïé õðüëïéðïé ÷ñÞóôåò äåí èá Ý÷ïõí äõíáôüôçôá íá áðïóôåßëïõí åñãáóßåò Ýùò üôïõ ïëïêëçñþóåôå ôïõò åëÝã÷ïõò óáò êáé åðáíåíåñãïðïéÞóåôå ôçí ïõñÜ áíáìïíÞò ìå ôçí åíôïëÞ `enable`.

`down` *`printer-name message`*

Ïäçãåß ôïí åêôõðùôÞ óå "êáôÝâáóìá" (down). Åßíáé éóïäýíáìï ìå ôï `disable` áêïëïõèïýìåíï áðü Ýíá `stop`. Ôï *`message`* (ìÞíõìá) åìöáíßæåôáé üôáí êÜðïéïò ÷ñÞóôçò åëÝã÷åé ôçí óåéñÜ áíáìïíÞò ìå lpq(1) Þ ôçí êáôÜóôáóç ôïõ åêôõðùôÞ ìå `lpc status`.

`enable` *`printer-name`*

Åíåñãïðïßçóç ôçò ïõñÜò áíáìïíÞò ôïõ åêôõðùôÞ. Ïé ÷ñÞóôåò ìðïñïýí íá áðïóôåßëïõí åñãáóßåò áëëÜ ï åêôõðùôÞò äåí èá ôõðþóåé Ýùò üôïõ îåêéíÞóåé.

`help` *`command-name`*

Ôõðþíåé óåëßäåò âïçèåßáò ãéá ôçí åíôïëÞ *`command-name`*. Äß÷ùò ôï *`command-name`*, åêôõðþíåé ìéá ðåñßëçøç üëùí ôùí äéáèÝóéìùí åíôïëþí.

`restart` *`printer-name`*

ÎåêéíÜ ôïí åêôõðùôÞ. Ïé êáíïíéêïß ÷ñÞóôåò ìðïñïýí íá ÷ñçóéìïðïéÞóïõí áõôÞ ôçí åíôïëÞ ìüíï óå êÜðïéá åéäéêÞ ðåñßðôùóç ðïõ ôï **LPD** äåí áðïêñßíåôáé, áëëÜ äåí ìðïñïýí íá îåêéíÞóïõí Ýíá åêôõðùôÞ ðïõ Ý÷åé óôáìáôÞóåé åîáéôßáò ôùí åíôïëþí `stop` Þ `down`. Ç åíôïëÞ `restart` åßíáé éóïäýíáìç ìå ôçí `abort` áêïëïõèïýìåíç áðü ôç `start`.

`start` *`printer-name`*

ÎåêéíÜ ôïí åêôõðùôÞ. Ï åêôõðùôÞò èá ôõðþóåé åñãáóßåò áðü ôçí ïõñÜ áíáìïíÞò ôïõ.

`stop` *`printer-name`*

ÓôáìáôÜåé ôïí åêôõðùôÞ. Ï åêôõðùôÞò èá ïëïêëçñþóåé ôçí ôñÝ÷ïõóá åñãáóßá ôïõ êáé äåí èá ôõðþóåé êáìßá Üëëç åñãáóßá áðü ôçí ïõñÜ áíáìïíÞò ôïõ. Áêüìç êáé áí ï åêôõðùôÞò åßíáé óôáìáôçìÝíïò, ïé ÷ñÞóôåò ìðïñïýí áêüìç íá óôÝëíïõí åñãáóßåò áí åßíáé åíåñãïðïéçìÝíç ç ïõñÜ áíáìïíÞò.

`topq` *`printer-name job-or-username`*

ÁíáêáôÜôáîç ôçò ïõñÜò áíáìïíÞò ãéá ôïí *`printer-name`*. Ôïðïèåôïýíôáé ðñþôåò ïé åñãáóßåò ìå áñéèìü áíáöïñÜò *`job`* Þ áõôÝò ðïõ áíÞêïõí óôï ÷ñÞóôç *`username`*. Ãéá áõôÞ ôçí åíôïëÞ, äåí ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå `all` óôçí èÝóç ôïõ *`printer-name`*.

`up` *`printer-name`*

Ïäçãåß ôïí åêôõðùôÞ óå "áíÝâáóìá" (up). Ôï áíôßèåôï ôçò åíôïëÞò `down`. Éóïäýíáìï ìå ôçí `start` áêïëïõèïýìåíç áðü ôçí åíôïëÞ `enable`.

Ôï lpc(8) äÝ÷åôáé ôéò ðáñáðÜíù åíôïëÝò óôçí ãñáììÞ åíôïëþí. Áí äåí åéóÜãåôå êáìßá åíôïëÞ, ôï lpc(8) ìðáßíåé óå êáôÜóôáóç áëëçëåðßäñáóçò (interactive), üðïõ ìðïñåßôå íá ðëçêôñïëïãåßôå åíôïëÝò ìÝ÷ñé íá äþóåôå `exit`, `quit`, Þ end-of-file.

10.6 ÅíáëëáêôéêÝò Ëýóåéò ãéá ôïí ÓôÜíôáñ Spooler

Áí Ý÷åôå ìåëåôÞóåé ðéóôÜ üëï ôï êåöÜëáéï ìÝ÷ñé åäþ, èá Ý÷åôå ìÜèåé ó÷åäüí ôá ðÜíôá ó÷åôéêÜ ìå ôï óýóôçìá ðáñï÷Ýôåõóçò **LPD** ðïõ äéáôßèåôáé ìå ôï FreeBSD. Èá Ý÷åôå êáôáíïÞóåé êáé ðïëëÝò áðü ôéò åëëåßøåéò ôïõ, ðïõ öõóéêÜ ãåííïýí ôï åñþôçìá: “Ðïéá Üëëá óõóôÞìáôá ðáñï÷Ýôåõóçò (ðïõ íá ëåéôïõñãïýí óôï FreeBSD) õðÜñ÷ïõí äéáèÝóéìá;”

LPRng

Ôï **LPRng**, ôï ïðïßï óçìáßíåé “LPR: the Next Generation (ç Åðüìåíç ÃåíéÜ)” åßíáé ìéá áðü ôçí áñ÷Þ õëïðïßçóç ôïõ PLP. Ï Patrick Powell êáé ï Justin Mason (êýñéïò óõíôçñçôÞò ôïõ PLP) óõíåñãÜóôçêáí ãéá íá öôéÜîïõí ôï **LPRng**. Ç êýñéá ôïðïèåóßá ôïõ **LPRng** åßíáé ç http://www.lprng.org/.

CUPS

Ôï **CUPS**, Þ áëëéþò Common UNIX Printing System, ðáñÝ÷åé ìéá öïñçôÞ ðëáôöüñìá åêôõðþóåùí ãéá ëåéôïõñãéêÜ óõóôÞìáôá âáóéóìÝíá óôï UNIX. Áíáðôý÷èçêå áðü ôçí Easy Software Products ãéá íá ðñïùèÞóåé ìéá óôÜíôáñ ëýóç åêôõðþóåùí ãéá üëïõò ôïõò ÷ñÞóôåò êáé êáôáóêåõáóôÝò UNIX.

Ôï **CUPS** ÷ñçóéìïðïéåß ôï ðñùôüêïëëï Internet Printing Protocol (IPP) ùò âÜóç ôïõ ãéá ôç äéá÷åßñéóç åñãáóéþí åêôýðùóçò êáé ïõñþí áíáìïíÞò. Õðïóôçñßæïíôáé åðßóçò, áëëÜ ìå ìåéùìÝíç ëåéôïõñãéêüôçôá, ôá ðñùôüêïëëá Line Printer Daemon (LPD), Server Message Block (SMB), êáé AppSocket (ãíùóôü ùò JetDirect). Ôï CUPS ðñïóèÝôåé äõíáôüôçôåò áíß÷íåõóçò äéêôõáêþí åêôõðùôþí, åíþ ìÝóù ôùí åðéëïãþí PostScript Printer Description (PPD) ãßíåôáé åöéêôÞ ç õðïóôÞñéîç óýã÷ñïíùí åêôõðùôþí óôïí êüóìï ôïõ UNIX.

Ç êýñéá ôïðïèåóßá ôïõ **CUPS** åßíáé ç http://www.cups.org/.

HPLIP

Ôï **HPLIP**, Þ Óýóôçìá Áðåéêüíéóçò êáé Åêôýðùóçò ôçò HP ãéá Linux, åßíáé ìéá óïõßôá åöáñìïãþí ãéá óõóêåõÝò ôçò HP, ðïõ õðïóôçñßæåé ëåéôïõñãßåò üðùò ç åêôýðùóç, ç óÜñùóç êáé ç áðïóôïëÞ / ëÞøç öáî. Ç óïõßôá áõôÞ ÷ñçóéìïðïéåß ôï **CUPS** ùò backend ãéá êÜðïéåò áðü óéò ëåéôïõñãßåò åêôýðùóçò ðïõ ðáñÝ÷åé.

Ç êýñéá äéêôõáêÞ ôïðïèåóßá ôçò åöáñìïãÞò **HPLIP** åßíáé http://hplipopensource.com/hplip-web/index.html.

10.7 Åíôïðéóìüò Âëáâþí

ÌåôÜ ôçí åêôÝëåóç ôïõ áðëïý ôåóô ìå ôï lptest(1), áíôß ôçò êáíïíéêÞò åêôýðùóçò, ìðïñåß íá Ý÷åôå ëÜâåé ùò áðïôÝëåóìá ìßá áðü ôéò áêüëïõèåò êáôáóôÜóåéò:

Ï åêôõðùôÞò êáèõóôÝñçóå íá îåêéíÞóåé Þ äåí åêôýðùóå ïëüêëçñç ôç óåëßäá.

Ï åêôõðùôÞò ôýðùóå ôï êåßìåíï, áëëÜ äåí îåêßíçóå áìÝóùò. ºóùò ÷ñåéÜóôçêå íá ðéÝóåôå ôï ðëÞêôñï PRINT REMAINING Þ ôï FORM FEED ôïõ åêôõðùôÞ óáò ãéá íá åìöáíéóôåß ôï åðéèõìçôü áðïôÝëåóìá.

ÅÜí åßíáé Ýôóé, áõôÞ ç ðåñßðôùóç óáò, ï åêôõðùôÞò ðéèáíþò íá Þôáí óå áíáìïíÞ ãéá íá åîáêñéâþóåé áí õðÞñ÷áí ðñüóèåôá äåäïìÝíá óôçí åñãáóßá åêôýðùóçò ðñéí îåêéíÞóåé íá åêôõðþíåé ïôéäÞðïôå. Ãéá íá äéïñèþóåôå ôï ðñüâëçìá, ìðïñåßôå íá èÝóåôå ôï ößëôñï êåéìÝíïõ íá óôÝëíåé Ýíá ÷áñáêôÞñá FORM FEED (Þ Üëëï êáôÜëëçëï) óôïí åêôõðùôÞ. Áõôü óõíÞèùò åßíáé áñêåôü ãéá íá ìðïñåßôå íá åêôõðþíåôå êáôåõèåßáí ïðïéïäÞðïôå êåßìåíï áðïìÝíåé óå áíáìïíÞ óôçí åóùôåñéêÞ ìíÞìç (buffer) ôïõ åêôõðùôÞ. Åßíáé åðßóçò ÷ñÞóéìï íá ñõèìßæåôå ôéò åêôõðþóåéò óáò þóôå íá ôåëåéþíïõí ìå äéáìÜñ ôçí ôåëåõôáßá óåëßäá, þóôå ç åðüìåíç åñãáóßá íá ìçí áñ÷ßæåé áðü ôá ìéóÜ ôïõ ðñïçãïýìåíïõ öýëëïõ.

Ç áêüëïõèç ôñïðïðïßçóç óôïõ shell script `/usr/local/libexec/if-simple` åêôõðþíåé Ýíá form feed ìåôÜ ôçí áðïóôïëÞ ôçò åñãáóßáò óôïí åêôõðùôÞ:

```
#!/bin/sh
#
# if-simple - Simple text input filter for lpd
# Installed in /usr/local/libexec/if-simple
#
```

```
# Simply copies stdin to stdout.  Ignores all filter arguments.
# Writes a form feed character (\f) after printing job.

/bin/cat && printf "\f" && exit 0
exit 2
```

Ç åêôýðùóç ðáñïõóéÜæåé “öáéíüìåíï óêÜëáò (staircase effect).”

Óôçí åêôýðùóç óáò öáßíåôáé ôï áêüëïõèï:

```
!"#$%&’()*+,-./01234
                "#$%&’()*+,-./012345
                                 #$%&’()*+,-./0123456
```

Ãßíáôå Ýíá áêüìá èýìá ôïõ *öáéíïìÝíïõ óêÜëáò*, ðïõ ðñïêëÞèçêå áðü áíôéöáôéêÝò åñìçíåßåò ôùí ÷áñáêôÞñùí ìå ôïõò ïðïßïõò äçëþíåôáé ç ôñïöïäïóßá íÝáò ãñáììÞò. Ôá ëåéôïõñãéêÜ óõóôÞìáôá ôýðïõ UNIX ÷ñçóéìïðïéïýí Ýíáí ìüíï ÷áñáêôÞñá ASCII ìå êùäéêü 10, ôïí line feed (ôñïöïäïóßá ãñáììÞò, LF). Ôï MS-DOS, ôï OS/2®, êáé äéÜöïñá Üëëá, ÷ñçóéìïðïéïýí Ýíá æåýãïò ÷áñáêôÞñùí ASCII êùäéêïý 10 *êáé* ASCII êùäéêïý 13 (ôïí carriage return Þ áëëéþò CR). Ðïëëïß åêôõðùôÝò ÷ñçóéìïðïéïýí ôçí óýìâáóç ôïõ MS-DOS ãéá ôçí áëëáãÞ ãñáììÞò.

¼ôáí åêôõðþíåôå ìå ôï FreeBSD, ôï êåßìåíï óáò áðëÜ ÷ñçóéìïðïéåß ôïí ÷áñáêôÞñá ôñïöïäïóßáò ãñáììÞò (line feed). Ï åêôõðùôÞò, ìüëéò áíôéëçöèåß ôïí ÷áñáêôÞñá line feed, ðñïùèåß ôï ÷áñôß êáôÜ ìßá ãñáììÞ, áëëÜ êñáôÜåé ôçí ßäéá èÝóç ïñéæüíôéá êáèþò êáëåßôáé íá åêôõðþóåé ôïí åðüìåíï ÷áñáêôÞñá. Óå áõôü ôï óçìåßï ÷ñçóéìïðïéåßôáé ôï CR (carriage return): ìåôáêéíåß äçëáäÞ ôçí èÝóç åêôýðùóçò ãéá ôïí åðüìåíï ÷áñáêôÞñá ðïõ ðñüêåéôáé íá åêôõðùèåß óôï áñéóôåñü Üêñï ôïõ ÷áñôéïý.

Ôï FreeBSD åðéèõìåß ï åêôõðùôÞò íá ìðïñåß íá åíåñãåß ùò åîÞò:

¼ôáí ï åêôõðùôÞò ëáìâÜíåé CR	Íá åêôõðþíåé CR
¼ôáí ï åêôõðùôÞò ëáìâÜíåé LF	Íá åêôõðþíåé CR + LF

ÕðÜñ÷ïõí äéÜöïñïé ôñüðïé ãéá íá åðéôåõ÷èåß áõôü:

- ×ñçóéìïðïéÞóôå ôá ðëÞêôñá ñýèìéóçò ôïõ åêôõðùôÞ Þ ôïí ðßíáêá åëÝã÷ïõ ãéá íá áëëÜîåôå ôïí ôñüðï ìå ôïí ïðïßï åñìçíåýåé áõôïýò ôïõò ÷áñáêôÞñåò ï åêôõðùôÞò óáò. Óõìâïõëåõôåßôå ôï åã÷åéñßäéï ÷ñÞóçò ôïõ ãéá íá äåßôå ðùò ìðïñåß íá ãßíåé áõôü.

> **Óçìåßùóç:** Áí Ý÷åôå êáé Üëëá ëåéôïõñãéêÜ óôï óýóôçìá óáò åêôüò áðü ôï FreeBSD, ðéèáíüí íá ÷ñåéáóôåß, üôáí ôá ÷ñçóéìïðïéåßôå, íá *åðáíáñõèìßóåôå* ôïí åêôõðùôÞ óáò þóôå íá åñìçíåýåé äéáöïñåôéêÜ ôïõò ÷áñáêôÞñåò CR êáé LF. Óôçí ðåñßðôùóç áõôÞ, ßóùò åßíáé êáëýôåñï íá ðñïôéìÞóåôå êÜðïéá áðü ôéò ëýóåéò ðïõ áêïëïõèïýí.

- Ï ïäçãüò (driver) ôçò óåéñéáêÞò ãñáììÞò ôïõ FreeBSD ìðïñåß íá ìåôáôñÝðåé áõôüìáôá áðü LF óå CR+LF. ÖõóéêÜ, áõôü äïõëåýåé *ìüíï* óå óåéñéáêÝò èýñåò. Ãéá íá åíåñãïðïéÞóåôå áõôÞ ôçí ëåéôïõñãßá, ÷ñçóéìïðïéÞóôå ôçí éêáíüôçôá `ms#` êáé ïñßóôå ôçí êáôÜóôáóç ëåéôïõñãßáò `onlcr` óôï áñ÷åßï `/etc/printcap` ãéá ôïí åêôõðùôÞ.
- Óôåßëôå Ýíá *êùäéêü äéáöõãÞò (escape code)* óôïí åêôõðùôÞ þóôå íá ÷åéñßæåôáé ðñïóùñéíÜ ôïõò ÷áñáêôÞñåò LF ìå äéáöïñåôéêü ôñüðï. Óõìâïõëåõôåßôå ôï åã÷åéñßäéï ÷ñÞóçò ôïõ åêôõðùôÞ óáò ãéá ôïõò êþäéêåò äéáöõãÞò ðïõ õðïóôçñßæïíôáé. ¼ôáí áíáêáëýøåôå ôïí êáôÜëëçëï, ìåôáôñÝøôå ôï ößëôñï êåéìÝíïõ þóôå íá óôÝëíåé ðñþôá ôïí êùäéêü, êáé Ýðåéôá ôçí åñãáóßá óôïí åêôõðùôÞ.

Åäþ åßíáé Ýíá ðáñÜäåéãìá ößëôñïõ êåéìÝíïõ ãéá åêôõðùôÝò ðïõ êáôáëáâáßíïõí ôïõò êùäéêïýò äéáöõãÞò PCL ôçò Hewlett-Packard. Áõôü ôï ößëôñï êÜíåé ôïí åêôõðùôÞ íá ÷åéñßæåôáé ôïõò ÷áñáêôÞñåò LF ùò LF êáé CR. ¸ðåéôá áðïóôÝëëåé ôçí åñãáóßá, óôÝëíïíôáò óôï ôÝëïò ôçò Ýíá ÷áñáêôÞñá áëëáãÞò óåëßäáò (form feed) þóôå íá ãßíåé óùóôÞ åîáãùãÞ ôçò ôåëåõôáßáò óåëßäáò. Ôï ößëôñï áõôü èá ðñÝðåé íá äïõëåýåé ìå ó÷åäüí üëïõò ôïõò åêôõðùôÝò ôçò Hewlett Packard.

```
#!/bin/sh
#
# hpif - Simple text input filter for lpd for HP-PCL based printers
# Installed in /usr/local/libexec/hpif
#
# Simply copies stdin to stdout.  Ignores all filter arguments.
# Tells printer to treat LF as CR+LF.  Ejects the page when done.

printf "\033&k2G" && cat && printf "\033&l0H" && exit 0
exit 2
```

Åäþ åßíáé Ýíá ðáñÜäåéãìá ãéá ôï `/etc/printcap` åíüò õðïëïãéóôÞ ìå üíïìá `orchid`. ¸÷åé Ýíá ìüíï åêôõðùôÞ óôçí ðñþôç ðáñÜëëçëç èýñá ôïõ, Ýíá Hewlett Packard LaserJet 3Si ìå üíïìá `teak`. ×ñçóéìïðïéåß ôï ðáñáðÜíù script ùò ößëôñï êåéìÝíïõ:

```
#
#  /etc/printcap for host orchid
#
teak|hp|laserjet|Hewlett Packard LaserJet 3Si:\
        :lp=/dev/lpt0:sh:sd=/var/spool/lpd/teak:mx#0:\
        :if=/usr/local/libexec/hpif:
```

Åêôõðþíåôáé ç ìßá ãñáììÞ ðÜíù óôçí Üëëç.

Ï åêôõðùôÞò äåí ðñïùèåß êáèüëïõ ôï ÷áñôß êáé üëåò ïé ãñáììÝò êåéìÝíïõ ôõðþíïíôáé ç ìßá ðÜíù áðü ôçí Üëëç, óå ìßá ãñáììÞ.

Áõôü ôï ðñüâëçìá åßíáé ôï “áíôßóôñïöï” ôïõ öáéíïìÝíïõ óêÜëáò, ðïõ ðåñéãñÜøáìå ðñïçãïõìÝíùò, êáé åßíáé ðïëý óðÜíéï. Óå êÜðïéï óçìåßï, ïé ÷áñáêôÞñåò LF ðïõ ÷ñçóéìïðïéåß ôï FreeBSD ãéá íá ôåñìáôßóåé ôçí ãñáììÞ, åñìçíåýïíôáé ùò ÷áñáêôÞñåò CR ïé ïðïßïé åðéóôñÝöïõí ôçí êåöáëÞ óôïí áñéóôåñü Üêñï ôïõ ÷áñôéïý, áëëÜ äßí÷ùò íá ðñïùèÞóïõí ôï ÷áñôß ìßá ãñáììÞ ðñïò ôá êÜôù.

×ñçóéìïðïéÞóôå ôïõò äéáêüðôåò ñõèìßóåùí ôïõ åêôõðùôÞ Þ ôïí ðßíáêá åëÝã÷ïõ ãéá íá èÝóåôå ôéò áêüëïõèåò åðéëïãÝò ãéá ôá LF êáé CR characters:

Ï åêôõðùôÞò ëáìâÜíåé	Ï åêôõðùôÞò ôõðþíåé
CR	CR
LF	CR + LF

Ï åêôõðùôÞò äåí åêôõðþíåé (÷Üíåé) êÜðïéïõò ÷áñáêôÞñåò.

Ï åêôõðùôÞò, åíþ åßíáé óå ëåéôïõñãßá åêôýðùóçò, äåí åêôõðþíåé êÜðïéïõò ÷áñáêôÞñåò óå üëåò ôéò ãñáììÝò. Ôï ðñüâëçìá ðéèáíþò íá ãßíåôáé åíôïíüôåñï êáèþò ç åêôýðùóç åîåëßóóåôáé, ÷Üíïíôáò áêüìç ðåñéóóüôåñïõò ÷áñáêôÞñåò.

Ôï ðñüâëçìá åßíáé ðùò ï åêôõðùôÞò, êáèþò åêôõðþíåé, äåí ðñïëáâáßíåé íá áêïëïõèÞóåé ôçí ôá÷ýôçôá ìå ôçí ïðïßá ï õðïëïãéóôÞò óôÝëíåé äåäïìÝíá ìÝóù ôçò óåéñéáêÞò äéáóýíäåóçò (áõôü ôï ðñüâëçìá äåí ðñÝðåé êáíïíéêÜ íá óõìâáßíåé óå åêôõðùôÝò óõíäåìÝíïõò óå ðáñÜëëçëåò èýñåò). ÕðÜñ÷ïõí äýï ôñüðïé ãéá íá îåðåñáóôåß áõôü ôï ðñüâëçìá:

- ÅÜí ï åêôõðùôÞò õðïóôçñßæåé Ýëåã÷ï ñïÞò XON/XOFF, ñõèìßóôå ôï FreeBSD íá ôïí ÷ñçóéìïðïéÞóåé ïñßæïíôáò ôçí êáôÜóôáóç ëåéôïõñãßáò `ixon` ìå ôçí éêáíüôçôá `ms#`.
- ÅÜí ï åêôõðùôÞò õðïóôçñßæåé Ýëåã÷ï ñïÞò ôýðïõ Request to Send / Clear to Send (hardware handshake, ãíùóôü êáé ìå ôçí ïíïìáóßá `RTS/CTS`), ðñÝðåé íá ïñéóôåß ç êáôÜóôáóç ëåéôïõñãßáò `crtscts` óôçí éêáíüôçôá `ms#`. Âåâáéùèåßôå ðùò ôï êáëþäéï ðïõ óõíäÝåé ôïí åêôõðùôÞ ìå ôïí õðïëïãéóôÞ åßíáé óùóôÜ öôéáãìÝíï ãéá ÷ñÞóç áõôïý ôïõ åëÝã÷ïõ ñïÞò.

Ï åêôõðùôÞò ôõðþíåé óêïõðßäéá.

Ï åêôõðùôÞò ôýðùóå êÜôé ðïõ áðïêáëïýìå ôõ÷áßá óêïõðßäéá, åíþíôáò ïôéäÞðïôå åêôüò ôïõ åðéèõìçôïý êåéìÝíïõ.

Áõôü åßíáé óõíÞèùò Ýíá áêüìá óýìðôùìá ëáíèáóìÝíùí ðáñáìÝôñùí óåéñéáêÞò åðéêïéíùíßáò ìå ôïí åêôõðùôÞ. ÅëÝãîôå îáíÜ ôçí ôéìÞ bps rate óôçí éêáíüôçôá `br`, êáé ôçí ñýèìéóç parity óôçí éêáíüôçôá `ms#`. Âåâáéùèåßôå ðùò ï åêôõðùôÞò ÷ñçóéìïðïéåß ôéò ßäéåò ñõèìßóåéò ðïõ Ý÷ïõí êáèïñéóôåß óôï áñ÷åßï `/etc/printcap`.

Äåí óõíÝâç ôßðïôå, ï åêôõðùôÞò äåí îåêßíçóå êáí.

Áí äåí óõíÝâç ôßðïôå, ôï ðñüâëçìá ðéèáíüí íá ïöåßëåôáé óôï FreeBSD êáé ü÷é óôï hardware. ÐñïóèÝóôå ôçí éêáíüôçôá áñ÷åßïõ êáôáãñáöÞò (log file, `lf`) óôï áñ÷åßï `/etc/printcap`, óôçí êáôá÷þñéóç ôïõ åêôõðùôÞ ðïõ Ý÷åé ôï ðñüâëçìá. Ãéá ðáñÜäåéãìá, åäþ åßíáé ç êáôá÷þñéóç ãéá ôïí `rattan`, ìå ôçí éêáíüôçôá `lf`:

```
rattan|line|diablo|lp|Diablo 630 Line Printer:\
        :sh:sd=/var/spool/lpd/rattan:\
        :lp=/dev/lpt0:\
        :if=/usr/local/libexec/if-simple:\
        :lf=/var/log/rattan.log
```

¸ðåéôá, ðñïóðáèÞóôå íá îáíáåêôõðþóåôå. ÅëÝãîôå ôï áñ÷åßï êáôáãñáöÞò (log) (óôï ðáñÜäåéãìá ìáò, `/var/log/rattan.log`) ãéá íá âñåßôå ðéèáíÝò áíáöïñÝò óöáëìÜôùí. Ìå âÜóç ôá ìçíýìáôá ðïõ âëÝðåôå, ðñïóðáèÞóôå íá äéïñèþóåôå ôï ðñüâëçìá.

Áí äåí êáèïñßóåôå ôçí éêáíüôçôá `lf`, ôï **LPD** ÷ñçóéìïðïéåß áðü ðñïåðéëïãÞ ôï `/dev/console`.

ÊåöÜëáéï 11 Óõìâáôüôçôá ìå ÅêôåëÝóéìá ôïõ Linux

ÁíáäïìÞèçêå êáé ìÝñç ôïõ áíáíåþèçêáí áðü ôïí Jim Mock. Áñ÷éêÞ óõíåéóöïñÜ áðü ôïí Brian N. Handy êáé Rich Murphey.

11.1 Óýíïøç

Ôï FreeBSD ðáñÝ÷åé binary óõìâáôüôçôá (åêôåëÝóéìùí) ìå áñêåôÜ Üëëá ëåéôïõñãéêÜ ôýðïõ UNIX, óõìðåñéëáìâáíïìÝíïõ êáé ôïõ Linux. Óå áõôü ôï óçìåßï, ìðïñåß íá áíáñùôéÝóôå ãéáôß áêñéâþò ÷ñåéÜæåôáé ôï FreeBSD íá ìðïñåß íá ôñÝîåé åêôåëÝóéìá Linux; H áðÜíôçóç óå áõôÞ ôçí åñþôçóç åßíáé áñêåôÜ áðëÞ. ÐïëëÝò åôáéñßåò êáé ðñïãñáììáôéóôÝò áíáðôýóóïõí åöáñìïãÝò ìüíï ãéá Linux, ìéá êáé åßíáé ðïëý "ôçò ìüäáò" óôï ÷þñï ôùí õðïëïãéóôþí. Áõôü áíáãêÜæåé åìÜò ôïõò õðüëïéðïõò, ðïõ ÷ñçóéìïðïéïýìå ôï FreeBSD, íá ðéÝæïõìå ôéò ßäéåò áõôÝò åôáéñßåò êáé ðñïãñáììáôéóôÝò íá äçìéïõñãÞóïõí åããåíéêÝò åêäüóåéò ôùí åöáñìïãþí ôïõò ãéá FreeBSD. Ôï ðñüâëçìá åßíáé, üôé ïé ðåñéóóüôåñåò áðü áõôÝò ôéò åôáéñßåò äåí áíôéëáìâÜíïíôáé ðñáãìáôéêÜ ðüóïé ðåñéóóüôåñïé Üíèñùðïé èá ÷ñçóéìïðïéïýóáí ôï ðñïúüí ôïõò áí åß÷áí åêäüóåéò êáé ãéá FreeBSD, êáé ïé ðåñéóóüôåñåò óõíå÷ßæïõí íá áíáðôýóóïõí ìüíï ãéá Linux. ¶ñá ôé ìðïñåß íá êÜíåé Ýíáò ÷ñÞóôçò ôïõ FreeBSD; Åäþ Ýñ÷åôáé íá âïçèÞóåé ç binary óõìâáôüôçôá ôïõ FreeBSD ìå ôï Linux.

Åí óõíôïìßá, ç óõìâáôüôçôá åðéôñÝðåé óôïõò ÷ñÞóôåò ôïõ FreeBSD íá åêôåëÝóïõí ðåñßðïõ ôï 90% üëùí ôùí Linux åöáñìïãþí ÷ùñßò ìåôáôñïðÝò. Áõôü ðåñéëáìâÜíåé åöáñìïãÝò üðùò ôï **StarOffice**, ôçí Linux Ýêäïóç ôïõ **Netscape**, **Adobe Acrobat**, **RealPlayer®**, **VMware™**, **Oracle**, **WordPerfect®**, **Doom**, **Quake**, êáé ðåñéóóüôåñá. ¸÷åé åðßóçò áíáöåñèåß üôé óå êÜðïéåò ðåñéðôþóåéò, ôá åêôåëÝóéìá ôïõ Linux Ý÷ïõí êáëýôåñç áðüäïóç óôï FreeBSD áðü üôé óôï Linux.

ÕðÜñ÷ïõí ùóôüóï êÜðïéá óõãêåêñéìÝíá ãéá ôï Linux óôïé÷åßá ôïõ ëåéôïõñãéêïý ðïõ äåí õðïóôçñßæïíôáé óôï FreeBSD. Ôá åêôåëÝóéìá ôïõ Linux äåí èá äïõëÝøïõí óôï FreeBSD áí ÷ñçóéìïðïéïýí ðïëëÝò åîåéäéêåõìÝíåò êëÞóåéò i386, üðùò ãéá ðáñÜäåéãìá ôçí åíåñãïðïßçóç ôçò åéêïíéêÞò êáôÜóôáóçò 8086.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá åíåñãïðïéÞóåôå ôçí óõìâáôüôçôá åêôåëÝóéìùí ìå ôï Linux óôï óýóôçìá óáò.
- Ðùò íá åãêáôáóôÞóåôå ðñüóèåôåò êïéíü÷ñçóôåò âéâëéïèÞêåò ôïõ Linux.
- Ðùò íá åãêáôáóôÞóåôå åöáñìïãÝò ôïõ Linux óôï FreeBSD.
- Ôéò ëåðôïìÝñåéåò ôçò õëïðïßçóçò ôçò óõìâáôüôçôáò ìå ôï Linux óôï FreeBSD.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá ãíùñßæåôå ðùò èá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

11.2 ÅãêáôÜóôáóç

Ç óõìâáôüôçôá ìå åêôåëÝóéìá ôïõ Linux äåí åßíáé åíåñãÞ åî' áñ÷Þò. Ï åõêïëüôåñïò ôñüðïò ãéá íá åíåñãïðïéÞóåôå áõôÞ ôç ëåéôïõñãßá åßíáé íá öïñôþóåôå ôï KLD (Üñèñùìá) `linux` ("Kernel LoaDable object"). Ìðïñåßôå íá öïñôþóåôå áõôü ôï Üñèñùìá óôïí ðõñÞíá äßíïíôáò ôç ðáñáêÜôù åíôïëÞ ùò `root`:

```
# kldload linux
```

Áí èÝëåôå íá Ý÷åôå ðÜíôá åíåñãïðïéçìÝíç ôç óõìâáôüôçôá ìå Linux, ôüôå èá ÷ñåéáóôåß íá ðñïóèÝóåôå ôç ðáñáêÜôù ãñáììÞ óôï `/etc/rc.conf`:

```
linux_enable="YES"
```

Ç åíôïëÞ kldstat(8) ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá åëåã÷èåß áí ôï KLD åßíáé öïñôùìÝíï:

```
% kldstat
Id Refs Address    Size     Name
 1    2 0xc0100000 16bdb8   kernel
 7    1 0xc24db000 d000     linux.ko
```

Áí ãéá êÜðïéï ëüãï äåí èÝëåôå Þ äå ìðïñåßôå íá öïñôþóåôå ôï KLD, ôüôå ìðïñåßôå íá óõíäÝóåôå óôáôéêÜ ôçí õðïóôÞñéîç åêôåëÝóéìùí ôïõ Linux óôïí ðõñÞíá ìå ôï íá ðñïóèÝóåôå ôçí åðéëïãÞ `options COMPAT_LINUX` óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá. Óôç óõíÝ÷åéá ìðïñåßôå íá åãêáôáóôÞóåôå ôïí íÝï ðõñÞíá üðùò ðåñéãñÜöåôáé óôï ÊåöÜëáéï 9.

11.2.1 ÅãêáôÜóôáóç ôùí Linux Runtime Libraries

Áõôü ìðïñåß íá ãßíåé ìå äýï ôñüðïõò. Åßôå ìå ôç ÷ñÞóç ôïõ linux_base-fc4 port, Þ ìå ÷åéñïêßíçôç åãêáôÜóôáóç ôïõò.

11.2.1.1 ÅãêáôÜóôáóç ìÝóù ôïõ linux_base Port

Áõôüò åßíáé êáôÜ ãåíéêÞ ïìïëïãßá ï åõêïëüôåñïò ôñüðïò ãéá ôçí åãêáôÜóôáóç ôùí runtime libraries. Åßíáé ç ßäéá äéáäéêáóßá åãêáôÜóôáóçò ðïõ áêïëïõèåßôáé êáé ãéá ïðïéïäÞðïôå Üëëï port áðü ôç ÓõëëïãÞ ôùí Ports (/usr/ports/). ÁðëÜ êÜíôå ôï ðáñáêÜôù:

```
# cd /usr/ports/emulators/linux_base-f10
# make install distclean
```

> **Óçìåßùóç:** Áí ÷ñçóéìïðïéåßôå êÜðïéá Ýêäïóç ôïõ FreeBSD ðñéí ôçí 8.0, èá ðñÝðåé íá åãêáôáóôÞóåôå ôï port `emulators/linux_base-fc4` áíôß ãéá ôï `emulators/linux_base-f10`.

Èá ðñÝðåé ôþñá íá Ý÷åôå êáíïíéêÞ óõìâáôüôçôá ìå åêôåëÝóéìá ôïõ Linux. ÌåñéêÜ ðñïãñÜììáôá ðáñáðïíéïýíôáé üôé ïé âéâëéïèÞêåò óõóôÞìáôïò (system libraries) äåí åßíáé ôçò ôåëåõôáßáò ôïõò Ýêäïóç. ÃåíéêÜ üìùò, áõôü äåí áðïôåëåß êáíÝíá ðñüâëçìá.

> **Óçìåßùóç:** Ìðïñïýí íá õðÜñ÷ïõí ðïëëáðëÝò åêäüóåéò ôïõ `emulators/linux_base`, ðïõ íá áíôéóôïé÷ïýí óôéò äéáöïñåôéêÝò åêäüóåéò ôùí äéáíïìþí Linux. Èá ðñÝðåé íá êÜíåôå åãêáôÜóôáóç ôùí ports ðïõ ðñïáðáéôïýíôáé áðü ôéò åöáñìïãÝò Linux ôéò ïðïßåò èÝëåôå íá åãêáôáóôÞóåôå.

11.2.1.2 ×åéñïêßíçôç åãêáôÜóôáóç ôùí Libraries

Áí äåí Ý÷åôå åãêáôáóôÞóåé ôçí óõëëïãÞ ôùí “ports”, ìðïñåßôå íá åãêáôáóôÞóåôå ôéò âéâëéïèÞêåò ÷åéñïêßíçôá. Èá ÷ñåéáóôåßôå ôá Linux shared libraries ôá ïðïßá áðáéôåß ôï ðñüãñáììá. Åðßóçò, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå êáé Ýíáí êáôÜëïãï “shadow root”, `/compat/linux`, ãéá ôéò âéâëéïèÞêåò Linux ðïõ èá õðÜñ÷ïõí óôï FreeBSD. ÏðïéáäÞðïôå êïéíÝò âéâëéïèÞêåò (shared libraries) ïé ïðïßåò ÷ñçóéìïðïéïýíôáé áðü åöáñìïãÝò Linux êáé åêôåëïýíôáé óôï FreeBSD èá êïéôÜîïõí ðñþôá óå áõôüí ôïí êáôÜëïãï. ÅðïìÝíùò, áí ìéá åöáñìïãÞ Linux öïñôþóåé ãéá ðáñÜäåéãìá ôï `/lib/libc.so`, ôï FreeBSD èá ðñïóðáèÞóåé íá öïñôþóåé ðñþôá ôï `/compat/linux/lib/libc.so`, êáé áí áõôü äåí õðÜñ÷åé, ôüôå èá ðñïóðáèÞóåé íá öïñôþóåé ôï `/lib/libc.so`. Ôá shared libraries èá ðñÝðåé íá åãêáôáóôáèïýí óôï shadow tree `/compat/linux/lib` áíôß ãéá ôéò ôïðïèåóßåò ðïõ áíáöÝñåé ôï `ld.so` óôï Linux.

ÃåíéêÜ, ôïõëÜ÷éóôïí óôéò ðñþôåò óáò åãêáôáóôÜóåéò åöáñìïãþí Linux, èá ÷ñåéáóôåß íá øÜîåôå ãéá ôéò êïéíÝò âéâëéïèÞêåò áðü ôá áíôßóôïé÷á åêôåëÝóéìá. ÌåôÜ áðü êÜðïéï äéÜóôçìá èá Ý÷åôå Ýíá éêáíïðïéçôéêü áñéèìü Linux shared libraries óôï óýóôçìÜ óáò êáé äåí èá ÷ñåéÜæåôáé åðéðëÝïí åñãáóßá ðÝñá áðü ôçí åãêáôÜóôáóç ôçò åöáñìïãÞò.

11.2.1.3 ÅãêáôÜóôáóç Ðñüóèåôùí Shared Libraries

Êáé ôé ãßíåôáé óôç ðåñßðôùóç ðïõ Ý÷åôå åãêáôáóôÞóåé ôï `linux_base` port êáé ïé åöáñìïãÝò óáò áêüìç ðáñáðïíéïýíôáé ãéá shared libraries ðïõ ëåßðïõí; Ðþò ìðïñåßôå íá îÝñåôå ðïéá shared libraries ÷ñåéÜæåôáé êÜðïéá åöáñìïãÞ, êáé ðïõ ìðïñåßôå íá ôá âñåßôå; ÂáóéêÜ, õðÜñ÷ïõí 2 åðéëïãÝò (ãéá íá áêïëïõèÞóåôå ôéò ðáñáêÜôù ïäçãßåò èá ðñÝðåé íá åßóôå `root` óôï óýóôçìÜ óáò).

Áí Ý÷åôå ðñüóâáóç óå êÜðïéï ìç÷Üíçìá Linux, ñßîôå ìéá ìáôéÜ óôá shared libraries ðïõ ÷ñåéÜæåôáé ìéá åöáñìïãÞ, êáé áíôéãñÜøôå ôá óôï FreeBSD. Äåßôå ôï ðáñáêÜôù ðáñÜäåéãìá:

Áò õðïèÝóïõìå üôé êáôåâÜóáôå ìÝóù FTP ôï åêôåëÝóéìï ôïõ **Doom** ãéá ôï Linux, êáé ôï âÜëáôå óôï Linux óýóôçìá óôï ïðïßï Ý÷åôå ðñüóâáóç. Ìðïñåßôå óôç óõíÝ÷åéá íá åëÝãîåôå ðïéá shared libraries ÷ñåéÜæåôáé ç åöáñìïãÞ ìå ôçí åíôïëÞ `ldd linuxdoom`, üðùò:

```
% ldd linuxdoom
libXt.so.3 (DLL Jump 3.1) => /usr/X11/lib/libXt.so.3.1.0
libX11.so.3 (DLL Jump 3.1) => /usr/X11/lib/libX11.so.3.1.0
libc.so.4 (DLL Jump 4.5pl26) => /lib/libc.so.4.6.29
```

Èá ÷ñåéáóôåß íá ðÜñåôå üëá ôá áñ÷åßá áðü ôç ôåëåõôáßá óôÞëç, êáé íá ôá áíôéãñÜøåôå óôïí êáôÜëïãï `/compat/linux`, êáé íá äçìéïõñãÞóåôå ðñïò áõôÜ ôïõò áíôßóôïé÷ïõò óõìâïëéêïýò äåóìïýò (symbolic links) ìå ôá ïíüìáôá ôçò ðñþôçò óôÞëçò. Áõôü óçìáßíåé üôé ôåëéêÜ, èá Ý÷åôå áõôÜ ôá áñ÷åßá óôï óýóôçìá óáò:

```
/compat/linux/usr/X11/lib/libXt.so.3.1.0
/compat/linux/usr/X11/lib/libXt.so.3 -> libXt.so.3.1.0
/compat/linux/usr/X11/lib/libX11.so.3.1.0
/compat/linux/usr/X11/lib/libX11.so.3 -> libX11.so.3.1.0
/compat/linux/lib/libc.so.4.6.29
/compat/linux/lib/libc.so.4 -> libc.so.4.6.29
```

> **Óçìåßùóç:** Óçìåéþóôå üôé áí Ý÷åôå Þäç êÜðïéï Linux shared library ðïõ ï áñéèìüò Ýêäïóçò åßíáé ï ßäéïò ìå áõôüí ôçò ðñþôçò óôÞëçò ôïõ `ldd`, äå èá ÷ñåéáóôåß íá áíôéãñÜøåôå ôï áñ÷åßï üðùò áõôü ïíïìÜæåôáé óôç ôåëåõôáßá óôÞëç, ôá õðÜñ÷ïíôá áñ÷åßá èá ðñÝðåé íá êÜíïõí ôç äïõëåéÜ ôïõò. Óáò óõìâïõëåýïõìå üìùò íá áíôéãñÜøåôå ôï shared library áí åßíáé êÜðïéá íåüôåñç Ýêäïóç. Ìðïñåßôå íá äéáãñÜøåôå ôá ðáëéÜ áñ÷åßá, áñêåß üìùò íá áíáíåþóåôå ôïõò óõìâïëéêïýò äåóìïýò þóôå íá äåß÷íïõí óôá íÝá áñ÷åßá. ÅðïìÝíùò, áí Ý÷åôå ôéò ðáñáêÜôù âéâëéïèÞêåò óôï óýóôçìÜ óáò:

```
/compat/linux/lib/libc.so.4.6.27
/compat/linux/lib/libc.so.4 -> libc.so.4.6.27
```

êáé âñåßôå ìéá åöáñìïãÞ ç ïðïßá æçôÜåé ìéá íåüôåñç Ýêäïóç ìÝóù ôïõ `ldd`:

```
libc.so.4 (DLL Jump 4.5pl26) -> libc.so.4.6.29
```

Áí ç äéáöïñÜ ôçò Ýêäïóçò óôï ôåëåõôáßá øçößï åßíáé ìüíï ìßáò Þ äýï åêäüóåùí, ôüôå ìçí óáò áðáó÷ïëåß ç áíôéãñáöÞ ôïõ `/lib/libc.so.4.6.29`, ãéáôß ôï ðñüãñáììá èá ðñÝðåé íá ôñÝ÷åé êáíïíéêÜ êáé ìå ôç ëßãï ðáëáéüôåñç Ýêäïóç. Ðáñ’ üëá áõôÜ, áí èÝëåôå, ìðïñåßôå íá áíôéêáôáóôÞóåôå ôï `libc.so` êáé Ýôóé èá Ý÷åôå ôï ðáñáêÜôù:

```
/compat/linux/lib/libc.so.4.6.29
/compat/linux/lib/libc.so.4 -> libc.so.4.6.29
```

Óçìåßùóç: Ï ìç÷áíéóìüò ôùí óõìâïëéêþí óõíäÝóìùí ÷ñåéÜæåôáé *ìüíï* ãéá ôéò åöáñìïãÝò ôïõ Linux. Ï runtime linker ôïõ FreeBSD êïéôÜåé ìüíïò ôïõ ãéá ôéò ðéï ðñüóöáôåò åêäüóåéò ôùí âéâëéïèçêþí êáé Ýôóé äå ÷ñåéÜæåôáé íá óáò áðáó÷ïëåß.

11.2.2 ÅãêáôÜóôáóç ôùí Linux ELF Binaries

Ôá ELF binaries ÷ñåéÜæïíôáé ìåñéêÝò öïñÝò Ýíá áêüìá âÞìá, ôï “branding”. Áí ðñïóðáèÞóåôå íá ôñÝîåôå Ýíá åêôåëÝóéìï ELF ÷ùñßò branding, ôüôå èá óáò åìöáíéóôåß ôï ðáñáêÜôù óöÜëìá:

```
% ./my-linux-elf-binary
ELF binary type not known
Abort
```

Ãéá íá âïçèÞóåôå ôïí ðõñÞíá ôïõ FreeBSD íá îå÷ùñßóåé Ýíá ELF ôïõ FreeBSD áðü Ýíá ôïõ Linux, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ brandelf(1).

```
% brandelf -t Linux my-linux-elf-binary
```

To GNU toolchain, ïìÜäá ðñüãñáììá GNU, ôïðïèåôåß ðëÝïí áõôüìáôá ôá êáôÜëëçëá ÷áñáêôçñéóôéêÜ óôá åêôåëÝóéìá ELF, åðïìÝíùò ôï ðáñáðÜíù âÞìá èá ÷ñåéÜæåôáé üëï êáé ëéãüôåñï óôï ìÝëëïí.

11.2.3 ÅãêáôÜóôáóç ìéáò Ôõ÷áßáò Linux RPM ÅöáñìïãÞò

Ôï FreeBSD äéáèÝôåé ôçí äéêÞ ôïõ âÜóç äåäïìÝíùí ãéá ôá ðáêÝôá, ç ïðïßá ÷ñçóéìïðïéåßôáé ãéá üëá ôá ports (êáé ãéá áõôÜ ðïõ ðñïÝñ÷ïíôáé áðü ôï Linux). Ãéá ôï ëüãï áõôü, ç âÜóç äåäïìÝíùí Linux RPM äåí ÷ñçóéìïðïéåßôáé (äåí õðïóôçñßæåôáé).

Áí ùóôüóï ÷ñåéÜæåôáé íá åãêáôáóôÞóåôå ìéá ïðïéáäÞðïôå åöáñìïãÞ ôïõ Linux ðïõ âáóßæåôáé óå ðáêÝôï RPM, ìðïñåßôå íá ôï åðéôý÷åôå ìå ôïí ðáñáêÜôù ôñüðï:

```
# cd /compat/linux
# rpm2cpio -q < /path/to/linux.archive.rpm | cpio -id
```

×ñçóéìïðïéÞóôå ôçí brandelf(1) ãéá íá óõðïðïéÞóåôå êáôÜëëçëá ôá åêôåëÝóéìá (ü÷é ôéò âéâëéïèÞêåò!) ùò åöáñìïãÝò Linux. Äåí èá ìðïñåßôå íá áðåãêáôáóôÞóåôå ôéò åöáñìïãÝò ìå êáèáñü ôñüðï, áëëÜ èá ìðïñÝóåôå íá êÜíåôå ôéò äïêéìÝò ðïõ åðéèõìåßôå.

11.2.4 Ñýèìéóç ôïõ Hostname Resolver

Áí ôï DNS äå äïõëåýåé Þ áí óáò åìöáíßæåôáé ôï ðáñáêÜôù óöÜëìá:

```
resolv+: "bind" is an invalid keyword resolv+:
"hosts" is an invalid keyword
```

Èá ÷ñåéáóôåß íá ñõèìßóåôå ôï `/compat/linux/etc/host.conf` þóôå íá ðåñéÝ÷åé:

```
order hosts, bind
multi on
```

Ç óåéñÜ åäþ äçëþíåé üôé áñ÷éêÜ åëÝã÷åôáé ôï áñ÷åßï `/etc/hosts` êáé óôç óõíÝ÷åéá ï DNS server. ¼ôáí ôï `/compat/linux/etc/host.conf` äåí åßíáé äéáèÝóéìï, ïé åöáñìïãÝò Linux ÷ñçóéìïðïéïýí ôï `/etc/host.conf` ôïõ FreeBSD êáé ðáñáðïíéïýíôáé üôé ç óýíôáîç ôïõ áñ÷åßïõ äåí åßíáé óùóôÞ. Èá ðñÝðåé íá áöáéñÝóåôå ôçí áíáöïñÜ óôï `bind` áí äåí Ý÷åôå ñõèìßóåé Ýíá name server ìÝóù ôïõ `/etc/resolv.conf`.

11.3 Åãêáèéóôþíôáò ôï Mathematica®

Áíáíåþèçêå ãéá ôï Mathematica 5.X áðü ôïí Boris Hollas.

Ôï êåßìåíï áõôü ðåñéãñÜöåé ôç äéáäéêáóßá åãêáôÜóôáóçò ôçò Ýêäïóçò Linux ôïõ **Mathematica 5.X** óå Ýíá óýóôçìá FreeBSD.

Ìðïñåßôå íá áãïñÜóåôå ôçí êáíïíéêÞ Þ ìáèçôéêÞ Ýêäïóç ôïõ **Mathematica** ãéá Linux, áðåõèåßáò áðü ôç Wolfram óôï http://www.wolfram.com/.

11.3.1 Ôï Ðñüãñáììá ÅãêáôÜóôáóçò ôïõ Mathematica

Áñ÷éêÜ, èá ðñÝðåé íá ðåßôå óôï FreeBSD üôé ôá åêôåëÝóéìá ãéá Linux ôïõ **Mathematica** êÜíïõí ÷ñÞóç ôïõ Linux ABI. Ï åõêïëüôåñïò ôñüðïò ãéá íá ôï êÜíåôå áõôü åßíáé íá ïñßóåôå ôïí ôýðï ôïõ ELF ùò Linux óå üëåò ôéò åöáñìïãÝò ðïõ äåí åßíáé Þäç branded, êÜíïíôáò ÷ñÞóç ôçò åíôïëÞò:

```
# sysctl kern.fallback_elf_brand=3
```

Áõôü èá êÜíåé ôï FreeBSD íá õðïèÝóåé üôé ôá åêôåëÝóéìá ELF ðïõ äåí åßíáé branded, êÜíïõí ÷ñÞóç ôïõ Linux ABI êáé Ýôóé èá ìðïñåßôå íá ôñÝîåôå ôï ðñüãñáììá ôçò åãêáôÜóôáóçò áðåõèåßáò áðü ôï CDROM.

Ôþñá, áíôéãñÜøôå ôï áñ÷åßï `MathInstaller` óôïí óêëçñü óáò äßóêï:

```
# mount /cdrom
# cp /cdrom/Unix/Installers/Linux/MathInstaller /localdir/
```

Áíïßîôå ôï áñ÷åßï êáé áíôéêáôáóôÞóôå ôï `/bin/sh` óôç ðñþôç ãñáììÞ ìå ôï `/compat/linux/bin/sh`. Áõôü èá óéãïõñÝøåé üôé ôï ðñüãñáììá åãêáôÜóôáóçò èá ôñÝ÷åé ìå ôçí Ýêäïóç sh(1) ãéá Linux. Óôç óõíÝ÷åéá, áíôéêáôáóôÞóôå üëåò ôéò åããñáöÝò `Linux)` ìå `FreeBSD)` ÷ñçóéìïðïéþíôáò Ýíáí óõíôÜêôç êåéìÝíïõ Þ ìå ôï ðáñáêÜôù script óôçí åðüìåíç åíüôçôá. Áõôü èá ðåé óôï ðñüãñáììá åãêáôÜóôáóçò ôïõ **Mathematica**, ôï ïðïßï ôñÝ÷åé ôçí åíôïëÞ `uname -s` ãéá íá äéáðéóôþóåé ôï ëåéôïõñãéêü óýóôçìá, íá áíôéìåôùðßóåé ôï FreeBSD óáí Ýíá ëåéôïõñãéêü ðáñåìöåñÝò ìå ôï Linux. Ç åêôÝëåóç ôïõ `MathInstaller` èá îåêéíÞóåé ôþñá ôçí åãêáôÜóôáóç ôïõ **Mathematica**.

11.3.2 Ôñïðïðïéþíôáò ôá ÅêôåëÝóéìá ôïõ Mathematica

Ôá shell scripts ôá ïðïßá äçìéïõñãåß ôï **Mathematica** êáôÜ ôç äéáäéêáóßá ôçò åãêáôÜóôáóçò ðñÝðåé íá ôñïðïðïéçèïýí ðñéí ÷ñçóéìïðïéçèïýí. Áí åðéëÝîåôå ôï `/usr/local/bin` ùò ôïí êáôÜëïãï ãéá ôá åêôåëÝóéìá ôïõ **Mathematica**, èá âñåßôå åêåß óõìâïëéêïýò äåóìïýò (symlinks) ðñïò ôá áñ÷åßá `math`, `mathematica`, `Mathematica`, êáé `MathKernel`. Óå êÜèå ðåñßðôùóç áðü ôéò ðáñáðÜíù, áíôéêáôáóôÞóôå ôéò åããñáöÝò `Linux)` ìå `FreeBSD)` ìå êÜðïéïí óõíôÜêôç êåéìÝíïõ Þ ìå ôï ðáñáêÜôù shell script:

```
#!/bin/sh
cd /usr/local/bin
for i in math mathematica Mathematica MathKernel
  do sed ’s/Linux)/FreeBSD)/g’ $i > $i.tmp
  sed ’s/\/bin\/sh/\/compat\/linux\/bin\/sh/g’ $i.tmp > $i
  rm $i.tmp
  chmod a+x $i
done
```

11.3.3 Áðïêôþíôáò Êùäéêü ãéá ôï Mathematica

¼ôáí åêêéíÞóåôå ôï **Mathematica** ãéá ðñþôç öïñÜ, èá åñùôçèåßôå ãéá Ýíáí êùäéêü. Áí äåí Ý÷åôå êÜðïéïí êùäéêü óå áõôü ôï óôÜäéï, ôñÝîôå ôï ðñüãñáììá `mathinfo` ðïõ âñßóêåôáé óôïí êáôÜëïãï åãêáôÜóôáóçò ãéá íá óáò äþóåé ôï “machine ID”. Ôï "machine ID" åßíáé åî’ ïëïêëÞñïõ âáóéóìÝíï óôç äéåýèõíóç MAC ôçò êÜñôáò äéêôýïõ ðïõ Ý÷åôå. Áõôü óçìáßíåé üôé äåí ìðïñåßôå íá ôñÝîåôå ôï **Mathematica** óå Üëëïõò õðïëïãéóôÝò.

¼ôáí åããñáöåßôå óôç Wolfram, ìå e-mail, ôçëÝöùíï Þ fax, èá ÷ñåéáóôåß íá äþóåôå ôï “machine ID” êáé èá óáò áðáíôÞóïõí ìå Ýíáí áíôßóôïé÷ï êùäéêü ðïõ èá áðïôåëåßôáé áðü ìéá óåéñÜ áñéèìþí.

11.3.4 ÔñÝ÷ïíôáò ôï Mathematica Frontend ìÝóù Äéêôýïõ

Ôï **Mathematica** êÜíåé ÷ñÞóç êÜðïéùí åéäéêþí ãñáììáôïóåéñþí ãéá íá åìöáíßóåé ÷áñáêôÞñåò ïé ïðïßïé äåí õðÜñ÷ïõí óôá óõíçèéóìÝíá óåô (ïëïêëçñþìáôá, áèñïßóìáôá, ÅëëçíéêÜ ãñÜììáôá, êëð). To ðñùôüêïëëï X áðáéôåß áõôÝò ïé ãñáììáôïóåéñÝò íá õðÜñ÷ïõí óôï *ôïðéêü* óýóôçìá. Áõôü óçìáßíåé üôé èá ÷ñåéáóôåß íá áíôéãñÜøåôå ôéò ãñáììáôïóåéñÝò áõôÝò áðü ôï CDROM Þ áðü áðü êÜðïéïí Üëëïí õðïëïãéóôÞ ðïõ Ý÷åé ôï **Mathematica**. ÓõíÞèùò áõôÝò ïé ãñáììáôïóåéñÝò ìðïñïýí íá âñåèïýí ìÝóá óôï êáôÜëïãï `/cdrom/Unix/Files/SystemFiles/Fonts` ôïõ CDROM, Þ óôïí êáôÜëïãï `/usr/local/mathematica/SystemFiles/Fonts` óôïí ôïðéêü óêëçñü äßóêï. Ïé ðñáãìáôéêÝò ãñáììáôïóåéñÝò âñßóêïíôáé óå õðïêáôáëüãïõò üðùò `Type1` êáé `X`. ÕðÜñ÷ïõí áñêåôïß ôñüðïé íá ôéò ÷ñçóéìïðïéÞóåôå, ïé ïðïßïé ðåñéãñÜöïíôáé óôç óõíÝ÷åéá.

Ï ðñþôïò ôñüðïò åßíáé íá ôéò áíôéãñÜøåôå ìÝóá óå Ýíáí õðÜñ÷ïíôá êáôÜëïãï óôï `/usr/X11R6/lib/X11/fonts`. Èá ÷ñåéáóôåß üìùò íá ôñïðïðïéÞóåôå ôï áñ÷åßï `fonts.dir`, þóôå íá ðñïóèÝóåôå ôá ïíüìáôá ôùí ãñáììáôïóåéñþí ìÝóá óå áõôü, êáé íá áëëÜîåôå ôïí áñéèìü ôùí ãñáììáôïóåéñþí óôç ðñþôç ãñáììÞ. ÅíáëëáêôéêÜ, åßíáé óõíÞèùò áñêåôü íá åêôåëÝóåôå áðëþò ôçí åíôïëÞ mkfontdir(1) ìÝóá óôïí êáôÜëïãï ðïõ Ý÷åôå áíôéãñÜøåé ôéò ãñáììáôïóåéñÝò.

Ï äåýôåñïò ôñüðïò åßíáé íá áíôéãñÜøåôå ôïõò ðáñáðÜíù êáôáëüãïõò ìÝóá óôï `/usr/X11R6/lib/X11/fonts`:

```
# cd /usr/X11R6/lib/X11/fonts
# mkdir X
# mkdir MathType1
# cd /cdrom/Unix/Files/SystemFiles/Fonts
# cp X/* /usr/X11R6/lib/X11/fonts/X
# cp Type1/* /usr/X11R6/lib/X11/fonts/MathType1
# cd /usr/X11R6/lib/X11/fonts/X
# mkfontdir
# cd ../MathType1
# mkfontdir
```

Ôþñá ðñïóèÝóôå ôïõò íÝïõò êáôáëüãïõò ìå ôéò ãñáììáôïóåéñÝò óôï font path:

```
# xset fp+ /usr/X11R6/lib/X11/fonts/X
# xset fp+ /usr/X11R6/lib/X11/fonts/MathType1
# xset fp rehash
```

Áí ÷ñçóéìïðïéåßôå ôï **Xorg**, ìðïñåßôå íá öïñôþíåôå ôéò ãñáììáôïóåéñÝò áõôÝò áõôüìáôá, ðñïóèÝôïíôáò ôïõò íÝïõò êáôáëüãïõò óôï áñ÷åßï `xorg.conf`.

Áí *äåí* Ý÷åôå Þäç Ýíáí êáôÜëïãï ìå ôï üíïìá `/usr/X11R6/lib/X11/fonts/Type1`, ìðïñåßôå íá áëëÜîåôå ôï üíïìá ôïõ `MathType1` áðü ôï ðáñáðÜíù ðáñÜäåéãìá óå `Type1`.

11.4 Åãêáèéóôþíôáò ôï Maple™

ÓõíåéóöïñÜ ôïõ Aaron Kaplan. Åõ÷áñéóôßåò óôïí Robert Getschmann.

Ôï **Maple™** åßíáé ìßá åìðïñéêÞ åöáñìïãÞ ìáèçìáôéêþí ðáñüìïéá ìå ôï **Mathematica**. Èá ðñÝðåé íá áãïñÜóåôå ôï ëïãéóìéêü áðü ôï http://www.maplesoft.com/ êáé óôç óõíÝ÷åéá íá êÜíåôå åßôçóç ãéá ìéá Üäåéá ÷ñÞóçò. Ãéá íá åãêáôáóôÞóåôå ôï ëïãéóìéêü óôï FreeBSD, áêïëïõèÞóôå ôá ðáñáêÜôù áðëÜ âÞìáôá.

1. ÅêôåëÝóôå ôï `INSTALL` shell script áðü ôï ìÝóï åãêáôÜóôáóçò ðïõ Ý÷åôå. ÅðéëÝîôå “RedHat” üôáí åñùôçèåßôå áðü ôï ðñüãñáììá åãêáôÜóôáóçò. Ï ôõðéêüò êáôÜëïãïò åßíáé ï `/usr/local/maple`.
2. Áí äåí Ý÷åôå áãïñÜóåé áêüìç êÜðïéá Üäåéá ãéá ôï **Maple**, áãïñÜóôå ìßá áðü ôï Maple Waterloo Software (http://register.maplesoft.com/) êáé áíôéãñÜøôå ôï áñ÷åßï ðïõ èá óáò äïèåß óôï `/usr/local/maple/license/license.dat`.
3. ÅãêáôáóôÞóôå ôï **FLEXlm** license manager åêôåëþíôáò ôï `INSTALL_LIC` shell script ôï ïðïßï ðáñÝ÷åôáé ìáæß ìå ôï **Maple**. Äþóôå ôï âáóéêü üíïìá ôïõ õðïëïãéóôÞ óáò ôï ïðïßï áðáéôåßôáé áðü ôïí åîõðçñåôçôÞ äéá÷åßñéóçò ôùí áäåéþí (license server).
4. ×ñçóéìïðïéÞóôå ôï ðáñáêÜôù patch óôï áñ÷åßï `/usr/local/maple/bin/maple.system.type`:

```
   ----- snip ------------------
*** maple.system.type.orig      Sun Jul  8 16:35:33 2001
--- maple.system.type   Sun Jul  8 16:35:51 2001
***************
```

```
*** 72,77 ****
--- 72,78 ----
          # the IBM RS/6000 AIX case
          MAPLE_BIN="bin.IBM_RISC_UNIX"
          ;;
+     "FreeBSD"|\
      "Linux")
          # the Linux/x86 case
        # We have two Linux implementations, one for Red Hat and
   ----- snip end of patch -----
```

Óçìåéþóôå üôé ìåôÜ ôï `"FreeBSD"|\` äåí ðñÝðåé íá åìöáíßæåôáé Üëëï êåíü äéÜóôçìá.

Ôï patch áõôü ïäçãåß ôï **Maple** íá áíáãíùñßóåé ôï “FreeBSD” óáí Ýíá óýóôçìá Linux. Ôï `bin/maple` shell script êáëåß ôï `bin/maple.system.type` shell script, ôï ïðïßï ìå ôç óåéñÜ ôïõ êáëåß ôçí åíôïëÞ `uname -a` ðñïêåéìÝíïõ íá åíôïðéóôåß ôï üíïìá ôïõ ëåéôïõñãéêïý óõóôÞìáôïò. Áíáëüãùò ìå ôï ðïéï ëåéôïõñãéêü âñåèåß, èá ÷ñçóéìïðïéçèïýí êáé ôá áíôßóôïé÷á åêôåëÝóéìá áñ÷åßá.

5. ÅêêéíÞóôå ôïí license server.

   ¸íáò âïëéêüò ôñüðïò ãéá íá åêêéíÞóåôå ôï `lmgrd` åßíáé ôï áêüëïõèï script ðïõ âñßóêåôáé óôï `/usr/local/etc/rc.d/lmgrd.sh`:

```
   ----- snip ------------

#! /bin/sh
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/usr/X11R6/bin
PATH=${PATH}:/usr/local/maple/bin:/usr/local/maple/FLEXlm/UNIX/LINUX
export PATH

LICENSE_FILE=/usr/local/maple/license/license.dat
LOG=/var/log/lmgrd.log

case "$1" in
start)
        lmgrd -c ${LICENSE_FILE} 2>> ${LOG} 1>&2
        echo -n " lmgrd"
        ;;
stop)
        lmgrd -c ${LICENSE_FILE} -x lmdown 2>> ${LOG} 1>&2
        ;;
*)
        echo "Usage: ‘basename $0‘ {start|stop}" 1>&2
        exit 64
        ;;
esac

exit 0
   ----- snip ------------
```

6. ÄïêéìÞ ôïõ **Maple**:

```
% cd /usr/local/maple/bin
% ./xmaple
```

Óå áõôü ôï óçìåßï èá ðñÝðåé íá åßíáé üëá Ýôïéìá êáé íá ìçí Ý÷åôå êáíÝíá ðñüâëçìá. Ìçí îå÷íÜôå üìùò íá óôåßëåôå Ýíá e-mail óôç Maplesoft êáé íá ôïõò ðåßôå üôé èÝëåôå ìéá Ýêäïóç ôïõ íá õðïóôçñßæåôáé åðßóçìá óôï FreeBSD.

11.4.1 ÓõíçèéóìÝíá ÐñïâëÞìáôá

- ºóùò äõóêïëåõôåßôå ìå ôçí ëåéôïõñãßá ôïõ **FLEXlm** license manager. ÅðéðëÝïí ôåêìçñßùóç ìðïñåßôå íá âñåßôå óôï http://www.globetrotter.com/.
- Ôï `lmgrd` åßíáé ãíùóôü üôé èÝëåé ôï áñ÷åßï ôçò Üäåéáò íá Ý÷åé óõãêåêñéìÝíç ìïñöÞ áëëéþò ç åêôÝëåóç ôïõ èá áðïôý÷åé. ¸íá óùóôü áñ÷åßï Üäåéáò ÷ñÞóçò ðñÝðåé åßíáé óå ãåíéêÝò ãñáììÝò üðùò ôï ðáñáêÜôù:

```
# =======================================================
# License File for UNIX Installations ("Pointer File")
# =======================================================
SERVER chillig ANY
#USE_SERVER
VENDOR maplelmg

FEATURE Maple maplelmg 2000.0831 permanent 1 XXXXXXXXXXXX \
         PLATFORMS=i86_r ISSUER="Waterloo Maple Inc." \
         ISSUED=11-may-2000 NOTICE=" Technische Universitat Wien" \
         SN=XXXXXXXXX
```

Óçìåßùóç: Ï óåéñéáêüò áñéèìüò êáé ôï êëåéäß öáßíïíôáé åäþ ìå ’X’. Ôï `chillig` åßíáé ôï üíïìá ôïõ óõóôÞìáôïò.

Ìðïñåßôå íá ôñïðïðïéÞóåôå ôï áñ÷åßï ôçò Üäåéáò ÷ñÞóçò, áñêåß íá ìçí áëëÜîåôå ôçí ãñáììÞ “FEATURE” (ç ïðïßá ðñïóôáôåýåôáé áðü ôï êëåéäß ôçò Üäåéáò).

11.5 Åãêáèéóôþíôáò ôï MATLAB®

Óõíåéóöïñ Ü ôïõ Dan Pelleg.

Ôï êåßìåíï áõôü ðåñéãñÜöåé ôç äéáäéêáóßá åãêáôÜóôáóçò ôçò Linux Ýêäïóçò ôïõ **MATLAB® 6.5** óå Ýíá óýóôçìá FreeBSD. Äïõëåýåé áñêåôÜ êáëÜ, ìå åîáßñåóç ôï **Java Virtual Machine™** (äåßôå óôï ÔìÞìá 11.5.3).

Ç Linux Ýêäïóç ôïõ **MATLAB** ìðïñåß íá áãïñáóôåß áðåõèåßáò áðü ôçí åôáéñåßá The MathWorks óôï http://www.mathworks.com. Óéãïõñåõôåßôå üôé ðÞñáôå êáé ôï áñ÷åßï ðïõ ðåñéÝ÷åé ôçí Üäåéá ÷ñÞóçò Þ ïäçãßåò ãéá ôï ðùò íá ôï äçìéïõñãÞóåôå. Ìéá êáé èá åðéêïéíùíÞóåôå ìå ôçí åôáéñåßá, ðåßôå ôïõò üôé èá èÝëáôå íá õðÜñ÷åé åðßóçò õðïóôÞñéîç ãéá ôï FreeBSD.

11.5.1 ÅãêáôÜóôáóç ôïõ MATLAB

Ãéá íá åãêáôáóôÞóåôå ôï **MATLAB**, êÜíôå ôá ðáñáêÜôù:

1. ÅéóÜãåôå ôï CD êáé ðñïóáñôÞóôå ôï óôï óýóôçìá óáò. Óõíäåèåßôå ùò ÷ñÞóôçò `root`, üðùò óõíéóôÜ ôï script ôçò åãêáôÜóôáóçò. Ãéá íá îåêéíÞóåôå ôï script ôçò åãêáôÜóôáóçò äþóôå ôçí åíôïëÞ:

   ```
   # /compat/linux/bin/sh /cdrom/install
   ```

   > **Õðüäåéîç:** Ôï ðñüãñáììá ôçò åãêáôÜóôáóçò åßíáé óå ãñáöéêü ðåñéâÜëëïí. Áí ëáìâÜíåôå óöÜëìáôá ó÷åôéêÜ ìå ôçí ïèüíç, äþóôå ôçí åíôïëÞ: `setenv HOME ~USER`, üðïõ *USER* åßíáé ï ÷ñÞóôçò áðü üðïõ äþóáôå ôçí åíôïëÞ su(1).

2. ¼ôáí åñùôçèåßôå ãéá ôïí êáôÜëïãï ôïõ **MATLAB**, äþóôå: **`/compat/linux/usr/local/matlab`**.

   > **Õðüäåéîç:** Ãéá åõêïëüôåñç äéáäéêáóßá åãêáôÜóôáóçò, ïñßóôå ôï ðáñáêÜôù: `set MATLAB=/compat/linux/usr/local/matlab` óôç ãñáììÞ åíôïëþí ôïõ êåëýöïõò óáò.

3. Ôñïðïðïéåßóôå ôï áñ÷åßï ôçò Üäåéáò (license file) óýìöùíá ìå ôéò ïäçãßåò ðïõ ëÜâáôå ìå ôçí Üäåéá ôïõ **MATLAB**.

   > **Õðüäåéîç:** Ìðïñåßôå íá åôïéìÜóåôå åê ôùí ðñïôÝñùí ôï áñ÷åßï áõôü êáé íá ôï áíôéãñÜøåôå óôï `$MATLAB/license.dat`, ðñéí êáí óáò ðåé ôï ðñüãñáììá åãêáôÜóôáóçò íá ôï ôñïðïðïéÞóåôå.

4. Ïëïêëçñþóç ôçò ÅãêáôÜóôáóçò

Óå áõôü ôï óçìåßï, ç åãêáôÜóôáóç ôïõ **MATLAB** Ý÷åé ïëïêëçñùèåß. Ôá åðüìåíá âÞìáôá ÷ñåéÜæïíôáé ãéá íá ìðïñÝóåôå íá ôï äïõëÝøåôå óùóôÜ ìå ôï FreeBSD.

11.5.2 Åêêßíçóç ôïõ License Manager

1. Äçìéïõñãßá óõìâïëéêþí óõíäÝóìùí ãéá ôá scripts ôïõ license manager:

   ```
   # ln -s $MATLAB/etc/lmboot /usr/local/etc/lmboot_TMW
   # ln -s $MATLAB/etc/lmdown /usr/local/etc/lmdown_TMW
   ```

2. Äçìéïõñãþóôå ôï áñ÷åßï åêêßíçóçò `/usr/local/etc/rc.d/flexlm.sh`. Ôï ðáñÜäåéãìá ðáñáêÜôù åßíáé ìéá ôñïðïðïéçìÝíç Ýêäïóç ôïõ `$MATLAB/etc/rc.lm.glnx86`. Ïé áëëáãÝò åßíáé óôéò ôïðïèåóßåò ôùí áñ÷åßùí, êáé óôçí åêêßíçóç ôïõ license manager óôï ðåñéâÜëëïí åîïìïßùóçò Linux ôïõ FreeBSD .

   ```
   #!/bin/sh
   case "$1" in
     start)
           if [ -f /usr/local/etc/lmboot_TMW ]; then
                 /compat/linux/bin/sh /usr/local/etc/lmboot_TMW -u username && echo ’MATLAB_lmgrd’
           fi
           ;;
     stop)
           if [ -f /usr/local/etc/lmdown_TMW ]; then
               /compat/linux/bin/sh /usr/local/etc/lmdown_TMW  > /dev/null 2>&1
           fi
   ```

```
        ;;
  *)
        echo "Usage: $0 {start|stop}"
        exit 1
        ;;
esac

exit 0
```

> **Óçìáíôéêü:** Ôï áñ÷åßï ðñÝðåé íá åßíáé åêôåëÝóéìï:
>
> ```
> # chmod +x /usr/local/etc/rc.d/flexlm.sh
> ```
>
> ÐñÝðåé åðßóçò íá áíôéêáôáóôÞóåôå ôï ðáñáðÜíù *`username`* ìå Ýíá õðáñêôü üíïìá ÷ñÞóôç ôïõ óõóôÞìáôïò óáò (êáé íá ìçí åßíáé ï `root`).

3. ÅêêéíÞóôå ôïí license manager ìå ôçí åíôïëÞ:

   ```
   # /usr/local/etc/rc.d/flexlm.sh start
   ```

11.5.3 Óýíäåóç ìå ôï ÐåñéâÜëëïí ôïõ Java Runtime Environment

ÁëëÜîôå ôïí óýíäåóìï ôïõ**Java** Runtime Environment (JRE) óå Ýíáí ï ïðïßïò èá äïõëåýåé óôï FreeBSD:

```
# cd $MATLAB/sys/java/jre/glnx86/
# unlink jre; ln -s ./jre1.1.8 ./jre
```

11.5.4 Äçìéïõñãßóôå ôï Script Åêêßíçóçò ôïõ MATLAB

1. Ôïðïèåôßóôå ôï ðáñáêÜôù script óôï `/usr/local/bin/matlab`:

   ```
   #!/bin/sh
   /compat/linux/bin/sh /compat/linux/usr/local/matlab/bin/matlab "$@"
   ```

2. Óôç óõíÝ÷åéá äþóôå ôçí åíôïëÞ `chmod +x /usr/local/bin/matlab`.

> **Õðüäåéîç:** ÁíÜëïãá ìå ôçí Ýêäïóç ôïõ `emulators/linux_base`, ðïõ Ý÷åôå, ìðïñåß íá åìöáíéóôïýí ìåñéêÜ óöÜëìáôá üôáí ôñÝîåôå ôï script. Ãéá íá ôá áðïöýãåôå áõôü, ôñïðïðïéÞóôå ôï áñ÷åßï `/compat/linux/usr/local/matlab/bin/matlab`, êáé áëëÜîôå ôç ãñáììÞ ðïõ ëÝåé:
>
> ```
> if [ ‘expr "$lscmd" : ’.*->.*’’ -ne 0 ]; then
> ```
>
> (óôçí Ýêäïóç 13.0.1 âñßóêåôáé óôç ãñáììÞ 410) óå áõôÞ ôç ãñáììÞ:
>
> ```
> if test -L $newbase; then
> ```

11.5.5 Äçìéïõñãßá Script Ôåñìáôéóìïý ôïõ MATLAB

Ôá åðüìåíá âÞìáôá ÷ñåéÜæïíôáé ãéá íá ëýóåôå Ýíá ðñüâëçìá ðïõ õðÜñ÷åé ìå ôïí ôåñìáôéóìü ôïõ MATLAB.

1. ÄçìéïõñãÞóôå ôï áñ÷åßï `$MATLAB/toolbox/local/finish.m`, êáé ìÝóá óå áõôü ðñïóèÝóôå ìüíï ôç ãñáììÞ:

   ```
   ! $MATLAB/bin/finish.sh
   ```

   Óçìåßùóç: To `$MATLAB` ãñÜøôå ôï áêñéâþò üðùò ôï âëÝðåôå.

   Õðüäåéîç: Óôïí ßäéï êáôÜëïãï, èá âñåßôå ôá áñ÷åßá `finishsav.m` êáé `finishdlg.m`, ôá ïðïßá èá óáò äßíïõí ôç äõíáôüôçôá íá óþæåôå ôçí åñãáóßá óáò ðñéí êëåßóåôå ôï ðñüãñáììá. Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå êÜðïéï áðü áõôÜ, ðñïóèÝóôå ôïõ ôçí ðáñáðÜíù ãñáììÞ áìÝóùò ìåôÜ ôçí åíôïëÞ `save` .

2. ÄçìéïõñãÞóôå ôï áñ÷åßï `$MATLAB/bin/finish.sh`, ôï ïðïßï èá ðåñéÝ÷åé ôá ðáñáêÜôù:

   ```
   #!/compat/linux/bin/sh
   (sleep 5; killall -1 matlab_helper) &
   exit 0
   ```

3. ÊÜíôå ôï áñ÷åßï åêôåëÝóéìï:

   ```
   # chmod +x $MATLAB/bin/finish.sh
   ```

11.5.6 ×ñçóéìïðïéþíôáò ôï MATLAB

Óå áõôü ôï óçìåßï èá ðñÝðåé íá åßóôå Ýôïéìïé íá äþóåôå ôçí åíôïëÞ `matlab` êáé íá áñ÷ßóåôå íá ÷ñçóéìïðïéåßôå ôçí åöáñìïãÞ.

11.6 ÅãêáôÜóôáóç ôçò Oracle®

ÓõíåéóöïñÜ ôïõ Marcel Moolenaar.

11.6.1 ÅéóáãùãÞ

Ôï êåßìåíï áõôü ðåñéãñÜöåé ôç äéáäéêáóßá åãêáôÜóôáóçò ôùí **Oracle 8.0.5** êáé **Oracle 8.0.5.1 Enterprise Edition** ãéá Linux óå Ýíá óýóôçìá FreeBSD.

11.6.2 ÅãêáôÜóôáóç ôïõ ÐåñéâÜëëïíôïò Linux

Óéãïõñåõôåßôå üôé Ý÷åôå åãêáôáóôÞóåé ôá `emulators/linux_base` êáé `devel/linux_devtools` áðü ôç óõëëïãÞ ôùí Ports. Áí áíôéìåôùðßæåôå äõóêïëßåò ìå ôá ðáñáðÜíù, ßóùò ÷ñåéáóôåß íá ôá åãêáôáóôÞóåôå áðü ðáêÝôá Þ áðü ðáëéüôåñåò åêäüóåéò ôçò óõëëïãÞò ôùí Ports.

Áí èÝëåôå íá ôñÝîåôå ôïí intelligent agent, èá ÷ñåéáóôåß íá åãêáôáóôÞóåôå êáé ôï ðáêÝôï Red Hat Tcl: `tcl-8.0.3-20.i386.rpm`. Ç åíôïëÞ ãéá ôçí åãêáôÜóôáóç ìÝóù ôïõ åðßóçìïõ **RPM** port (`archivers/rpm`) åßíáé:

```
# rpm -i --ignoreos --root /compat/linux --dbpath /var/lib/rpm package
```

Ç åãêáôÜóôáóç ôïõ *`package`* èá ðñÝðåé íá ãßíåé ïìáëÜ êáé ÷ùñßò ðñïâëÞìáôá.

11.6.3 Ñõèìßæïíôáò ôï ÐåñéâÜëëïí ãéá ôçí Oracle

Ðñéí ôçí åãêáôÜóôáóç ôçò **Oracle**, èá ðñÝðåé íá ñõèìßóåôå óùóôÜ ôï ðåñéâÜëëïí ôïõ óõóôÞìáôüò óáò. Ôï ðáñáêÜôù êåßìåíï ðåñéãñÜöåé ôé *áêñéâþò* ðñÝðåé íá êÜíåôå ãéá íá åêôåëÝóåôå ôçí **Oracle** ãéá Linux óôï FreeBSD, êáé äåí ðåñéãñÜöåé üôé õðÜñ÷åé Þäç óôïí ïäçãü åãêáôÜóôáóçò ôçò **Oracle**.

11.6.3.1 Ñýèìéóç ôïõ ÐõñÞíá

¼ðùò ðåñéãñÜöåé ï ïäçãüò åãêáôÜóôáóçò ôçò **Oracle**, èá ðñÝðåé íá ïñßóåôå ôéò ôéìÝò ôçò shared memory óôï ìÝãéóôï. Ìçí ÷ñçóéìïðïéÞóåôå ôï `SHMMAX` óôï FreeBSD. Ôï `SHMMAX` õðïëïãßæåôáé áðëþò áðü ôï `SHMMAXPGS` êáé ôï `PGSIZE`. ÅðïìÝíùò êáèïñßóôå ôï `SHMMAXPGS`. ¼ëåò ïé Üëëåò åðéëïãÝò ìðïñïýí íá ïñéóôïýí üðùò ðåñéãñÜöåôáé óôïí ïäçãü. Ãéá ðáñÜäåéãìá:

```
options SHMMAXPGS=10000
options SHMMNI=100
options SHMSEG=10
options SEMMNS=200
options SEMMNI=70
options SEMMSL=61
```

Ïñßóôå ôéò ôéìÝò ôùí åðéëïãþí Ýôóé þóôå íá ôáéñéÜæïõí óôç ÷ñÞóç ôçò **Oracle** ðïõ èÝëåôå íá êÜíåôå.

Åðßóçò, âåâáéùèåßôå üôé Ý÷åôå åíåñãïðïéÞóåé ôéò ðáñáêÜôù åðéëïãÝò óôéò ñõèìßóåéò ôïõ ðõñÞíá:

```
options SYSVSHM #SysV shared memory
options SYSVSEM #SysV semaphores
options SYSVMSG #SysV interprocess communication
```

11.6.3.2 Ï ×ñÞóôçò Oracle

ÄçìéïõñãÞóôå Ýíá ÷ñÞóôç óõóôÞìáôïò ìå üíïìá `oracle`, ìå ôïí ßäéï ôñüðï ðïõ èá äçìéïõñãïýóáôå êáé ïðïéïíäÞðïôå Üëëïí ÷ñÞóôç. Ôï ìüíï éäéáßôåñï ÷áñáêôçñéóôéêü ôïõ ÷ñÞóôç `oracle` åßíáé üôé ÷ñåéÜæåôáé íá ôïõ äþóåôå Ýíá êÝëõöïò Linux. ÐñïóèÝóôå ôï `/compat/linux/bin/bash` óôï `/etc/shells` êáé ïñßóôå ôï êÝëõöïò ôïõ ÷ñÞóôç `oracle` óå `/compat/linux/bin/bash`.

11.6.3.3 Ôï ÐåñéâÜëëïí

Åêôüò ôùí óõíçèéóìÝíùí ìåôáâëçôþí ôçò **Oracle**, üðùò ïé `ORACLE_HOME` êáé `ORACLE_SID` èá ðñÝðåé íá ïñßóåôå êáé ôéò áêüëïõèåò ìåôáâëçôÝò ðåñéâÜëëïíôïò:

ÌåôáâëçôÞ	ÔéìÞ
`LD_LIBRARY_PATH`	`$ORACLE_HOME/lib`

ÌåôáâëçôÞ	ÔéìÞ
`CLASSPATH`	`$ORACLE_HOME/jdbc/lib/classes111.zip`
`PATH`	`/compat/linux/bin /compat/linux/sbin /compat/linux/usr/bin /compat/linux/usr/sbin /bin /sbin /usr/bin /usr/sbin /usr/local/bin $ORACLE_HOME/bin`

Óáò óõíéóôïýìå íá ïñßóåôå üëåò ôéò ìåôáâëçôÝò ðåñéâÜëëïíôïò óôï áñ÷åßï `.profile`. ¸íá ïëïêëçñùìÝíï ðáñÜäåéãìá åßíáé ôï ðáñáêÜôù:

```
ORACLE_BASE=/oracle; export ORACLE_BASE
ORACLE_HOME=/oracle; export ORACLE_HOME
LD_LIBRARY_PATH=$ORACLE_HOME/lib
export LD_LIBRARY_PATH
ORACLE_SID=ORCL; export ORACLE_SID
ORACLE_TERM=386x; export ORACLE_TERM
CLASSPATH=$ORACLE_HOME/jdbc/lib/classes111.zip
export CLASSPATH
PATH=/compat/linux/bin:/compat/linux/sbin:/compat/linux/usr/bin
PATH=$PATH:/compat/linux/usr/sbin:/bin:/sbin:/usr/bin:/usr/sbin
PATH=$PATH:/usr/local/bin:$ORACLE_HOME/bin
export PATH
```

11.6.4 ÅãêáôÜóôáóç ôçò Oracle

Ëüãù ìéá ìéêñÞò Ýëëåéøçò óôïí åîïìïéùôÞ ôïõ Linux, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå Ýíáí êáôÜëïãï ìå ôï üíïìá `.oracle` ìÝóá óôï `/var/tmp`, ðñéí îåêéíÞóåôå ôï ðñüãñáììá åãêáôÜóôáóçò. Ï êáôÜëïãïò áõôüò èá ðñÝðåé íá áíÞêåé óôïí ÷ñÞóôç `oracle`. Èá ðñÝðåé ôþñá íá ðñáãìáôïðïéÞóåôå ôçí åãêáôÜóôáóç ôçò **Oracle** äß÷ùò êáíÝíá ðñüâëçìá. Áí áíôéìåôùðßæåôå üìùò áêüìç ðñïâëÞìáôá, åëÝãîôå ôçí Ýêäïóç ôçò **Oracle** ðïõ Ý÷åôå Þ/êáé ôéò ñõèìßóåéò óáò! Áöüôïõ Ý÷åôå ðñáãìáôïðïéÞóåé ôçí åãêáôÜóôáóç ôçò **Oracle**, åöáñìüóôå ôá patches ðïõ ðåñéãñÜöïíôáé óôéò äýï ðáñáêÜôù åíüôçôåò.

¸íá óõ÷íü ðñüâëçìá åßíáé üôé äåí ãßíåôáé óùóôÞ åãêáôÜóôáóç ôïõ ðñùôïêüëëïõ TCP. Áõôü Ý÷åé ùò áðïôÝëåóìá íá ìçí ìðïñåßôå íá îåêéíÞóåôå ôïõò TCP listeners. Ïé áêüëïõèåò ïäçãßåò èá óáò âïçèÞóïõí íá ëýóåôå áõôü ôï ðñüâëçìá.:

```
# cd $ORACLE_HOME/network/lib
# make -f ins_network.mk ntcontab.o
# cd $ORACLE_HOME/lib
# ar r libnetwork.a ntcontab.o
# cd $ORACLE_HOME/network/lib
# make -f ins_network.mk install
```

Ìç îå÷Üóåôå íá ôñÝîåôå îáíÜ ôï `root.sh`

11.6.4.1 Äéüñèùóç ôïõ root.sh

¼ôáí åãêáèéóôÜôå ôçí **Oracle**, êÜðïéåò åíÝñãåéåò, ïé ïðïßåò ÷ñåéÜæïíôáé íá ãßíïõí ùò `root`, êáôáãñÜöïíôáé óå Ýíá shell script ðïõ ëÝãåôáé `root.sh`. Ôï script áõôü äçìéïõñãåßôáé óôïí êáôÜëïãï `orainst`. Åöáñìüóôå ôï ðáñáêÜôù patch óôï `root.sh`, ãéá íá ìðïñÝóåé íá âñåé êáé íá ÷ñçóéìïðïéÞóåé ôï `chown`. ÅíáëëáêôéêÜ, ôñÝîôå ôï script ìÝóá áðü Ýíá êÝëõöïò Linux.

```
*** orainst/root.sh.orig Tue Oct 6 21:57:33 1998
--- orainst/root.sh Mon Dec 28 15:58:53 1998
***************
*** 31,37 ****
# This is the default value for CHOWN
# It will redefined later in this script for those ports
# which have it conditionally defined in ss_install.h
! CHOWN=/bin/chown
#
# Define variables to be used in this script
--- 31,37 ----
# This is the default value for CHOWN
# It will redefined later in this script for those ports
# which have it conditionally defined in ss_install.h
! CHOWN=/usr/sbin/chown
#
# Define variables to be used in this script
```

¼ôáí äåí êÜíåôå ÷ñÞóç ôïõ CD ãéá ôçí åãêáôÜóôáóç, ìðïñåßôå íá ðåñÜóåôå ôï patch ãéá ôï `root.sh`, óôçí ðçãÞ åãêáôÜóôáóçò. To áñ÷åßï ïíïìÜæåôáé `rthd.sh` êáé âñßóêåôáé óôïí êáôÜëïãï `orainst`.

11.6.4.2 Äéüñèùóç ôïõ genclntsh

To script `genclntsh` ÷ñçóéìïðïéåßôáé ãéá íá äçìéïõñãÞóåé ìéá shared client library. ÔñÝîôå ôï ðáñáêÜôù patch ãéá íá óâÞóåôå ôï êáèïñéóìÝíï `PATH`:

```
*** bin/genclntsh.orig Wed Sep 30 07:37:19 1998
--- bin/genclntsh Tue Dec 22 15:36:49 1998
***************
*** 32,38 ****
#
# Explicit path to ensure that we’re using the correct commands
#PATH=/usr/bin:/usr/ccs/bin export PATH
! PATH=/usr/local/bin:/bin:/usr/bin:/usr/X11R6/bin export PATH
#
# each product MUST provide a $PRODUCT/admin/shrept.lst
--- 32,38 ----
#
# Explicit path to ensure that we’re using the correct commands
#PATH=/usr/bin:/usr/ccs/bin export PATH
! #PATH=/usr/local/bin:/bin:/usr/bin:/usr/X11R6/bin export PATH
#
# each product MUST provide a $PRODUCT/admin/shrept.lst
```

11.6.5 ÅêôÝëåóç ôçò Oracle

Áöïý Ý÷åôå áêïëïõèÞóåé áõôÝò ôéò ïäçãßåò, èá ðñÝðåé íá ìðïñåßôå íá åêôåëÝóåôå ôçí **Oracle** óáí íá âñéóêüóáóôáí óå Ýíá óýóôçìá Linux.

11.7 Ðñï÷ùñçìÝíá ÈÝìáôá

Áí Ý÷åôå ôçí áðïñßá ðùò ëåéôïõñãåß ç óõìâáôüôçôá ìå åöáñìïãÝò Linux, ôüôå èá ðñÝðåé íá äéáâÜóåôå ôç ðáñáêÜôù åíüôçôá. Ôá ðåñéóóüôåñá áðü üóá Ý÷ïõí ãñáöôåß åßíáé âáóéóìÝíá óôçí çëåêôñïíéêÞ ëßóôá ãåíéêþí óõæçôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chat) êáé Ý÷ïõí ãñáöôåß áðü ôïí Terry Lambert <`tlambert@primenet.com`> (Message ID: <`199906020108.SAA07001@usr09.primenet.com`>).

11.7.1 Ðùò Ëåéôïõñãåß;

Ôï FreeBSD ðåñéÝ÷åé Ýíá åðßðåäï áöáßñåóçò (abstraction) ðïõ ïíïìÜæåôáé “execution class loader”. Áõôü âáóßæåôáé óôï execve(2).

Áõôü ðïõ óõìâáßíåé åßíáé üôé ôï FreeBSD Ý÷åé ìéá ëßóôá öïñôùôþí (loaders), áíôß ãéá Ýíá ðïõ íá êáôáöåýãåé óå ðåñßðôùóç áðïôõ÷ßáò óôï `#!` ãéá íá ôñÝîåé êÜðïéï shell interpreter Þ shell script.

ÉóôïñéêÜ, ï ìüíïò öïñôùôÞò óôç ðëáôöüñìá ôïõ UNIX Ýëåã÷å ôïí ìáãéêü áñéèìü (ãåíéêÜ ôá ðñþôá 4 Þ 8 bytes ôïõ áñ÷åßïõ) ãéá íá äåé áí åßíáé êÜðïéï åêôåëÝóéìï / åöáñìïãÞ ãíùóôü óôï óýóôçìá, êáé óôçí ðåñßðôùóç áõôÞ íá êáëÝóåé ôïí áíôßóôïé÷ï öïñôùôÞ.

Áí ôï áñ÷åßï äåí Þôáí åêôåëÝóéìï ìå âÜóç ôïí ôýðï ôïõ óõóôÞìáôïò, ç êëÞóç óôï execve(2) åðÝóôñåöå êÜðïéï óöÜëìá, êáé ôï shell ðñïóðáèïýóå íá åêôåëÝóåé ôï áñ÷åßï óáí shell script.

Ç ãåíéêÞ éäÝá Þôáí “áí äåí åßíáé åêôåëÝóéìï, ðñïóðÜèçóå íá ôï ôñÝîåéò ùò shell script ìå âÜóç ôï ôñÝ÷ïí shell ”.

Áñãüôåñá, âñÝèçêå Ýíáò Ýîõðíïò ôñüðïò þóôå ôï sh(1) íá åëÝã÷åé ôïõò ðñþôïõò äýï ÷áñáêôÞñåò, êáé áí Þôáí `:\n`, ôüôå êáëïýóå ôï shell csh(1) (ðéóôåýïõìå ðùò ç ëýóç áõôÞ âñÝèçêå áñ÷éêÜ áðü ôç SCO).

Áõôü ðïõ êÜíåé ôþñá ôï FreeBSD åßíáé íá äéáôñÝ÷åé ôç ëßóôá ìå üëïõò ôïõò öïñôùôÝò, ìå Ýíá ãåíéêü öïñôùôÞ `#!` ï ïðïßïò áíáãíùñßæåé ùò äéåñìçíÝá (interpreter) ôïõò ÷áñáêôÞñåò áðü ôï åðüìåíï êåíü ìåôÜ ôï `!` êáé ìÝ÷ñé ôï ôÝëïò, åíþ áí äåí áíáãíùñéóôåß êÜðïéïò, ÷ñçóéìïðïéåßôáé ùò Ýó÷áôç ëýóç ôï `/bin/sh`.

Ãéá ôçí õðïóôÞñéîç ôïõ Linux ABI, ôï FreeBSD âëÝðåé ôïí ìáãéêü áñéèìü ôïõ ELF binary (äå áíáãíùñßæåé ôç äéáöïñÜ áíÜìåóá óå FreeBSD, Solaris, Linux, Þ êÜðïéï Üëëï ëåéôïõñãéêü óýóôçìá ôï ïðïßï ÷ñçóéìïðïéåß áñ÷åßá ôýðïõ ELF).

Ï öïñôùôÞò ELF êïéôÜåé ãéá Ýíá åéäéêü *brand*, ôï ïðïßï åßíáé ìéá åíüôçôá ó÷ïëßùí ìÝóá óôï ELF image, êáé ôï ïðïßï äåí õðÜñ÷åé óå ELF binaries ãéá SVR4/Solaris

Ãéá íá ëåéôïõñãÞóïõí ôá åêôåëÝóéìá ôïõ Linux, èá ðñÝðåé íá ãßíïõí *branded* (ìáñêáñéóôïýí) ùò `Linux` ìÝóù ôçò brandelf(1):

```
# brandelf -t Linux file
```

¼ôáí ãßíåé áõôü, ï öïñôùôÞò ELF èá âëÝðåé ôï `Linux` brand ðÜíù óôï áñ÷åßï.

¼ôáí ï öïñôùôÞò ELF äåé ôï `Linux` brand, èá áíôéêáôáóôÞóåé Ýíáí äåßêôç ìÝóá óôç äïìÞ `proc`. ¼ëåò ïé êëÞóåéò ôïõ óõóôÞìáôïò ôáîéíïìïýíôáé ìÝóá áðü áõôüí ôïí äåßêôç (óå Ýíá ðáñáäïóéáêü óýóôçìá UNIX, ï äåßêôçò èá Þôáí ï ðßíáêáò `sysent[]`, ðïõ ðåñéÝ÷åé ôéò êëÞóåéò ôïõ óõóôÞìáôïò (system calls)). ÅðéðëÝïí, ç äéåñãáóßá óçìåéþíåôáé ãéá åéäéêÞ ìåôá÷åßñéóç ôïõ trap vector êáé Üëëåò (ìéêñÝò) äéïñèþóåéò, ôéò ïðïßåò ÷åéñßæåôáé ôï Üñèñùìá ðõñÞíá ôçò óõìâáôüôçôáò Linux.

Ôï system call vector ôïõ Linux ðåñéÝ÷åé, ìåôáîý Üëëùí, ìéá ëßóôá ìå ôá äåäïìÝíá ôïõ `sysent[]` ôùí ïðïßùí ïé äéåõèýíóåéò âñßóêïíôáé ìÝóá óôï Üñèñùìá ôïõ ðõñÞíá.

¼ôáí ãßíåôáé ìéá êëÞóç óõóôÞìáôïò áðü ìéá åöáñìïãÞ Linux, ï êþäéêáò (trap code) ôñïðïðïéåß ôïí äåßêôç ôçò ìÝóù ôçò äïìÞò ðïõ Ý÷åé åããñáöåß óôï `proc`, êáé áëëÜæåé ôçí äéåýèõíóç þóôå íá äåß÷íåé óôï óçìåßï åéóüäïõ ôçò óõíÜñôçóçò ôïõ Linux, êáé ü÷é ôïõ FreeBSD.

Åðßóçò, ôï óýóôçìá óõìâáôüôçôáò ìå Linux ìðïñåß êáé ðñïóáñìüæåé äõíáìéêÜ ôéò ôïðïèåóßåò áíáæÞôçóçò. Ïõóéáóôéêü áõôü êÜíåé êáé ç åðéëïãÞ `union` êáôÜ ôçí ðñïóÜñôçóç åíüò óõóôÞìáôïò áñ÷åßùí (*äåí* åííïýìå åäþ ôï óýóôçìá áñ÷åßùí `unionfs`!). Áñ÷éêÜ, ãßíåôáé áðüðåéñá íá âñåèåß ôï áñ÷åßï óôïí êáôÜëïãï `/compat/linux/`*`original-path`*, *êáé ìüíï* áí áõôü áðïôý÷åé, èá ãßíåé áíáæÞôçóç óôïí êáôÜëïãï `/`*`original-path`*. Ìå ôïí ôñüðï áõôü óéãïõñåýïõìå üôé ôá åêôåëÝóéìá ðïõ ÷ñåéÜæïíôáé Üëëá åêôåëÝóéìá èá ôñÝîïõí (ãéá ðáñÜäåéãìá, ôï óýíïëï åñãáëåßùí ôïõ Linux ìðïñåß íá åêôåëåóôåß ìÝóù ôçò õðïóôÞñéîçò ôïõ Linux ABI). Åðßóçò óçìáßíåé üôé ôá åêôåëÝóéìá ôïõ Linux ìðïñïýí íá öïñôþóïõí êáé íá åêôåëÝóïõí áñ÷åßá ôïõ FreeBSD áí äåí ìðïñïýí íá åíôïðßóïõí ôá áíôßóôïé÷á áñ÷åßá óôï Linux. Ìðïñåßôå åðßóçò íá ôïðïèåôÞóåôå ìéá åíôïëÞ uname(1) ìÝóá óôï `/compat/linux` ðñïêåéìÝíïõ ôá áñ÷åßá ôïõ Linux íá ìç ìðïñïýí íá áíáãíùñßóïõí üôé äåí ÷ñçóéìïðïéïýíôáé ðñáãìáôéêÜ óå Linux.

Ïõóéáóôéêü, õðÜñ÷åé Ýíáò ðõñÞíáò Linux ìÝóá óôïí ðõñÞíá ôïõ FreeBSD. Ïé äéÜöïñåò ëåéôïõñãßåò ïé ïðïßåò õëïðïéïýí üëåò ôéò õðçñåóßåò ðïõ ðáñÝ÷ïíôáé áðü ôïí ðõñÞíá åßíáé ßäéåò ôüóï óôïí ðßíáêá êëÞóåùí óõóôÞìáôïò ôïõ FreeBSD üóï êáé óôïí áíôßóôïé÷ï ôïõ Linux: ëåéôïõñãßåò ôïõ óõóôÞìáôïò áñ÷åßùí, åéêïíéêÞ ìíÞìç, äéá÷åßñéóç óçìÜôùí, System V IPC êëð. Ç ìüíç äéáöïñÜ åßíáé üôé ôá åêôåëÝóéìá ôïõ FreeBSD êÜíïõí ÷ñÞóç ôùí óõíáñôÞóåùí *glue* ôïõ FreeBSD, åíþ ôá åêôåëÝóéìá ôïõ Linux, êÜíïõí ÷ñÞóç ôùí óõíáñôÞóåùí *glue* ôïõ Linux (ðïëëÜ áðü ôá ðáëéÜ ëåéôïõñãéêÜ åß÷áí ôéò äéêÝò ôïõò óõíáñôÞóåéò *glue*: ïé äéåõèýíóåéò ôùí óõíáñôÞóåùí âñßóêïíôáí óôï óôáôéêü ðßíáêá `sysent[]`, áíôß íá äéáõêñéíßæïíôáé ìÝóù åíüò äõíáìéêïý äåßêôç óôç äïìÞ `proc` ôçò äéåñãáóßáò ðïõ ðñáãìáôïðïéåß ôçí êëÞóç).

Ðïéï åßíáé ôüôå ôï åããåíÝò FreeBSD ABI; Äåí Ý÷åé êáé ðïëý óçìáóßá. Ç ìüíç âáóéêÞ äéáöïñÜ åßíáé (êÜôé ôï ïðïßï ìðïñåß åýêïëá íá áëëÜîåé óå ìåëëïíôéêÝò åêäüóåéò, êáé ðïëý ðéèáíüí íá áëëÜîåé) üôé ïé óõíáñôÞóåéò *glue* ôïõ FreeBSD åßíáé óôáôéêÜ óõíäåäåìÝíåò óôïí ðõñÞíá, åíþ ïé áíôßóôïé÷åò ôïõ Linux ìðïñïýí åßôå íá åßíáé óõíäåäåìÝíåò óôáôéêÜ, åßôå íá åßíáé ðñïóâÜóéìåò ìÝóù åíüò áñèñþìáôïò ðõñÞíá.

Åßíáé áõôü üìùò ðñáãìáôéêÞ åîïìïßùóç; ¼÷é. Åßíáé ìéá õëïðïßçóç ôïõ ABI, ü÷é åîïìïßùóç. Äåí õðÜñ÷åé êáìßá åîïìïßùóç (Þ ðñïóïìïßùóç, ãéá íá ðñïëÜâïõìå ôçí åðüìåíç óáò åñþôçóç).

Ôüôå ãéáôß ìåñéêÝò öïñÝò ìéëÜìå ãéá “åîïìïßùóç Linux”; Ãéá íá äõóêïëåõôåß ç ðñïþèçóç ôïõ FreeBSD! Ç áñ÷éêÞ õëïðïßçóç Ýãéíå ôçí åðï÷Þ üðïõ äåí õðÞñ÷å Üëëç ëÝîç ðïõ íá ìðïñïýóå íá ðåñéãñÜøåé ôï ôé áêñéâþò ãéíüôáí. Ôï íá ëÝãáìå üôé ôï FreeBSD Ýôñå÷å åêôåëÝóéìá Linux äåí èá Þôáí áëçèéíü, ìéá êáé ÷ñåéáæüôáí íá åíóùìáôùèåß êÜðïéïò êþäéêáò óôïí ðõñÞíá, Þ íá öïñôùèåß êÜðïéï Üñèñùìá. ×ñåéáæüôáí êÜðïéá ëÝîç ðïõ íá ðåñéãñÜöåé ôé öïñôùíüôáí—Ýôóé ðñïÝêõøå ï “åîïìïéùôÞò Linux”.

III. Äéá÷åßñéóç ÓõóôÞìáôïò

Ôá êåöÜëáéá ôïõ FreeBSD Handbook ðïõ áêïëïõèïýí áíáöÝñïíôáé óå èÝìáôá ðïõ Ý÷ïõí ó÷Ýóç ìå ôç *äéá÷åßñéóç* ôïõ óõóôÞìáôïò. ÊÜèå êåöÜëáéï îåêéíÜ ðåñéãñÜöïíôáò ôé èá ìÜèåôå äéáâÜæïíôáò ôï óõãêåêñéìÝíï êåöÜëáéï, êáèþò êáé ôé ðñïáðáéôïýìåíá Ý÷åé ôï êåöÜëáéï áõôü: ôé ðñÝðåé íá Ý÷åôå Þäç äéáâÜóåé êáé êáôáíïÞóåé ðñéí áó÷ïëçèåßôå ìå áõôü ôï êåöÜëáéï.

ÁõôÜ ôá êåöÜëáéá Ý÷ïõí ó÷åäéáóôåß ðåñéóóüôåñï ùò ïäçãüò áíáöïñÜò ðáñÜ ùò åéóáãùãéêü êåßìåíï. Ãé áõôü åßíáé ðéï ÷ñÞóéìá ùò ïäçãïß óôïõò ïðïßïõò ìðïñåßôå íá áíáôñÝîåôå üôáí ÷ñåéÜæåóôå êÜðïéá ðëçñïöïñßá ãéá ôï FreeBSD. Äå ÷ñåéÜæåôáé íá ôá äéáâÜóåôå ìå êÜðïéá óõãêåêñéìÝíç óåéñÜ, ïýôå ÷ñåéÜæåôáé íá ôá Ý÷åôå äéáâÜóåé üëá ðñéí áñ÷ßóåôå íá áó÷ïëåßóôå ìå ôï FreeBSD.

ÊåöÜëáéï 12 Ñýèìéóç êáé Âåëôéóôïðïßçóç

ÃñÜöôçêå áðü ôïí Chern Lee. Âáóßóôçêå óå tutorial ãñáììÝíï áðü ôïí Mike Smith. Âáóéóìİíï åðßóçò óôï tuning(7) ðïõ ãñÜöçêå áðü ôïí Matt Dillon.

12.1 Óýíïøç

¸íá áðü ôá óçìáíôéêÜ ÷áñáêôçñéóôéêÜ ôïõ FreeBSD åßíáé ç äõíáôüôçôá ñýèìéóçò ôïõ óõóôÞìáôïò. Ìå ôéò óùóôÝò ñõèìßóåéò óõóôÞìáôïò åßíáé åýêïëï íá áðïöåõ÷èïýí ðïëëÜ ðñïâëÞìáôá êáôÜ ôç äéÜñêåéá ìåëëïíôéêþí áíáâáèìßóåùí. Ôï êåöÜëáéï áõôü èá åîçãÞóåé ìåãÜëï ìÝñïò ôçò äéáäéêáóßáò ñýèìéóçò ôïõ FreeBSD, óõìðåñéëáìâáíïìÝíùí êáé êÜðïéùí ðáñáìÝôñùí ðïõ ìðïñïýí íá ñõèìéóôïýí ãéá ôçí âåëôéóôïðïßçóç ôçò áðüäïóçò ôïõ óõóôÞìáôïò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá äïõëÝøåôå áðïäïôéêÜ ìå óõóôÞìáôá áñ÷åßùí êáé êáôáôìÞóåéò swap.
- Ôá âáóéêÜ ôùí óõóôçìÜôùí ñýèìéóçò êáé åêêßíçóçò `rc.conf` êáé `/usr/local/etc/rc.d`.
- Ðùò íá ñõèìßóåôå êáé íá äïêéìÜóåôå ìéá êÜñôá äéêôýïõ.
- Ðùò íá ñõèìßóåôå virtual hosts óôéò äéêôõáêÝò óáò óõóêåõÝò.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôá äéÜöïñá áñ÷åßá ñõèìßóåùí óôïí êáôÜëïãï `/etc`.
- Ðùò íá âåëôéóôïðïéÞóåôå ôï FreeBSD ÷ñçóéìïðïéþíôáò ìåôáâëçôÝò `sysctl`.
- Ðùò íá âåëôéóôïðïéÞóåôå ôçí áðüäïóç ôïõ äßóêïõ êáé íá áëëÜîåôå ôïõò ðåñéïñéóìïýò ôïõ ðõñÞíá.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).
- Íá åßóôå åîïéêåéùìÝíïé ìå ôá âáóéêÜ ôçò ñýèìéóçò êáé ôçò ìåôáãëþôôéóçò ôïõ ðõñÞíá (ÊåöÜëáéï 9).

12.2 Áñ÷éêÞ Ñýèìéóç

12.2.1 ÄéÜôáîç ÊáôáôìÞóåùí

12.2.1.1 ÂáóéêÝò ÊáôáôìÞóåéò

¼ôáí äçìéïõñãåßôå óõóôÞìáôá áñ÷åßùí ìå ôï bsdlabel(8) Þ ôï sysinstall(8), èõìçèåßôå üôé ïé óêëçñïß äßóêïé ìåôáöÝñïõí äåäïìÝíá ãñçãïñüôåñá áðï ôá åîùôåñéêÜ ìÝñçé ôïõò óôá åóùôåñéêÜ. ¸óé ìéêñüôåñá êáé ðåñéóóüôåñï ðñïóâÜóéìá óõóôÞìáôá áñ÷åßùí ðñÝðåé íá åßíáé ðëçóéÝóôåñá óôï åîùôåñéêü ôïõ äßóêïõ, åíþ ìåãáëýôåñåò êáôáôìÞóåéò üðùò ôï `/usr` ðñÝðåé íá ôïðïèåôïýíôáé ðéï êïíôÜ óôï åóùôåñéêü ôïõ äßóêïõ. Åßíáé êáëÞ éäÝá íá äçìéïõñãåßôå êáôáôìÞóåéò ìå ðáñüìïéá óåéñÜ ìå áõôÞí: root, swap, `/var`, `/usr`.

Ôï ìÝãåèïò ôïõ `/var` áíôáíáêëÜ ôçí åðéäéùêüìåíç ÷ñÞóç ôïõ ìç÷áíÞìáôïò. Ôï `/var` ÷ñçóéìïðïéåßôå ãéá ôçí áðïèÞêåõóç ôùí ãñáììáôïêéâùôßùí, ôùí áñ÷åßùí êáôáãñáöÞò êáé ôïõ spooler ôïõ åêôõðùôÞ. Ôá ãñáììáôïêéâþôéá êáé ôá áñ÷åßá êáôáãñáöÞò ìðïñïýí íá ìåãáëþóïõí óå áðñïóäüêçôá ìåãÝèç áíÜëïãá ìå ôïí áñéèìü ôùí ÷ñçóôþí ôïõ óõóôÞìáôïò êáé ôï ÷ñïíéêü äéÜóôçìá ðïõ êñáôïýíôáé ôá áñ÷åßá êáôáãñáöÞò. ÓðÜíéá ÷ñåéÜæåôáé ôï `/var/tmp` íá Ý÷åé ðÜíù áðü Ýíá gigabyte ÷þñï, áëëÜ êáëü åßíáé íá Ý÷åôå êáôÜ íïõ üôé ðñÝðåé íá åßíáé áñêåôÜ ìåãÜëï ãéá íá êñáôÜåé ôá ðáêÝôá ðïõ èÝëåôå íá åãêáôáóôÞóåôå.

Ç êáôÜôìçóç `/usr` ðåñéÝ÷åé ôá ðåñéóóüôåñá áñ÷åßá ðïõ áðáéôïýíôáé ãéá ôçí õðïóôÞñéîç ôïõ óõóôÞìáôïò, ôç óõëëïãÞ ôùí ports(7) (ðñïôåßíåôáé) êáé ôïí ðçãáßï êþäéêá (ðñïáéñåôéêü). Êáé ôá äýï áõôÜ åßíáé ðñïáéñåôéêÜ êáôá ôçí åãêáôÜóôáóç. ÔïõëÜ÷éóôïí 2 gigabytes ðñïôåßíïíôáé ãéá áõôÞ ôçí êáôÜôìçóç.

¼ôáí åðéëÝãåôå ìÝãåèïò ãéá ôéò êáôáôìÞóåéò, íá Ý÷åôå õðüøéí óáò ôéò áðáéôÞóåéò óå ÷þñï. Ìðïñåß íá åßíáé ëßãï ðñüâëçìá ôï íá ìåßíåôå ÷ùñßò ÷þñï óå ìéá êáôÜôìçóç åíþ ÷ñçóéìïðïéåßôå åëÜ÷éóôá ìéá Üëëç.

> **Óçìåßùóç:** ÌåñéêÝò öïñÝò ç åðéëïãÞ `Auto-defaults` ôïõ êáôáôìçôÞ ôïõ sysinstall(8) ìðïñåß íá åðéëÝîåé ðïëý ìéêñü ìÝãåèïò ãéá ôéò êáôáôìÞóåéò `/var` êáé `/`. Ðñïóðáèåßóôå íá åðéëÝîåôå Ýîõðíá êáé ãåííáéüäùñá ìåãÝèç ãéá ôéò êáôáôìÞóåéò óáò.

12.2.1.2 Swap ÊáôÜôìçóç

¸íáò åìðåéñéêüò êáíüíáò ãéá íá åðéëÝîåôå ìÝãåèïò ãéá ôçí êáôÜôìçóç swap åßíáé: ðñÝðåé íá åßíáé ðåñßðïõ äéðëÞ áðï ôï ìÝãåèïò ôçò ìíÞìçò (RAM) ôïõ óõóôÞìáôïò. Ãéá ðáñÜäåéãìá, áí ôï ìç÷Üíçìá Ý÷åé 128 megabytes ìíÞìçò, ç êáôÜôìçóç swap ðñÝðåé íá åßíáé 256 megabytes. ÓõóôÞìáôá ìå ëéãüôåñç ìíÞìç ìðïñïýí íá áðïäßäïõí êáëýôåñá ìå ðåñéóóüôåñï swap. Ëéãüôåñï áðï 256 megabytes swap äåí ðñïôåßíåôáé êáé ðñÝðåé íá åîåôáóôåß ç åðÝêôáóç ôçò ìíÞìçò. Ïé áëãüñéèìïé VM paging ôïõ ðõñÞíá åßíáé Ýôóé ñõèìéóìÝíïé þóôå íá áðïäßäïõí êáëýôåñá üôáí ç êáôÜôìçóç swap åßíáé ôïõëÜ÷éóôïí äýï öïñÝò ôï ìÝãåèïò ôçò êåíôñéêÞò ìíÞìçò. Áí ñõèìßóåôå ðïëý ìéêñü swap, ìðïñåß íá Ý÷ïõí ìåéùìÝíç áðüäïóç ïé áëãüñéèìïé óÜñùóçò óåëßäùí ôïõ õðïóõóôÞìáôïò VM êáé ìðïñåß áñãüôåñá íá äçìéïõñãçèïýí ðñïâëÞìáôá áí ðñïóèÝóåôå ðåñéóóüôåñç öõóéêÞ ìíÞìç.

Óå ìåãáëýôåñá óõóôÞìáôá ìå ðïëëáðëïýò SCSI äßóêïõò (Þ ðïëëáðëïýò IDE äßóêïõò óå äéáöïñåôéêïýò åëåãêôÝò), åßíáé ðñïôéìüôåñï ôï swap íá åßíáé ñõèìéóìÝíï óå êÜèå äßóêï (ìÝ÷ñé ôÝóóåñéò äßóêïõò). Ïé îå÷ùñéóôÝò êáôáôìÞóåéò swap êáëü åßíáé íá Ý÷ïõí ðåñßðïõ ôï ßäéï ìÝãåèïò. Ï ðõñÞíáò ìðïñåß íá ÷åéñéóôåß áõèáßñåôá ìåãÝèç swap, áëëÜ ïé åóùôåñéêÝò äïìÝò äåäïìÝíùí ñõèìßæïíôáé ìå âÜóç ôï ìÝãåèïò ôçò ìåãáëýôåñçò êáôÜôìçóçò swap. Êñáôþíôáò ôçí êáôÜôìçóç swap ó÷åäüí óôï ßäéï ìÝãåèïò èá åðéôñÝøåé óôïí ðõñÞíá íá âåëôéóôïðïéÞóåé ôçí ÷ñÞóç ôïõ swap, ìïéñÜæïíôáò ðéï êáëÜ ôï öüñôï óå êÜèå äßóêï. Äåí ðåéñÜæåé íá Ý÷åôå ìåãÜëï ìÝãåèïò swap, áêüìá êáé áí äå ÷ñçóéìïðïéåßôáé áñêåôÜ. Ìðïñåß íá åßíáé åõêïëüôåñç ç áíÜêáìøç áðï Ýíá åêôüò åëÝã÷ïõ ðñüãñáììá ðñïôïý ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôï óýóôçìá.

12.2.1.3 Ãéáôß íá öôéÜîåôå êáôáôìÞóåéò;

Áñêåôïß ÷ñÞóôåò íïìßæïõí üôé ìßá ìåãÜëç êáôÜôìçóç èá åßíáé åíôÜîåé, áëëÜ õðÜñ÷ïõí áñêåôïß ëüãïé ãéáôß áõôü åßíáé êáêÞ éäÝá. Êáôáñ÷Þí, êÜèå êáôÜôìçóç Ý÷åé äéáöïñåôéêÜ ëåéôïõñãéêÜ ÷áñáêôçñéóôéêÜ, ïðüôå îå÷ùñßæïíôáò ôéò êáôáôìÞóåéò åðéôñÝðïõìå óôï óýóôçìá áñ÷åßùí íá åíáñìïíßæåôáé áíÜëïãá. Ãéá ðáñÜäåéãìá, ïé root êáé `/usr` êáôáôìÞóåéò åßíáé êõñßùò ãéá áíÜãíùóç, ÷ùñßò ðïëëÝò åããñáöÝò. Áíôßèåôá, ãßíïíôáé ðïëëÝò áíáãíþóåéò êáé åããñáöÝò óôéò `/var` êáé `/var/tmp`.

ÊÜíïíôáò óùóôÞ êáôÜôìçóç óå Ýíá óýóôçìá, ï êáôáêåñìáôéóìüò ðïõ óõìâáßíåé óå ìéêñüôåñåò êáé ðåñéóóüôåñï åããñÜøéìåò êáôáôìÞóåéò äåí èá äéáññåýóåé óôéò êáôáôìÞóåéò ðïõ äéáâÜæïíôáé ðéï óõ÷íÜ áðü üôé ãñÜöïíôáé. Êñáôþíôáò ôéò ðåñéóóüôåñï åããñÜøéìåò êáôáôìÞóåéò ðéï êïíôÜ óôçí Üêñç ôïõ äßóêïõ, èá áõîçèåß ç I/O áðüäïóç óôéò êáôáôìÞóåéò üðïõ êáé ÷ñåéÜæåôáé ðéï óõ÷íÜ. Ôþñá åíþ ç áðüäïóç I/O ÷ñåéÜæåôáé óôéò ìåãáëýôåñåò êáôáôìÞóåéò, áëëÜæïíôáò áõôÝò ðéï êïíôÜ óôçí Üêñç ôïõ äßóêïõ äåí èá ïäçãÞóåé óå óçìáíôéêÞ áýîçóç ôçò áðüäïóçò üóï ôï íá ìåôáêéíÞóåôå ôçí `/var` óôçí Üêñç. ÔÝëïò, õðÜñ÷åé êáé èÝìá áóöÜëåéáò. Ìßá ìéêñÞ, ðñïóåãìÝíç root êáôÜôìçóç ç ïðïßá åßíáé äéáèÜæåôáé ðéï óõ÷íÜ áðü üôé ãñÜöåôáé Ý÷åé ìåãáëýôåñç ðéèáíüôçôá íá åðéæÞóåé åíüò Üó÷çìïõ ÷ôõðÞìáôïò.

12.3 Êýñéá Ñýèìéóç

Ç êýñéá ôïðïèåóßá ôùí ðëçñïöïñéþí ãéá ôçí ñýèìéóç ôïõ óõóôÞìáôïò âñßóêåôáé ìÝóá óôï `/etc/rc.conf`. Áõôü ôï áñ÷åßï ðåñéÝ÷åé Ýíá åõñý öÜóìá ñõèìßóåùí, êõñßùò ÷ñçóéìïðïéïýìåíåò óôçí åêêßíçóç ôïõ óõóôÞìáôïò ãéá ôçí ñýèìéóç ôïõ óõóôÞìáôïò. Ôï üíïìá ôïõ áðåõèåßáò óõíåðÜãåôáé áõôü; åßíáé ñõèìßóåéò ãéá ôá áñ÷åßá `rc*`.

¸íáò äéá÷åéñéóôÞò ðñÝðåé íá äçìéïõñãÞóåé åããñáöÝò ìÝóá óôï áñ÷åßï `rc.conf` þóôå íá áíôéêáôáóôÞóåé ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò áðï ôï áñ÷åßï `/etc/defaults/rc.conf`. Ôï áñ÷åßï ðñïåðéëïãþí äåí ðñÝðåé íá áíôéãñáöåß áõôïëåîåß óôï `/etc` - áõôü ðåñéÝ÷åé ðñïåðéëåãìÝíåò ôéìÝò, ü÷é ðáñáäåßãìáôá. ¼ëåò ïé áëëáãÝò ðïõ áöïñïýí ôï óýóôçìá ðñÝðåé íá ãßíïõí óôï áñ÷åßï `rc.conf` áðïêëåéóôéêÜ.

¸íáò áñéèìüò óôñáôçãéêþí ìðïñåß íá åöáñìïóôåß óå Ýíá óýíïëï åöáñìïãþí ãéá íá îå÷ùñßóïõìå ñõèìßóåéò ôïõ åõñý óõíüëïõ áðï ôéò ñõèìßóåéò åðéêåíôñùìÝíåò ãéá Ýíá óýóôçìá ãéá íá êñáôÞóïõìå ôïí öüñôï äéá÷åßñéóçò ÷áìçëÜ. Ç ðñïôåéíüìåíç ðñïóÝããéóç åßíáé íá ôïðïèåôïýìå ôéò ñõèìßóåéò åõñý óõíüëïõ óå Ýíá äéáöïñåôéêü áñ÷åßï, üðùò ôï `/etc/rc.conf.site`, êáé ôüôå íá óõìðåñéëÜâïõìå ôï áñ÷åßï áõôü óôï `/etc/rc.conf`, ôï ïðïßï èá ðåñéÝ÷åé ðëçñïöïñßåò åðéêåíôñùìÝíåò ãéá Ýíá óýóôçìá.

ÌéÜò êáé ôï `rc.conf` äéáâÜæåôáé áðï ôï sh(1) åßíáé åýêïëï íá ôï åðéôý÷ïõìå áõôü. Ãéá ðáñÜäåéãìá:

- rc.conf:

```
. /etc/rc.conf.site
hostname="node15.example.com"
network_interfaces="fxp0 lo0"
ifconfig_fxp0="inet 10.1.1.1"
```

- rc.conf.site:

```
defaultrouter="10.1.1.254"
saver="daemon"
blanktime="100"
```

Ôï áñ÷åßï `rc.conf.site` ìðïñåß Ýðåéôá íá äéáíåìçèåß óå êÜèå óýóôçìá ÷ñçóéìïðïéþíôáò ôï `rsync` Þ êÜðïéï ðáñüìïéï ðñüãñáììá, åíþ ôï áñ÷åßï `rc.conf` ðáñáìÝíåé ìïíáäéêü.

Áíáâáèìßæïíôáò ôï óýóôçìá ÷ñçóéìïðïéþíôáò sysinstall(8) Þ `make world` äåí èá áíôéêáôáóôÞóåé ôï áñ÷åßï `rc.conf`, Ýôóé ïé ñõèìßóåéò äåí èá ÷áèïýí.

12.4 Ñýèìéóç Åöáñìïãþí

ÔõðéêÜ, ïé åãêáôåóôçìÝíåò åöáñìïãÝò Ý÷ïõí ôá äéêÜ ôïõò áñ÷åßá ñõèìßóåùí, ìå ôï äéêü ôïõò ôñüðï óýíôáîçò, êôëð. Åßíáé óçìáíôéêü áõôÜ ôá áñ÷åßá íá êñáôïýíôáé îå÷ùñéóôÜ áðï ôï âáóéêü óýóôçìá, Ýôóé þóôå íá åßíáé åýêïëá åíôïðßóéìá êáé äéá÷åéñßóéìá áðï ôá åñãáëåßá äéá÷åßñéóçò ðáêÝôùí.

ÔõðéêÜ, áõôÜ ôá áñ÷åßá åßíáé åãêáôåóôçìÝíá óôï `/usr/local/etc`. Óå áõôÞ ôçí ðåñßðôùóç üôáí ìßá åöáñìïãÞ Ý÷åé ìåãÜëï áñéèìü áñ÷åßùí ñõèìßóåùí, Ýíáò õðïêáôÜëïãïò äçìéïõñãåßôáé ãéá íá ôá áðïèçêåýóåé.

ÊáíïíéêÜ, üôáí Ýíá port Þ Ýíá package åãêáèéóôÜôå, ðáñáäåßãìáôá áñ÷åßùí ñõèìßóåùí åãêáèéóôÜíôáé åðßóçò. ÁõôÜ åßíáé óõíÞèùò áíáãíùñßóéìá áðï ôçí `.default` êáôÜëçîç ôïõò. Áí äåí õðÜñ÷ïõí áñ÷åßá ñõèìßóåùí ãéá ôçí åöáñìïãÞ, ôüôå èá äçìéïõñãçèïýí êÜíïíôáò áíôéãñáöÞ ôá `.default` áñ÷åßá.

Ãéá ðáñÜäåéãìá, Ý÷åôå õðüøç óáò ôá ðåñéå÷üìåíá ôïõ êáôáëüãïõ `/usr/local/etc/apache`:

```
-rw-r--r--  1 root  wheel   2184 May 20  1998 access.conf
-rw-r--r--  1 root  wheel   2184 May 20  1998 access.conf.default
-rw-r--r--  1 root  wheel   9555 May 20  1998 httpd.conf
-rw-r--r--  1 root  wheel   9555 May 20  1998 httpd.conf.default
-rw-r--r--  1 root  wheel  12205 May 20  1998 magic
-rw-r--r--  1 root  wheel  12205 May 20  1998 magic.default
-rw-r--r--  1 root  wheel   2700 May 20  1998 mime.types
-rw-r--r--  1 root  wheel   2700 May 20  1998 mime.types.default
-rw-r--r--  1 root  wheel   7980 May 20  1998 srm.conf
-rw-r--r--  1 root  wheel   7933 May 20  1998 srm.conf.default
```

Ôá ìåãÝèïé ôùí áñ÷åßùí äåß÷íïõí üôé ìüíï ôï áñ÷åßï `srm.conf` Ý÷åé áëëÜîåé. Ìßá ìåôÝðåéôá áíáâÜèìéóç ôïõ port ôçò åöáñìïãÞò **Apache** äåí èá áíôéêáôáóôÞóåé ôï áëëáãìÝíï áñ÷åßï.

12.5 Eêêéíþíôáò Õðçñåóßåò

Contributed by Tom Rhodes.

Ðïëëïß ÷ñÞóôåò åðéëÝãïõí íá åãêáôáóôÞóïõí ëïãéóìéêü áðï ôñßôïõò êáôáóêåõáóôÝò óôï FreeBSD áðï ôçí óõëëïãÞ ôùí Ports. Óå ðïëëÝò áðï áõôÝò ôéò ðåñéðôþóåéò ìðïñåß íá åßíáé áðáñáßôçôï íá ñõèìßóïõí ôï ëïãéóìéêü ìå ôÝôïéï ôñüðï þóôå íá ìðïñåß íá åðéôñáðåß ç åêêßíçóç ôïõ êáôá ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Õðçñåóßåò, üðùò ôï `mail/postfix` Þ ôï `www/apache13` åßíáé ìüíï äýï áðï ôá ðïëëÜ ðáêÝôá ëïãéóìéêïý ðïõ ìðïñåß íá ÷ñåéÜæïíôáé íá åêêéíçèïýí êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ôï ìÝñïò áõôü èá åîçãÞóåé ôéò äéáèÝóéìåò äéáäéêáóßåò ãéá ôçí åêêßíçóç ëïãéóìéêïý ðñïåñ÷üìåíï áðï ôñßôïõò êáôáóêåõáóôÝò.

Óôï FreeBSD, ïé ðåñéóóüôåñåò ðåñéå÷üìåíåò õðçñåóßåò, üðùò ôï cron(8), åßíáé åêêéíÞóéìåò ìÝóá áðü ôá óåíÜñéá åêêßíçóçò ôïõ óõóôÞìáôïò. Ôá óåíÜñéá áõôÜ ìðïñåß íá äéáöÝñïõí áíÜëïãá ôï FreeBSD Þ ôçí Ýêäïóç ôïõ êáôáóêåõáóôÞ; ùóôüóï, ç ðéï óçìáíôéêÞ ðôõ÷Þ ðïõ ðñÝðåé íá åîåôáóôåß åßíáé üôé ïé ñõèìßóåéò åêêßíçóçò ôïõò ìðïñïýí íá ÷åéñéóôïýí ìÝóá áðï Ýíá áðëü óåíÜñéï åêêßíçóçò.

Ðñéí ôçí Ýëåõóç ôïõ `rc.d`, ïé åöáñìïãÝò ìðïñïýóáí íá ôïðïèåôÞóïõí Ýíá áðëü óåíÜñéï åêêßíçóçò ìÝóá óôïí êáôÜëïãï `/usr/local/etc/rc.d` ï ïðïßïò ìðïñïýóå íá äéáâáóôåß áðï ôá óåíÜñéá åêêßíçóçò ôïõ óõóôÞìáôïò. ÁõôÜ ôá óåíÜñéá ìðïñïýóáí íá åêôåëåóôïýí êáôá ôá ìåôÝðåéôá óôÜäéá åêêßíçóçò ôïõ óõóôÞìáôïò.

Åíþ ðïëëïß éäéþôåò îüäåõóáí ÷ñüíï ðñïóðáèþíôáò íá óõí÷ùíåýóïõí ôï ðáëéü óôõë ñõèìßóåùí ìå ôï íÝï óôõë, ðáñáìÝíåé ãåãïíüò üôé ìåñéêÜ ðñïãñÜììáôá áêüìá áðáéôïýí Ýíá óåíÜñéï íá ôïðïèåôçèåß ìÝóá óôïí ðñïáíáöåñèÝíôá êáôÜëïãï. Ïé ëåðôÝò äéáöïñÝò áíÜìåóá óôá óåíÜñéá åîáñôþíôáé áðü ôï áí Þ ü÷é ï `rc.d` ÷ñçóéìïðïéåßôå. ÐñïãåíÝóôåñá ôïõ FreeBSD 5.1 ôï ðáëéü óôõë ñõèìßóåùí ÷ñçóéìïðïéïýíôáí êáé ó÷åäüí óå üëåò ôéò ðåñéðôþóåéò Ýíá íÝïõ óôõë óåíÜñéï èá åßíáé óùìâáôü.

Åíþ êÜèå óåíÜñéï ðñÝðåé íá ôçñåß ïñéóìÝíåò åëÜ÷éóôåò áðáéôÞóåéò, ôéò ðåñéóóüôåñåò öïñÝò áõôÝò ïé áðáéôÞóåéò åßíáé áíåîÜñôçôåò ôçò Ýêäïóçò ôïõ FreeBSD. ÊÜèå óåíÜñéï ðñÝðåé íá Ý÷åé ìéá `.sh` åðÝêôáóç ðñïóáñôçìÝíç óôï ôÝëïò ôïõ êáé êÜèå óåíÜñéï ðñÝðåé íá åßíáé åêôåëÝóéìï áðï ôï óýóôçìá. Ôï äåýôåñï ìðïñåß íá åðéôåõ÷èåß ÷ñçóéìïðïéþíôáò ôçí `chmod` åíôïëÞ êáé ñõèìßæïíôáò ôçí Üäåéá `755`. Åêåß ðñÝðåé íá õðÜñ÷åé, ôïõëÜ÷éóôïí, ìéá åðéëïãÞ `start` êáé ìßá åðéëïãÞ `stop` ãéá ôçí åöáñìïãÞ.

Ôï ðéï áðëü óåíÜñéï åêêßíçóçò ðéèáíüôáôá íá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#!/bin/sh
echo -n ’ utility’

case "$1" in
start)
        /usr/local/bin/utility
        ;;
stop)
        kill -9 ‘cat /var/run/utility.pid‘
        ;;
*)
        echo "Usage: ‘basename $0‘ {start|stop}" >&2
        exit 64
        ;;
esac

exit 0
```

Ôï óåíÜñéï áõôü ðáñÝ÷åé ìéá `stop` êáé ìéá `start` åðéëïãÞ ãéá ôçí åöáñìïãÞ üðïõ óôï ðáñÜäåéãìá åäþ áíáöÝñåôáé óáí `utility`.

Ìðïñåß íá åêêéíçèåß ÷åéñùíáêôéêÜ êÜíïíôáò:

```
# /usr/local/etc/rc.d/utility.sh start
```

Ðáñüëï ðïõ äåí áðáéôïýí üëåò ïé åöáñìïãÝò íá ðñïóôåèåß ìßá åããñáöÞ óôï `rc.conf`, ó÷åäüí êáèçìåñéíÜ êÜðïéï íÝï port èá ôñïðïðïéÞôå ãéá íá äÝ÷åôáé áõôÞ ôçí ñýèìéóç. ÅëÝãîôå ôçí ôåëéêÞ Ýîïäï ôçò åãêáôÜóôáóçò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ðÜíù óôçí óõãêåêñéìÝíç åöáñìïãÞ. ÌåñéêÝò åöáñìïãÝò áðï ôñßôïõò êáôáóêåõáóôÝò ðáñÝ÷ïõí óåíÜñéá åêêßíçóçò ôá ïðïßá åðéôñÝðïõí óôçí åöáñìïãÞ íá ÷ñçóéìïðïéçèåß ìå ôï `rc.d`, ðáñüëá áõôá, áõôü èá óõæçôçèåß óôï åðüìåíï ìÝñïò.

12.5.1 ÅêôåôáìÝíç Ñýèìéóç Åöáñìïãþí

ÐëÝïí ôï FreeBSD ðåñéÝ÷åé ôï `rc.d`, ç ñýèìéóç ôçò åêêßíçóçò ôùí åöáñìïãþí Ý÷åé ãßíåé åõêïëüôåñç, êáé ðéï ðëïýóéá óå ÷áñáêôçñéóôéêÜ. ×ñçóéìïðïéþíôáò ëÝîåéò êëåéäéÜ ìÝóá óôïí êáôÜëïãï rc.d, ïé åöáñìïãÝò ìðïñïýí ðëÝïí íá åêêéíïýí Ýðåéôá áðï óõãêåêñéìÝíåò õðçñåóßåò ãéá ðáñÜäåéãìá ôçí DNS, ìðïñåß íá åðéôñáðåß ç åéóáãùãÞ åðéðëÝïí ðáñáìÝôñùí ìÝóá áðï ôï `rc.conf` óôçí èÝóç ôùí Þäç õðÜñ÷ïíôùí ðáñáìÝôñùí áðï ôá óåíÜñéá åêêéíÞóçò, êôëð. ¸íá âáóéêü óåíÜñéï ìðïñåß íá ìïéÜæåé ìå ôï áêüëïõèï:

```
#!/bin/sh
#
# PROVIDE: utility
# REQUIRE: DAEMON
# KEYWORD: shutdown

. /etc/rc.subr

name=utility
rcvar=utility_enable
```

```
command="/usr/local/sbin/utility"

load_rc_config $name

#
# DO NOT CHANGE THESE DEFAULT VALUES HERE
# SET THEM IN THE /etc/rc.conf FILE
#
utility_enable=${utility_enable-"NO"}
pidfile=${utility_pidfile-"/var/run/utility.pid"}

run_rc_command "$1"
```

Ôï óåíÜñéï áõôü èá åîáóöáëßóåé üôé ôï ðñüãñáììá **utility** èá åêêéíçèåß ìåôÜ áðï ôçí `daemon` õðçñåóßá. Èá åîáóöáëßóåé åðßóçò ðåñéðëÝïí Ýíáí ôñüðï ãéá ôçí ñýèìéóç êáé ôïí åíôïðéóìü ôïõ PID, Þ ôïõ áñ÷åßïõ ôïõ ID ôçò äéåñãáóßáò.

Ç åöáñìïãÞ ìðïñåß ðëÝïí íá Ý÷åé ôçí ðáñáêÜôù ãñáììÞ ôïðïèåôçìÝíç óôï `/etc/rc.conf`:

```
utility_enable="YES"
```

Ï íÝïò áõôüò ôñüðïò åðéôñÝðåé åðéðëÝïí ôïí åõêïëüôåñï ÷åéñéóìü ôùí ðáñáìÝôñùí ôçò ãñáììÞò åíôïëþí, óå óõíäõáóìü ìå ôéò ðñïõðÜñ÷ïõóåò ëåéôïõñãßåò ðáñå÷üìåíåò áðï ôï `/etc/rc.subr`, ôç óõìâáôüôçôá ìå ôï âïçèçôéêü ðñüãñáììá rcorder(8) êáé åðéðëÝïí ôçí åõêïëüôåñç ñýèìéóç ìÝóù ôïõ `rc.conf` áñ÷åßïõ.

12.5.2 ×ñçóéìïðïéþíôáò Õðçñåóßåò Ãéá Ôçí Åêêßíçóç Õðçñåóéþí

¶ëëåò õðçñåóßåò, üðùò ï äáßìïíáò ôïõ åîõðçñåôÞ POP3, IMAP, êôëð. ìðïñïýí íá åêêéíçèïýí ÷ñçóéìïðïéþíôáò ôï inetd(8). Áõôü áðáéôåß ôçí åãêáôÜóôáóç ôïõ âïçèçôéêïý ðñïãñÜììáôïò õðçñåóéþí áðï ôçí Ports óõëëïãÞ êáé ìéá ãñáììÞ ñõèìßóåùí ðñïóáñôçìÝíç óôï áñ÷åßï `/etc/inetd.conf`, Þ áðï÷áñáêôçñßæïíôáò ìéá áðï ôéò Þäç õðÜñ÷ïõóåò ãñáììÝò ñõèìßóåùí. Äïõëåýïíôáò ìå ôï **inetd** êáé ôéò ñõèìßóåéò ôïõ ðåñéãñÜöåôáé áíáëõôéêÜ óôï ìÝñïò inetd.

Óå ðïëëÝò ðåñéðôþóåéò, åßíáé åýëïãï íá ÷ñçóéìïðïéåßôå ï äáßìïíáò cron(8) ãéá ôçí åêêßíçóç ôùí õðçñåóéþí ôïõ óõóôÞìáôïò. Ç ðñïóÝããéóç áõôÞ Ý÷åé Ýíáí áñéèìü ðëåïíåêôçìÜôùí ãéáôß ôï `cron` ôñÝ÷åé ôéò äéåñãáóßåò óáí éäéïêôÞôçò ôïõ `crontab` áñ÷åßïõ. Áõôü åðéôñÝðåé óôïõò êáíïíéêïýò ÷ñÞóôåò íá åêêéíïýí êáé íá äéá÷åéñßæïíôáé ìåñéêÝò åöáñìïãÝò.

Ôï âïçèçôéêü ðñüãñáììá `cron` ðáñÝ÷åé Ýíá ìïíáäéêü ÷áñáêôçñéóôéêü, ôï `@reboot`, ôï ïðïßï ìðïñåß íá ÷ñçóéìïðïéçèåß óôçí èÝóç ôïõ ÷ñïíéêïý ïñéóìïý. Áõôü èá êÜíåé ôçí åñãáóßá íá ôñÝîåé üôáí ôï cron(8) åêêéíçèåß, óõíÞèùò êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò.

12.6 Ñõèìßæïíôáò Ôï Ðñüãñáììá `cron`

Contributed by Tom Rhodes.

¸íá áðï ôá ðéï ÷ñÞóéìá âïçèçôéêÜ ðñïãñÜììáôá óôï FreeBSD åßíáé ôï cron(8). Ôï ðñüãñáììá `cron` ôñÝ÷åé óôï ðáñáóêÞíéï êáé óõíå÷þò åëÝã÷åé ôï áñ÷åßï `/etc/crontab`. Ôï `cron` åëÝã÷åé åðßóçò ôïí êáôÜëïãï `/var/cron/tabs`, øÜ÷íïíôáò ãéá íÝá `crontab` áñ÷åßá. Ôá áñ÷åßá `crontab` Ý÷ïõí áðïèçêåõìÝíåò ðëçñïöïñßåò ãéá óõãêåêñéìÝíåò äéáäéêáóßåò ôéò ïðïßåò ôï `cron` ðñÝðåé íá åêôåëÝóåé óå óõãêåêñéìÝíï ÷ñüíï.

Ôï `cron` ÷ñçóéìïðïéåß äýï äéáöïñåôéêïýò ôýðïõò áñ÷åßùí ñõèìßóåùí, ôï crontab ôïõ óõóôÞìáôïò êáé ôï crontab ôùí ÷ñçóôþí. Ç ìüíç äéáöïñÜ áíÜìåóá óôïõò äýï áõôïýò ôýðïõò åßíáé ôï Ýêôï ðåäßï. Óôï crontab ôïõ óõóôÞìáôïò, ôï Ýêôï ðåäßï åßíáé ôï üíïìá ôïõ ÷ñÞóôç ìå ôïõ ïðïßïõ èá åêôåëåóôåß ç åíôïëÞ. Áõôü äßíåé ôçí äõíáôüôçôá óôï crontab ôïõ óõóôÞìáôïò íá åêôåëåß åíôïëÝò óáí ïðïéïäÞðïôå ÷ñÞóôçò. Óôï crontab ôùí ÷ñçóôþí, ôï Ýêôï ðåäßï åßíáé ç åíôïëÞ ðïõ ðñÝðåé íá åêôåëåóôåß, êáé üëåò ïé åíôïëÝò åêôåëïýíôáé óôï üíïìá ôïõ ÷ñÞóôç ðïõ äçìéïýñãçóå ôï crontab; áõôü åßíáé Ýíá óçìáíôéêü ÷áñáêôçñéóôéêü áóöáëåßáò.

Óçìåßùóç: Ôá crontabs ôùí ÷ñçóôþí åðéôñÝðïõí óå ìåìïíùìÝíïõò ÷ñÞóôåò íá ðñïãñáììáôßóïõí åñãáóßåò ÷ùñßò ôçí áíÜãêç `root` äéêáéùìÜôùí. Ïé åíôïëÝò ìÝóá óôï crontab åíüò ÷ñÞóôç ôñÝ÷ïõí ìå ôá äéêáéþìáôá ôïõ ÷ñÞóôç ôïõ ïðïßïõ áíÞêåé ôï crontab.

Ï ÷ñÞóôçò `root` ìðïñåß íá Ý÷åé Ýíá crontab ÷ñÞóôç áêñéâþò üðùò êÜèå ÷ñÞóôçò. Áõôü åßíáé äéáöïñåôéêü áðï ôï `/etc/crontab` (ôï crontab ôïõ óõóôÞìáôïò). Ëüãù ôïõ crontab ôïõ óõóôÞìáôïò, äåí õðÜñ÷åé óõíÞèùò êáìßá áíÜãêç ãéá ôçí äçìéïõñãßá åíüò îå÷ùñéóôïý crontab ãéá ôïí ÷ñÞóôç `root`.

Áò ñßîïõìå ìéá ìáôéá óôï áñ÷åßï `/etc/crontab` (ôï crontab ôïõ óõóôÞìáôïò):

```
# /etc/crontab - root’s crontab for FreeBSD
#
# $FreeBSD: src/etc/crontab,v 1.32 2002/11/22 16:13:39 tom Exp $
# ❶
#
SHELL=/bin/sh
PATH=/etc:/bin:/sbin:/usr/bin:/usr/sbin ❷
HOME=/var/log
#
#
#minute hour    mday    month   wday    who     command ❸
#
#
*/5     *       *       *       *       root    /usr/libexec/atrun ❹
```

❶ ¼ðùò óôá ðåñéóóüôåñá áñ÷åßá ñõèìßóåùí óôï FreeBSD, ï ÷áñáêôÞñáò # ðáñéóôÜíåé Ýíá ó÷üëéï. ¸íá ó÷üëéï ìðïñåß íá ôïðïèåôçèåß ìÝóá óôï áñ÷åßï óáí õðåíèýìéóç ãéá ôï ôé ðñáãìáôïðïéåß êáé ãéáôß ìßá åíÝñãåéá. Ôá ó÷üëéá äåí ìðïñïýí íá åßíáé óôçí ßäéá ãñáììÞ ìå ìßá åíôïëÞ ãéáôß áëëéþò èá åñìçíåõôïýí óáí êïììÜôé ôçò åíôïëÞò; ðñÝðåé íá åßíáé óå ìßá íÝá ãñáììÞ. Ïé êåíÝò ãñáììÝò áãíïïýíôáé.

❷ Êáôáñ÷Þí, ðñÝðåé íá êáèïñéóôåß ôï ðåñéâÜëëïí. Ï ÷áñáêôÞñáò ßóïí (=) ÷ñçóéìïðïéåßôå ãéá íá êáèïñßóåé ôéò ñõèìßóåéò ôïõ ðåñéâÜëëïíôïò, üðùò óå áõôü ôï ðáñÜäåéãìá ðïõ ÷ñçóéìïðïéïýíôáé ïé ìåôáâëçôÝò `SHELL`, `PATH`, êáé `HOME`. Áí ç ãñáììÞ ôïõ êÝëõöïõò ðáñáëåéöèåß, ôï `cron` èá ÷ñçóéìïðïéÞóåé ôçí ðñïåðéëåãìÝíç, ïé ïðïßá åßíáé ç `sh`. Áí ç ìåôáâëçôÞ `PATH` ðáñáëåéöèåß, äåí èá ÷ñçóéìïðïéçèåß ðñïåðéëåãìÝíç êáé ç ôïðïèåóßåò ôùí áñ÷åßùí èá ðñÝðåé íá êáèïñéóôïýí ìå áêñßâåéá. Áí ç `HOME` ðáñáëåéöèåß, ôï `cron` èá ÷ñçóéìïðïéÞóåé ôïí êåíôñéêü êáôÜëïãï ôùí åêÜóôïôå ÷ñçóôþí.

❸ Ç ãñáììÞ áõôÞ êáèïñßæåé óõíïëéêÜ åðôÜ ðåäßá. Ôá ðåäßá áõôÜ åßíáé ôá `minute`, `hour`, `mday`, `month`, `wday`, `who`, êáé `command`. ÁõôÜ åßíáé áðï ìüíá ôïõò åðåîçãçìáôéêÜ. Ôï ðåäßï `minute` åßíáé ï ÷ñüíïò óå ëåðôÜ ôïí ïðïßïí ç åíôïëÞ èá åêôåëåóôåß. Ôï ðåäßï `hour` åßíáé ðáñüìïéï ìå ôï ðåäßï `minute`, áðëÜ åßíáé óå þñåò. Ôï ðåäßï `mday` êáèïñßæåé ôçí çìÝñá ôïõ ìÞíá. Ôï ðåäßï `month` åßíáé ðáñüìïéï ìå ôï ðåäßï `hour` êáé ôï ðåäßï `minute`, õðïäåéêíýïíôáò ôïí ìÞíá. Ôï ðåäßï `wday` êáèïñßæåé ôçí çìÝñá ôçò åâäïìÜäáò. ¼ëá áõôÜ ôá ðåäßá ðñÝðåé íá Ý÷ïõí áñéèìçôéêÝò ôéìÝò, êáé íá áêïëïõèïýí ôï åßêïóé-ôåôñÜùñï ñïëüé. Ôï ðåäßï `who` åßíáé éäéáßôåñï, êáé õðÜñ÷åé ìüíï ìÝóá óôï áñ÷åßï `/etc/crontab`. Ôï ðåäßï áõôü êáèïñßæåé óáí ðïéüò ÷ñÞóôçò èá ôñÝîåé ôçí åíôïëÞ. ¼ôáí Ýíáò ÷ñÞóôçò åãêáèéóôÜ ôï `crontab` áñ÷åßï ôïõ, äåí èá Ý÷åé ôï ðåäßï áõôü äéáèÝóéìï. ÔÝëïò, èá áêïëïõèÞóåé ç åðéëïãÞ `command`. Áõôü åßíáé ôï ôåëåõôáßï ðåäßï, Ýôóé êáé ëïãéêÜ õðïäåéêíýåé ôçí åíôïëÞ ðïõ èá åêôåëåóôåß.

❹ Ç ôåëåõôáßá áõôÞ ãñáììÞ èá êáèïñßóåé ôá ìåãÝèçé ðïõ óõæçôÞèçêáí ðáñáðÜíù. ÐñïóÝîôå åäþ üôé Ý÷ïõìå Ýíáí ïñéóìü `*/5`, áêïëïõèïýìåíï áðï áñêåôïýò ÷áñáêôÞñåò `*`. Ïé ÷áñáêôÞñåò `*` óçìáßíïõí "ðñþôï-ôåëåõôáßï", êáé ìðïñïýí íá åñìçíåõèïýí óáí *êÜèå* öïñÜ. ¸ôóé, êñßíïíôáò áðï áõôÞ ôçí ãñáììÞ, åßíáé ðñïöáíÝò üôé ç åíôïëÞ `atrun` åðéêáëåßôáé áðï ôïí ÷ñÞóôç `root` êÜèå ðÝíôå ëåðôÜ áíåîÜñôçôá áðï ôçí çìÝñá êáé ôïí ìÞíá. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åíôïëÞ `atrun`, êïéôÜîôå ôçí óåëßäá âïçèåßáò atrun(8).

Ïé åíôïëÝò ìðïñïýí íá Ý÷ïõí áðåñéüñéóôï áñéèìü ðáñáìÝôñùí, ùóôüóï, ïé åíôïëÝò ìå åêôåôáìÝíï áñéèìü ãñáììþí ðñÝðåé íá äéáóðáóôïýí ìå ôïí ÷áñáêôÞñá óõíÝ÷åéáò áíôßèåôçò êáèÝôïõ "\".

ÁõôÝò åßíáé ïé âáóéêÝò ñõèìßóåéò ãéá êÜèå áñ÷åßï `crontab`, ùóôüóï õðÜñ÷åé êáé êÜôé äéáöïñåôéêü. Ôï ðåäßï Ýîé, üðïõ êáèïñßæïõìå ôï üíïìá ÷ñÞóôç, õðÜñ÷åé ìüíï óôï áñ÷åßï ôïõ óõóôÞìáôïò `/etc/crontab`. Ôï ðåäßï áõôü ðñÝðåé íá ðáñáëåéöèåß ãéá êÜèå `crontab` áñ÷åßï ÷ñÞóôç.

12.6.1 Åãêáèéóôþíôáò ¸íá Crontab

Óçìáíôéêü: Äåí èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí äéáäéêáóßá ðïõ ðåñéãñÜöåôáé åäþ ãéá ôçí äéüñèùóç/åãêáôÜóôáóç ôïõ crontab ôïõ óõóôÞìáôïò. Áðëþ ÷ñçóéìïðïéÞóôå ôïí áãáðçìÝíï óáò êåéìåíïãñÜöï: ôï `cron` èá åíôïðßóåé üôé ôï áñ÷åßï Ý÷åé ôñïðïðïéçèåß êáé èá áñ÷ßóåé Üìåóá íá ÷ñçóéìïðïéåß ôçí áíáíåùìÝíç Ýêäïóç ôïõ. Äåßôå áõôÞ ôçí åããñáöÞ ôïõ FAQ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/faq/admin.html#ROOT-NOT-FOUND-CRON-ERRORS) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ãéá íá åãêáôáóôÞóåôå Ýíá íÝï `crontab` ÷ñÞóôç, ðñþôá ÷ñçóéìïðïéÞóôå ôïí áãáðçìÝíï óáò êåéìåíïãñÜöï ãéá íá äçìéïõñãÞóåôå Ýíá áñ÷åßï ìå ôï áðáéôïýìåíï ôýðï, êáé ôüôå ÷ñçóéìïðïéÞóôå ôï `crontab`. Ç ðéï êïéíÞ ÷ñÞóç ôïõ åßíáé:

```
% crontab crontab-file
```

Óôï ðáñÜäåéãìá áõôü, ôï áñ÷åßï `crontab-file` åßíáé ôï üíïìá ôïõ áñ÷åßïõ `crontab` ðïõ åß÷å äçìéïõñãçèåß ðñïçãïõìÝíùò.

ÕðÜñ÷åé åðßóçò ìßá åðéëïãÞ ãéá íá áðáñéèìÞóåôå ôá åãêáôåóôçìÝíá áñ÷åßá `crontab`: áðëÜ åéóÜãåôå ôçí åðéëïãÞ `-l` óôçí åíôïëÞ `crontab` êáé åëÝãîôå ôï áðïôÝëåóìá.

Ãéá ôïõò ÷ñÞóôåò ðïõ èÝëïõí íá áñ÷ßóïõí ôï crontab áñ÷åßï ôïõò áðï ôçí áñ÷Þ, ÷ùñßò ôçí ÷ñÞóç ðñïôýðïõ, ìðïñïýí íá ÷ñçóéìïðïéÞóïõí ôçí åíôïëÞ `crontab -e`. ÁõôÞ ç åíôïëÞ èá îåêéíÞóåé ôïí êåéìåíïãñÜöï ìå Ýíá êåíü áñ÷åßï. ¼ôáí ôï áñ÷åßï áðïèçêåõèåß, èá åãêáôáóôáèåß áõôüìáôá áðï ôçí åíôïëÞ `crontab`.

Áí áñãüôåñá èÝëåôå íá äéáãñÜøåôå ôï `crontab` áñ÷åßï ÷ñÞóôç ôåëåßùò, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `crontab` ìáæß ìå ôçí åðéëïãÞ `-r`.

12.7 ×ñçóéìïðïéþíôáò Ôï Óýóôçìá rc Óôï FreeBSD

Contributed by Tom Rhodes.

Ôï 2002 ôï FreeBSD åíóùìÜôùóå ôï óýóôçìá `rc.d` ôïõ NetBSD ãéá ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ïé ÷ñÞóôåò èá ðñÝðåé íá Ý÷ïõí áíôéëçöèåß ôá áñ÷åßá ðïõ âñßóêïíôáé óôïí êáôÜëïãï `/etc/rc.d`. ÐïëëÜ áðï áõôÜ ôá áñ÷åßá åßíáé ãéá ôéò âáóéêÝò õðçñåóßåò êáé ìðïñïýí íá åëåã÷èïýí ìå ôéò åðéëïãÝò `start`, `stop`, êáé `restart`. Ãéá ðáñÜäåéãìá, ôï sshd(8) ìðïñåß íá åëåã÷èåß ÷ñçóéìïðïéþíôáò ôçí åîÞò åíôïëÞ:

```
# /etc/rc.d/sshd restart
```

Ç äéáäéêáóßá áõôÞ åßíáé ðáñüìïéá êáé ãéá ôéò õðüëïéðåò õðçñåóßåò. ÖõóéêÜ, ïé õðçñåóßåò áõôÝò åßíáé óõíÞèùò áõôüìáôá åêêéíÞóéìåò êáôá ôçí åêêßíçóç ôïõ óõóôÞìáôïò üðùò êáé êáèïñßæåôáé óôï rc.conf(5). Ãéá ðáñÜäåéãìá, åíåñãïðïéþíôáò ôïí äáßìïíá Network Address Translation óôçí åêêßíçóç åßíáé ôüóï áðëü üóï êÜíïíôáò ðñïóèÞêç ôçò áêüëïõèçò ãñáììÞò óôï `/etc/rc.conf`:

```
natd_enable="YES"
```

Áí ç åðéëïãÞ `natd_enable="NO"` åßíáé Þäç ðáñïýóá, ôüôå áðëÜ áëëÜîôå ôçí åðéëïãÞ `NO` óå `YES`. Ôá óåíÜñéá rc èá öïñôþóïõí áõôüìáôá ïðïéáäÞðïôå åîáñôþìåíç õðçñåóßá êáôÜ ôçí äéÜñêåéá ôçò åðüìåíçò åêêßíçóçò, üðùò êáé ðåñéãñÜöåôáé ðáñáêÜôù.

Ìéáò êáé ôï óýóôçìá `rc.d` åßíáé êõñßùò ãéá ôçí åêêßíçóç êáé ôïí ôåñìáôéóìü õðçñåóéþí êáôá ôçí åêêßíçóç êáé ôïí ôåñìáôéóìü ôïõ óõóôÞìáôïò áíôßóôïé÷á, ïé ðñïêáèïñéóìÝíåò åðéëïãÝò `start`, `stop` êáé `restart` èá ðñáãìáôïðïéÞóïõí ôéò áíôßóôïé÷åò åíÝñãåéåò áí ç êáôÜëëçëåò ìåôáâëçôÝò åßíáé êáèïñéóìÝíåò óôï `/etc/rc.conf`. Ãéá ðáñÜäåéãìá ç ðáñáðÜíù åíôïëÞ `sshd restart` èá äïõëÝøåé ìüíï áí ç ìåôáâëçôÞ `sshd_enable` Ý÷åé ôåèåß óå `YES` ìÝóá óôï `/etc/rc.conf`. Ãéá íá åêôåëÝóåôå ôéò åðéëïãÝò `start`, `stop` Þ `restart` ìéáò õðçñåóßáò áíåîÜñôçôá áðï ôéò ñõèìßóåéò ôçò óôï `/etc/rc.conf`, ç åíôïëÞ ðñÝðåé íá Ý÷åé ÷áñáêôçñéóôåß ìå “one”. Ãéá ðáñÜäåéãìá ãéá ôçí åðáíåêêßíçóç ôïõ `sshd` áíåîÜñôçôá áðï ôéò ôñÝ÷ïõóåò ñõèìßóåéò óôï `/etc/rc.conf`, åêôåëåßôå ôçí áêüëïõèç åíôïëÞ:

```
# /etc/rc.d/sshd onerestart
```

Åßíáé åýêïëï íá åëÝãîåôå áí ç õðçñåóßá åßíáé åíåñãïðïéçìÝíç óôï `/etc/rc.conf` ôñÝ÷ïíôáò ôï êáôÜëëçëï óåíÜñéï `rc.d` ìå ôçí ðáñÜìåôñï `rcvar`. ÊáôÜ óõíÝðåéá, Ýíáò äéá÷åéñéóôÞò ìðïñåß íá åëÝãîåé áí ôï `sshd` åßíáé üíôùò åíåñãïðïéçìÝíï óôï `/etc/rc.conf` åêôåëþíôáò:

```
# /etc/rc.d/sshd rcvar
# sshd
$sshd_enable=YES
```

> **Óçìåßùóç:** Ç äåýôåñç ãñáììÞ (`# sshd`) åßíáé ç Ýîïäïò ôçò åíôïëÞò `sshd`, êáé ü÷é ç êïíóïëÜ ôïõ ÷ñÞóôç `root`.

Ãéá íá åëÝãîåôå áí ìéá õðçñåóßá ôñÝ÷åé, ç åðéëïãÞ `status` åßíáé äéáèÝóéìç. Ãéá ðáñÜäåéãìá ãéá íá åðéâåâáéþóåôå üôé ç õðçñåóßá `sshd` ôñÝ÷åé:

```
# /etc/rc.d/sshd status sshd is
      running as pid 433.
```

Óå ðïëëÝò ðåñéðôþóåéò åßíáé äõíáôüí ôï `reload` ìßáò õðçñåóßáò. Áõôü èá óôåßëåé Ýíá óÞìá óôçí õðçñåóßá, åðéâÜëëïíôáò ôçò íá îáíáöïñôþóåé ôá áñ÷åßá ñõèìßóåùí ôçò. Óôçí ðñáãìáôéêüôçôá áõôü óçìáßíåé üôé èá óôåßëåé Ýíá óÞìá `SIGHUP` óôçí õðçñåóßá. Ç õðïóôÞñéîç ãéá áõôü ôï ÷áñáêôçñéóôéêü äåí ðáñÝ÷åôáé óå êÜèå õðçñåóßá.

Ôï óýóôçìá `rc.d` äåí ÷ñçóéìïðïéåßôå ìüíï ãéá ôéò õðçñåóßåò äéêôýïõ, áëëÜ åðßóçò óõìâÜëëåé êáé êáôá ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ãéá ðáñÜäåéãìá, óêåöôåßôå ôï áñ÷åßï `bgfsck`. ¼ôáí Ýíá óåíÜñéï åêôåëåßôå, èá åêôõðþíåé ôï áêüëïõèï ìÞíõìá:

```
Starting background file system checks in 60 seconds.
```

ÅðïìÝíùò ôï áñ÷åßï áõôü ÷ñçóéìïðïéåßôå óôï ðáñáóêÞíéï ãéá ôïí Ýëåã÷ï ôïõ óõóôÞìáôïò áñ÷åßùí, ï ïðïßïò êáé óõìâáßíåé êáôá ôçí åêêßíçóç ôïõ óõóôÞìáôïò.

ÐïëëÝò õðçñåóßåò åîáñôþíôáé áðü Üëëåò õðçñåóßåò ãéá íá ôá êáôáöÝñïõí íá ëåéôïõñãÞóïõí óùóôÜ. Ãéá ðáñÜäåéãìá, ç õðçñåóßá NIS êáé Üëëåò âáóéóìÝíåò óôï RPC õðçñåóßåò èá áðïôý÷ïõí íá åêêéíçèïýí áí ç õðçñåóßá `rpcbind` (portmapper) äåí Ý÷åé Þäç åêêéíçèåß. Ãéá íá ëýèåé ôï ðñüâëçìá áõôü, õðÜñ÷ïõí ðëçñïöïñßåò ãéá ôéò åîáñôÞóåéò êáé Üëëá ìåôá-äåäïìÝíá ìÝóá óôá ó÷üëéá óôçí áñ÷Þ êÜèå óåíáñßïõ. Ôï ðñüãñáììá rcorder(8) ÷ñçóéìïðïéåßôå ãéá ôçí áíÜëõóç ôùí ó÷ïëßùí áõôþí êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò ãéá íá êáèïñßóôåé ìå ðïéÜ óåéñÜ èá ðñÝðåé íá åêêéíçèïýí ïé õðçñåóßåò þóôå íá åêðëçñùèïýí ïé åîáñôÞóåéò. Ïé åðüìåíåò ðñïôÜóåéò ìðïñïýí íá ðåñéëçöèïýí ìÝóá óå êÜèå áñ÷åßï åêêßíçóçò:

- `PROVIDE`: Êáèïñßæåé ôçí õðçñåóßá ðïõ ðáñÝ÷åé ôï áñ÷åßï áõôü.
- `REQUIRE`: Áðáñéèìåß ôéò õðçñåóßåò ðïõ áðáéôïýíôáé ãéá ôçí ôçí õðçñåóßá áõôÞ. Ôï áñ÷åßï áõôü èá åêôåëåóôåß *ìåôÜ* áðï ôçí êáèïñéóìÝíç õðçñåóßá.
- `BEFORE`: Áðáñéèìåß ôéò õðçñåóßåò ïé ïðïßåò åîáñôþíôáé áðï ôçí õðçñåóßá áõôÞ. Ôï áñ÷åßï áõôü èá åêôåëåóôåß *ðñßí* ôéò êáèïñéóìÝíåò õðçñåóßåò.

×ñçóéìïðïéþíôáò ôçí ìÝèïäï áõôÞ, ïé äéá÷åéñéóôÝò ìðïñïýí åýêïëá íá åëÝãîïõí ôéò õðçñåóßåò ôïõ óõóôÞìáôïò ÷ùñßò ôá äõóíüçôá “runlevels” üðùò óå ìåñéêÜ Üëëá ëåéôïõñãéêÜ óõóôÞìáôá UNIX.

ÅðéðëÝïí ðëçñïöïñßåò ãéá ôï óýóôçìá `rc.d` ìðïñïýí íá âñåèïýí óôéò óåëßäåò âïçèåßáò rc(8) êáé rc.subr(8). Áí åíäéáöÝñåóôå ãéá ôçí åããñáöÞ äéêþí óáò óåíáñßùí `rc.d` Þ ãéá ôçí âåëôßùóç ôùí Þäç õðÜñ÷ïíôùí, èá âñåßôå ôïí óýíäåóìï áõôüí (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/rc-scripting) áñêåôÜ ÷ñÞóéìï.

12.8 Ñõèìßæïíôáò Ôéò ÊÜñôåò Äéêôýïõ

Contributed by Marc Fonvieille.

Ôçí óÞìåñïí åðï÷Þ äåí ìðïñïýìå íá óêåöôïýìå Ýíáí õðïëïãéóôÞ ÷ùñßò íá óêåöôïýìå êáé ìßá óýíäåóç äéêôýïõ. ÐñïóèÝôïíôáò êáé ñõèìßæïíôáò ìéá êÜñôá äéêôýïõ åßíáé ìßá óõíçèéóìÝíç åñãáóßá ãéá Ýíáí ïðïéïäÞðïôå äéá÷åéñéóôÞ ôïõ FreeBSD.

12.8.1 Åíôïðßæïíôáò Ôïí Óùóôü Ïäçãü

Ðñéí áñ÷ßóåôå, èá ðñÝðåé íá ãíùñßæåôå ôï ìïíôÝëï ôçò êÜñôáò ðïõ Ý÷åôå, ðïéü chip ÷ñçóéìïðïéåß, êáé áí åßíáé PCI Þ ISA êÜñôá. Ôï FreeBSD õðïóôçñßæåé Ýíá ìåãÜëï åýñïò êáñôþí PCI êáé ISA. ÅëÝãîôå ôçí Ëßóôá Óõìâáôüôçôáò Õëéêïý ãéá ôçí Ýêäïóç óáò ãéá íá äåßôå áí ç êÜñôá óáò õðïóôçñßæåôáé.

Åöüóïí åßóôå ðëÝïí óßãïõñïò üôé ç êÜñôá óáò õðïóôçñßæåôáé, èá ÷ñåéáóôåß íá êáèïñßóåôå ôïí êáôÜëëçëï ïäçãü ãéá ôçí êÜñôá óáò. Ôï áñ÷åßï `/usr/src/sys/conf/NOTES` êáé ôï áñ÷åßï `/usr/src/sys/`*`arch`*`/conf/NOTES` èá óáò äþóïõí ìéá ëßóôá ìå êÜñôåò äéêôýïõ êáé ìåñéêÝò ðëçñïöïñßåò ãéá ôá õðïóôçñéæüìåíá chipsets êáé ôéò õðïóôçñéæüìåíåò êÜñôåò. Áí Ý÷åôå áìöéâïëßåò ãéá ôï ðïéüò ïäçãüò åßíáé ï óùóôüò, äéáâÜóôå ôçí óåëßäá âïçèåßáò ôïõ ïäçãïý. Ç óåëßäá âïçèåßáò èá óáò äþóåé ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï õðïóôçñéæüìåíï õëéêü êáé áêüìá êáé ãéá ôá ðéèáíÜ ðñïâëÞìáôá ðïõ ìðïñåß íá ðñïêýøïõí.

Áí Ý÷åôå ìéá óõíçèéóìÝíç êÜñôá, êáôá ðÜóá ðéèáíüôçôá äåí èá ÷ñåéáóôåß íá øÜîåôå ðïëý ãéá ôïí ïäçãü. Ïé ïäçãïß ãéá ôéò óõíçèéóìÝíåò êÜñôåò äéêôýïõ õðÜñ÷ïõí óôïí ðõñÞíá `GENERIC`, Ýôóé þóôå êáé èá åìöáíéóôåß êáôá ôçí äéÜñêåéá ôçò åêêßíçóçò, ãéá ðáñÜäåéãìá:

```
dc0: <82c169 PNIC 10/100BaseTX> port 0xa000-0xa0ff mem 0xd3800000-0xd38
000ff irq 15 at device 11.0 on pci0
dc0: Ethernet address: 00:a0:cc:da:da:da
miibus0: <MII bus> on dc0
ukphy0: <Generic IEEE 802.3u media interface> on miibus0
ukphy0:  10baseT, 10baseT-FDX, 100baseTX, 100baseTX-FDX, auto
dc1: <82c169 PNIC 10/100BaseTX> port 0x9800-0x98ff mem 0xd3000000-0xd30
000ff irq 11 at device 12.0 on pci0
dc1: Ethernet address: 00:a0:cc:da:da:db
miibus1: <MII bus> on dc1
ukphy1: <Generic IEEE 802.3u media interface> on miibus1
ukphy1:  10baseT, 10baseT-FDX, 100baseTX, 100baseTX-FDX, auto
```

Óôï ðáñÜäåéãìá áõôü, âëÝðïõìå üôé äýï êÜñôåò ðïõ ÷ñçóéìïðïéïýí ôïí ïäçãü dc(4) Ý÷ïõí åíôïðéóôåß óôï óýóôçìá.

Áí ï ïäçãüò ôçò NIC óáò äåí åßíáé ðáñùí óôïí `GENERIC`, èá ðñÝðåé íá öïñôþóåôå ôïí êáôÜëëçëï ïäçãü ãéá íá ÷ñçóéìïðïéÞóåôå ôçí NIC óáò. Áõôü ìðïñåß íá åðéôåõ÷èåß ìå Ýíáí áðï ôïõò äýï áõôïýò ôñüðïõò:

- Ï ðéü åýêïëïò ôñüðïò åßíáé áðëÜ íá öïñôþóåôå Ýíá Üñèñùìá ôïõ ðõñÞíá ãéá ôçí êÜñôá äéêôýïõ óáò ìå ôï kldload(8), Þ áõôüìáôá êáôá ôçí åêêßíçóç ðñïóèÝôïíôáò ôçí êáôÜëëçëç ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`. Äåí åßíáé üëïé ïé ïäçãïß NIC äéáèÝóéìïé óáí áñèñþìáôá, ÷áñáêôçñéóôéêÜ ðáñáäåßãìáôá åßíáé ôá áñèñþìáôá ãéá óõóêåõÝò ISA.
- ÅíáëëáêôéêÜ, ìðïñåßôå íá ìåôáãëùôôßóåôå óôáôéêÜ ôçí õðïóôÞñéîç ãéá ôçí êÜñôá óáò óôïí ðõñÞíá. ÅëÝãîôå ôï áñ÷åßï `/usr/src/sys/conf/NOTES`, ôï `/usr/src/sys/`*`arch`*`/conf/NOTES` êáé ôçí óåëßäá âïçèåßáò ôïõ ïäçãïý ãéá íá ìÜèåôå ôé ðñÝðåé íá ðñïóèÝóåôå óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï ðùò íá ìåôáãëùôôßóåôå ôïí ðõñÞíá, ðáñáêáëþ äéáâÜóôå ôï ÊåöÜëáéï 9. Áí ç êÜñôá óáò åíôïðéóôåß êáôá ôçí åêêßíçóç áðï ôïí ðõñÞíá (`GENERIC`) äåí ÷ñåéÜæåôå íá ìåôáãëùôôßóåôå Ýíáí íÝï ðõñÞíá.

12.8.1.1 ×ñçóéìïðïéþíôáò Ïäçãïýò Windows Ìå Ôï NDIS

Äõóôõ÷þò, õðÜñ÷ïõí áêüìá ðïëëïß êáôáóêåõáóôÝò ðïõ äåí ðáñÝ÷ïõí ôå÷íéêÝò ðñïäéáãñáöÝò ãéá ôïõò ïäçãïýò ôïõò óôçí êïéíüôçôá ôïõ áíïéêôïý ëïãéóìéêïý ãéáôß áíôéìåôùðßæïõí ôÝôïéåò ðëçñïöïñßåò óáí ìõóôéêÜ ôïõ åìðïñßïõ. Óõíåðþò, ïé õðåýèõíïé ãéá ôçí áíÜðôõîç ôïõ FreeBSD êáé Üëëùí ëåéôïõñãéêþí óõóôçìÜôùí ìÝíïõí ìå äýï åðéëïãÝò: íá áíáðôýîïõí ïäçãïýò ìå ôçí ìáêñÜ êáé åðßðïíç äéáäéêáóßá ôçò áíôßóôñïöçò ìç÷áíéêÞò Þ íá ÷ñçóéìïðïéÞóïõí ôïõò õðÜñ÷ïíôåò ïäçãïýò óå äõáäéêÞ ìïñöÞ äéáèÝóéìïõò ãéá ôçí ðëáôöüñìá Microsoft Windows. Ïé ðåñéóóüôåñïé õðåýèõíïé ãéá ôçí áíÜðôõîç, ìåôáîý ôïõò êáé áõôïß ðïõ åìðëÝêïíôáé ìå ôï FreeBSD, Ý÷ïõí åðéëÝîåé ôçí äåýôåñç ðñïóÝããéóç.

×Üñç óôçí ðñïóöïñÜ ôïõ Bill Paul (wpaul), ìéÜò êáé áðï ôï FreeBSD 5.3-RELEASE õðÜñ÷åé "ãçãåíÞò" õðïóôÞñéîç ãéá ôï Network Driver Interface Specification (NDIS). Ôï Ýñãï FreeBSD NDISulator (äéáöïñåôéêÜ ãíùóôü óáò Project Evil) ðáßñíåé Ýíáí ïäçãü Windows óå äõáäéêÞ ìïñöÞ êáé óôçí ïõóßá ôïí îåãåëÜ þóôå íá íïìßæåé üôé ôñÝ÷åé óå Windows. Ëüãù ôïõ üôé ï ïäçãüò ndis(4) ÷ñçóéìïðïéåß ìßá Windows äõáäéêÞ ìïñöÞ, ìðïñåß íá ÷ñçóéìïðïéçèåß ìüíï óå i386 êáé amd64 óõóôÞìáôá.

> **Óçìåßùóç:** Ï ïäçãüò ndis(4) åßíáé ó÷åäéáóìÝíïò þóôå íá õðïóôçñßæåé êõñßùò óõóêåõÝò PCI, CardBus êáé PCMCIA, ïé óõóêåõÝò USB äåí õðïóôçñßæïíôáé áêüìá.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôïí NDISulator, èá ÷ñåéáóôåßôå ôñßá ðñÜãìáôá:

1. Ôïí ðçãáßï êþäéêá ôïõ ðõñÞíá
2. Ôçí Windows XP äõáäéêÞ ìïñöÞ ôïõ ïäçãïý (`.SYS` åðÝêôáóç)
3. Ôï Windows XP áñ÷åßï ñõèìßóåùí ôïõ ïäçãïý (`.INF` åðÝêôáóç)

Åíôïðßóôå ôá áñ÷åßá áõôÜ ãéá ôçí êÜñôá óáò. ÃåíéêÜ, áõôÜ ìðïñïýí íá âñåèïýí óôá ðáñå÷üìåíá CDs Þ óôïõò éóôüôïðïõò ôùí êáôáóêåõáóôþí. Óôá áêüëïõèá ðáñáäåßãìáôá, èá ÷ñçóéìïðïéÞóïõìå ôá áñ÷åßá `W32DRIVER.SYS` êáé `W32DRIVER.INF`.

> **Óçìåßùóç:** Äåí ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ïäçãïýò Windows/i386 óå óõóôÞìáôá FreeBSD/amd64, èá ðñÝðåé íá âñåßôå ïäçãïýò Windows/amd64 ãéá íá äïõëÝøïõí óùóôÜ.

Ôï åðüìåíï âÞìá åßíáé íá ìåôáãëùôôßóåôå ôïí äõáäéêü ïäçãü ìÝóá óå Ýíá öïñôþóéìï Üñèñùìá ôïõ ðõñÞíá. Ãéá íá ôï åðéôý÷åôå áõôü, èá ðñÝðåé óáí `root`, íá ÷ñçóéìïðïéÞóåôå ôï ndisgen(8):

```
# ndisgen /path/to/W32DRIVER.INF /path/to/W32DRIVER.SYS
```

Ôï âïçèçôéêü ðñüãñáììá ndisgen(8) åßíáé äéáäñáóôéêü êáé èá óáò åíçìåñþóåé ãéá ïðïéáäÞðïôå åðéðëÝïí ðëçñïöïñßá ìðïñåß íá ÷ñåéáóôåß; èá ðáñÜãåé Ýíá Üñèñùìá ôïõ ðõñÞíá óôïí ôñÝ÷ïíôá êáôÜëïãï êáé ìðïñåß íá öïñôùèåß ùò åîÞò:

```
# kldload ./W32DRIVER.ko
```

ÅðéðëÝïí ôïõ ðáñáãüìåíïõ áñèñþìáôïò, èá ðñÝðåé íá öïñôþóåôå ôá áñèñþìáôá `ndis.ko` êáé `if_ndis.ko`. Áõôü èá ðñÝðåé íá ãßíåé áõôüìáôá üôáí öïñôþíåôå ïðïéáäÞðïôå åîáñôÜôáé áðï ôï ndis(4). Áí èÝëåôå íá ôá êÜíåôå ÷åéñùíáêôéêÜ, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôéò áêüëïõèåò åíôïëÝò:

```
# kldload ndis
# kldload if_ndis
```

Ç ðñþôç åíôïëÞ öïñôþíåé ôïí ïäçãü NDIS miniport wrapper, åíþ ç äåýôåñç öïñôþíåé ôçí ðñáãìáôéêÞ êÜñôá äéêôýïõ.

Ôþñá, åëÝãîôå ôï dmesg(8) ãéá íá äåßôå áí õðÞñ÷áí óöÜëìáôá êáôá ôçí öüñôùóç. Áí üëá ðÞãáí êáëÜ, èá ðñÝðåé íá äåßôå ìéá ðáñüìïéá Ýîïäï ìå ôçí åðüìåíç:

```
ndis0: <Wireless-G PCI Adapter> mem 0xf4100000-0xf4101fff irq 3 at device 8.0 on pci1
ndis0: NDIS API version: 5.0
ndis0: Ethernet address: 0a:b1:2c:d3:4e:f5
ndis0: 11b rates: 1Mbps 2Mbps 5.5Mbps 11Mbps
ndis0: 11g rates: 6Mbps 9Mbps 12Mbps 18Mbps 36Mbps 48Mbps 54Mbps
```

Áðï åäþ êáé ðÝñá ìðïñåßôå íá ÷åéñéóôåßôå ôçí óõóêåõÞ `ndis0` óáí ìéá ïðïéáäÞðïôå êÜñôá äéêôýïõ (ð.÷., `dc0`).

Ìðïñåßôå íá ñõèìßóåôå ôï óýóôçìá íá öïñôþíåé ôá NDIS áñèñþìáôá êáôá ôçí åêêßíçóç ìå ôïí ßäéï ôñüðï ìå ôá üðùò ìå ïðïéáäÞðïôå Üëëá áñèñþìáôá. Ðñþôá, áíôéãñÜøôå ôï ðáñá÷èåßóá Üñèñùìá, `W32DRIVER.ko`, óôïí êáôÜëïãï `/boot/modules`. Ôüôå, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï `/boot/loader.conf`:

```
W32DRIVER_load="YES"
```

12.8.2 Ñõèìßæïíôáò Ôçí ÊÜñôá Äéêôýïõ

Ìüëéò ï êáôÜëëçëïò ïäçãüò öïñôùèåß ãéá ôçí êÜñôá äéêôýïõ, ÷ñåéÜæåôáé íá ñõèìéóôåß. ¼ðùò ðïëëÜ Üëëá ðñÜãìáôá, ç êÜñôá äéêôýïõ åß÷å ñõèìéóôåß êáôá ôçí óôéãìÞ ôçò åãêáôÜóôáóçò ìå ôï **sysinstall**.

Ãéá íá åìöáíßóåôå ôéò êÜñôåò äéêôýïõ ðïõ Ý÷åôå óôï óýóôçìá óáò, ðëçêôñïëïãÞóôå ôçí áêüëïõèç åíôïëÞ:

```
% ifconfig
dc0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet 192.168.1.3 netmask 0xffffff00 broadcast 192.168.1.255
        ether 00:a0:cc:da:da:da
        media: Ethernet autoselect (100baseTX <full-duplex>)
        status: active
dc1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet 10.0.0.1 netmask 0xffffff00 broadcast 10.0.0.255
        ether 00:a0:cc:da:da:db
        media: Ethernet 10baseT/UTP
        status: no carrier
lp0: flags=8810<POINTOPOINT,SIMPLEX,MULTICAST> mtu 1500
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet 127.0.0.1 netmask 0xff000000
tun0: flags=8010<POINTOPOINT,MULTICAST> mtu 1500
```

> **Óçìåßùóç:** Ðáëáéüôåñåò åêäüóåéò ôïõ FreeBSD ìðïñåß íá ÷ñåéÜæïíôáé ôçí ðáñÜìåôñï `-a` áêïëïõèïýìåíç óôçí ifconfig(8), ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôçí óùóôÞ óýíôáîç ôïõ ifconfig(8), ðáñáêáëþ áíáôñÝîôå óôçí óåëßäá âïçèåßáò. Óçìåéþóôå åðßóçò üôé ïé åããñáöÝò ðïõ áöïñïýí ôï IPv6 (`inet6` êôëð.) Ý÷ïõí ðáñáëåéöèåß óå áõôü ôï ðáñÜäåéãìá.

Óå áõôü ôï ðáñÜäåéãìá, ïé áêüëïõèåò óõóêåõÝò Ý÷ïõí åìöáíéóôåß:

- `dc0`: Ç ðñþôç Ethernet êÜñôá äéêôýïõ
- `dc1`: Ç äåýôåñç Ethernet êÜñôá äéêôýïõ
- `lp0`: Ç ðáñÜëëçëç èýñá
- `lo0`: Ç óõóêåõÞ loopback
- `tun0`: Ç óõóêåõÞ tunnel ÷ñçóéìïðïéïýìåíç áðï ôï ðñüãñáììá **ppp**

Ôï FreeBSD ÷ñçóéìïðïéåß ôá ïíüìáôá ôùí ïäçãþí ìå ôçí óåéñÜ êáôá ôçí ïðïßá åíôïðßóôçêáí ïé áíôßóôïé÷åò êÜñôåò êáôá ôçí åêêßíçóç. Ãéá ðáñÜäåéãìá ç óõóêåõÞ `sis2` èá åßíáé ç ôñßôç êÜñôá äéêôýïõ ðïõ ÷ñçóéìïðïéåß ôïí ïäçãü sis(4).

Óôï ðáñÜäåéãìá áõôü, ç óõóêåõÞ `dc0` åßíáé ðÜíù êáé ôñÝ÷åé. Ïé ëÝîåéò êëåéäéÜ åßíáé:

1. `UP` óçìáßíåé üôé ç êÜñôá åßíáé ñõèìéóìÝíç êáé Ýôïéìç.
2. Ç êÜñôá Ý÷åé ìßá Internet äéåýèõíóç (`inet`) ñõèìéóìÝíç (óå áõôÞ ôçí ðåñßðôùóç `192.168.1.3`).
3. ¸÷åé ìßá Ýãêõñç ìÜóêá õðïäéêôýïõ (`netmask`; `0xffffff00` åßíáé ôï ßäéï ìå ôï `255.255.255.0`).
4. ¸÷åé ìßá Ýãêõñç broadcast äéåýèõíóç (óå áõôÞ ôçí ðåñßðôùóç, `192.168.1.255`).
5. Ç äéåýèõíóç MAC ôçò êÜñôáò (`ether`) åßíáé `00:a0:cc:da:da:da`
6. Ç åðéëïãÞ ôïõ öõóéêïý ìÝóïõ åßíáé óå êáôÜóôáóç autoselection (`media: Ethernet autoselect (100baseTX <full-duplex>)`). Ðáñáôçñïýìå üôé ç `dc1` Ý÷åé ñõèìéóôåß íá ôñÝ÷åé óáí `10baseT/UTP` ìÝóï. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôïõò ôýðïõò ôùí ìÝóùí åíüò ïäçãïý, ðáñáêáëïýìå áíáôñÝîôå óôçí óåëßäá âïçèåßáò.
7. Ç êáôÜóôáóç ôçò óýíäåóçò (`status`) åßíáé `active`, äçë. Ý÷åé åíôïðéóôåß óÞìá ìåôáöïñÜò. Óôçí `dc1`, ðáñáôçñïýìå `status: no carrier`. Áõôü åßíáé öõóéêü áöïý ôï êáëþäéï Ethernet äåí Ý÷åé óõíäåèåß ìå ôçí êÜñôá.

Áí ôï ifconfig(8) åìöáíßæåé êÜôé ðáñüìïéï ìå áõôü:

```
dc0: flags=8843<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
                ether 00:a0:cc:da:da:da
```

óçìáßíåé üôé ç êÜñôá äåí Ý÷åé ñõèìéóôåß.

Ãéá íá ñõèìßóåôå ôçí êÜñôá óáò, èá ÷ñåéáóôåßôå ðñïíüìéá `root`. Ç ñýèìéóç ôçò êÜñôáò äéêôýïõ ìðïñåß íá ãßíåé áðï ôçí ãñáììÞ åíôïëþí ìå ôï ifconfig(8) áëëÜ èá ðñÝðåé íá ôï åðáíáëÜâåôå óå êÜèå åðáíåêêßíçóç ôïõ óõóôÞìáôïò. Ôï áñ÷åßï `/etc/rc.conf` åßíáé åêåß üðïõ ðñÝðåé íá ðñïóèÝóåôå ôéò ñõèìßóåéò ôçò êÜñôáò äéêôýïõ.

Áíïßîôå ôï áñ÷åßï `/etc/rc.conf` ìå ôïí áãáðçìÝíï óáò êåéìåíïãñÜöï. Èá ÷ñåéáóôåß íá ðñïóèÝóåôå ìßá ãñáììÞ ãéá êÜèå êÜñôá äéêôýïõ ðïõ õðÜñ÷åé óôï óýóôçìá óáò, ãéá ðáñÜäåéãìá óôçí ðåñßðôùóç ìáò, èá ðñÝðåé íá ðñïóèÝóåôå ôé åîÞò ãñáììÝò:

```
ifconfig_dc0="inet 192.168.1.3 netmask 255.255.255.0"
ifconfig_dc1="inet 10.0.0.1 netmask 255.255.255.0 media 10baseT/UTP"
```

Èá ðñÝðåé íá áíôéêáôáóôÞóåôå ôï `dc0`, `dc1`, êáé ïýôù êÜèå åîÞò, ìå ôéò óùóôÝò óõóêåõÝò ôùí êáñôþí óáò, êáé ôéò óùóôÝò äéåõèýíóåéò. Èá ðñÝðåé íá äéáâÜóåôå ôçí óåëßäá âïçèåßáò ôïõ ïäçãïý êáé ôïõ ifconfig(8) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôéò åðéôñåðüìåíåò ðáñáìÝôñïõò êáé åðßóçò ôçí óåëßäá âïçèåßáò ôïõ rc.conf(5) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôçí óýíôáîç ôïõ `/etc/rc.conf`.

Áí ñõèìßóáôå ôï äßêôõï óáò êáôÜ ôçí åãêáôÜóôáóç, ìåñéêÝò ãñáììÝò ó÷åôéêÝò ìå ôçí/ôéò êÜñôá/êÜñôåò äéêôýïõ èá õðÜñ÷ïõí Þäç. ÅëÝãîôå äéðëÜ ôï `/etc/rc.conf` ðñïôïý ðñïóèÝóåôå åðéðëÝïí ãñáììÝò.

Èá ðñÝðåé åðßóçò íá äéïñèþóåôå ôï áñ÷åßï `/etc/hosts` þóôå íá ðñïóèÝóåôå ôá ïíüìáôá êáé ôéò IP äéåõèýíóåéò áðï ôá äéÜöïñá ìç÷áíÞìáôá óôï LAN óáò, áí äåí åßíáé Þäç ñõèìéóìÝíá. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò áíáôñÝîôå óôçí óåëßäá âïçèåßáò ôïõ hosts(5) êáé ôïõ `/usr/share/examples/etc/hosts`.

12.8.3 ÄïêéìÝò Êáé Åðßëõóç ÐñïâëçìÜôùí

Ìüëéò êÜíåôå ôéò âáóéêÝò áëëáãÝò óôï `/etc/rc.conf`, èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï óýóôçìá óáò. Áõôü èá åðéôñÝøåé óå ðéèáíÝò áëëáãÝò óôéò êÜñôåò íá åöáñìïóôïýí, êáé íá åðéâåâáéþóåôå üôé ôï óýóôçìá åðáíåêêéíåß ÷ùñßò êáíÝíá ëÜèïò óôéò ñõèìßóåéò.

Ìüëéò ôï óýóôçìá åðáíåêêéíçèåß, èá ðñÝðåé íá äïêéìÜóåôå ôéò êÜñôåò äéêôýïõ.

12.8.3.1 ÄïêéìÜæïíôáò Ìéá Ethernet ÊÜñôá

Ãéá íá åðéâåâáéþóåôå üôé ç Ethernet êÜñôá ëåéôïõñãåß óùóôÜ, èá ðñÝðåé íá êÜíåôå äýï ðñÜãìáôá. Ðñþôá, êÜíôå ping ôçí êÜñôá ôçí ßäéá, êáé ìåôÜ êÜíôå ping Ýíá Üëëï ìç÷Üíçìá óôï LAN.

Ðñþôá äïêéìÜóôå óôçí ôïðéêÞ êÜñôá:

```
% ping -c5 192.168.1.3
PING 192.168.1.3 (192.168.1.3): 56 data bytes
64 bytes from 192.168.1.3: icmp_seq=0 ttl=64 time=0.082 ms
64 bytes from 192.168.1.3: icmp_seq=1 ttl=64 time=0.074 ms
64 bytes from 192.168.1.3: icmp_seq=2 ttl=64 time=0.076 ms
64 bytes from 192.168.1.3: icmp_seq=3 ttl=64 time=0.108 ms
64 bytes from 192.168.1.3: icmp_seq=4 ttl=64 time=0.076 ms

--- 192.168.1.3 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.074/0.083/0.108/0.013 ms
```

Ôþñá äïêéìÜóôå óå Ýíá Üëëï ìç÷Üíçìá óôï LAN:

```
% ping -c5 192.168.1.2
PING 192.168.1.2 (192.168.1.2): 56 data bytes
64 bytes from 192.168.1.2: icmp_seq=0 ttl=64 time=0.726 ms
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=0.766 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=0.700 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=0.747 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=64 time=0.704 ms

--- 192.168.1.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.700/0.729/0.766/0.025 ms
```

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå êáé ôï üíïìá ôï ìç÷áíÞìáôïò áíôß ôçò äéåýèõíóçò `192.168.1.2` áí Ý÷åôå ñõèìßóåé ôï áñ÷åßï `/etc/hosts`.

12.8.3.2 Åðßëõóç ÐñïâëçìÜôùí

Ç åðßëõóç ðñïâëçìÜôùí õëéêïý êáé ëïãéóìéêïý åßíáé ðÜíôïôå åðßðïíç, Ýíáò ðüíïò ï ïðïéüò ìðïñåß íá áíáêïõöéóôåß åëÝã÷ïíôáò ìåñéêÜ áðëÜ ðñÜãìáôá ðñþôá. Åßíáé ôï êáëþäéï ôïõ äéêôýïõ óõíäåäåìÝíï; ¸÷åôå ñõèìßóåé óùóôÜ ôéò õðçñåóßåò äéêôýïõ; ¸÷åôå ñõèìßóåé óùóôÜ ôï ðýñéíï ôåß÷ïò; ¸÷åé ðñÜãìáôé ôï FreeBSD õðïóôÞñéîç ãéá áõôÞ ôçí êÜñôá äéêôýïõ; ÐñÝðåé ðÜíôá íá åëÝã÷åôå ôéò óçìåéþóåéò ôïõ õëéêïý ðñéí óôåßëåå ìßá áíáöïñÜ ãéá Ýíá ðñüâëçìá. Áíáâáèìßóôå ôçí Ýêäïóç ôïõ FreeBSD óôçí ôåëåõôáßá ÓÔÁÈÅÑÇ Ýêäïóç. ÅëÝãîôå ôá áñ÷åßá ôùí ëéóôþí ìçíõìÜôùí, Þ øÜîôå óôï Internet.

Áí ç êÜñôá äïõëåýåé, áëëÜ ìå ÷áìçëÞ áðüäïóç, èá Üîéæå íá äéáâÜóåôå ôçí óåëßäá âïçèåßáò tuning(7). Ìðïñåßôå åðßóçò íá åëÝãîåôå ïé áí ëáíèáóìÝíåò ñõèìßóåéò ôïõ äéêôýïõ ðñïêáëïýí ôéò áñãÝò óõíäÝóåéò.

Ìåñéêïß ÷ñÞóôåò áíôéìåôùðßæïõí Ýíá Þ äýï ìçíýìáôá `device timeout`, ôá ïðïßá åßíáé öõóéïëïãéêÜ ãéá ìåñéêÝò êÜñôåò. Áí óõíå÷éóôïýí, Þ ãßíïõí åíï÷ëçôéêÜ, èá ðñÝðåé íá åëÝãîåôå ìÞðùò êáé êÜðïéåò óõóêåõÝò ðáñåìðïäßæïõí ç ìßá ôçí Üëëç. ÅëÝãîôå äéðëÜ ôéò óõíäÝóåéò ôùí êáëùäßùí. ºóùò èá ðñÝðåé íá áðïêôÞóåôå ìßá Üëëç êÜñôá.

ÌåñéêÝò öïñÝò, ïé ÷ñÞóôåò ðáñáôçñïýí ìåñéêÜ ìçíýìáôá ëÜèïõò `watchdog timeout`. Ôï ðñþôï ðñÜãìá ðïõ ðñÝðåé íá êÜíåôå åßíáé íá åëÝãîåôå ôï êáëþäéï ôïõ äéêôýïõ. ÁñêÝôåò êÜñôåò ÷ñåéÜæïíôáé ìßá èÝóç PCI ðïõ íá õðïóôçñßæåé Bus Mastering. Óå ìåñéêÝò ðáëéÝò ìçôñéêÝò êÜñôåò. ìüíï ìßá èÝóç PCI ôï õðïóôÞñéæå (óõíÞèùò ç èÝóç 0). ÅëÝãîôå ôçí êÜñôá äéêôýïõ êáé ôçí ôåêìçñßùóç ôçò ìçôñéêÞò êÜñôáò ãéá íá äéáðéóôþóåôå áí åêåß åßíáé ôï ðñüâëçìá.

Ôï ìÞíõìá `No route to host` åìöáíßæåôáé áí ôï óýóôçìá áäõíáôåß íá äñïìïëïãÞóåé ôá ðáêÝôá óôïí ðñïïñéóìü ôïõò. Áõôü óõìâáßíåé áí äåí Ý÷åé êáèïñéóôåß ðñïåðéëåãìÝíç äéåýèõíóç äñïìïëüãçóçò, Þ áí Ýíá êáëþäéï Ý÷åé îåóõíäåèåß. ÅëÝãîôå ôçí Ýîïäï ôçò åíôïëÞò `netstat -rn` êáé óéãïõñåõôåßôå üôé ç äéåýèõíóç äñïìïëüãçóçò åßíáé Ýãêõñç. Áí äåí Ý÷åé êáèïñéóôåß, äéáâÜóôå ôï ÊåöÜëáéï 32 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ôï ìÞíõìá ëÜèïõò `ping: sendto: Permission denied` óõìâáßíåé êõñßùò ëüãï êÜðïéáò ëÜèïò ñýèìéóçò óôï ðýñéíï ôåß÷ïò. Áí ôï `ipfw` åßíáé åíåñãïðïéçìÝíï óôïí ðõñÞíá áëëÜ äåí Ý÷ïõí êáèïñéóôåß êáíüíåò, ôüôå ç ðñïåðéëåãìÝíç ðïëéôéêÞ åßíáé ç áðáãüñåõóç üëçò ôçò êßíçóçò, áêüìá êáé ôùí áéôçìÜôùí ping! ÄéáâÜóôå ôï ÊåöÜëáéï 31 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

ÌåñéêÝò öïñÝò ç áðüäïóç ôçò êÜñôáò ìðïñåß íá åßíáé öôù÷Þ, Þ êÜôù ôïõ ìÝóïõ üñïõ. Óå áõôÝò ôéò ðåñéðôþóåéò ôï êáëýôåñï åßíáé íá ñõèìßóåôå ôçí êáôÜóôáóç ôïõ ìÝóïõ áðï `autoselect` óôçí êáôÜëëçëç êáôÜóôáóç. Åíþ óõíÞèùò áõôü öáßíåôå íá äïõëåýåé óôá ðåñéóóüôåñá õëéêÜ, ìðïñåß íá ìçí ëýóåé ôï ðñüâëçìá óôïí êáèÝíáí. Êáé ðÜëé, åëÝãîôå üëåò ôéò ñõèìßóåéò ôïõ äéêôýïõ, êáé îáíáäéáâÜóôå ðÜëé ôçí óåëßäá âïçèåßáò tuning(7).

12.9 ÅéêïíéêÜ Hosts

Ìßá áñêåôÜ óõíçèéóìÝíç ÷ñÞóç ôïõ FreeBSD åßíáé ç åéêïíéêÞ öéëïîåíßá éóôï÷þñùí, üðïõ êáé Ýíáò åîõðçñåôçôÞò åìöáíßæåôáé óôï äßêôõï óáí ðåñéóóüôåñï áðï Ýíáò. Áõôü åðéôõã÷Üíåôáé áíáèÝôïíôáò ðïëëáðëÝò äéêôõáêÝò äéåõèýíóåéò óå ìßá êáé ìüíï óõóêåõÞ.

Ìßá êÜñôá äéêôýïõ Ý÷åé ìßá "ðñáãìáôéêÞ" äéåýèõíóç, êáé áðåñéüñéóôï áñéèìü "åéêïíéêþí" äéåõèýíóåùí. Ïé åéêïíéêÝò áõôÝò äéåõèýíóåéò ðñïóèÝôïíôáé ìå ôçí ìïñöÞ åããñáöþí óôï áñ÷åßï `/etc/rc.conf`.

Ìßá åããñáöÞ åéêïíéêÞò äéåýèõíóçò ãéá ôçí êÜñôá äéêôýïõ `fxp0` ìïéÜæåé ùò åîÞò:

```
ifconfig_fxp0_alias0="inet xxx.xxx.xxx.xxx netmask xxx.xxx.xxx.xxx"
```

Óçìåéþóôå üôé ïé åããñáöÝò áõôÝò ðñÝðåé íá îåêéíïýí ìå `alias0` êáé íá óõíå÷ßæïõí ðñüò ôá ðÜíù óå óåéñÜ, (ãéá ðáñÜäåéãìá, `_alias1`, `_alias2`, êáé ïýôù êÜèå åîÞò). Ç äéáäéêáóßá ñýèìéóçò èá óôáìáôÞóåé óôïí ðñþôï áñéèìü ðïõ ëåßðåé.

Ï õðïëïãéóìüò ôçò ìÜóêáò äéêôýïõ åßíáé óçìáíôéêüò, áëëÜ åõôõ÷þò êáé åýêïëïò. Ãéá êÜèå êÜñôá, ðñÝðåé íá õðÜñ÷åé ìßá äéåýèõíóç ç ïðïßá áíôéðñïóùðåýåé óùóôÜ ôçí ìÜóêá ôïõ äéêôýïõ. Ïðïéáäçðïôå Üëëç äéåýèõíóç ðïõ óõìðßðôåé óôï ßäéï äßêôõï ðñÝðåé íá Ý÷åé ìÜóêá äéêôýïõ `1s` (åêöñáóìÝíç åßôå óáí `255.255.255.255` åßôå óáí `0xffffffff`).

Ãéá ðáñÜäåéãìá, åîåôÜóôå ôçí ðåñßðôùóç üðïõ ç êÜñôá äéêôýïõ `fxp0` åßíáé óõíäåäåìÝíç óå äýï äßêôõá, ôï äßêôõï `10.1.1.0` ìå ìÜóêá äéêôýïõ `255.255.255.0` êáé ôï äßêôõï `202.0.75.16` ìå ìÜóêá äéêôýïõ `255.255.255.240`. ÈÝëïõìå ôï óýóôçìá íá ðÜñåé ôéò äéåõèýíóåéò áðü `10.1.1.1` ìÝ÷ñé `10.1.1.5` êáé ôéò `202.0.75.17` ìÝ÷ñé `202.0.75.20`. ¼ðùò óçìåéþèçêå ðáñáðÜíù, ìüíï ç ðñþôåò äéåõèýíóåéò (óôçí ðåñßðôùóç áõôÞ, ç `10.0.1.1` êáé ç `202.0.75.17`) ðñÝðåé íá Ý÷ïõí ðñáãìáôéêÝò ìÜóêåò äéêôýïõ. ¼ëåò ïé õðüëïéðåò, áðü (`10.1.1.2` ìÝ÷ñé `10.1.1.5` êáé `202.0.75.18` ìÝ÷ñé `202.0.75.20`) ðñÝðåé íá ñõèìéóôïýí ìå ìÜóêá äéêôýïõ `255.255.255.255`.

Ç áêüëïõèåò åããñáöÝò óôï áñ÷åßï `/etc/rc.conf` èá ñõèìßóïõí ôçí êÜñôá üðùò ðñÝðåé ãéá ôï ðáñÜäåéãìá:

```
ifconfig_fxp0="inet 10.1.1.1 netmask 255.255.255.0"
```

```
ifconfig_fxp0_alias0="inet 10.1.1.2 netmask 255.255.255.255"
ifconfig_fxp0_alias1="inet 10.1.1.3 netmask 255.255.255.255"
ifconfig_fxp0_alias2="inet 10.1.1.4 netmask 255.255.255.255"
ifconfig_fxp0_alias3="inet 10.1.1.5 netmask 255.255.255.255"
ifconfig_fxp0_alias4="inet 202.0.75.17 netmask 255.255.255.240"
ifconfig_fxp0_alias5="inet 202.0.75.18 netmask 255.255.255.255"
ifconfig_fxp0_alias6="inet 202.0.75.19 netmask 255.255.255.255"
ifconfig_fxp0_alias7="inet 202.0.75.20 netmask 255.255.255.255"
```

12.10 Áñ÷åßá Ñõèìßóåùí

12.10.1 Ï êáôÜëïãïò `/etc`

Ôá áñ÷åßá ñõèìßóåùí áðïèçêåýïíôáé óå êáôáëüãïõò. Ìåñéêïß áðü áõôïýò åßíáé:

`/etc`	ÃåíéêÝò ñõèìßóåéò ôïõ óõóôÞìáôïò, data here is system-specific.
`/etc/defaults`	Default versions of system configuration files.
`/etc/mail`	Extra sendmail(8) configuration, other MTA configuration files.
`/etc/ppp`	Configuration for both user- and kernel-ppp programs.
`/etc/namedb`	Default location for named(8) data. Normally `named.conf` and zone files are stored here.
`/usr/local/etc`	Configuration files for installed applications. May contain per-application subdirectories.
`/usr/local/etc/rc.d`	Start/stop scripts for installed applications.
`/var/db`	Automatically generated system-specific database files, such as the package database, the locate database, and so on

12.10.2 Hostnames

12.10.2.1 `/etc/resolv.conf`

`/etc/resolv.conf` dictates how FreeBSD’s resolver accesses the Internet Domain Name System (DNS).

The most common entries to `resolv.conf` are:

`nameserver`	The IP address of a name server the resolver should query. The servers are queried in the order listed with a maximum of three.
`search`	Search list for hostname lookup. This is normally determined by the domain of the local hostname.
`domain`	The local domain name.

A typical `resolv.conf`:

```
search example.com
```

```
nameserver 147.11.1.11
nameserver 147.11.100.30
```

> **Óçìåßùóç:** Only one of the `search` and `domain` options should be used.

If you are using DHCP, dhclient(8) usually rewrites `resolv.conf` with information received from the DHCP server.

12.10.2.2 `/etc/hosts`

`/etc/hosts` is a simple text database reminiscent of the old Internet. It works in conjunction with DNS and NIS providing name to IP address mappings. Local computers connected via a LAN can be placed in here for simplistic naming purposes instead of setting up a named(8) server. Additionally, `/etc/hosts` can be used to provide a local record of Internet names, reducing the need to query externally for commonly accessed names.

```
# $FreeBSD$
#
# Host Database
# This file should contain the addresses and aliases
# for local hosts that share this file.
# In the presence of the domain name service or NIS, this file may
# not be consulted at all; see /etc/nsswitch.conf for the resolution order.
#
#
::1                     localhost localhost.my.domain myname.my.domain
127.0.0.1               localhost localhost.my.domain myname.my.domain

#
# Imaginary network.
#10.0.0.2               myname.my.domain myname
#10.0.0.3               myfriend.my.domain myfriend
#
# According to RFC 1918, you can use the following IP networks for
# private nets which will never be connected to the Internet:
#
#       10.0.0.0        -   10.255.255.255
#       172.16.0.0      -   172.31.255.255
#       192.168.0.0     -   192.168.255.255
#
# In case you want to be able to connect to the Internet, you need
# real official assigned numbers.  PLEASE PLEASE PLEASE do not try
# to invent your own network numbers but instead get one from your
# network provider (if any) or from the Internet Registry (ftp to
# rs.internic.net, directory ‘/templates’).
#
```

`/etc/hosts` takes on the simple format of:

```
[Internet address] [official hostname] [alias1] [alias2] ...
```

For example:

```
10.0.0.1 myRealHostname.example.com myRealHostname foobar1 foobar2
```

Consult hosts(5) for more information.

12.10.3 Log File Configuration

12.10.3.1 `syslog.conf`

`syslog.conf` is the configuration file for the syslogd(8) program. It indicates which types of `syslog` messages are logged to particular log files.

```
# $FreeBSD$
#
#       Spaces ARE valid field separators in this file. However,
#       other *nix-like systems still insist on using tabs as field
#       separators. If you are sharing this file between systems, you
#       may want to use only tabs as field separators here.
#       Consult the syslog.conf(5) manual page.
*.err;kern.debug;auth.notice;mail.crit          /dev/console
*.notice;kern.debug;lpr.info;mail.crit;news.err /var/log/messages
security.*                                      /var/log/security
mail.info                                       /var/log/maillog
lpr.info                                        /var/log/lpd-errs
cron.*                                          /var/log/cron
*.err                                           root
*.notice;news.err                               root
*.alert                                         root
*.emerg                                         *
# uncomment this to log all writes to /dev/console to /var/log/console.log
#console.info                                   /var/log/console.log
# uncomment this to enable logging of all log messages to /var/log/all.log
#*.*                                            /var/log/all.log
# uncomment this to enable logging to a remote log host named loghost
#*.*                                            @loghost
# uncomment these if you're running inn
# news.crit                                     /var/log/news/news.crit
# news.err                                      /var/log/news/news.err
# news.notice                                   /var/log/news/news.notice
!startslip
*.*                                             /var/log/slip.log
!ppp
*.*                                             /var/log/ppp.log
```

Consult the syslog.conf(5) manual page for more information.

12.10.3.2 `newsyslog.conf`

`newsyslog.conf` is the configuration file for newsyslog(8), a program that is normally scheduled to run by cron(8). newsyslog(8) determines when log files require archiving or rearranging. `logfile` is moved to `logfile.0`, `logfile.0` is moved to `logfile.1`, and so on. Alternatively, the log files may be archived in gzip(1) format causing them to be named: `logfile.0.gz`, `logfile.1.gz`, and so on.

`newsyslog.conf` indicates which log files are to be managed, how many are to be kept, and when they are to be touched. Log files can be rearranged and/or archived when they have either reached a certain size, or at a certain periodic time/date.

```
# configuration file for newsyslog
# $FreeBSD$
#
# filename          [owner:group]    mode count size when [ZB] [/pid_file] [sig_num]
/var/log/cron                           600  3     100  *     Z
/var/log/amd.log                        644  7     100  *     Z
/var/log/kerberos.log                   644  7     100  *     Z
/var/log/lpd-errs                       644  7     100  *     Z
/var/log/maillog                        644  7     *    @T00  Z
/var/log/sendmail.st                    644  10    *    168   B
/var/log/messages                       644  5     100  *     Z
/var/log/all.log                        600  7     *    @T00  Z
/var/log/slip.log                       600  3     100  *     Z
/var/log/ppp.log                        600  3     100  *     Z
/var/log/security                       600  10    100  *     Z
/var/log/wtmp                           644  3     *    @01T05 B
/var/log/daily.log                      640  7     *    @T00  Z
/var/log/weekly.log                     640  5     1    $W6D0 Z
/var/log/monthly.log                    640  12    *    $M1D0 Z
/var/log/console.log                    640  5     100  *     Z
```

Consult the newsyslog(8) manual page for more information.

12.10.4 `sysctl.conf`

`sysctl.conf` looks much like `rc.conf`. Values are set in a `variable=value` form. The specified values are set after the system goes into multi-user mode. Not all variables are settable in this mode.

To turn off logging of fatal signal exits and prevent users from seeing processes started from other users, the following tunables can be set in `sysctl.conf`:

```
# Do not log fatal signal exits (e.g. sig 11)
kern.logsigexit=0

# Prevent users from seeing information about processes that
# are being run under another UID.
security.bsd.see_other_uids=0
```

12.11 Tuning with sysctl

sysctl(8) is an interface that allows you to make changes to a running FreeBSD system. This includes many advanced options of the TCP/IP stack and virtual memory system that can dramatically improve performance for an experienced system administrator. Over five hundred system variables can be read and set using sysctl(8).

At its core, sysctl(8) serves two functions: to read and to modify system settings.

To view all readable variables:

```
% sysctl -a
```

To read a particular variable, for example, `kern.maxproc`:

```
% sysctl kern.maxproc
kern.maxproc: 1044
```

To set a particular variable, use the intuitive *`variable`*`=`*`value`* syntax:

```
# sysctl kern.maxfiles=5000
kern.maxfiles: 2088 -> 5000
```

Settings of sysctl variables are usually either strings, numbers, or booleans (a boolean being `1` for yes or a `0` for no).

If you want to set automatically some variables each time the machine boots, add them to the `/etc/sysctl.conf` file. For more information see the sysctl.conf(5) manual page and the ÔìÞìá 12.10.4.

12.11.1 sysctl(8) Read-only

Contributed by Tom Rhodes.

In some cases it may be desirable to modify read-only sysctl(8) values. While this is sometimes unavoidable, it can only be done on (re)boot.

For instance on some laptop models the cardbus(4) device will not probe memory ranges, and fail with errors which look similar to:

```
cbb0: Could not map register memory
device_probe_and_attach: cbb0 attach returned 12
```

Cases like the one above usually require the modification of some default sysctl(8) settings which are set read only. To overcome these situations a user can put sysctl(8) “OIDs” in their local `/boot/loader.conf`. Default settings are located in the `/boot/defaults/loader.conf` file.

Fixing the problem mentioned above would require a user to set `hw.pci.allow_unsupported_io_range=1` in the aforementioned file. Now cardbus(4) will work properly.

12.12 Tuning Disks

12.12.1 Sysctl Variables

12.12.1.1 `vfs.vmiodirenable`

The `vfs.vmiodirenable` sysctl variable may be set to either 0 (off) or 1 (on); it is 1 by default. This variable controls how directories are cached by the system. Most directories are small, using just a single fragment (typically 1 K) in the file system and less (typically 512 bytes) in the buffer cache. With this variable turned off (to 0), the buffer cache will only cache a fixed number of directories even if you have a huge amount of memory. When turned on (to 1), this sysctl allows the buffer cache to use the VM Page Cache to cache the directories, making all the memory available for caching directories. However, the minimum in-core memory used to cache a directory is the physical page size (typically 4 K) rather than 512 bytes. We recommend keeping this option on if you are running any services which manipulate large numbers of files. Such services can include web caches, large mail systems, and news systems. Keeping this option on will generally not reduce performance even with the wasted memory but you should experiment to find out.

12.12.1.2 `vfs.write_behind`

The `vfs.write_behind` sysctl variable defaults to `1` (on). This tells the file system to issue media writes as full clusters are collected, which typically occurs when writing large sequential files. The idea is to avoid saturating the buffer cache with dirty buffers when it would not benefit I/O performance. However, this may stall processes and under certain circumstances you may wish to turn it off.

12.12.1.3 `vfs.hirunningspace`

The `vfs.hirunningspace` sysctl variable determines how much outstanding write I/O may be queued to disk controllers system-wide at any given instance. The default is usually sufficient but on machines with lots of disks you may want to bump it up to four or five *megabytes*. Note that setting too high a value (exceeding the buffer cache's write threshold) can lead to extremely bad clustering performance. Do not set this value arbitrarily high! Higher write values may add latency to reads occurring at the same time.

There are various other buffer-cache and VM page cache related sysctls. We do not recommend modifying these values, the VM system does an extremely good job of automatically tuning itself.

12.12.1.4 `vm.swap_idle_enabled`

The `vm.swap_idle_enabled` sysctl variable is useful in large multi-user systems where you have lots of users entering and leaving the system and lots of idle processes. Such systems tend to generate a great deal of continuous pressure on free memory reserves. Turning this feature on and tweaking the swapout hysteresis (in idle seconds) via `vm.swap_idle_threshold1` and `vm.swap_idle_threshold2` allows you to depress the priority of memory pages associated with idle processes more quickly then the normal pageout algorithm. This gives a helping hand to the pageout daemon. Do not turn this option on unless you need it, because the tradeoff you are making is essentially pre-page memory sooner rather than later; thus eating more swap and disk bandwidth. In a small system this option will have a determinable effect but in a large system that is already doing moderate paging this option allows the VM system to stage whole processes into and out of memory easily.

12.12.1.5 `hw.ata.wc`

FreeBSD 4.3 flirted with turning off IDE write caching. This reduced write bandwidth to IDE disks but was considered necessary due to serious data consistency issues introduced by hard drive vendors. The problem is that IDE drives lie about when a write completes. With IDE write caching turned on, IDE hard drives not only write data to disk out of order, but will sometimes delay writing some blocks indefinitely when under heavy disk loads. A crash or power failure may cause serious file system corruption. FreeBSD’s default was changed to be safe. Unfortunately, the result was such a huge performance loss that we changed write caching back to on by default after the release. You should check the default on your system by observing the `hw.ata.wc` sysctl variable. If IDE write caching is turned off, you can turn it back on by setting the kernel variable back to 1. This must be done from the boot loader at boot time. Attempting to do it after the kernel boots will have no effect.

For more information, please see ata(4).

12.12.1.6 `SCSI_DELAY` (`kern.cam.scsi_delay`)

The `SCSI_DELAY` kernel config may be used to reduce system boot times. The defaults are fairly high and can be responsible for `15` seconds of delay in the boot process. Reducing it to `5` seconds usually works (especially with modern drives). Newer versions of FreeBSD (5.0 and higher) should use the `kern.cam.scsi_delay` boot time tunable. The tunable, and kernel config option accept values in terms of *milliseconds* and *not seconds*.

12.12.2 Soft Updates

The tunefs(8) program can be used to fine-tune a file system. This program has many different options, but for now we are only concerned with toggling Soft Updates on and off, which is done by:

```
# tunefs -n enable /filesystem
# tunefs -n disable /filesystem
```

A filesystem cannot be modified with tunefs(8) while it is mounted. A good time to enable Soft Updates is before any partitions have been mounted, in single-user mode.

Soft Updates drastically improves meta-data performance, mainly file creation and deletion, through the use of a memory cache. We recommend to use Soft Updates on all of your file systems. There are two downsides to Soft Updates that you should be aware of: First, Soft Updates guarantees filesystem consistency in the case of a crash but could very easily be several seconds (even a minute!) behind updating the physical disk. If your system crashes you may lose more work than otherwise. Secondly, Soft Updates delays the freeing of filesystem blocks. If you have a filesystem (such as the root filesystem) which is almost full, performing a major update, such as `make installworld`, can cause the filesystem to run out of space and the update to fail.

12.12.2.1 More Details about Soft Updates

There are two traditional approaches to writing a file systems meta-data back to disk. (Meta-data updates are updates to non-content data like inodes or directories.)

Historically, the default behavior was to write out meta-data updates synchronously. If a directory had been changed, the system waited until the change was actually written to disk. The file data buffers (file contents) were passed through the buffer cache and backed up to disk later on asynchronously. The advantage of this implementation is that it operates safely. If there is a failure during an update, the meta-data are always in a consistent state. A file is either created completely or not at all. If the data blocks of a file did not find their way out of the buffer cache onto the disk by the time of the crash, fsck(8) is able to recognize this and repair the filesystem by setting the file length to 0. Additionally, the implementation is clear and simple. The disadvantage is that meta-data changes are slow. An `rm -r`, for instance, touches all the files in a directory sequentially, but each directory change (deletion of a file) will be written synchronously to the disk. This includes updates to the directory itself, to the inode table, and possibly to indirect blocks allocated by the file. Similar considerations apply for unrolling large hierarchies (`tar -x`).

The second case is asynchronous meta-data updates. This is the default for Linux/ext2fs and `mount -o async` for *BSD ufs. All meta-data updates are simply being passed through the buffer cache too, that is, they will be intermixed with the updates of the file content data. The advantage of this implementation is there is no need to wait until each meta-data update has been written to disk, so all operations which cause huge amounts of meta-data updates work much faster than in the synchronous case. Also, the implementation is still clear and simple, so there is a low risk for bugs creeping into the code. The disadvantage is that there is no guarantee at all for a consistent state of the filesystem. If there is a failure during an operation that updated large amounts of meta-data (like a power failure, or someone pressing the reset button), the filesystem will be left in an unpredictable state. There is no opportunity to examine the state of the filesystem when the system comes up again; the data blocks of a file could already have been written to the disk while the updates of the inode table or the associated directory were not. It is actually impossible to implement a `fsck` which is able to clean up the resulting chaos (because the necessary information is not available on the disk). If the filesystem has been damaged beyond repair, the only choice is to use newfs(8) on it and restore it from backup.

The usual solution for this problem was to implement *dirty region logging*, which is also referred to as *journaling*, although that term is not used consistently and is occasionally applied to other forms of transaction logging as well. Meta-data updates are still written synchronously, but only into a small region of the disk. Later on they will be moved to their proper location. Because the logging area is a small, contiguous region on the disk, there are no long distances for the disk heads to move, even during heavy operations, so these operations are quicker than synchronous updates. Additionally the complexity of the implementation is fairly limited, so the risk of bugs being present is low. A disadvantage is that all meta-data are written twice (once into the logging region and once to the proper location) so for normal work, a performance “pessimization” might result. On the other hand, in case of a crash, all pending meta-data operations can be quickly either rolled-back or completed from the logging area after the system comes up again, resulting in a fast filesystem startup.

Kirk McKusick, the developer of Berkeley FFS, solved this problem with Soft Updates: all pending meta-data updates are kept in memory and written out to disk in a sorted sequence (“ordered meta-data updates”). This has the effect that, in case of heavy meta-data operations, later updates to an item “catch” the earlier ones if the earlier ones are still in memory and have not already been written to disk. So all operations on, say, a directory are generally performed in memory before the update is written to disk (the data blocks are sorted according to their position so that they will not be on the disk ahead of their meta-data). If the system crashes, this causes an implicit “log rewind”: all operations which did not find their way to the disk appear as if they had never happened. A consistent filesystem state is maintained that appears to be the one of 30 to 60 seconds earlier. The algorithm used guarantees that all resources in use are marked as such in their appropriate bitmaps: blocks and inodes. After a crash, the only resource allocation error that occurs is that resources are marked as “used” which are actually “free”. fsck(8) recognizes this situation, and frees the resources that are no longer used. It is safe to ignore the dirty state of the filesystem after a crash by forcibly mounting it with `mount -f`. In order to free resources that may be unused, fsck(8) needs to be run at a later time. This is the idea behind the *background fsck*: at system startup time, only a *snapshot* of the filesystem is recorded. The `fsck` can be run later on. All file systems can then be mounted “dirty”, so the system startup proceeds in multiuser mode. Then, background `fsck`s will be scheduled for all file systems where this is required, to free resources that may be unused. (File systems that do not use Soft Updates still need the usual foreground `fsck` though.)

The advantage is that meta-data operations are nearly as fast as asynchronous updates (i.e. faster than with *logging*, which has to write the meta-data twice). The disadvantages are the complexity of the code (implying a higher risk for bugs in an area that is highly sensitive regarding loss of user data), and a higher memory consumption. Additionally there are some idiosyncrasies one has to get used to. After a crash, the state of the filesystem appears to be somewhat "older". In situations where the standard synchronous approach would have caused some zero-length files to remain after the `fsck`, these files do not exist at all with a Soft Updates filesystem because neither the meta-data nor the file contents have ever been written to disk. Disk space is not released until the updates have been written to disk, which may take place some time after running `rm`. This may cause problems when installing large amounts of data on a filesystem that does not have enough free space to hold all the files twice.

12.13 Tuning Kernel Limits

12.13.1 File/Process Limits

12.13.1.1 `kern.maxfiles`

`kern.maxfiles` can be raised or lowered based upon your system requirements. This variable indicates the maximum number of file descriptors on your system. When the file descriptor table is full, `file: table is full` will show up repeatedly in the system message buffer, which can be viewed with the `dmesg` command.

Each open file, socket, or fifo uses one file descriptor. A large-scale production server may easily require many thousands of file descriptors, depending on the kind and number of services running concurrently.

In older FreeBSD releases, the default value of `kern.maxfiles` is derived from the `maxusers` option in your kernel configuration file. `kern.maxfiles` grows proportionally to the value of `maxusers`. When compiling a custom kernel, it is a good idea to set this kernel configuration option according to the uses of your system. From this number, the kernel is given most of its pre-defined limits. Even though a production machine may not actually have 256 users connected at once, the resources needed may be similar to a high-scale web server.

As of FreeBSD 4.5, `kern.maxusers` is automatically sized at boot based on the amount of memory available in the system, and may be determined at run-time by inspecting the value of the read-only `kern.maxusers` sysctl. Some sites will require larger or smaller values of `kern.maxusers` and may set it as a loader tunable; values of 64, 128, and 256 are not uncommon. We do not recommend going above 256 unless you need a huge number of file descriptors; many of the tunable values set to their defaults by `kern.maxusers` may be individually overridden at boot-time or run-time in `/boot/loader.conf` (see the loader.conf(5) man page or the `/boot/defaults/loader.conf` file for some hints) or as described elsewhere in this document. Systems older than FreeBSD 4.4 must set this value via the kernel config(8) option `maxusers` instead.

In older releases, the system will auto-tune `maxusers` for you if you explicitly set it to `0`[1]. When setting this option, you will want to set `maxusers` to at least 4, especially if you are using the X Window System or compiling software. The reason is that the most important table set by `maxusers` is the maximum number of processes, which is set to `20 + 16 * maxusers`, so if you set `maxusers` to 1, then you can only have 36 simultaneous processes, including the 18 or so that the system starts up at boot time and the 15 or so you will probably create when you start the X Window System. Even a simple task like reading a manual page will start up nine processes to filter, decompress, and view it. Setting `maxusers` to 64 will allow you to have up to 1044 simultaneous processes, which should be enough for nearly all uses. If, however, you see the dreaded proc table full error when trying to start another program, or are running a server with a large number of simultaneous users (like `ftp.FreeBSD.org`), you can always increase the number and rebuild.

> **Óçìåßùóç:** `maxusers` does *not* limit the number of users which can log into your machine. It simply sets various table sizes to reasonable values considering the maximum number of users you will likely have on your system and how many processes each of them will be running. One keyword which *does* limit the number of simultaneous remote logins and X terminal windows is `pseudo-device pty 16`. With FreeBSD 5.X, you do not have to worry about this number since the pty(4) driver is "auto-cloning"; you simply use the line `device pty` in your configuration file.

12.13.1.2 `kern.ipc.somaxconn`

The `kern.ipc.somaxconn` sysctl variable limits the size of the listen queue for accepting new TCP connections. The default value of `128` is typically too low for robust handling of new connections in a heavily loaded web server environment. For such environments, it is recommended to increase this value to `1024` or higher. The service daemon may itself limit the listen queue size (e.g. sendmail(8), or **Apache**) but will often have a directive in its configuration file to adjust the queue size. Large listen queues also do a better job of avoiding Denial of Service (DoS) attacks.

12.13.2 Network Limits

The `NMBCLUSTERS` kernel configuration option dictates the amount of network Mbufs available to the system. A heavily-trafficked server with a low number of Mbufs will hinder FreeBSD's ability. Each cluster represents approximately 2 K of memory, so a value of 1024 represents 2 megabytes of kernel memory reserved for network buffers. A simple calculation can be done to figure out how many are needed. If you have a web server which maxes out at 1000 simultaneous connections, and each connection eats a 16 K receive and 16 K send buffer, you need approximately 32 MB worth of network buffers to cover the web server. A good rule of thumb is to multiply by 2, so 2x32 MB / 2 KB = 64 MB / 2 kB = 32768. We recommend values between 4096 and 32768 for machines with greater amounts of memory. Under no circumstances should you specify an arbitrarily high value for this parameter as it could lead to a boot time crash. The `-m` option to netstat(1) may be used to observe network cluster use.

`kern.ipc.nmbclusters` loader tunable should be used to tune this at boot time. Only older versions of FreeBSD will require you to use the `NMBCLUSTERS` kernel config(8) option.

For busy servers that make extensive use of the sendfile(2) system call, it may be necessary to increase the number of sendfile(2) buffers via the `NSFBUFS` kernel configuration option or by setting its value in `/boot/loader.conf` (see loader(8) for details). A common indicator that this parameter needs to be adjusted is when processes are seen in the `sfbufa` state. The sysctl variable `kern.ipc.nsfbufs` is a read-only glimpse at the kernel configured variable. This parameter nominally scales with `kern.maxusers`, however it may be necessary to tune accordingly.

> **Óçìáíôéêü:** Even though a socket has been marked as non-blocking, calling sendfile(2) on the non-blocking socket may result in the sendfile(2) call blocking until enough `struct sf_buf`'s are made available.

12.13.2.1 `net.inet.ip.portrange.*`

The `net.inet.ip.portrange.*` sysctl variables control the port number ranges automatically bound to TCP and UDP sockets. There are three ranges: a low range, a default range, and a high range. Most network programs use the default range which is controlled by the `net.inet.ip.portrange.first` and `net.inet.ip.portrange.last`, which default to 1024 and 5000, respectively. Bound port ranges are used for outgoing connections, and it is possible to run the system out of ports under certain circumstances. This most commonly occurs when you are running a heavily loaded web proxy. The port range is not an issue when running servers which handle mainly incoming connections, such as a normal web server, or has a limited number of outgoing connections, such as a mail relay. For situations where you may run yourself out of ports, it is recommended to increase `net.inet.ip.portrange.last` modestly. A value of `10000`, `20000` or `30000` may be reasonable. You should also consider firewall effects when changing the port range. Some firewalls may block large ranges of ports (usually low-numbered ports) and expect systems to use higher ranges of ports for outgoing connections — for this reason it is not recommended that `net.inet.ip.portrange.first` be lowered.

12.13.2.2 TCP Bandwidth Delay Product

The TCP Bandwidth Delay Product Limiting is similar to TCP/Vegas in NetBSD. It can be enabled by setting `net.inet.tcp.inflight.enable` sysctl variable to `1`. The system will attempt to calculate the bandwidth delay product for each connection and limit the amount of data queued to the network to just the amount required to maintain optimum throughput.

This feature is useful if you are serving data over modems, Gigabit Ethernet, or even high speed WAN links (or any other link with a high bandwidth delay product), especially if you are also using window scaling or have configured a large send window. If you enable this option, you should also be sure to set `net.inet.tcp.inflight.debug` to `0` (disable debugging), and for production use setting `net.inet.tcp.inflight.min` to at least `6144` may be beneficial. However, note that setting high minimums may effectively disable bandwidth limiting depending on the link. The limiting feature reduces the amount of data built up in intermediate route and switch packet queues as well as reduces the amount of data built up in the local host's interface queue. With fewer packets queued up, interactive connections, especially over slow modems, will also be able to operate with lower *Round Trip Times*. However, note that this feature only effects data transmission (uploading / server side). It has no effect on data reception (downloading).

Adjusting `net.inet.tcp.inflight.stab` is *not* recommended. This parameter defaults to 20, representing 2 maximal packets added to the bandwidth delay product window calculation. The additional window is required to stabilize the algorithm and improve responsiveness to changing conditions, but it can also result in higher ping times over slow links (though still much lower than you would get without the inflight algorithm). In such cases, you may wish to try reducing this parameter to 15, 10, or 5; and may also have to reduce `net.inet.tcp.inflight.min` (for example, to 3500) to get the desired effect. Reducing these parameters should be done as a last resort only.

12.13.3 Virtual Memory

12.13.3.1 `kern.maxvnodes`

A vnode is the internal representation of a file or directory. So increasing the number of vnodes available to the operating system cuts down on disk I/O. Normally this is handled by the operating system and does not need to be changed. In some cases where disk I/O is a bottleneck and the system is running out of vnodes, this setting will need to be increased. The amount of inactive and free RAM will need to be taken into account.

To see the current number of vnodes in use:

```
# sysctl vfs.numvnodes
vfs.numvnodes: 91349
```

To see the maximum vnodes:

```
# sysctl kern.maxvnodes
kern.maxvnodes: 100000
```

If the current vnode usage is near the maximum, increasing `kern.maxvnodes` by a value of 1,000 is probably a good idea. Keep an eye on the number of `vfs.numvnodes`. If it climbs up to the maximum again, `kern.maxvnodes` will need to be increased further. A shift in your memory usage as reported by top(1) should be visible. More memory should be active.

12.14 Adding Swap Space

No matter how well you plan, sometimes a system does not run as you expect. If you find you need more swap space, it is simple enough to add. You have three ways to increase swap space: adding a new hard drive, enabling swap over NFS, and creating a swap file on an existing partition.

For information on how to encrypt swap space, what options for this task exist and why it should be done, please refer to ÔìÞìá 19.17 of the Handbook.

12.14.1 Swap on a New Hard Drive

The best way to add swap, of course, is to use this as an excuse to add another hard drive. You can always use another hard drive, after all. If you can do this, go reread the discussion of swap space in ÔìÞìá 12.2 of the Handbook for some suggestions on how to best arrange your swap.

12.14.2 Swapping over NFS

Swapping over NFS is only recommended if you do not have a local hard disk to swap to; NFS swapping will be limited by the available network bandwidth and puts an additional burden on the NFS server.

12.14.3 Swapfiles

You can create a file of a specified size to use as a swap file. In our example here we will use a 64MB file called `/usr/swap0`. You can use any name you want, of course.

ÐáñÜäåéãìá 12-1. Creating a Swapfile on FreeBSD

1. Be certain that your kernel configuration includes the memory disk driver (md(4)). It is default in `GENERIC` kernel.

   ```
   device   md   # Memory "disks"
   ```

2. Create a swapfile (`/usr/swap0`):

   ```
   # dd if=/dev/zero of=/usr/swap0 bs=1024k count=64
   ```

3. Set proper permissions on (`/usr/swap0`):

   ```
   # chmod 0600 /usr/swap0
   ```

4. Enable the swap file in `/etc/rc.conf`:

   ```
   swapfile="/usr/swap0"   # Set to name of swapfile if aux swapfile desired.
   ```

5. Reboot the machine or to enable the swap file immediately, type:

   ```
   # mdconfig -a -t vnode -f /usr/swap0 -u 0 && swapon /dev/md0
   ```

12.15 Power and Resource Management

Written by Hiten Pandya êáé Tom Rhodes.

It is important to utilize hardware resources in an efficient manner. Before ACPI was introduced, it was difficult and inflexible for operating systems to manage the power usage and thermal properties of a system. The hardware was managed by the BIOS and thus the user had less control and visibility into the power management settings. Some limited configurability was available via *Advanced Power Management (APM)*. Power and resource management is one of the key components of a modern operating system. For example, you may want an operating system to monitor system limits (and possibly alert you) in case your system temperature increased unexpectedly.

In this section of the FreeBSD Handbook, we will provide comprehensive information about ACPI. References will be provided for further reading at the end.

12.15.1 What Is ACPI?

Advanced Configuration and Power Interface (ACPI) is a standard written by an alliance of vendors to provide a standard interface for hardware resources and power management (hence the name). It is a key element in *Operating System-directed configuration and Power Management*, i.e.: it provides more control and flexibility to the operating system (OS). Modern systems "stretched" the limits of the current Plug and Play interfaces prior to the introduction of ACPI. ACPI is the direct successor to APM (Advanced Power Management).

12.15.2 Shortcomings of Advanced Power Management (APM)

The *Advanced Power Management (APM)* facility controls the power usage of a system based on its activity. The APM BIOS is supplied by the (system) vendor and it is specific to the hardware platform. An APM driver in the OS mediates access to the *APM Software Interface*, which allows management of power levels. APM should still be used for systems manufactured at or before the year 2000.

There are four major problems in APM. Firstly, power management is done by the (vendor-specific) BIOS, and the OS does not have any knowledge of it. One example of this, is when the user sets idle-time values for a hard drive in the APM BIOS, that when exceeded, it (BIOS) would spin down the hard drive, without the consent of the OS. Secondly, the APM logic is embedded in the BIOS, and it operates outside the scope of the OS. This means users can only fix problems in their APM BIOS by flashing a new one into the ROM; which is a very dangerous procedure with the potential to leave the system in an unrecoverable state if it fails. Thirdly, APM is a vendor-specific technology, which means that there is a lot of parity (duplication of efforts) and bugs found in one vendor’s BIOS, may not be solved in others. Last but not the least, the APM BIOS did not have enough room to implement a sophisticated power policy, or one that can adapt very well to the purpose of the machine.

Plug and Play BIOS (PNPBIOS) was unreliable in many situations. PNPBIOS is 16-bit technology, so the OS has to use 16-bit emulation in order to “interface” with PNPBIOS methods.

The FreeBSD APM driver is documented in the apm(4) manual page.

12.15.3 Configuring ACPI

The `acpi.ko` driver is loaded by default at start up by the loader(8) and should *not* be compiled into the kernel. The reasoning behind this is that modules are easier to work with, say if switching to another `acpi.ko` without doing a kernel rebuild. This has the advantage of making testing easier. Another reason is that starting ACPI after a system has been brought up often doesn’t work well. If you are experiencing problems, you can disable ACPI altogether. This driver should not and can not be unloaded because the system bus uses it for various hardware interactions. ACPI can be disabled by setting `hint.acpi.0.disabled="1"` in `/boot/loader.conf` or at the loader(8) prompt.

> **Óçìåßùóç:** ACPI and APM cannot coexist and should be used separately. The last one to load will terminate if the driver notices the other running.

ACPI can be used to put the system into a sleep mode with acpiconf(8), the `-s` flag, and a `1-5` option. Most users will only need `1` or `3` (suspend to RAM). Option `5` will do a soft-off which is the same action as:

```
# halt -p
```

Other options are available via sysctl(8). Check out the acpi(4) and acpiconf(8) manual pages for more information.

12.16 Using and Debugging FreeBSD ACPI

Written by Nate Lawson. With contributions from Peter Schultz êáé Tom Rhodes.

ACPI is a fundamentally new way of discovering devices, managing power usage, and providing standardized access to various hardware previously managed by the BIOS. Progress is being made toward ACPI working on all systems, but bugs in some motherboards’ *ACPI Machine Language* (AML) bytecode, incompleteness in FreeBSD’s kernel subsystems, and bugs in the Intel ACPI-CA interpreter continue to appear.

This document is intended to help you assist the FreeBSD ACPI maintainers in identifying the root cause of problems you observe and debugging and developing a solution. Thanks for reading this and we hope we can solve your system’s problems.

12.16.1 Submitting Debugging Information

> **Óçìåßùóç:** Before submitting a problem, be sure you are running the latest BIOS version and, if available, embedded controller firmware version.

For those of you that want to submit a problem right away, please send the following information to freebsd-acpi@FreeBSD.org (mailto:freebsd-acpi@FreeBSD.org):

- Description of the buggy behavior, including system type and model and anything that causes the bug to appear. Also, please note as accurately as possible when the bug began occurring if it is new for you.
- The dmesg(8) output after `boot -v`, including any error messages generated by you exercising the bug.
- The dmesg(8) output from `boot -v` with ACPI disabled, if disabling it helps fix the problem.
- Output from `sysctl hw.acpi`. This is also a good way of figuring out what features your system offers.
- URL where your *ACPI Source Language* (ASL) can be found. Do *not* send the ASL directly to the list as it can be very large. Generate a copy of your ASL by running this command:

  ```
  # acpidump -dt > name-system.asl
  ```

  (Substitute your login name for *`name`* and manufacturer/model for *`system`*. Example: `njl-FooCo6000.asl`)

Most of the developers watch the çëåêôñïíéêÞ ëßóôá ôçò Ýêäïóçò FreeBSD-CURRENT (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current) but please submit problems to freebsd-acpi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi) to be sure it is seen. Please be patient, all of us have full-time jobs elsewhere. If your bug is not immediately apparent, we will probably ask you to submit a PR via send-pr(1). When entering a PR, please include the same information as requested above. This will help us track the problem and resolve it. Do not send a PR without emailing freebsd-acpi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi) first as we use PRs as reminders of existing problems, not a reporting mechanism. It is likely that your problem has been reported by someone before.

12.16.2 Background

ACPI is present in all modern computers that conform to the ia32 (x86), ia64 (Itanium), and amd64 (AMD) architectures. The full standard has many features including CPU performance management, power planes control, thermal zones, various battery systems, embedded controllers, and bus enumeration. Most systems implement less than the full standard. For instance, a desktop system usually only implements the bus enumeration parts while a laptop might have cooling and battery management support as well. Laptops also have suspend and resume, with their own associated complexity.

An ACPI-compliant system has various components. The BIOS and chipset vendors provide various fixed tables (e.g., FADT) in memory that specify things like the APIC map (used for SMP), config registers, and simple configuration values. Additionally, a table of bytecode (the *Differentiated System Description Table* DSDT) is provided that specifies a tree-like name space of devices and methods.

The ACPI driver must parse the fixed tables, implement an interpreter for the bytecode, and modify device drivers and the kernel to accept information from the ACPI subsystem. For FreeBSD, Intel has provided an interpreter (ACPI-CA) that is shared with Linux and NetBSD. The path to the ACPI-CA source code is `src/sys/contrib/dev/acpica`. The glue code that allows ACPI-CA to work on FreeBSD is in `src/sys/dev/acpica/Osd`. Finally, drivers that implement various ACPI devices are found in `src/sys/dev/acpica`.

12.16.3 Common Problems

For ACPI to work correctly, all the parts have to work correctly. Here are some common problems, in order of frequency of appearance, and some possible workarounds or fixes.

12.16.3.1 Mouse Issues

In some cases, resuming from a suspend operation will cause the mouse to fail. A known work around is to add `hint.psm.0.flags="0x3000"` to the `/boot/loader.conf` file. If this does not work then please consider sending a bug report as described above.

12.16.3.2 Suspend/Resume

ACPI has three suspend to RAM (STR) states, `S1`-`S3`, and one suspend to disk state (`STD`), called `S4`. `S5` is "soft off" and is the normal state your system is in when plugged in but not powered up. `S4` can actually be implemented two separate ways. `S4`BIOS is a BIOS-assisted suspend to disk. `S4`OS is implemented entirely by the operating system.

Start by checking `sysctl hw.acpi` for the suspend-related items. Here are the results for a Thinkpad:

```
hw.acpi.supported_sleep_state: S3 S4 S5
hw.acpi.s4bios: 0
```

This means that we can use `acpiconf -s` to test `S3`, `S4`OS, and `S5`. If `s4bios` was one (`1`), we would have `S4`BIOS support instead of `S4` OS.

When testing suspend/resume, start with `S1`, if supported. This state is most likely to work since it does not require much driver support. No one has implemented `S2` but if you have it, it is similar to `S1`. The next thing to try is `S3`. This is the deepest STR state and requires a lot of driver support to properly reinitialize your hardware. If you have problems resuming, feel free to email the freebsd-acpi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi) list but do not expect the problem to be resolved since there are a lot of drivers/hardware that need more testing and work.

To help isolate the problem, remove as many drivers from your kernel as possible. If it works, you can narrow down which driver is the problem by loading drivers until it fails again. Typically binary drivers like `nvidia.ko`, X11 display drivers, and USB will have the most problems while Ethernet interfaces usually work fine. If you can properly load/unload the drivers, you can automate this by putting the appropriate commands in `/etc/rc.suspend` and `/etc/rc.resume`. There is a commented-out example for unloading and loading a driver. Try setting `hw.acpi.reset_video` to zero (`0`) if your display is messed up after resume. Try setting longer or shorter values for `hw.acpi.sleep_delay` to see if that helps.

Another thing to try is load a recent Linux distribution with ACPI support and test their suspend/resume support on the same hardware. If it works on Linux, it is likely a FreeBSD driver problem and narrowing down which driver causes the problems will help us fix the problem. Note that the ACPI maintainers do not usually maintain other drivers (e.g sound, ATA, etc.) so any work done on tracking down a driver problem should probably eventually be posted to the freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current) list and mailed to the driver maintainer. If you are feeling adventurous, go ahead and start putting some debugging printf(3)s in a problematic driver to track down where in its resume function it hangs.

Finally, try disabling ACPI and enabling APM instead. If suspend/resume works with APM, you may be better off sticking with APM, especially on older hardware (pre-2000). It took vendors a while to get ACPI support correct and older hardware is more likely to have BIOS problems with ACPI.

12.16.3.3 System Hangs (temporary or permanent)

Most system hangs are a result of lost interrupts or an interrupt storm. Chipsets have a lot of problems based on how the BIOS configures interrupts before boot, correctness of the APIC (MADT) table, and routing of the *System Control Interrupt* (SCI).

Interrupt storms can be distinguished from lost interrupts by checking the output of `vmstat -i` and looking at the line that has `acpi0`. If the counter is increasing at more than a couple per second, you have an interrupt storm. If the system appears hung, try breaking to DDB (**CTRL**+**ALT**+**ESC** on console) and type `show interrupts`.

Your best hope when dealing with interrupt problems is to try disabling APIC support with `hint.apic.0.disabled="1"` in `loader.conf`.

12.16.3.4 Panics

Panics are relatively rare for ACPI and are the top priority to be fixed. The first step is to isolate the steps to reproduce the panic (if possible) and get a backtrace. Follow the advice for enabling `options DDB` and setting up a serial console (see ÔìÞìá 27.6.5.3) or setting up a dump(8) partition. You can get a backtrace in DDB with `tr`. If you have to handwrite the backtrace, be sure to at least get the lowest five (5) and top five (5) lines in the trace.

Then, try to isolate the problem by booting with ACPI disabled. If that works, you can isolate the ACPI subsystem by using various values of `debug.acpi.disable`. See the acpi(4) manual page for some examples.

12.16.3.5 System Powers Up After Suspend or Shutdown

First, try setting `hw.acpi.disable_on_poweroff="0"` in loader.conf(5). This keeps ACPI from disabling various events during the shutdown process. Some systems need this value set to `1` (the default) for the same reason. This usually fixes the problem of a system powering up spontaneously after a suspend or poweroff.

12.16.3.6 Other Problems

If you have other problems with ACPI (working with a docking station, devices not detected, etc.), please email a description to the mailing list as well; however, some of these issues may be related to unfinished parts of the ACPI subsystem so they might take a while to be implemented. Please be patient and prepared to test patches we may send you.

12.16.4 ASL, `acpidump`, and IASL

The most common problem is the BIOS vendors providing incorrect (or outright buggy!) bytecode. This is usually manifested by kernel console messages like this:

```
ACPI-1287: *** Error: Method execution failed [\\_SB_.PCI0.LPC0.FIGD._STA] \\
(Node 0xc3f6d160), AE_NOT_FOUND
```

Often, you can resolve these problems by updating your BIOS to the latest revision. Most console messages are harmless but if you have other problems like battery status not working, they are a good place to start looking for problems in the AML. The bytecode, known as AML, is compiled from a source language called ASL. The AML is found in the table known as the DSDT. To get a copy of your ASL, use acpidump(8). You should use both the `-t` (show contents of the fixed tables) and `-d` (disassemble AML to ASL) options. See the Submitting Debugging Information section for an example syntax.

The simplest first check you can do is to recompile your ASL to check for errors. Warnings can usually be ignored but errors are bugs that will usually prevent ACPI from working correctly. To recompile your ASL, issue the following command:

```
# iasl your.asl
```

12.16.5 Fixing Your ASL

In the long run, our goal is for almost everyone to have ACPI work without any user intervention. At this point, however, we are still developing workarounds for common mistakes made by the BIOS vendors. The Microsoft interpreter (`acpi.sys` and `acpiec.sys`) does not strictly check for adherence to the standard, and thus many BIOS vendors who only test ACPI under Windows never fix their ASL. We hope to continue to identify and document exactly what non-standard behavior is allowed by Microsoft's interpreter and replicate it so FreeBSD can work without forcing users to fix the ASL. As a workaround and to help us identify behavior, you can fix the ASL manually. If this works for you, please send a diff(1) of the old and new ASL so we can possibly work around the buggy behavior in ACPI-CA and thus make your fix unnecessary.

Here is a list of common error messages, their cause, and how to fix them:

12.16.5.1 _OS dependencies

Some AML assumes the world consists of various Windows versions. You can tell FreeBSD to claim it is any OS to see if this fixes problems you may have. An easy way to override this is to set `hw.acpi.osname="Windows 2001"` in `/boot/loader.conf` or other similar strings you find in the ASL.

12.16.5.2 Missing Return statements

Some methods do not explicitly return a value as the standard requires. While ACPI-CA does not handle this, FreeBSD has a workaround that allows it to return the value implicitly. You can also add explicit Return statements where required if you know what value should be returned. To force `iasl` to compile the ASL, use the `-f` flag.

12.16.5.3 Overriding the Default AML

After you customize `your.asl`, you will want to compile it, run:

```
# iasl your.asl
```

You can add the `-f` flag to force creation of the AML, even if there are errors during compilation. Remember that some errors (e.g., missing Return statements) are automatically worked around by the interpreter.

`DSDT.aml` is the default output filename for `iasl`. You can load this instead of your BIOS's buggy copy (which is still present in flash memory) by editing `/boot/loader.conf` as follows:

```
acpi_dsdt_load="YES"
acpi_dsdt_name="/boot/DSDT.aml"
```

Be sure to copy your `DSDT.aml` to the `/boot` directory.

12.16.6 Getting Debugging Output From ACPI

The ACPI driver has a very flexible debugging facility. It allows you to specify a set of subsystems as well as the level of verbosity. The subsystems you wish to debug are specified as “layers” and are broken down into ACPI-CA components (ACPI_ALL_COMPONENTS) and ACPI hardware support (ACPI_ALL_DRIVERS). The verbosity of debugging output is specified as the “level” and ranges from ACPI_LV_ERROR (just report errors) to ACPI_LV_VERBOSE (everything). The “level” is a bitmask so multiple options can be set at once, separated by spaces. In practice, you will want to use a serial console to log the output if it is so long it flushes the console message buffer. A full list of the individual layers and levels is found in the acpi(4) manual page.

Debugging output is not enabled by default. To enable it, add `options ACPI_DEBUG` to your kernel configuration file if ACPI is compiled into the kernel. You can add `ACPI_DEBUG=1` to your `/etc/make.conf` to enable it globally. If it is a module, you can recompile just your `acpi.ko` module as follows:

```
# cd /sys/modules/acpi/acpi
&& make clean &&
make ACPI_DEBUG=1
```

Install `acpi.ko` in `/boot/kernel` and add your desired level and layer to `loader.conf`. This example enables debug messages for all ACPI-CA components and all ACPI hardware drivers (CPU, LID, etc.). It will only output error messages, the least verbose level.

```
debug.acpi.layer="ACPI_ALL_COMPONENTS ACPI_ALL_DRIVERS"
debug.acpi.level="ACPI_LV_ERROR"
```

If the information you want is triggered by a specific event (say, a suspend and then resume), you can leave out changes to `loader.conf` and instead use `sysctl` to specify the layer and level after booting and preparing your system for the specific event. The `sysctl`s are named the same as the tunables in `loader.conf`.

12.16.7 References

More information about ACPI may be found in the following locations:

- The çëåêôñïíéêÞ ëßóôá ãéá ACPI ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi)
- The ACPI Mailing List Archives http://lists.freebsd.org/pipermail/freebsd-acpi/
- The old ACPI Mailing List Archives http://home.jp.FreeBSD.org/mail-list/acpi-jp/
- The ACPI 2.0 Specification http://acpi.info/spec.htm
- FreeBSD Manual pages: acpi(4), acpi_thermal(4), acpidump(8), iasl(8), acpidb(8)
- DSDT debugging resource (http://www.cpqlinux.com/acpi-howto.html#fix_broken_dsdt). (Uses Compaq as an example but generally useful.)

Óçìåéþóåéò

1. The auto-tuning algorithm sets `maxusers` equal to the amount of memory in the system, with a minimum of 32, and a maximum of 384.

ÊåöÜëáéï 13 Ç Äéáäéêáóßá Åêêßíçóçò ôïõ FreeBSD

13.1 Óýíïøç

Ç äéáäéêáóßá ôçò åêêßíçóçò åíüò õðïëïãéóôÞ êáé öüñôùóçò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò áíáöÝñåôáé ùò “äéáäéêáóßá bootstrap”, Þ áðëþò “booting”. Ç äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD ìðïñåß íá ðñïóáñìïóôåß ðïëý åýêïëá óôéò áðáéôÞóåéò óáò, åðéôñÝðïíôáò óÜò íá åðéëÝîåôå åßôå äéáöïñåôéêÜ ëåéôïõñãéêÜ óõóôÞìáôá ðïõ åßíáé åãêáôåóôçìÝíá óôïí ßäéï õðïëïãéóôÞ, Þ áêüìá êáé äéáöïñåôéêÝò åêäüóåéò ôïõ ßäéïõ ëåéôïõñãéêïý óõóôÞìáôüò Þ ôïõ åãêáôåóôçìÝíïõ ðõñÞíá.

Ôï êåöÜëáéï áõôü ðåñéãñÜöåé ëåðôïìåñþò ôéò åðéëïãÝò ñõèìßóåùí ðïõ ìðïñåßôå íá êÜíåôå êáé ðùò íá öÝñåôå óôá ìÝôñá óáò ôç äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD. Ç äéáäéêáóßá åêêßíçóçò ðåñéëáìâÜíåé ïôéäÞðïôå óõìâáßíåé áðü ôçí åêêßíçóç ôïõ ðõñÞíá ôïõ FreeBSD, ôçí áíß÷íåõóç ôùí óõóêåõþí, ìÝ÷ñé êáé ôçí åêêßíçóç ôçò init(8). Ç åêêßíçóç ôçò init(8) óçìáôïäïôåßôáé áðü ôçí áëëáãÞ ÷ñþìáôïò ôïõ êåéìÝíïõ áðü öùôåéíü ëåõêü óå ãêñé.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðïéá åßíáé ôá ôìÞìáôá ôïõ óõóôÞìáôïò åêêßíçóçò ôïõ FreeBSD, êáé ðùò áëëçëåðéäñïýí ìåôáîý ôïõò.
- Ôéò åðéëïãÝò ðïõ ìðïñåßôå íá äþóåôå óôá ôìÞìáôá ôçò åêêßíçóçò ôïõ FreeBSD ãéá íá åëÝãîåôå ôç äéáäéêáóßá åêêßíçóçò.
- Ôá âáóéêÜ ôïõ device.hints(5).

Ìüíï ãéá õðïëïãéóôÝò áñ÷éôåêôïíéêÞò x86: Ôï êåöÜëáéï áõôü ðåñéãñÜöåé ôç äéáäéêáóßá åêêßíçóçò ôïõ FreeBSD ìüíï óå óõóôÞìáôá áñ÷éôåêôïíéêÞò Intel x86.

13.2 Ôï Ðñüâëçìá ôçò Åêêßíçóçò

Ç åíåñãïðïßçóç åíüò õðïëïãéóôÞ êáé ç åêêßíçóç ôïõ ëåéôïõñãéêïý óõóôÞìáôïò, ìáò öÝñíåé áíôéìÝôùðïõò ìå Ýíá åíäéáöÝñïí äßëçììá. Åî’ ïñéóìïý, ï õðïëïãéóôÞò äåí îÝñåé íá êÜíåé ôßðïôá ìÝ÷ñé ôçí åêêßíçóç ôïõ ëåéôïõñãéêïý óõóôÞìáôïò. Áõôü ðåñéëáìâÜíåé êáé ôçí åêôÝëåóç ðñïãñáììÜôùí áðü ôï äßóêï. ¸ôóé, áí ï õðïëïãéóôÞò äåí ìðïñåß íá åêôåëÝóåé ðñïãñÜììáôá áðü ôï äßóêï ÷ùñßò ôï ëåéôïõñãéêü óýóôçìá, áëëÜ êáé ôá ðñïãñÜììáôá ôïõ ëåéôïõñãéêïý óõóôÞìáôïò åßíáé åðßóçò óôï äßóêï, ðùò åßíáé äõíáôÞ ç åêêßíçóç ôïõ ëåéôïõñãéêïý;

Ôï ðñüâëçìá ìïéÜæåé ìå áõôü óôï âéâëßï *Ïé ÐåñéðÝôåéåò ôïõ Âáñþíïõ Ìéí÷Üïõæåí*. ¸íáò ÷áñáêôÞñáò Ý÷åé ðÝóåé óå Ýíá ðçãÜäé, êáé âãáßíåé ðéÜíïíôáò êáé ôñáâþíôáò ôá êïñäüíéá ôïõ (bootstraps). Óôéò ðñþôåò ìÝñåò ôùí õðïëïãéóôþí, ÷ñçóéìïðïéïýóáí ï üñïò *bootstrap* ãéá ôï ìç÷áíéóìü öüñôùóçò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò, ôï ïðïßï óõíôïìåýôçêå óå “booting”.

Óôçí áñ÷éôåêôïíéêÞ x86, ôï Âáóéêü Óýóôçìá Åéóüäïõ Åîüäïõ (BIOS) åßíáé õðåýèõíï ãéá ôç öüñôùóç ôïõ ëåéôïõñãéêïý óõóôÞìáôïò. Ãéá íá ôï åðéôý÷åé áõôü, ôï BIOS áíé÷íåýåé ôï óêëçñü äßóêï ãéá ôçí ÊåíôñéêÞ ÅããñáöÞ Åêêßíçóçò (Master Boot Record, MBR), ç ïðïßá ðñÝðåé íá âñßóêåôáé óå óõãêåêñéìÝíï óçìåßï óôï äßóêï. Ôï BIOS ãíùñßæåé áñêåôÜ ãéá íá öïñôþóåé êáé íá åêôåëÝóåé ôï MBR, êáé õðïèÝôåé üôé ôï MBR ìðïñåß êáôüðéí íá åêôåëÝóåé ôçí õðüëïéðç äéáäéêáóßá öüñôùóçò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò, åíäå÷ïìÝíùò êáé ìå ôç âïÞèåéá ôïõ BIOS.

Ï êþäéêáò ìÝóá óôï MBR óõíÞèùò áíáöÝñåôáé ùò *äéá÷åéñéóôÞò åêêßíçóçò (boot manager)*, åéäéêÜ üôáí áëëçëåðéäñÜ ìå ôï ÷ñÞóôç. Óôçí ðåñßðôùóç áõôÞ, ï äéá÷åéñéóôÞò åêêßíçóçò Ý÷åé óõíÞèùò ðåñéóóüôåñï êþäéêá óôçí ðñþôç *ôñï÷éÜ (track)* ôïõ äßóêïõ Þ ìÝóá óå êÜðïéï óýóôçìá áñ÷åßùí ôïõ ëåéôïõñãéêïý. (ÌåñéêÝò öïñÝò ï äéá÷åéñéóôÞò åêêßíçóçò áðïêáëåßôáé êáé *öïñôùôÞò åêêßíçóçò (boot loader)*, áëëÜ óôï FreeBSD ï üñïò áõôüò ÷ñçóéìïðïéåßôáé óå ìåôáãåíÝóôåñï óôÜäéï ôçò åêêßíçóçò.) Óôïõò äçìïöéëåßò äéá÷åéñéóôÝò åêêßíçóçò ðåñéëáìâÜíïíôáé ôï **boot0** (ãíùóôü êáé ùò **Boot Easy**, ï óôÜíôáñ äéá÷åéñéóôÞò åêêßíçóçò ôïõ FreeBSD), ôï **Grub**, ôï **GAG**, êáé ôï **LILO**. (Ìüíï ôï **boot0** ÷ùñÜåé ìÝóá óôï MBR.)

Áí Ý÷åôå åãêáôåóôçìÝíï Ýíá ìüíï ëåéôïõñãéêü óýóôçìá óôïõò äßóêïõò óáò, ôï ôõðïðïéçìÝíï MBR ãéá PC åßíáé åðáñêÝò. Áõôü ôï MBR øÜ÷íåé ãéá ôï ðñþôï åêêéíÞóéìï (Þ åíåñãü) äéáìÝñéóìá (slice) óôï äßóêï, êáé åêôåëåß ôïí êþäéêá ðïõ õðÜñ÷åé óå áõôü ãéá íá öïñôþóåé ôï õðüëïéðï ôïõ ëåéôïõñãéêïý óõóôÞìáôïò. ¸á MBR áõôïý ôïõ ôýðïõ, åßíáé áõôü ðïõ åãêáèßóôáôáé áðü ðñïåðéëïãÞ ìå ôçí fdisk(8). Âáóßæåôáé óôï `/boot/mbr`.

Áí Ý÷åôå åãêáôáóôÞóåé ðïëëáðëÜ ëåéôïõñãéêÜ óõóôÞìáôá óôïõò äßóêïõò óáò, ìðïñåßôå íá åãêáôáóôÞóåôå äéáöïñåôéêü äéá÷åéñéóôÞ åêêßíçóçò, êÜðïéïí ðïõ íá ìðïñåß íá äåßîåé ìéá ëßóôá ôùí äéáöïñåôéêþí óõóôçìÜôùí êáé íá óáò åðéôñÝøåé íá äéáëÝîåôå ðïéï íá îåêéíÞóåé. Óôï åðüìåíï ôìÞìá èá óõæçôÞóïõìå ãéá äýï áðü áõôïýò ôïõò äéá÷åéñéóôÝò åêêßíçóçò.

Ôï õðüëïéðï ôïõ óõóôÞìáôïò åêêßíçóçò ôïõ FreeBSD åßíáé ÷ùñéóìÝíï óå ôñßá óôÜäéá. Ôï ðñþôï óôÜäéï åêôåëåßôáé áðü ôï MBR, ôï ïðïßï ãíùñßæåé áñêåôÜ ãéá íá öÝñåé ôïí õðïëïãéóôÞ óå ìéá óõãêåêñéìÝíç êáôÜóôáóç êáé íá åêôåëÝóåé ôï äåýôåñï óôÜäéï. Ôï äåýôåñï óôÜäéï ìðïñåß íá êÜíåé ëßãá ðåñéóóüôåñá ðñÜãìáôá ðñéí ôçí åêôÝëåóç ôïõ ôñßôïõ óôáäßïõ. Ôï ôñßôï óôÜäéï ïëïêëçñþíåé ôç äéáäéêáóßá öüñôùóçò ôïõ ëåéôïõñãéêïý óõóôÞìáôïò. Ç åñãáóßá ãßíåôáé óå ôñßá óôÜäéá, ãéáôß ôï ðñüôõðï ôïõ PC åðéâÜëëåé ðåñéïñéóìïýò óôï ìÝãåèïò ôùí ðñïãñáììÜôùí ðïõ ìðïñïýí íá åêôåëåóôïýí óôá óôÜäéá Ýíá êáé äýï. Ç óõíÝíùóç áõôÞ ôùí åñãáóéþí åðéôñÝðåé óôï FreeBSD íá ðáñÝ÷åé Ýíá ðéï åõÝëéêôï óýóôçìá öüñôùóçò.

¸ðåéôá îåêéíÜåé ï ðõñÞíáò êáé áñ÷ßæåé ôçí áíß÷íåõóç êáé áñ÷éêïðïßçóç ôùí óõóêåõþí þóôå íá ìðïñïýí íá ÷ñçóéìïðïéçèïýí. ÌÝôá ôçí ïëïêëÞñùóç ôçò äéáäéêáóßáò åêêßíçóçò ôïõ ðõñÞíá, ï Ýëåã÷ïò ðåñíÜåé óôç äéáäéêáóßá ÷ñÞóôç init(8), ç ïðïßá êáé åðéâåâáéþíåé üôé ïé äßóêïé åßíáé óå ëåéôïõñãéêÞ (÷ñÞóéìç) êáôÜóôáóç. Ç init(8) îåêéíÜåé Ýðåéôá ôçí ñýèìéóç ðüñùí (åðßðåäï ÷ñÞóôç), ìå ôçí ïðïßá ðñïóáñôþíïíôáé ôá óõóôÞìáôá áñ÷åßùí, ñõèìßæïíôáé ïé êÜñôåò äéêôýïõ ãéá åðéêïéíùíßá ìå ôï äßêôõï, êáé ãåíéêÜ åêêéíïýí üëåò ïé äéáäéêáóßåò ðïõ åêôåëïýíôáé ôõðéêÜ êáôÜ ôçí åêêßíçóç åíüò FreeBSD óõóôÞìáôïò.

13.3 Ï Äéá÷åéñéóôÞò Åêêßíçóçò êáé ôá ÓôÜäéá Åêêßíçóçò

13.3.1 Ï Äéá÷åéñéóôÞò Åêêßíçóçò (boot manager)

Ï êþäéêáò óôï MBR Þ äéá÷åéñéóôÞò åêêßíçóçò áíáöÝñåôáé ìåñéêÝò öïñÝò êáé ùò *óôÜäéï ìçäÝí (stage zero)* ôçò äéáäéêáóßáò åêêßíçóçò. Ôï ôìÞìá áõôü ðåñéãñÜöåé äýï áðü ôïõò äéá÷åéñéóôÝò åêêßíçóçò ðïõ áíáöÝñáìå ðñïçãïõìÝíùò: Ôï **boot0** êáé ôï **LILO**.

Ï Äéá÷åéñéóôÞò Åêêßíçóçò boot0: Ôï MBR ðïõ åãêáèßóôáôáé áðü ôï ðñüãñáììá åãêáôÜóôáóçò ôïõ FreeBSD Þ ôï boot0cfg(8), âáóßæåôáé áðü ðñïåðéëïãÞ óôï `/boot/boot0`. (Ôï ðñüãñáììá **boot0** åßíáé ðïëý áðëü, êáèþò ï êþäéêáò óôï MBR ìðïñåß íá Ý÷åé ìÝãåèïò ùò 446 bytes, åîáéôßáò ôïõ ðßíáêá êáôáôìÞóåùí (slice table) êáé ôïõ áíáãíùñéóôéêïý `0x55AA` ðïõ âñßóêåôáé óôï ôÝëïò ôïõ MBR.) Áí Ý÷åôå åãêáôáóôÞóåé ôï **boot0** êáé ðïëëáðëÜ ëåéôïõñãéêÜ óõóôÞìáôá óôïõò óêëçñïýò äßóêïõò óáò, èá äåßôå êáôÜ ôçí åêêßíçóç, ìéá ïèüíç ðáñüìïéá ìå ôçí ðáñáêÜôù:

ÐáñÜäåéãìá 13-1. `boot0` Screenshot

```
F1 DOS
F2 FreeBSD
F3 Linux
F4 ??
F5 Drive 1

Default: F2
```

¶ëëá ëåéôïõñãéêÜ óõóôÞìáôá, êáé åéäéêÜ ôá Windows, åßíáé ãíùóôü üôé ãñÜöïõí ôï äéêü ôïõò MBR ðÜíù óå êÜðïéï Þäç õðÜñ÷ïí. Áí óáò óõìâåß áõôü, Þ áí èÝëåôå íá áíôéêáôáóôÞóåôå ôï õðÜñ÷ïí MBR óáò ìå áõôü ôïõ FreeBSD, ÷ñçóéìïðïéÞóôå ôçí áêüëïõèç åíôïëÞ:

```
# fdisk -B -b /boot/boot0 device
```

üðïõ *`device`* åßíáé ç óõóêåõÞ áðü ôçí ïðïßá ãßíåôáé åêêßíçóç, üðùò ð.÷. ôï `ad0` ãéá ôïí ðñþôï äßóêï IDE, ôï `ad2` ãéá ôïí ðñþôï IDE äßóêï óôï äåõôåñåýïíôá åëåãêôÞ, ôï `da0` ãéá ôïí ðñþôï SCSI äßóêï ê.ï.ê. Áí ðÜëé èÝëåôå ðñïóáñìïóìÝíç ñýèìéóç ôïõ MBR, ÷ñçóéìïðïéÞóôå ôï boot0cfg(8).

Ï Äéá÷åéñéóôÞò Åêêßíçóçò LILO. Ãéá íá åãêáôáóôÞóåôå áõôü ôï äéá÷åéñéóôÞ åêêßíçóçò þóôå íá ìðïñåß íá åêêéíåß ôï FreeBSD, åãêáôáóôÞóôå ðñþôá ôï Linux êáé ðñïóèÝóôå ôçí áêüëïõèç êáôá÷þñçóç óôï õðÜñ÷ïí áñ÷åßï ñõèìßóåùí `/etc/lilo.conf`:

```
other=/dev/hdXY
table=/dev/hdX
loader=/boot/chain.b
label=FreeBSD
```

Óôï ðáñáðÜíù, êáèïñßóôå ôï ðñùôåýïí äéáìÝñéóìá êáé ôï äßóêï ôïõ FreeBSD áíôéêáèéóôþíôáò ôï *`X`* ìå ôï ãñÜììá äßóêïõ êáé ôï *`Y`* ìå ôïí áñéèìü ôïõ ðñùôåýïíôïò äéáìåñßóìáôïò, ÷ñçóéìïðïéþíôáò üìùò ôçí ïíïìáôïëïãßá ôïõ Linux. Áí ÷ñçóéìïðïéåßôå ïäçãü SCSI èá ÷ñåéáóôåß íá áëëÜîåôå ôï *`/dev/hd`* óå êÜôé áíôßóôïé÷ï ìå *`/dev/sd`*. Ç ãñáììÞ `loader=/boot/chain.b` ìðïñåß íá ðáñáëåéöèåß áí Ý÷åôå êáé ôá äýï ëåéôïõñãéêÜ óõóôÞìáôá óôïí ßäéï äßóêï. ÅêôåëÝóôå ôþñá ôçí åíôïëÞ `/sbin/lilo -v` ãéá íá êáôá÷ùñÞóåôå ôéò íÝåò áëëáãÝò óáò óôï óýóôçìá. Ìðïñåßôå íá ôéò åðéâåâáéþóåôå åëÝã÷ïíôáò ôá ìçíýìáôá ðïõ èá åìöáíéóôïýí óôçí ïèüíç óáò.

13.3.2 Ôï ÓôÜäéï ¸íá, `/boot/boot1`, êáé ôï ÓôÜäéï Äýï, `/boot/boot2`

Ïõóéáóôéêü, ôï ðñþôï êáé äåýôåñï óôÜäéï åßíáé ôìÞìáôá ôïõ ßäéïõ ðñïãñÜììáôïò, óôçí ßäéá ðåñéï÷Þ ôïõ äßóêïõ. Ëüãù ðåñéïñéóìþí ÷þñïõ Ý÷ïõí ÷ùñéóôåß óå äýï, áëëÜ åãêáèßóôáíôáé ðÜíôá ìáæß. ÁíôéãñÜöïíôáé áðü ôï óõíäõáóìÝíï áñ÷åßï `/boot/boot` áðü ôï ðñüãñáììá åãêáôÜóôáóçò Þ ôï **bsdlabel** (äåßôå ðáñáêÜôù).

Âñßóêïíôáé Ýîù áðü óõóôÞìáôá áñ÷åßùí, óôçí ðñþôç ôñï÷éÜ (track) ôïõ slice åêêßíçóçò, îåêéíþíôáò áðü ôïí ðñþôï ôïìÝá. Åßíáé ôï óçìåßï üðïõ ôï boot0, Þ ïðïéïóäÞðïôå Üëëïò äéá÷åéñéóôÞò åêêßíçóçò, áíáìÝíåé íá âñåé ðñüãñáììá ðïõ èá óõíå÷ßóåé ôç äéáäéêáóßá åêêßíçóçò. Ï áñéèìüò ôùí ôïìÝùí ðïõ ÷ñçóéìïðïéïýíôáé ìðïñåß íá âñåèåß åýêïëá áðü ôï ìÝãåèïò ôïõ áñ÷åßïõ `/boot/boot`.

Ôï `boot1` åßíáé ðïëý áðëü, ìéá êáé ìðïñåß íá åßíáé ìüíï 512 bytes óå ìÝãåèïò, êáé ãíùñßæåé üóá ÷ñåéÜæåôáé ãéá ôï *bsdlabel* ôïõ FreeBSD, ôï ïðïßï áðïèçêåýåé ðëçñïöïñßåò ó÷åôéêÜ ìå ôï slice, þóôå íá âñåé êáé íá åêôåëÝóåé ôï `boot2`.

Ôï `boot2` åßíáé åëáöñÜ ðéï ðïëýðëïêï êáé êáôáíïåß åðáñêþò ôï óýóôçìá áñ÷åßùí ôïõ FreeBSD þóôå íá ìðïñåß íá âñåé áñ÷åßá óå áõôü, êáé ìðïñåß åðßóçò íá ðáñÝ÷åé ìéá áðëÞ äéåðáöÞ ìå ôï ÷ñÞóôç þóôå íá ìðïñåß íá ãßíåé ç åðéëïãÞ ôïõ ðõñÞíá Þ ôïõ ðñïãñÜììáôïò öüñôùóçò ðïõ èá åêôåëåóôåß.

Ôï `boot2` óõíÞèùò åêôåëåß ôïí loader (öïñôùôÞò åêêßíçóçò) ï ïðïßïò åßíáé åîáéñåôéêÜ ðéï ðïëýðëïêïò, áëëÜ ðáñÝ÷åé Ýíá ùñáßï êáé åýêïëï ôñüðï ñýèìéóçò ôçò åêêßíçóçò. Ðáëéüôåñá ôï `boot2` áíáëÜìâáíå íá öïñôþóåé áðåõèåßáò ôïí ðõñÞíá.

ÐáñÜäåéãìá 13-2. Åéêüíá áðü ôï `boot2`

```
>> FreeBSD/i386 BOOT
Default: 0:ad(0,a)/boot/loader
boot:
```

Áí ÷ñåéáóôåß ðïôÝ íá áíôéêáôáóôÞóåôå ôá åãêáôåóôçìÝíá `boot1` êáé `boot2` ÷ñçóéìïðïéÞóôå ôï bsdlabel(8):

```
# bsdlabel -B diskslice
```

üðïõ ôï *`diskslice`* åßíáé ï äßóêïò êáé ôï slice áðü ôï ïðïßï ãßíåôáé ç åêêßíçóç, üðùò ð.÷. `ad0s1` ãéá ôï ðñþôï slice óôïí ðñþôï IDE äßóêï.

> **Åðéêßíäõíá ÁöïóéùìÝíç ÊáôÜóôáóç (Dangerously Dedicated Mode):** Áí ÷ñçóéìïðïéÞóåôå ìüíï ôï üíïìá ôïõ äßóêïõ, üðùò ð.÷. `ad0`, óôçí åíôïëÞ bsdlabel(8) èá äçìéïõñãÞóåôå Ýíá åðéêßíäõíá áöïóéùìÝíï äßóêï, ÷ùñßò slices. Åßíáé ó÷åäüí óßãïõñï üôé äåí èÝëåôå íá ôï êÜíåôå áõôü, ãé’ áõôü óéãïõñåõôåßôå üôé åëÝãîáôå ôçí åíôïëÞ bsdlabel(8) ðñéí ðéÝóåôå **Return**.

13.3.3 ÓôÜäéï Ôñßá, `/boot/loader`

Ï loader, Þ öïñôùôÞò åêêßíçóçò, åßíáé ôï ôåëéêü óôÜäéï ôïõ óõóôÞìáôïò åêêßíçóçò ôñéþí óôáäßùí, êáé âñßóêåôáé óôï óýóôçìá áñ÷åßùí, óõíÞèùò ùò `/boot/loader`.

Ðñïïñéóìüò ôïõ loader åßíáé íá ðáñÝ÷åé ìéá ìÝèïäï ñýèìéóçò öéëéêÞ ðñïò ôï ÷ñÞóôç, êáé ÷ñçóéìïðïéåß Ýíá åýêïëï óýíïëï åíôïëþí, ôï ïðïßï õðïóôçñßæåôáé áðü Ýíá éó÷õñü ìåôáöñáóôÞ åíôïëþí ìå Ýíá ðïëõðëïêüôåñï óýíïëï åíôïëþí.

13.3.3.1 ÑïÞ ôïõ ÐñïãñÜììáôïò Loader

ÊáôÜ ôçí áñ÷éêïðïßçóç, ï loader èá áíé÷íåýóåé ôçí êïíóüëá êáé ôïõò äßóêïõò êáé èá êáèïñßóåé áðü ðïéï äßóêï ãßíåôáé ç åêêßíçóç. Èá ñõèìßóåé êáôÜëëçëá ôéò áíôßóôïé÷åò ìåôáâëçôÝò êáé èá îåêéíÞóåé Ýíá ðñüãñáììá ìåôÜöñáóçò åíôïëþí (interpreter) óôï ïðïßï ìðïñåß ï ÷ñÞóôçò íá äßíåé åíôïëÝò, åßôå áðåõèåßáò, åßôå ìÝóù êÜðïéïõ script.

Ï loader êáôüðéí èá äéáâÜóåé ôï áñ÷åßï `/boot/loader.rc`, ôï ïðïßï ìå ôç óåéñÜ ôïõ äéáâÜæåé, áðü ðñïåðéëïãÞ, ôï `/boot/defaults/loader.conf`. ÌÝóá áðü ôï áñ÷åßï áõôü ôßèåíôáé ëïãéêÝò ðñïåðéëåãìÝíåò ôéìÝò ãéá êÜðïéåò ìåôáâëçôÝò. ¸ðåéôá, äéáâÜæåôáé ôï áñ÷åßï `/boot/loader.conf` ãéá ôõ÷üí ôïðéêÝò áëëáãÝò óôéò ìåôáâëçôÝò áõôÝò. Êáôüðéí ôï `loader.rc` ÷ñçóéìïðïéåß áõôÝò ôéò ìåôáâëçôÝò, öïñôþíïíôáò ôá áñèñþìáôá (modules) êáé ôïí ðõñÞíá ðïõ Ý÷åé åðéëåãåß.

ÔåëéêÜ, ï loader, ðåñéìÝíåé 10 äåõôåñüëåðôá (ðñïåðéëåãìÝíï ÷ñïíéêü äéÜóôçìá) ãéá ôçí ðßåóç êÜðïéïõ ðëÞêôñïõ, êáé áí äåí õðÜñîåé ðáñÝìâáóç áðü ôïí ÷ñÞóôç, îåêéíÜåé ôïí ðõñÞíá. Áí ãßíåé ðáñÝìâáóç, åìöáíßæåôáé óôïí ÷ñÞóôç ìéá ðñïôñïðÞ ç ïðïßá êáôáíïåß ôï åýêïëï óýíïëï åíôïëþí ðïõ áíáöÝñáìå ðñïçãïõìÝíùò, êáé üðïõ ï ÷ñÞóôçò ìðïñåß íá ñõèìßóåé ìåôáâëçôÝò, íá áðïöïñôþóåé üëá ôá áñèñþìáôá, íá öïñôþóåé áñèñþìáôá êáé ôåëéêÜ íá ðñïâåß óå åêêßíçóç Þ åðáíåêêßíçóç.

13.3.3.2 ÅíôïëÝò ÅíóùìáôùìÝíåò óôï Loader

ÐáñáêÜôù èá äåßôå ôéò ðéï óõ÷íÜ ÷ñçóéìïðïéïýìåíåò åíôïëÝò ôïõ loader. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå üëåò ôéò äéáèÝóéìåò åíôïëÝò, ðáñáêáëïýìå íá äåßôå ôï loader(8).

autoboot *`seconds`*

Ðñï÷ùñÜ óçí åêêßíçóç ôïõ ðõñÞíá, áí äåí õðÜñîåé ðáñÝìâáóç áðü ôï ÷ñÞóôç ìÝóá óôï êáèïñéóìÝíï ÷ñïíéêü äéÜóôçìá ðïõ äßíåôáé óå äåõôåñüëåðôá. Áðåéêïíßæåé áíôßóôñïöç ìÝôñçóç, êáé ï ðñïåðéëåãìÝíïò ÷ñüíïò åßíáé ôá 10 äåõôåñüëåðôá.

boot [`-`*`options`*] [*`kernelname`*]

Ðñï÷ùñÜåé Üìåóá óôçí åêêßíçóç ôïõ ðõñÞíá, ÷ñçóéìïðïéþíôáò üðïéåò ôõ÷üí åðéëïãÝò Ý÷ïõí ïñéóôåß êáé ôï üíïìá ôïõ ðõñÞíá ðïõ èá åêôåëåóôåß áí Ý÷åé äïèåß. Ãéá íá ëçöèåß äéáöïñåôéêü üíïìá ðõñÞíá óôçí ãñáììÞ åíôïëÞò, èá ðñÝðåé ðñþôá íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ *unload*. ÄéáöïñåôéêÜ, èá ÷ñçóéìïðïéçèåß ï ðõñÞíáò ðïõ Ý÷åé öïñôùèåß Þäç.

boot-conf

ÄéáôñÝ÷åé ôçí áõôüìáôç ñýèìéóç ôùí áñèñùìÜôùí (module) ðïõ âáóßæåôáé óå ìåôáâëçôÝò, ìå ôïí ßäéï ôñüðï ðïõ ãßíåôáé êáé óå êáíïíéêÞ åêêßíçóç. Áõôü Ý÷åé íüçìá ìüíï áí ÷ñçóéìïðïéÞóåôå ðñþôá ôï `unload` êáé áëëÜîåôå êÜðïéåò ìåôáâëçôÝò, óõíÞèùò ôï `kernel`.

help [*`topic`*]

Äåß÷íåé ìçíýìáôá âïÞèåéáò, ôá ïðïßá äéáâÜæïíôáé áðü ôï `/boot/loader.help`. Áí ôï topic (èÝìá) ðïõ äüèçêå åßíáé ç ëÝîç `index`, èá äåßôå ìéá ëßóôá ìå ôá äéáèÝóéìá èÝìáôá âïÞèåéáò.

include *`filename`* ...

ÅðåîåñãÜæåôáé ôï áñ÷åßï ìå ôï üíïìá áñ÷åßïõ ðïõ äüèçêå (filename). Ãßíåôáé áíÜãíùóç êáé ãñáììÞ ðñïò ãñáììÞ ìåôÜöñáóç ôïõ áñ÷åßïõ. Ç åíôïëÞ include óôáìáôÜåé Üìåóá áí åíôïðéóôåß êÜðïéï ëÜèïò.

load [`-t` *`type`*] *`filename`*

Öïñôþíåé ôïí ðõñÞíá, ôï Üñèñùìá ðõñÞíá Þ Ýíá áñ÷åßï ôïõ ôýðïõ ðïõ êáèïñßóôçêå, ìå âÜóç ôï üíïìá áñ÷åßïõ ðïõ äüèçêå. Áí ìåôÜ ôï üíïìá áñ÷åßïõ õðÜñ÷ïõí ðáñÜìåôñïé, ðåñíéïýíôáé ùò ðáñÜìåôñïé óôï áñ÷åßï ðïõ öïñôþíåôáé.

ls [`-l`] [*`path`*]

Äåß÷íåé Ýíá êáôÜëïãï ôùí áñ÷åßùí ôçò äéáäñïìÞò ðïõ äüèçêå, Þ áí äåí êáèïñßóôçêå äéáäñïìÞ, ôïõ ñéæéêïý êáôáëüãïõ. Áí ïñéóôåß êáé ç åðéëïãÞ `-l` èá åìöáíßæïíôáé åðßóçò êáé ôá ìåãÝèç ôùí áñ÷åßùí.

lsdev [`-v`]

Åìöáíßæåé üëåò ôéò óõóêåõÝò áðü ôéò ïðïßåò åßíáé äõíáôÞ ç öüñôùóç áñèñùìÜôùí. Áí ïñéóôåß ìå ôçí åðéëïãÞ `-v`, åìöáíßæïíôáé ðåñéóóüôåñåò ëåðôïìÝñåéåò.

lsmod [`-v`]

Åìöáíßæåé ôá áñèñþìáôá ðïõ Ý÷ïõí öïñôùèåß. Áí ïñéóôåß ç åðéëïãÞ `-v`, åìöáíßæïíôáé ðåñéóóüôåñåò ëåðôïìÝñåéåò.

more *`filename`*

Åìöáíßæåé ôï áñ÷åßï ðïõ êáèïñßæåôáé, ìå ðáýóåéò êÜèå `LINES` áñéèìü ãñáììþí.

reboot

Åðáíåêêéíåß Üìåóá ôï óýóôçìá.

set *`variable`*
set *`variable`*`=`*`value`*

Êáèïñßæåé ìåôáâëçôÝò ðåñéâÜëëïíôïò ãéá ôïí loader.

unload

Áðïöïñôþíåé üëá ôá áñèñþìáôá.

13.3.3.3 Ðáñáäåßãìáôá ãéá ôïí Loader

Åäþ èá âñåßôå ìåñéêÜ ðñáêôéêÜ ðáñáäåßãìáôá ó÷åôéêÜ ìå ôçí ÷ñÞóç ôïõ loader:

- Ãéá íá îåêéíÞóåôå ôï óõíçèéóìÝíï ðõñÞíá óáò, áëëÜ óå êáôÜóôáóç åíüò ÷ñÞóôç:

  ```
  boot -s
  ```

- Ãéá íá áðïöïñôþóåôå ôï óõíçèéóìÝíï ðõñÞíá óáò êáé íá öïñôþóåôå ôïí ðáëéü óáò (Þ êÜðïéï Üëëï):

  ```
  unload
  load kernel.old
  ```

  Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï üíïìá `kernel.GENERIC` ãéá íá áíáöåñèåßôå óôïí áñ÷éêü (generic) ðõñÞíá ï ïðïßïò õðÜñ÷åé óôï CD ôçò åãêáôÜóôáóçò, Þ ôï `kernel.old` ãéá íá áíáöåñèåßôå óôïí ðõñÞíá ðïõ åß÷áôå åãêáôåóôçìÝíï ðñéí (ãéá ðáñÜäåéãìá, ôïí ðáëéü óáò ðõñÞíá áí êÜíáôå ðñüóöáôá ñýèìéóç êáé åãêáôÜóôáóç íÝïõ äéêïý óáò ðñïóáñìïóìÝíïõ ðõñÞíá).

  > **Óçìåßùóç:** ×ñçóéìïðïéÞóôå ôï ðáñáêÜôù ãéá íá öïñôþóåôå ôá óõíçèéóìÝíá óáò áñèñþìáôá óå êÜðïéï Üëëï ðõñÞíá:
  >
  > ```
  > unload
  > set kernel="kernel.old"
  > boot-conf
  > ```

- Ãéá íá öïñôþóåôå Ýíá script ñýèìéóçò ðõñÞíá (Ýíá áõôïìáôïðïéçìÝíï ðñüãñáììá ôï ïðïßï åêôåëåß ôéò ëåéôïõñãßåò ðïõ êáíïíéêÜ èá êÜíáôå ìÝóù êÜðïéïõ ðñïãñÜììáôïò ñýèìéóçò ðõñÞíá êáôÜ ôçí åêêßíçóç):

  ```
  load -t userconfig_script /boot/kernel.conf
  ```

13.3.3.4 Ãñáöéêü Ïèüíç Åêêßíçóçò

Óõíåéóöïñ Ü áðü ôïí Joseph J. Barbish.

Ç ãñáöéêÞ ïèüíç åêêßíçóçò (splash screen) äçìéïõñãåß Ýíá ðéï åõ÷Üñéóôï ðåñéâÜëëïí óå ó÷Ýóç ìå ôçí áðëÞ áðåéêüíéóç ôùí ìçíõìÜôùí åêêßíçóçò óå ìïñöÞ êåéìÝíïõ. Ç ãñáöéêÞ ïèüíç åêêßíçóçò åìöáíßæåôáé ùò üôïõ ôï óýóôçìá öôÜóåé óôçí ðñïôñïðÞ åéóüäïõ (login), åßôå óôçí êïíóüëá, åßôå óôï ãñáöéêü ðåñéâÜëëïí.

Ôï FreeBSD äéáèÝôåé äýï âáóéêÜ ðåñéâÜëëïíôá. Ôï ðñþôï åßíáé ôï ðñïåðéëåãìÝíï ðåñéâÜëëïí êåéìÝíïõ ãñáììÞò åíôïëþí (êïíóüëá). ÌåôÜ ôï ôÝëïò ôçò åêêßíçóçò, åìöáíßæåôáé óôçí êïíóüëá ìéá ðñïôñïðÞ åéóüäïõ. Ôï äåýôåñï, åßíáé ôï ãñáöéêü ðåñéâÜëëïí ðïõ ðáñÝ÷åôáé áðü ôï óýóôçìá ×11. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ X11 êáé åíüò áðü ôïõò ãñáöéêïýò äéá÷åéñéóôÝò ðáñáèýñùí Þ desktop, üðùò åßíáé ôá **GNOME**, **KDE** Þ **XFce**, ìðïñåßôå íá îåêéíÞóåôå ôï ãñáöéêü ðåñéâÜëëïí ìå ôçí åíôïëÞ `startx`.

Ìåñéêïß ÷ñÞóôåò ðñïôéìïýí íá óõíäÝïíôáé óôï óýóôçìá ìÝóù ãñáöéêÞò ïèüíçò åéóüäïõ, áíôß íá ÷ñçóéìïðïéïýí ôçí ðñïôñïðÞ åéóüäïõ ôçò êïíóüëáò. Ç äõíáôüôçôá áõôÞ ðáñÝ÷åôáé áðï äéá÷åéñéóôÝò ïèüíçò, üðùò ï **XDM** ãéá ôï Xorg, o **gdm** ãéá ôï **GNOME** êáé ï **kdm** ãéá ôï **KDE** (êáèþò êáé Üëëïõò ðïõ äéáôßèåíôáé óôç ÓõëëïãÞ ôùí Ports). ÌåôÜ áðü ìéá åðéôõ÷çìÝíç åßóïäï, ðáñïõóéÜæåôáé Üìåóá óôï ÷ñÞóôç ôï ãñáöéêü ðåñéâÜëëïí ôçò åðéëïãÞò ôïõ.

Óôï ðåñéâÜëëïí ôçò ãñáììÞò åíôïëþí, ç ãñáöéêÞ ïèüíç åêêßíçóçò èá áðïêñýøåé üëá ôá ìçíýìáôá áíß÷íåõóçò ôùí óõóêåõþí êáé õðçñåóéþí, ìÝ÷ñé ôçí åìöÜíéóç ôçò ðñïôñïðÞò åéóüäïõ. Ìå áðåõèåßáò åêêßíçóç óå ðåñéâÜëëïí X11, ç åìðåéñßá åêêßíçóçò èá åßíáé áêüìá ðéï êáèáñÞ, êáé èá ìïéÜæåé ðåñéóóüôåñï ìå ôçí áíôßóôïé÷ç óå Ýíá ðåñéâÜëëïí Microsoft Windows Þ Üëëïõ ìç-UNIX óõóôÞìáôïò.

13.3.3.4.1 Ëåéôïõñãßá ôçò ÃñáöéêÞò Ïèüíçò Åêêßíçóçò

Ç ãñáöéêÞ ïèüíç åêêßíçóçò õðïóôçñßæåé ìüíï åéêüíåò bitmap (`.bmp`) Þ ZSoft PCX (`.pcx`) 256 ÷ñùìÜôùí. Åðéðñüóèåôá, ïé åéêüíåò ðïõ ÷ñçóéìïðïéïýíôáé ðñÝðåé íá Ý÷ïõí áíÜëõóç 320x200 Þ ìéêñüôåñç ãéá íá ëåéôïõñãÞóïõí óå ôõðéêïýò ðñïóáñìïãåßò ïèüíçò VGA.

Ãéá íá ÷ñçóéìïðïéÞóåôå ìåãáëýôåñåò åéêüíåò, ìÝ÷ñé ôçí ìÝãéóôç áíÜëõóç ôùí 1024x768 pixels, åíåñãïðïéÞóôå ôçí õðïóôÞñéîç VESA ðïõ ðåñéëáìâÜíåôáé óôï FreeBSD. Ìðïñåßôå íá ôçí åíåñãïðïéÞóåôå öïñôþíïíôáò ôï Üñèñùìá VESA êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò, ç ðñïóèÝôïíôáò ôçí åðéëïãÞ `VESA` óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá, êáé äçìéïõñãþíôáò Ýíá íÝï ðñïóáñìïóìÝíï ðõñÞíá (ÊåöÜëáéï 9). Ç õðïóôÞñéîç VESA äßíåé óôïõò ÷ñÞóôåò ôçí äõíáôüôçôá íá ÷ñçóéìïðïéÞóïõí ìéá åéêüíá ðïõ íá êáëýðôåé üëç ôçí ïèüíç.

Ìðïñåßôå íá äåßôå ôá êáíïíéêÜ ìçíýìáôá åêêßíçóçò üóï åìöáíßæåôáé ç ãñáöéêÞ ïèüíç åêêßíçóçò, ðéÝæïíôáò áðëþò ïðïéïäÞðïôå ðëÞêôñï.

Ç ïèüíç åêêßíçóçò ãßíåôáé åðßóçò ç ðñïåðéëåãìÝíç ðñïöýëáîç ïèüíçò, üóï ôï óýóôçìá ëåéôïõñãåß óå ðåñéâÜëëïí êïíóüëáò. ÌåôÜ áðü êÜðïéï ÷ñïíéêü äéÜóôçìá áäñÜíåéáò, ç ïèüíç áëëÜæåé, áðåéêïíßæïíôáò ôçí åéêüíá ðïõ ÷ñçóéìïðïéÞèçêå óôçí åêêßíçóç, ìå öùôåéíÞ åíáëëáãÞ ôçò öùôåéíüôçôáò áðü ðïëý öùôåéíÞ ùò ðïëý óêïôåéíÞ. Ìðïñåßôå íá áëëÜîåôå áõôÞ ôçí ðñïåðéëåãìÝíç ðñïöýëáîç ïèüíçò, ðñïóèÝôïíôáò ìéá ãñáììÞ `saver=` óôï áñ÷åßï `/etc/rc.conf`. Ãéá ôçí åðéëïãÞ `saver=`, õðÜñ÷ïõí áñêåôÝò åíóùìáôùìÝíåò ðñïöõëÜîåéò ïèüíçò ãéá íá åðéëÝîåôå. Ìðïñåßôå íá äåßôå ôçí ðëÞñç ëßóôá óôç óåëßäá manual ôïõ splash(4). Ç ðñïåðéëåãìÝíç ðñïöýëáîç ïèüíçò ïíïìÜæåôáé “warp”. Óçìåéþóôå üôé ç ðñïöýëáîç ïèüíçò ðïõ êáèïñßæåôáé óôï áñ÷åßï `/etc/rc.conf` ìÝóù ôçò åðéëïãÞò `saver=` Ý÷åé åðßäñáóç ìüíï óôéò åéêïíéêÝò êïíóüëåò. Äåí åðçñåÜæåé êáèüëïõ ôï ãñáöéêü ðåñéâÜëëïí X11.

ÊÜðïéá ìçíýìáôá åêêßíçóçò åîáêïëïõèïýí íá åìöáíßæïíôáé, áêüìá êáé ìåôÜ ôçí åöáñìïãÞ ôçò ãñáöéêÞò ïèüíçò åêêßíçóçò. Ôá ìçíýìáôá áõôÜ ðåñéëáìâÜíïõí ôï ìåíïý åðéëïãþí åêêßíçóçò êáé ôçí áíôßóôñïöç ìÝôñçóç ÷ñüíïõ ðïõ ôï óõíïäåýåé.

Ìðïñåßôå íá êáôåâÜóåôå õðïäåßãìáôá åéêüíùí ãéá ÷ñÞóç óôçí åêêßíçóç, áðü ôç óõëëïãÞ åéêüíùí óôçí ôïðïèåóßá http://artwork.freebsdgr.org (http://artwork.freebsdgr.org/node/3). Áí åãêáôáóôÞóåôå ôï Port `sysutils/bsd-splash-changer`, èá Ý÷åôå ôõ÷áßá åíáëëáãÞ åéêüíùí (ðïõ èá åðéëÝãïíôáé áðü ìéá Ýôïéìç óõëëïãÞ) óå êÜèå åêêßíçóç ôïõ óõóôÞìáôïò.

13.3.3.4.2 Åíåñãïðïßçóç ôçò ÃñáöéêÞò Ïèüíçò Åêêßíçóçò

Ôï áñ÷åßï ðïõ èá ÷ñçóéìïðïéçèåß ãéá ôçí ãñáöéêÞ ïèüíç åêêßíçóçò (ôýðïõ `.bmp` Þ `.pcx`) èá ðñÝðåé íá ôïðïèåôçèåß óôçí ñéæéêÞ (root) êáôÜôìçóç, ãéá ðáñÜäåéãìá óôïí êáôÜëïãï `/boot/`.

Ãéá ôçí ðñïåðéëåãìÝíç áíÜëõóç ïèüíçò (320x200 Þ ìéêñüôåñç, 256 ÷ñþìáôá), åðåîåñãáóôåßôå ôï áñ÷åßï `/boot/loader.conf` þóôå íá ðåñéÝ÷åé ôá ðáñáêÜôù:

```
splash_bmp_load="YES"
bitmap_load="YES"
bitmap_name="/boot/splash.bmp"
```

Ãéá ìåãáëýôåñåò áíáëýóåéò, ìÝ÷ñé ôçí ìÝãéóôç 1024x768, åðåîåñãáóôåßôå ôï áñ÷åßï `/boot/loader.conf` þóôå íá ðåñéÝ÷åé ôï ðáñáêÜôù:

```
vesa_load="YES"
splash_bmp_load="YES"
bitmap_load="YES"
bitmap_name="/boot/splash.bmp"
```

Ôï ðáñáðÜíù õðïèÝôåé üôé èá ÷ñçóéìïðïéÞóåôå ôï áñ÷åßï `/boot/splash.bmp` ãéá ôçí ãñáöéêÞ ïèüíç åêêßíçóçò. Áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå åéêüíá ôýðïõ PCX, ÷ñçóéìïðïéÞóôå ôéò ðáñáêÜôù åðéëïãÝò, êáèþò êáé ôçí åðéëïãÞ `vesa_load="YES"`, áíÜëïãá ìå ôçí áíÜëõóç:

```
splash_pcx_load="YES"
bitmap_load="YES"
bitmap_name="/boot/splash.pcx"
```

Ôï üíïìá áñ÷åßïõ äåí åßíáé áðáñáßôçôï íá åßíáé “splash” üðùò öáßíåôáé óôï ðáñáðÜíù ðáñÜäåéãìá. Ìðïñåß íá åßíáé ïôéäÞðïôå, áñêåß íá ðñüêåéôáé ãéá áñ÷åßï ôýðïõ BMP Þ PCX, üðùò ãéá ðáñÜäåéãìá `splash_640x400.bmp` Þ `blue_wave.pcx`.

ÐáñáêÜôù öáßíïíôáé ìåñéêÝò áêüìá åíäéáöÝñïõóåò åðéëïãÝò ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå óôï `/boot/loader.conf`:

`beastie_disable="YES"`

Ç åðéëïãÞ áõôÞ êáôáñãåß ôçí åìöÜíéóç ôïõ ìåíïý åðéëïãþí åêêßíçóçò. ÐáñáìÝíåé ùóôüóï ç áíôßóôñïöç ìÝôñçóç ìå ôçí ðñïôñïðÞ åéóáãùãÞò åðéëïãþí åêêßíçóçò. Áêüìá êáé üôáí äåí åìöáíßæåôáé ôï ìåíïý åðéëïãþí, áí ï ÷ñÞóôçò êÜíåé ìéá åðéëïãÞ óôç äéÜñêåéá ôïõ ðñïåðéëåãìÝíïõ ÷ñüíïõ áíáìïíÞò, ç åðéëïãÞ áõôÞ èá éó÷ýóåé ãéá ôçí åêêßíçóç.

`loader_logo="beastie"`

Ç åðéëïãÞ áõôÞ áëëÜæåé ôï êåßìåíï “FreeBSD” ðïõ åìöáíßæåôáé óôï äåîéü ìÝñïò ôïõ ìåíïý åðéëïãþí åêêßíçóçò, ìå Ýíá Ýã÷ñùìï ëïãüôõðï ôïõ beastie, üðùò åìöáíéæüôáí óôéò ðáëáéüôåñåò åêäüóåéò.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, ðáñáêáëïýìå áíáôñÝîôå óôéò óåëßäåò manual splash(4), loader.conf(5) êáé vga(4).

13.4 Áëëçëåðßäñáóç ìå ôïí ÐõñÞíá êáôÜ ôçí Åêêßíçóç

Áðü ôç óôéãìÞ ðïõ ï ðõñÞíáò öïñôùèåß, åßôå ìÝóù ôïõ loader (üðùò óõíÞèùò) åßôå ìÝóù ôïõ boot2 (ðáñáêÜìðôïíôáò ôïí loader), åîåôÜæåé ôéò ðáñáìÝôñïõò åêêßíçóçò (boot flags), áí õðÜñ÷ïõí, êáé ðñïóáñìüæåé áíÜëïãá ôç óõìðåñéöïñÜ ôïõ.

13.4.1 ÐáñÜìåôñïé Åêêßíçóçò ÐõñÞíá (Boot Flags)

ÐáñáêÜôù èá âñåßôå ôéò ðéï óõíçèéóìÝíåò ðáñáìÝôñïõò åêêßíçóçò:

`-a`

êáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò, èá ãßíåé åñþôçóç ãéá ôçí óõóêåõÞ áðü ôçí ïðïßá èá ãßíåé ç ðñïóÜñôçóç ôïõ ñéæéêïý (root) óõóôÞìáôïò áñ÷åßùí.

`-C`

åêêßíçóç áðü ôï CDROM.

`-c`

åêôÝëåóç ôïõ UserConfig, ôïõ ðñïãñÜììáôïò ñýèìéóçò ðõñÞíá êáôÜ ôçí åêêßíçóç.

`-s`

åêêßíçóç óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç (single user).

`-v`

åìöÜíéóç ðåñéóóüôåñùí ðëçñïöïñéþí êáôÜ ôç äéÜñêåéá åêêßíçóçò ôïõ ðõñÞíá.

Óçìåßùóç: ÕðÜñ÷ïõí êáé Üëëåò ðáñÜìåôñïé åêêßíçóçò, äéáâÜóôå ôç óåëßäá boot(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÝò.

13.5 Device Hints

ÓõíåéóöïñÜ áðü ôïí Tom Rhodes.

ÊáôÜ ôç äéÜñêåéá ôçò áñ÷éêÞò åêêßíçóçò ôïõ óõóôÞìáôïò, ôï ðñüãñáììá ôïõ boot loader(8) äéáâÜæåé ôï áñ÷åßï device.hints(5). Ôï áñ÷åßï áõôü ðåñéÝ÷åé ðëçñïöïñßåò åêêßíçóçò ãéá ôïí ðõñÞíá, ãíùóôÝò ùò ìåôáâëçôÝò, ïé ïðïßåò ìåñéêÝò öïñÝò áíáöÝñïíôáé åðßóçò êáé ùò “device hints”. ÁõôÜ ôá “device hints” ÷ñçóéìïðïéïýíôáé áðü ðñïãñÜììáôá ïäÞãçóçò óõóêåõþí ãéá ñýèìéóç ôùí áíôßóôïé÷ùí óõóêåõþí.

Ìðïñïýìå åðßóçò íá ïñßóïõìå Device hints óôçí ðñïôñïðÞ ôïõ Óôáäßïõ 3 ôïõ boot loader. Ïé ìåôáâëçôÝò ìðïñïýí íá ïñéóôïýí ìå ÷ñÞóç ôçò åíôïëÞò `set`, êáé íá áöáéñåèïýí ìå ôçí `unset`. Ìðïñïýìå åðßóçò íá ôéò åìöáíßóïõìå ìå ôçí åíôïëÞ `show`. Áêüìá, ìðïñïýìå åäþ íá ðáñáêÜìøïõìå êáé íá áëëÜîïõìå ôçí ôéìÞ ìåôáâëçôþí ðïõ Ý÷ïõí ïñéóôåß óôï áñ÷åßï `/boot/device.hints`. Ôá Device hints ðïõ ïñßæïõìå óôï boot loader äåí ðáñáìÝíïõí ìüíéìá êáé äåí èá éó÷ýïõí óôçí åðüìåíç åêêßíçóç.

ÌåôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò, ìðïñåß íá ÷ñçóéìïðïéçèåß ç åíôïëÞ kenv(1) ãéá íá åìöáíéóôïýí ïé ôéìÝò üëùí ôùí ìåôáâëçôþí.

Ôï óõíôáêôéêü ôïõ áñ÷åßïõ `/boot/device.hints` åßíáé ìéá ìåôáâëçôÞ áíÜ ãñáììÞ, êáé ÷ñçóéìïðïéåßôáé ôï ôõðïðïéçìÝíï “#” ãéá ãñáììÝò ðïõ äçëþíïíôáé ùò ó÷üëéá. Ïé ãñáììÝò äçìéïõñãïýíôáé üðùò öáßíåôáé ðáñáêÜôù:

```
hint.driver.unit.keyword="value"
```

Ç óýíôáîç ãéá ôï ÓôÜäéï 3 ôïõ boot loader åßíáé:

```
set hint.driver.unit.keyword=value
```

üðïõ `driver` åßíáé ôï üíïìá ôïõ ïäçãïý óõóêåõÞò, `unit` åßíáé ï áñéèìüò ìïíÜäáò ôçò óõóêåõÞò, êáé `keyword` åßíáé ç ëÝîç-êëåéäß ãéá ôï óõãêåêñéìÝíï hint. Ç ëÝîç-êëåéäß ìðïñåß íá áðïôåëåßôáé áðü ôéò áêüëïõèåò åðéëïãÝò:

- `at`: êáèïñßæåé ôï äßáõëï (bus) óôï ïðïßï ðñïóáñôÜôáé ç óõóêåõÞ.
- `port`: êáèïñßæåé ôçí áñ÷éêÞ äéåýèõíóç ôçò èýñáò I/O ðïõ èá ÷ñçóéìïðïéçèåß.
- `irq`: êáèïñßæåé ôïí áñéèìü ôçò áßôçóçò äéáêïðÞò (interrupt request) ðïõ èá ÷ñçóéìïðïéçèåß.
- `drq`: êáèïñßæåé ôïí áñéèìü ôïõ êáíáëéïý DMA.
- `maddr`: êáèïñßæåé ôç öõóéêÞ äéåýèõíóç ìíÞìçò ðïõ êáôáëáìâÜíåôáé áðü ôç óõóêåõÞ.
- `flags`: ïñßæåé äéÜöïñá bits ðáñáìÝôñùí ãéá ôçí óõóêåõÞ.
- `disabled`: Áí ïñéóôåß óå ôéìÞ `1`, ç óõóêåõÞ áðåíåñãïðïéåßôáé.

Ïé ïäçãïß óõóêåõþí ìðïñåß íá äÝ÷ïíôáé (Þ íá áðáéôïýí) ðåñéóóüôåñá hints ôá ïðïßá äåí öáßíïíôáé åäþ, êáé óáò óõíéóôïýìå íá äåßôå ôçí áíôßóôïé÷ç óåëßäá manual ôïõ êÜèå ïäçãïý. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò óõìâïõëåõèåßôå åðßóçò ôéò óåëßäåò manual ôùí device.hints(5), kenv(1), loader.conf(5), êáé loader(8).

13.6 Init: Áñ÷éêïðïßçóç ÅëÝã÷ïõ Äéáäéêáóéþí

Ìüëéò ïëïêëçñùèåß ç åêêßíçóç ôïõ ðõñÞíá, ï Ýëåã÷ïò ìåôáöÝñåôáé óôçí äéáäéêáóßá ÷ñÞóôç init(8), ç ïðïßá âñßóêåôáé óôï áñ÷åßï `/sbin/init`, Þ óôç äéáäñïìÞ ðïõ êáèïñßæåôáé óôçí ìåôáâëçôÞ `init_path` ôïõ `loader`.

13.6.1 Áêïëïõèßá Áõôüìáôçò Åðáíåêêßíçóçò

Ç áêïëïõèßá áõôüìáôçò åðáíåêêßíçóçò åîáóöáëßæåé üôé ôá óõóôÞìáôá áñ÷åßùí åßíáé óå êáíïíéêÞ, óôáèåñÞ êáôÜóôáóç. Áí äåí åßíáé, êáé ç fsck(8) äåí ìðïñåß íá äéïñèþóåé ôá ðñïâëÞìáôá, ôüôå ç init(8) èá ìåôáöÝñåé ôï óýóôçìá óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç þóôå íá ìðïñÝóåé Üìåóá ï äéá÷åéñéóôÞò óõóôÞìáôïò íá åðéëçöèåß ôùí ðñïâëçìÜôùí áõôþí.

13.6.2 ÊáôÜóôáóç Ëåéôïõñãßáò Åíüò ×ñÞóôç

Ìðïñåßôå íá åéóÝëèåôå óôçí êáôÜóôáóç áõôÞ ìÝóù ôçò áêïëïõèßáò áõôüìáôçò åðáíåêêßíçóçò, Þ ìÝóù ôçò åðéëïãÞò `-s` êáôÜ ôçí åêêßíçóç Þ áêüìá êáé èÝôïíôáò ôç ìåôáâëçôÞ `boot_single` óôïí `loader`.

Ìðïñåßôå åðßóçò íá åéóÝëèåôå óå áõôÞ êôåëþíôáò ôçí åíôïëÞ shutdown(8) ÷ùñßò ôçí åðéëïãÞ åðáíåêêßíçóçò (`-r`) Þ ôåñìáôéóìïý (`-h`), åíþ åßóôå óå êáôÜóôáóç ëåéôïõñãßáò ðïëëþí ÷ñçóôþí (multi-user).

Áí ç `êïíóüëá` ôïõ óõóôÞìáôïò Ý÷åé ôåèåß ùò `insecure` (áíáóöáëÞò) óôï `/etc/ttys`, ôï óýóôçìá èá æçôÞóåé ôïí êùäéêü ôïõ `root` ðñéí åéóÝëèåé óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç.

ÐáñÜäåéãìá 13-3. ÁíáóöáëÞò Êïíóüëá óôï `/etc/ttys`

```
# name  getty                           type    status          comments
#
```

```
# If console is marked "insecure", then init will ask for the root password
# when going to single-user mode.
console none                            unknown off insecure
```

> **Óçìåßùóç:** Ìéá `insecure` (áíáóöáëÞò) êïíóüëá óçìáßíåé üôé äåí èåùñåßôå áóöáëÞ ôçí êïíóüëá üóï áöïñÜ ôç öõóéêÞ ôçò ðñüóâáóç êáé èÝëåôå íá åßóôå âÝâáéïò üôé ìüíï üðïéïò ãíùñßæåé ôïí êùäéêü ôïõ `root` èá ìðïñåß íá ÷ñçóéìïðïéÞóåé ôç ëåéôïõñãßá åíüò ÷ñÞóôç. Ç åðéëïãÞ áõôÞ äåí óçìáßíåé üôé èÝëåôå ç êïíóüëá óáò íá ëåéôïõñãåß ÷ùñßò áóöÜëåéá. Áí èÝëåôå áóöÜëåéá, èá ðñÝðåé íá åðéëÝîåôå `insecure`, ü÷é `secure`.

13.6.3 ÊáôÜóôáóç Ëåéôïõñãßá Ðïëëáðëþí ×ñçóôþí (multi-user)

Áí ç init(8) äåí âñåé ðñïâëÞìáôá óôá óõóôÞìáôá áñ÷åßùí óáò, Þ ìüëéò ï ÷ñÞóôçò ôåñìáôßóåé ôçí êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç, ôï óýóôçìá åéóÝñ÷åôáé óå ëåéôïõñãßá ðïëëáðëþí ÷ñçóôþí, üðïõ êáé îåêéíÜ ðëÝïí ç ñýèìéóç ðüñùí (resources) ôïõ óõóôÞìáôïò.

13.6.3.1 Ñýèìéóç Ðüñùí (rc)

Ôï óýóôçìá ñýèìéóçò ðüñùí, äéáâÜæåé ôéò ðñïåðéëåãìÝíåò åðéëïãÝò áðü ôï `/etc/defaults/rc.conf`, êáé åðéëïãÝò ãéá ôï óõãêåêñéìÝíï ìç÷Üíçìá áðü ôï `/etc/rc.conf`, êáé ðñï÷ùñåß óôçí ðñïóÜñôçóç ôùí óõóôçìÜôùí áñ÷åßùí ðïõ áíáãñÜöïíôáé óôï `/etc/fstab`, îåêéíÜ ôéò õðçñåóßåò äéêôýïõ, åêêéíåß äéÜöïñïõò äáßìïíåò, êáé ôÝëïò åêôåëåß ôá scripts åêêßíçóçò ôùí ôïðéêÜ åãêáôåóôçìÝíùí ðáêÝôùí (åöáñìïãþí).

Ç óåëßäá manual rc(8) ðáñÝ÷åé ìéá êáëÞ áíáöïñÜ óôï óýóôçìá ñýèìéóçò ðüñùí, êáèþò åîåôÜæåé ôá ßäéá ôá scripts åêêßíçóçò.

13.7 Áêïëïõèßá Ôåñìáôéóìïý

ÊáôÜ ôïí åëåã÷üìåíï ôåñìáôéóìü, ìÝóù ôçò shutdown(8), ç init(8) èá áðïðåéñáèåß íá åêôåëÝóåé ôï script `/etc/rc.shutdown`, êáé áêïëïýèùò èá óôåßëåé óå üëåò ôéò äéåñãáóßåò ôï óÞìá `TERM`, êáé ôÝëïò ôï óÞìá `KILL` óå üðïéá äéåñãáóßá äåí ôåñìáôßóåé óå åýëïãï ÷ñïíéêü äéÜóôçìá.

Ãéá íá ãßíåé êáé äéáêïðÞ ôçò ôñïöïäïóßáò óå Ýíá óýóôçìá FreeBSD ìå áñ÷éôåêôïíéêÞ ðïõ õðïóôçñßæåé äéá÷åßñéóç åíÝñãåéáò, áðëþò ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `shutdown -p now` ãéá áðåíåñãïðïßçóç ìåôÜ ôïí ôåñìáôéóìü. Ãéá íá êÜíåôå áðëþò åðáíåêêßíçóç óå Ýíá óýóôçìá FreeBSD ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `shutdown -r now`. Èá ðñÝðåé íá åßóôå `root` Þ ìÝëïò ôçò ïìÜäáò `operator` ãéá íá åêôåëÝóåôå ôçí shutdown(8). Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôéò åíôïëÝò halt(8) êáé reboot(8), êïéôÜîôå ôéò áíôßóôïé÷åò óåëßäåò manual êáèþò êáé ôç óåëßäá manual ôçò shutdown(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

> **Óçìåßùóç:** Ç äéá÷åßñéóç åíÝñãåéáò áðáéôåß ôçí õðïóôÞñéîç ôïõ acpi(4), åßôå óôïí ðõñÞíá, åßôå öïñôùìÝíç ùò Üñèñùìá (module).

ÊåöÜëáéï 14 ×ñÞóôåò êáé ÂáóéêÞ Äéá÷åßñéóç Ëïãáñéáóìþí

ÓõíåéóöïñÜ áðü ôïí Neil Blakey-Milner.

14.1 Óýíïøç

Ôï FreeBSD åðéôñÝðåé óå ðïëëáðëïýò ÷ñÞóôåò íá ÷ñçóéìïðïéïýí ôïí õðïëïãéóôÞ ôçí ßäéá óôéãìÞ. Ðñïöáíþò, ìüíï Ýíáò áðü áõôïýò ôïõò ÷ñÞóôåò ìðïñåß íá êÜèåôáé ìðñïóôÜ áðü ôçí ïèüíç êáé ôï ðëçêôñïëüãéï êÜèå äåäïìÝíç óôéãìÞ[1], áëëÜ ïðïéïóäÞðïôå áñéèìüò ÷ñçóôþí ìðïñåß íá åéóÝëèïõí ìÝóù ôïõ äéêôýïõ ãéá íá öÝñïõí óå ðÝñáò ôéò åñãáóßåò ôïõò. Ãéá íá ÷ñçóéìïðïéÞóåé ôï óýóôçìá, êÜèå ÷ñÞóôçò ðñÝðåé íá Ý÷åé Ýíá ëïãáñéáóìü.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôéò äéáöïñÝò áíÜìåóá óôá äéÜöïñá åßäç ëïãáñéáóìþí ÷ñçóôþí óå Ýíá óýóôçìá FreeBSD.
- Ðùò íá ðñïóèÝóåôå ëïãáñéáóìïýò ÷ñçóôþí.
- Ðùò íá äéáãñÜøåôå ëïãáñéáóìïýò ÷ñçóôþí.
- Ðùò íá áëëÜîåôå ôéò ëåðôïìÝñåéåò åíüò ëïãáñéáóìïý, üðùò ôï ðëÞñåò üíïìá ôïõ ÷ñÞóôç, Þ ôï ðñïôéìþìåíï êÝëõöïò (shell).
- Ðùò íá èÝóåôå üñéá áíÜ ëïãáñéáóìü, ãéá íá åëÝã÷åôå ðüñïõò üðùò ç ìíÞìç êáé ï ÷ñüíïò ôçò CPU, ðïõ ìðïñïýí íá Ý÷ïõí óôç äéÜèåóç ôïõò óõãêåêñéìÝíïé ëïãáñéáóìïß Þ ïìÜäåò ëïãáñéáóìþí.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ïìÜäåò ãéá íá êÜíåôå åõêïëüôåñç ôç äéá÷åßñéóç ôùí ëïãáñéáóìþí.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).

14.2 ÅéóáãùãÞ

Ç ðñüóâáóç óôï óýóôçìá åðéôõã÷Üíåôáé ìÝóù ëïãáñéáóìþí, åíþ ïé äéåñãáóßåò åêôåëïýíôáé áðü ÷ñÞóôåò, Ýôóé ç äéá÷åßñéóç ÷ñçóôþí êáé ëïãáñéáóìþí åßíáé ìåãÜëçò óçìáóßáò óôá FreeBSD óõóôÞìáôá.

ÊÜèå ëïãáñéáóìüò óå Ýíá óýóôçìá FreeBSD Ý÷åé óõãêåêñéìÝíåò ðëçñïöïñßåò ðïõ ôïí ó÷åôßæïõí ìå áõôüí þóôå íá áíáãíùñßæåôáé áðü ôï óýóôçìá.

¼íïìá ÷ñÞóôç

Ôï üíïìá ÷ñÞóôç åßíáé áõôü ðïõ èá ãñÜøåé óôçí ðñïôñïðÞ `login:`. Ôá ïíüìáôá ÷ñçóôþí ðñÝðåé íá åßíáé ìïíáäéêÜ ãéá ôïí õðïëïãéóôÞ, äåí ìðïñåßôå íá Ý÷åôå äýï ÷ñÞóôåò ìå ôï ßäéï üíïìá ÷ñÞóôç. ÕðÜñ÷åé Ýíáò áñéèìüò êáíüíùí ãéá ôçí äçìéïõñãßá Ýãêõñùí ïíïìÜôùí ÷ñçóôþí, ðïõ ôåêìçñéþíïíôáé óôï passwd(5). ÓõíÞèùò èá ÷ñçóéìïðïéåßôå ïíüìáôá ÷ñçóôþí ðïõ áðïôåëïýíôáé áðü ïêôþ Þ ëéãüôåñïõò üëïõò ìéêñïýò ÷áñáêôÞñåò.

Êùäéêüò

ÊÜèå ëïãáñéáóìüò Ý÷åé Ýíá êùäéêü ðïõ ó÷åôßæåôáé ìå áõôüí. Ï êùäéêüò ìðïñåß íá åßíáé êåíüò, ïðüôå êáé äåí èá áðáéôåßôáé ãéá ðñüóâáóç óôï óýóôçìá. Áõôü êáôÜ êáíüíá åßíáé ìéá ðïëý êáêÞ éäÝá, êÜèå ëïãáñéáóìüò èá ðñÝðåé íá Ý÷åé Ýíáí êùäéêü.

User ID (UID)

Ôï UID åßíáé Ýíáò áñéèìüò, êáôÜ ðáñÜäïóç áðü ôï 0 Ýùò ôï 65535 [2], ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí ìïíáäéêÞ áíáãíþñéóç ôïõ ÷ñÞóôç óôï óýóôçìá. Åóùôåñéêü, ôï FreeBSD ÷ñçóéìïðïéåß ôï UID ãéá íá áíáãíùñßóåé ÷ñÞóôåò—ïðïéåóäÞðïôå åíôïëÝò ôïõ FreeBSD ðïõ óáò åðéôñÝðïõí íá ïñßóåôå Ýíá üíïìá ÷ñÞóôç èá ôï ìåôáôñÝøïõí óôï UID ðñéí ôï ÷ñçóéìïðïéÞóïõí. Áõôü óçìáßíåé üôé ìðïñåßôå íá Ý÷åôå ðïëëïýò ëïãáñéáóìïýò ìå äéáöïñåôéêÜ ïíüìáôá ÷ñÞóôç áëëÜ ôï ßäéï UID. ¼óï áöïñÜ ôï FreeBSD, áõôïß ïé ëïãáñéáóìïß åßíáé Ýíáò ÷ñÞóôçò. Åßíáé áðßèáíï íá ÷ñåéáóôåß ðïôÝ íá êÜíåôå êÜôé ôÝôïéï.

Group ID (GID)

Ôï GID åßíáé Ýíáò áñéèìüò, êáôÜ ðáñÜäïóç áðü ôï 0 Ýùò ôï 65535 [2], ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí ìïíáäéêÞ áíáãíþñéóç ôçò ðñùôåýïõóáò ïìÜäáò ðïõ áíÞêåé ï ÷ñÞóôçò. Ïé ïìÜäåò åßíáé Ýíáò ìç÷áíéóìüò ãéá ôïí Ýëåã÷ï ôçò ðñüóâáóçò óå ðüñïõò ðïõ óôçñßæåôáé óôï GID åíüò ÷ñÞóôç, ðáñÜ óôï UID. Áõôü ìðïñåß íá ìåéþóåé óçìáíôéêÜ ôï ìÝãåèïò êÜðïéùí áñ÷åßùí äéáìüñöùóçò. ¸íáò ÷ñÞóôçò ìðïñåß åðßóçò íá áíÞêåé óå ðåñéóóüôåñåò ôçò ìßáò ïìÜäåò.

ÊëÜóåéò óýíäåóçò

Ïé êëÜóåéò óýíäåóçò (login classes) åßíáé ìéá åðÝêôáóç óôïí ìç÷áíéóìü ôùí ïìÜäùí ðïõ ðáñÝ÷ïõí ðñüóèåôç åõåëéîßá üôáí ðñïóáñìüæïõìå ôï óýóôçìá óå äéáöïñåôéêïýò ÷ñÞóôåò.

×ñüíïò áëëáãÞò êùäéêïý

Åî’ ïñéóìïý ôï FreeBSD äåí åðéâÜëëåé óôïõò ÷ñÞóôåò íá áëëÜæïõí ðåñéïäéêÜ ôïí êùäéêü ôïõò. Ìðïñåßôå íá ôï åðéâÜëëåôå áõôü óå ìéá áíÜ ÷ñÞóôç âÜóç, áíáãêÜæïíôáò êÜðïéïõò Þ üëïõò ôïõò ÷ñÞóôåò íá áëëÜæïõí ôïí êùäéêü ôïõò áöïý Ý÷åé ðåñÜóåé Ýíá óõãêåêñéìÝíï ÷ñïíéêü äéÜóôçìá.

×ñüíïò ëÞîçò ëïãáñéáóìþí

Åî’ ïñéóìïý óôï FreeBSD äåí ëÞãïõí ëïãáñéáóìïß. Áí äçìéïõñãåßôå ëïãáñéáóìïýò ðïõ ãíùñßæåôå üôé Ý÷ïõí ðåñéïñéóìÝíç äéÜñêåéá æùÞò, ãéá ðáñÜäåéãìá, óå Ýíá ó÷ïëåßï üðïõ Ý÷åôå ëïãáñéáóìïýò ãéá ôïõò ìáèçôÝò, ôüôå ìðïñåßôå íá ïñßóåôå ðüôå ëÞãåé ï ëïãáñéáóìüò. Áöïý ï ÷ñüíïò ëÞîçò Ý÷åé ðåñÜóåé, ï ëïãáñéáóìüò äåí ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí óýíäåóç óôï óýóôçìá, áí êáé ïé öÜêåëïé ôïõ ëïãáñéáóìïý êáé ôá áñ÷åßá èá ðáñáìåßíïõí.

Ðñáãìáôéêü üíïìá ÷ñÞóôç

Ôï üíïìá ÷ñÞóôç áíáãíùñßæåé ìïíáäéêÜ ôïí ëïãáñéáóìü óôï FreeBSD, áëëÜ äåí áíôéêáôïðôñßæåé áðáñáßôçôá ôï ðñáãìáôéêü üíïìá ôïõ ÷ñÞóôç. ÁõôÞ ç ðëçñïöïñßá ìðïñåß íá óõó÷åôéóôåß ìå ôïí ëïãáñéáóìü.

Ðñïóùðéêüò êáôÜëïãïò

Ï ðñïóùðéêüò êáôÜëïãïò äåß÷íåé ôçí ðëÞñç äéáäñïìÞ ðñïò Ýíá êáôÜëïãï ôïõ óõóôÞìáôïò. Áõôüò åßíáé êáé ï áñ÷éêüò êáôÜëïãïò ôïõ ÷ñÞóôç, êÜèå öïñÜ ðïõ óõíäÝåôáé óôï óýóôçìá. Ìéá êïéíÞ óýìâáóç åßíáé íá ìðáßíïõí ïé ðñïóùðéêïß êáôÜëïãïé ÷ñçóôþí óôï `/home/username` Þ óôï `/usr/home/username`. Ï ÷ñÞóôçò èá áðïèçêåýåé ôá ðñïóùðéêÜ ôïõ áñ÷åßá êáé ôïõò êáôáëüãïõò ðïõ äçìéïõñãåß, ìÝóá óôïí ðñïóùðéêü ôïõ êáôÜëïãï.

ÊÝëõöïò ÷ñÞóôç

> Ôï êÝëõöïò ðáñÝ÷åé ôï åî’ ïñéóìïý ðåñéâÜëëïí ðïõ ïé ÷ñÞóôåò ÷ñçóéìïðïéïýí ãéá íá áëëçëåðéäñïýí ìå ôï óýóôçìá. ÕðÜñ÷ïõí ðïëëÜ äéáöïñåôéêÜ åßäç êåëõöþí, êáé ïé Ýìðåéñïé ÷ñÞóôåò èá Ý÷ïõí ôéò äéêÝò ôïõò ðñïôéìÞóåéò, ïé ïðïßåò ìðïñåß íá áíôéêáôïðôñßæïíôáé óôéò ñõèìßóåéò ôùí ëïãáñéáóìþí ôïõò.

ÕðÜñ÷ïõí ôñåéò êýñéïé ôýðïé ëïãáñéáóìþí: ï õðåñ÷ñÞóôçò (superuser), ïé ÷ñÞóôåò óõóôÞìáôïò, êáé ïé ëïãáñéáóìïß ÷ñçóôþí. Ï ëïãáñéáóìüò õðåñ÷ñÞóôç, óõíÞèùò ïíïìÜæåôáé `root`, ÷ñçóéìïðïéåßôáé ãéá ôç äéá÷åßñéóç ôïõ óõóôÞìáôïò ÷ùñßò ðåñéïñéóìïýò óôá ðñïíüìéá. Ïé ÷ñÞóôåò óõóôÞìáôïò ôñÝ÷ïõí õðçñåóßåò. ÔÝëïò, ïé ëïãáñéáóìïß ÷ñçóôþí ÷ñçóéìïðïéïýíôáé áðü ðñáãìáôéêïýò áíèñþðïõò, ðïõ óõíäÝïíôáé, äéáâÜæïõí mail, êáé ïýôù êáèåîÞò.

14.3 Ï Ëïãáñéáóìüò Õðåñ÷ñÞóôç

Ï ëïãáñéáóìüò õðåñ÷ñÞóôç, óõíÞèùò êáëåßôáé `root`, åßíáé ðñïñõèìéóìÝíïò ãéá íá äéåõêïëýíåôáé ç äéá÷åßñéóç ôïõ óõóôÞìáôïò, êáé äåí èá ðñÝðåé íá ÷ñçóéìïðïéåßôáé ãéá êáèçìåñéíÝò åñãáóßåò üðùò áðïóôïëÞ êáé ëÞøç mail, ãåíéêÞ åîåñåýíçóç ôïõ óõóôÞìáôïò, Þ ðñïãñáìáôéóìü.

Áõôü äéüôé ï õðåñ÷ñÞóôçò, óå áíôßèåóç ìå ôïõò êáíïíéêïýò ëïãáñéáóìïýò ÷ñçóôþí, ìðïñåß íá ëåéôïõñãåß ÷ùñßò üñéá, êáé êáêïìåôá÷åßñéóç ôïõ ëïãáñéáóìïý áõôïý ìðïñåß íá Ý÷åé ùò óõíÝðåéá èåáìáôéêÝò êáôáóôñïöÝò. Ïé ëïãáñéáóìïß ÷ñçóôþí äåí ìðïñïýí íá êáôáóôñÝøïõí ôï óýóôçìá áðü ëÜèïò, Ýôóé åßíáé ãåíéêÜ êáëýôåñá íá ÷ñçóéìïðïéåßôå êáíïíéêïýò ëïãáñéáóìïýò ÷ñçóôþí üðïôå åßíáé äõíáôüí, åêôüò åÜí åéäéêüôåñá ÷ñåéÜæåóôå ôá åðéðëÝïí ðñïíüìéá.

Èá ðñÝðåé ðÜíôá íá åëÝã÷åôå äýï êáé ôñåéò öïñÝò ôéò åíôïëÝò ðïõ äßíåôå óáí õðåñ÷ñÞóôçò, áöïý Ýíá åðéðëÝïí êåíü Þ Ýíáò ÷áñáêôÞñáò ðïõ ëåßðåé, ìðïñåß íá óçìáßíåé áíåðáíüñèùôç áðþëåéá äåäïìÝíùí.

¸ôóé, ôï ðñþôï ðñÜãìá ðïõ èá ðñÝðåé íá êÜíåôå áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, åßíáé íá äçìéïõñãÞóåôå Ýíáí ëïãáñéáóìü ÷ñÞóôç, ÷ùñßò ðñïíüìéá, ãéá ôïí åáõôü óáò ãéá ãåíéêÞ ÷ñÞóç áí äåí ôï Ý÷åôå êÜíåé Þäç. Áõôü éó÷ýåé åßôå ôñÝ÷åôå Ýíá ðïëõ-÷ñçóôéêü Þ ìïíï-÷ñçóôéêü ìç÷Üíçìá. Áñãüôåñá óå áõôü ôï êåöÜëáéï, èá óõæçôÞóïõìå ðùò íá äçìéïõñãåßôå ðñüóèåôïõò ëïãáñéáóìïýò, êáé ðùò íá áëëÜæåôå ìåôáîý ôïõ êáíïíéêïý ÷ñÞóôç êáé ôïõ õðåñ÷ñÞóôç.

14.4 Ëïãáñéáóìïß ÓõóôÞìáôïò

Ïé ÷ñÞóôåò óõóôÞìáôïò åßíáé áõôïß ðïõ ÷ñçóéìïðïéïýíôáé ãéá íá ôñÝ÷ïõí õðçñåóßåò üðùò ôï DNS, mail, web servers, êáé ïýôù êáèåîÞò. Ï ëüãïò ãéá áõôü åßíáé ç áóöÜëåéá: áí üëåò ïé õðçñåóßåò Ýôñå÷áí ìå äéêáéþìáôá õðåñ÷ñÞóôç, èá ëåéôïõñãïýóáí ÷ùñßò ðåñéïñéóìïýò.

Ðáñáäåßãìáôá áðü ÷ñÞóôåò óõóôÞìáôïò åßíáé ïé `daemon`, `operator`, `bind` (ãéá ôï Domain Name Service), `news`, êáé `www`.

Ï `nobody` åßíáé ï ãåíéêüò, ÷ùñßò ðñïíüìéá, ÷ñÞóôçò óõóôÞìáôïò. Ùóôüóï, åßíáé óçìáíôéêü íá Ý÷åôå êáôÜ íïõ üôé üóï ðåñéóóüôåñåò õðçñåóßåò ÷ñçóéìïðïéïýí ôïí `nobody`, ôüóï ðåñéóóüôåñá áñ÷åßá êáé äéåñãáóßåò èá ó÷åôßæïíôáé ìå áõôüí, êáé Ýôóé ôüóï ðåñéóóüôåñï ðñïíïìéïý÷ïò ãßíåôáé áõôüò ï ÷ñÞóôçò.

14.5 Ëïãáñéáóìïß ×ñçóôþí

Ïé ëïãáñéáóìïß ÷ñçóôþí åßíáé ôï ðñùôáñ÷éêü ìÝóï ðñüóâáóçò ãéá ðñáãìáôéêïýò áíèñþðïõò óôï óýóôçìá, êáé ìÝóù áõôþí áðïìïíþíåôáé ï êÜèå ÷ñÞóôçò êáé ôï ðåñéâÜëëïí åñãáóßáò ôïõ, áðïôñÝðïíôáò Ýôóé ðéèáíÞ êáôáóôñïöÞ ôïõ óõóôÞìáôïò Þ Üëëùí ÷ñçóôþí, êáé åðéôñÝðïíôáò óå êÜèå Ýíá íá ðñïóáñìüæåé ôï äéêü ôïõ ðåñéâÜëëïí ÷ùñßò íá åðçñåÜæåé ôïõò Üëëïõò.

ÊÜèå Üôïìï ðïõ Ý÷åé ðñüóâáóç óôï óýóôçìÜ óáò èá ðñÝðåé íá Ý÷åé Ýíá ìïíáäéêü ëïãáñéáóìü ÷ñÞóôç. Áõôü óáò åðéôñÝðåé íá âñåßôå ðïéïò êÜíåé ôé, áðïôñÝðåé áíèñþðïõò áðü ôï íá ðåéñÜæïõí ôéò ñõèìßóåéò ï Ýíáò ôïõ Üëëïõ, Þ íá äéáâÜóïõí ï Ýíáò ôá mail ôïõ Üëëïõ, êáé ïýôù êáèåîÞò.

ÊÜèå ÷ñÞóôçò ìðïñåß íá óôÞóåé ôï äéêü ôïõ ðåñéâÜëëïí þóôå íá ðñïóáñìüóåé ôçí ÷ñÞóç ôïõ óõóôÞìáôïò, ÷ñçóéìïðïéþíôáò åíáëëáêôéêÜ êåëýöç, óõíôÜêôåò, óõíäõáóìïýò ðëÞêôñùí êáé ãëþóóáò.

14.6 Ôñïðïðïéþíôáò Ëïãáñéáóìïýò

ÕðÜñ÷åé ìéá ðïéêéëßá áðü äéáöïñåôéêÝò åíôïëÝò äéáèÝóéìåò óôï ðåñéâÜëëïí UNIX ãéá íá ÷åéñéóôåßôå ëïãáñéáóìïýò ÷ñçóôþí. Ïé ðéï êïéíÝò åíôïëÝò óõíïøßæïíôáé ðáñáêÜôù, áêïëïõèïýìåíåò áðü ëåðôïìåñÞ ðáñáäåßãìáôá ôçò ÷ñÞóçò ôïõò.

ÅíôïëÞ	ÐåñéãñáöÞ
adduser(8)	Ç ðñïôåéíüìåíç åöáñìïãÞ ãñáììÞò åíôïëþí ãéá ôçí ðñïóèÞêç íÝùí ÷ñçóôþí.
rmuser(8)	Ç ðñïôåéíüìåíç åöáñìïãÞ ãñáììÞò åíôïëþí ãéá ôçí äéáãñáöÞ ÷ñçóôþí.
chpass(1)	¸íá åõÝëéêôï åñãáëåßï ãéá ôçí áëëáãÞ ðëçñïöïñéþí ôçò âÜóçò äåäïìÝíùí ôùí ÷ñçóôþí.
passwd(1)	Ôï áðëü åñãáëåßï ãñáììÞò åíôïëþí ãéá ôçí áëëáãÞ ôùí êùäéêþí ôùí ÷ñçóôþí.
pw(8)	¸íá äõíáôü êáé åõÝëéêôï åñãáëåßï ãéá ôçí áëëáãÞ üëùí ôùí ñõèìßóåùí ôùí ëïãáñéáóìþí ôùí ÷ñçóôþí.

14.6.1 adduser

Ôï adduser(8) åßíáé Ýíá áðëü ðñüãñáììá ãéá íá ðñïóèÝôåôå íÝïõò ÷ñÞóôåò. Äçìéïõñãåß åããñáöÝò óôá áñ÷åßá óõóôÞìáôïò `passwd` êáé `group`. Äçìéïõñãåß åðßóçò Ýíáí ðñïóùðéêü êáôÜëïãï ãéá ôïí íÝï ÷ñÞóôç, áíôéãñÜöåé åêåß ôá åî’ ïñéóìïý áñ÷åßá ñõèìßóåùí (“dotfiles”) áðü ôï `/usr/share/skel`, êáé ìðïñåß ðñïáéñåôéêÜ íá óôåßëåé Ýíá ìÞíõìá êáëùóïñßóìáôïò óôïí íÝï ÷ñÞóôç.

ÐáñÜäåéãìá 14-1. ÐñïóèÝôïíôáò Ýíáí ÷ñÞóôç óôï FreeBSD

```
# adduser
Username: jru
Full name: J. Random User
Uid (Leave empty for default):
Login group [jru]:
Login group is jru. Invite jru into other groups? []: wheel
Login class [default]:
Shell (sh csh tcsh zsh nologin) [sh]: zsh
Home directory [/home/jru]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
```

```
Enter password again:
Lock out the account after creation? [no]:
Username   : jru
Password   : ****
Full Name  : J. Random User
Uid        : 1001
Class      :
Groups     : jru wheel
Home       : /home/jru
Shell      : /usr/local/bin/zsh
Locked     : no
OK? (yes/no): yes
adduser: INFO: Successfully added (jru) to the user database.
Add another user? (yes/no): no
Goodbye!
#
```

> **Óçìåßùóç:** Ï êùäéêüò ðïõ ðëçêôñïëïãåßôå äåí öáßíåôáé, ïýôå åìöáíßæïíôáé áóôåñßóêïé. Óéãïõñåõôåßôå üôé äåí ãñÜøáôå ëÜèïò ôïí êùäéêü.

14.6.2 `rmuser`

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï rmuser(8) ãéá íá äéáãñÜøåôå åíôåëþò Ýíáí ÷ñÞóôç áðü ôï óýóôçìá. Ç rmuser(8) åêôåëåß ôá ðáñáêÜôù âÞìáôá:

1. ÄéáãñÜöåé ôçí åããñáöÞ crontab(1) ôïõ ÷ñÞóôç (áí õðÜñ÷åé).
2. ÄéáãñÜöåé üðïéá åñãáóßá at(1) áíÞêåé óôïí ÷ñÞóôç.
3. Ôåñìáôßæåé üëåò ôéò äéåñãáóßåò ðïõ áíÞêïõí óôïí ÷ñÞóôç.
4. ÄéáãñÜöåé ôïí ÷ñÞóôç áðü ôï ôïðéêü áñ÷åßï êùäéêþí ôïõ óõóôÞìáôïò.
5. ÄéáãñÜöåé ôïí ðñïóùðéêü êáôÜëïãï ôïõ ÷ñÞóôç (áí áíÞêåé óôïí ÷ñÞóôç).
6. ÄéáãñÜöåé ôá åéóåñ÷üìåíá áñ÷åßá mail ðïõ áíÞêïõí óôïí ÷ñÞóôç áðü ôï `/var/mail`.
7. ÄéáãñÜöåé üëá ôá áñ÷åßá ðïõ áíÞêïõí óôïí ÷ñÞóôç áðü ôéò ðñïóùñéíÝò ðåñéï÷Ýò áðïèÞêåõóçò üðùò ôï `/tmp`.
8. ÔÝëïò, äéáãñÜöåé ôï üíïìá ÷ñÞóôç áðü üëåò ôéò ïìÜäåò óôéò ïðïßåò áíÞêåé óôï `/etc/group`.

> **Óçìåßùóç:** Áí êáôÜ ôç äéáãñáöÞ ôïõ ÷ñÞóôç, õðÜñ÷åé ïìÜäá ìå ôï üíïìá ôïõ ç ïðïßá äåí ðåñéÝ÷åé Üëëá ìÝëç, ç ïìÜäá áõôÞ äéáãñÜöåôáé. Ç óõìðåñéöïñÜ áõôÞ åßíáé óõìðëçñùìáôéêÞ ìå ôçí áíôßóôïé÷ç ôçò adduser(8), ðïõ äçìéïõñãåß ïìÜäá ìå ôï üíïìá ôïõ ÷ñÞóôç êáôÜ ôç äçìéïõñãßá ôïõ ëïãáñéáóìïý.

Ôï rmuser(8) äåí ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí äéáãñáöÞ ôùí ëïãáñéáóìþí õðåñ÷ñÞóôç, áöïý áõôü åßíáé ó÷åäüí ðÜíôá ìéá Ýíäåéîç ìáæéêÞò êáôáóôñïöÞò.

Åî' ïñéóìïý, ÷ñçóéìïðïéåßôáé ìéá äéáäñáóôéêÞ ëåéôïõñãßá, ðïõ ðñïóðáèåß íá åðéâåâáéþóåé üôé óßãïõñá ãíùñßæåôå ôé ðñüêåéôáé íá êÜíåôå.

ĐáñÜäåéãìá 14-2. `rmuser` ÄéáäñáóôéêÞ ÄéáãñáöÞ Ëïãáñéáóìïý

```
# rmuser jru
Matching password entry:
jru:*:1001:1001::0:0:J. Random User:/home/jru:/usr/local/bin/zsh
Is this the entry you wish to remove? y
Remove user’s home directory (/home/jru)? y
Updating password file, updating databases, done.
Updating group file: trusted (removing group jru -- personal group is empty) done.
Removing user’s incoming mail file /var/mail/jru: done.
Removing files belonging to jru from /tmp: done.
Removing files belonging to jru from /var/tmp: done.
Removing files belonging to jru from /var/tmp/vi.recover: done.
#
```

14.6.3 chpass

Ôï chpass(1) áëëÜæåé ðëçñïöïñßåò ôçò âÜóçò äåäïìÝíùí ôïõ ÷ñÞóôç üðùò êùäéêïýò, êåëýöç, êáé ðñïóùðéêÝò ðëçñïöïñßåò.

Ìüíï äéá÷åéñéóôÝò ôïõ óõóôÞìáôïò, üðùò ï õðåñ÷ñÞóôçò, ìðïñåß íá áëëÜæåé ôéò ðëçñïöïñßåò Üëëùí ÷ñçóôþí êáèþò êáé ôïõò êùäéêïýò ìå ôï chpass(1).

¼ôáí äåí äßíïíôáé åðéëïãÝò, åêôüò áðü Ýíá ðñïáéñåôéêü üíïìá ÷ñÞóôç, ôï chpass(1) åìöáíßæåé Ýíáí óõíôÜêôç ðïõ ðåñéÝ÷åé ôéò ðëçñïöïñßåò ôïõ ÷ñÞóôç. ¼ôáí ï ÷ñÞóôçò âãåé áðü ôïí óõíôÜêôç, ç âÜóç äåäïìÝíùí ÷ñçóôþí åíçìåñþíåôáé ìå ôéò íÝåò ðëçñïöïñßåò.

> **Óçìåßùóç:** ÊáôÜ ôçí Ýîïäï áðü ôïí óõíôÜêôç, áí äåí åßóôå ï õðåñ÷ñÞóôçò, èá åñùôçèåßôå ãéá ôïí êùäéêü óáò.

ĐáñÜäåéãìá 14-3. ÄéáäñáóôéêÞ `chpass` áðü ôïí Õðåñ÷ñÞóôç

```
#Changing user database information for jru.
Login: jru
Password: *
Uid [#]: 1001
Gid [# or name]: 1001
Change [month day year]:
Expire [month day year]:
Class:
Home directory: /home/jru
Shell: /usr/local/bin/zsh
Full Name: J. Random User
Office Location:
Office Phone:
Home Phone:
Other information:
```

Ï êáíïíéêüò ÷ñÞóôçò ìðïñåß íá áëëÜîåé ìüíï Ýíá ìéêñü õðïóýíïëï áðü áõôÝò ôéò ðëçñïöïñßåò, êáé ìüíï ãéá ôïí åáõôü ôïõ.

ÐáñÜäåéãìá 14-4. ÄéáäñáóôéêÞ chpass áðü Êáíïíéêü ×ñÞóôç

```
#Changing user database information for jru.
Shell: /usr/local/bin/zsh
Full Name: J. Random User
Office Location:
Office Phone:
Home Phone:
Other information:
```

> **Óçìåßùóç:** Ïé chfn(1) êáé chsh(1) åßíáé áðëÜ óýíäåóìïé óôçí chpass(1), üðùò åßíáé êáé ïé ypchpass(1), ypchfn(1), êáé ypchsh(1). Ç õðïóôÞñéîç NIS åßíáé áõôüìáôç, Ýôóé äåí åßíáé áðáñáßôçôï íá êáèïñßóåôå ôï yp ðñéí ôçí åíôïëÞ. Áí áõôü óáò ìðåñäåýåé, ìçí áíçóõ÷åßôå, ôï NIS èá êáëõöèåß óôï ÊåöÜëáéï 30.

14.6.4 `passwd`

Ôï passwd(1) åßíáé ï óõíÞèçò ôñüðïò íá áëëÜîåôå ôï äéêü óáò êùäéêü óáí ÷ñÞóôçò, Þ ôïí êùäéêü Üëëïõ ÷ñÞóôç óáí õðåñ÷ñÞóôçò.

> **Óçìåßùóç:** Ãéá íá áðïôñáðïýí ôõ÷áßåò Þ ìç åîïõóéïäïôçìÝíåò áëëáãÝò, èá óáò æçôçèåß ï ðáëéüò êùäéêüò ðñéí ïñßóåôå íÝï.

ÐáñÜäåéãìá 14-5. ÁëëÜæïíôáò ôïí Êùäéêü óáò

```
% passwd
Changing local password for jru.
Old password:
New password:
Retype new password:
passwd: updating the database...
passwd: done
```

ÐáñÜäåéãìá 14-6. ÁëëÜæïíôáò ôïí Êùäéêü Üëëïõ ×ñÞóôç ùò Õðåñ÷ñÞóôçò

```
# passwd jru
Changing local password for jru.
New password:
Retype new password:
passwd: updating the database...
passwd: done
```

> **Óçìåßùóç:** ¼óï ãéá ôéò chpass(1), yppasswd(1) åßíáé áðëÜ óýíäåóìïé óôçí passwd(1), Ýôóé ôï NIS ëåéôïõñãåß ìå ïðïéáäÞðïôå åíôïëÞ.

14.6.5 `pw`

Ç pw(8) åßíáé ìéá ëåéôïõñãßá ôçò ãñáììÞò åíôïëþí ãéá äçìéïõñãßá, äéáãñáöÞ, áëëáãÞ, êáé åìöÜíéóç ÷ñçóôþí êáé ïìÜäùí. Ëåéôïõñãåß ùò front end ãéá ôá áñ÷åßá ÷ñçóôþí êáé ïìÜäùí ôïõ óõóôÞìáôïò. Ç pw(8) Ý÷åé Ýíá ðïëý äõíáôü óýíïëï åðéëïãþí ãñáììÞò åíôïëþí ðïõ ôçí êáèéóôïýí êáôÜëëçëç ãéá ÷ñÞóç óå äÝóìåò åíôïëþí (scripts) êåëõöþí, áëëÜ ôïõò íÝïõò ÷ñÞóôåò ßóùò öáíåß ðåñéóóüôåñï ðåñßðëïêç áðü üôé ïé Üëëåò åíôïëÝò ðïõ ðáñïõóéÜæïíôáé åäþ.

14.7 Ðåñéïñßæïíôáò ×ñÞóôåò

Áí Ý÷åôå ÷ñÞóôåò, ßóùò Ý÷åôå óêåöôåß íá ðåñéïñßóåôå ôçí äõíáôüôçôá ÷ñÞóçò ôïõ óõóôÞìáôïò áðü áõôïýò. Ôï FreeBSD ðáñÝ÷åé óôï äéá÷åéñéóôÞ áñêåôïýò ôñüðïõò ãéá íá ðåñéïñßóåé ôïõò ðüñïõò ôïõ óõóôÞìáôïò ðïõ ìðïñåß íá ÷ñçóéìïðïéÞóåé Ýíá Üôïìï. ÁõôÜ ôá üñéá ÷ùñßæïíôáé óå äýï ôìÞìáôá: ìåñßäéá äßóêïõ (disk quotas), êáé Üëëá üñéá ðüñùí.

Ôá ìåñßäéá äßóêïõ ðåñéïñßæïõí ôçí ÷ñÞóç ôùí äßóêùí óôïõò ÷ñÞóôåò, êáé ðáñÝ÷ïõí Ýíáí ôñüðï ãñÞãïñïõ åëÝã÷ïõ áõôÞò ôçò ÷ñÞóçò ÷ùñßò íá õðïëïãßæïíôáé áðü ôçí áñ÷Þ êÜèå öïñÜ. Ôá ìåñßäéá óõæçôïýíôáé óôï ÔìÞìá 19.15.

Ôá Üëëá üñéá ðüñùí ðåñéëáìâÜíïõí ôñüðïõò ãéá ðåñéïñéóìü ÷ñÞóçò ôçò CPU, ôçò ìíÞìçò, êáé Üëëùí ðüñùí ðïõ ìðïñåß íá êáôáíáëþóåé Ýíá ÷ñÞóôçò. Ôá üñéá áõôÜ êáèïñßæïíôáé ÷ñçóéìïðïéþíôáò êëÜóåéò óýíäåóçò êáé óõæçôïýíôáé åäþ.

Ïé êëÜóåéò óýíäåóçò êáèïñßæïíôáé óôï `/etc/login.conf`. Ïé áêñéâåßò Ýííïéåò åßíáé ðÝñá áðü ôïí óêïðü áõôïý ôïõ ôìÞìáôïò, áëëÜ ðåñéãñÜöïíôáé ìå ëåðôïìÝñåéá óôçí óåëßäá login.conf(5) ôïõ manual. Åßíáé áñêåôü íá ðïýìå üôé êÜèå ÷ñÞóôçò áíÞêåé óå ìßá êëÜóç óýíäåóçò (ôçí `default` åî’ ïñéóìïý), êáé üôé êÜèå êëÜóç óýíäåóçò Ý÷åé Ýíá óýíïëï áðü äõíáôüôçôåò óýíäåóçò ðïõ ó÷åôßæïíôáé ìå áõôÞí. Ìéá äõíáôüôçôá óýíäåóçò êáèïñßæåôáé áðü Ýíá æåýãïò *`name`*=*`value`*, üðïõ *`name`* åßíáé Ýíá ãíùóôü áíáãíùñéóôéêü êáé *`value`* åßíáé ìéá åðéëåãìÝíç ôéìÞ ðïõ èá ÷ñçóéìïðïéçèåß óýìöùíá ìå ôï üíïìá. To óôÞóéìï êëÜóåùí óýíäåóçò êáé äõíáôïôÞôùí åßíáé ìéá ìÜëëïí áðëÞ äéáäéêáóßá êáé ðåñéãñÜöåôáé åðßóçò óôï login.conf(5).

> **Óçìåßùóç:** Ôï óýóôçìá óõíÞèùò äåí äéáâÜæåé áðåõèåßáò ôï áñ÷åßï ñõèìßóåùí óôï `/etc/login.conf`, áëëÜ ôï áñ÷åßï âÜóçò äåäïìÝíùí `/etc/login.conf.db` ôï ïðïßï ðáñÝ÷åé ãñçãïñüôåñåò áíáæçôÞóåéò. Ãéá íá äçìéïõñãÞóïõìå ôï `/etc/login.conf.db` áðü ôï `/etc/login.conf`, åêôåëïýìå ôçí ðáñáêÜôù åíôïëÞ:
>
> ```
> # cap_mkdb /etc/login.conf
> ```

Ôá üñéá ðüñùí åßíáé äéáöïñåôéêÜ áðü ôéò áðëÝò äõíáôüôçôåò óýíäåóçò ãéá äýï ëüãïõò. Ðñþôá, ãéá êÜèå üñéï, õðÜñ÷åé Ýíá ìåôáâëçôü (ôñÝ÷ïí) êáé Ýíá ìüíéìï üñéï. ¸íá ìåôáâëçôü üñéï ìðïñåß íá áëëÜîåé áðü ôïí ÷ñÞóôç Þ ôçí åöáñìïãÞ, áëëÜ äåí ìðïñåß íá åßíáé õøçëüôåñï áðü ôï ìüíéìï üñéï. Ôï ôåëåõôáßï ìðïñåß íá åëáôôùèåß áðü ôïí ÷ñÞóôç, áëëÜ ðïôÝ íá áõîçèåß. Äåýôåñïí, ôá ðåñéóóüôåñá üñéá ðüñùí åöáñìüæïíôáé áíÜ äéåñãáóßá óå Ýíá óõãêåêñéìÝíï ÷ñÞóôç, ü÷é óôïí ÷ñÞóôç óõíïëéêÜ. Óçìåéþóôå, üìùò, üôé áõôÝò ïé äéáöïñÝò åßíáé õðï÷ñåùôéêÝò áðü ôïí óõãêåêñéìÝíï ÷åéñéóìü ôùí ïñßùí, ü÷é áðü ôçí õëïðïßçóç ôïõ ðëáéóßïõ ôùí äõíáôïôÞôùí óýíäåóçò (äçëáäÞ, äåí åßíáé *üíôùò* ìéá åéäéêÞ ðåñßðôùóç ôùí äõíáôïôÞôùí óýíäåóçò).

Êáé Ýôóé, ÷ùñßò ðñüóèåôç öáóáñßá, ðáñáêÜôù åßíáé ôá ðéï óõ÷íÜ ÷ñçóéìïðïéïýìåíá üñéá ðüñùí (ôá õðüëïéðá, ìáæß ìå üëåò ôéò Üëëåò äõíáôüôçôåò óýíäåóçò, ìðïñåßôå íá ôá âñåßôå óôï login.conf(5)).

`coredumpsize`

Ôï üñéï óôï ìÝãåèïò åíüò áñ÷åßïõ core ðïõ äçìéïõñãåßôáé áðü Ýíá ðñüãñáììá, åßíáé ãéá ðñïöáíåßò ëüãïõò, åîáñôþìåíï áðü Üëëá üñéá ôçò ÷ñÞóçò ôïõ äßóêïõ (ð.÷., `filesize`, Þ ìåñßäéá äßóêïõ). Ðáñ' üëá áõôÜ, ÷ñçóéìïðïéåßôáé óõ÷íÜ óáí ìßá ëéãüôåñï áõóôçñÞ ìÝèïäï åëÝã÷ïõ ôçò êáôáíÜëùóçò ÷þñïõ ôïõ äßóêïõ: áöïý ïé ÷ñÞóôåò äåí äçìéïõñãïýí áñ÷åßá core áðü ìüíïé ôïõò, êáé óõ÷íÜ äåí ôá äéáãñÜöïõí, ïñßæïíôáò ôï coredumpsize ìðïñåß íá ôïõò ãëõôþóåé áðü ðñüùñï ôÝëïò áðïèçêåõôéêïý ÷þñïõ, áí ãéá ðáñÜäåéãìá êáôáññåýóåé Ýíá ìåãÜëï ðñüãñáììá (üðùò ð.÷. ôï **emacs**).

`cputime`

Áõôü åßíáé ôï ìÝãéóôï ðïóü ÷ñüíïõ ôçò CPU ðïõ ìðïñåß íá êáôáíáëþóåé Ýíáò ÷ñÞóôçò Þ ìéá äéåñãáóßá. Äéåñãáóßåò ðïõ õðåñâáßíïõí áõôü ôï üñéï èá ôåñìáôéóôïýí áðü ôïí ðõñÞíá.

> **Óçìåßùóç:** Áõôü åßíáé Ýíá üñéï óôïí *÷ñüíï* ôçò CPU ðïõ êáôáíáëþíåôáé, ü÷é óôï ðïóïóôü ôçò CPU üðùò åìöáíßæåôáé óå êÜðïéá ðåäßá áðü ôéò top(1) êáé ps(1). ¼ñéï óôï ðïóïóôü, ìÝ÷ñé ôç óôéãìÞ ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò, äåí åßíáé äõíáôü, êáé ìÜëëïí èá åßíáé Ü÷ñçóôï: Ýíáò ìåôáãëùôôéóôÞò—ðéèáíüôáôá ìéá Ýãêõñç åñãáóßá— ìðïñåß åýêïëá íá ÷ñçóéìïðïéÞóåé ó÷åäüí ôï 100% ìéáò CPU ãéá êÜðïéï ÷ñüíï.

`filesize`

Áõôü åßíáé ôï ìÝãéóôï ìÝãåèïò åíüò áñ÷åßïõ ðïõ ìðïñåß íá êáôÝ÷åé Ýíáò ÷ñÞóôçò. Óå áíôßèåóç ìå ôá ìåñßäéá äßóêïõ, áõôü ôï üñéï åðéâÜëëåôáé óå êÜèå áñ÷åßï ÷ùñéóôÜ, ü÷é óôï óýíïëï üëùí ôùí áñ÷åßùí ðïõ êáôÝ÷åé Ýíáò ÷ñÞóôçò.

`maxproc`

Áõôü åßíáé ï ìÝãéóôïò áñéèìüò äéåñãáóéþí ðïõ ìðïñåß íá åêôåëåß Ýíáò ÷ñÞóôçò. ÐåñéëáìâÜíåé ìå ôïí ßäéï ôñüðï äéåñãáóßåò ôüóï ðáñáóêçíßïõ üóï êáé ðñïóêçíßïõ. Ãéá ðñïöáíåßò ëüãïõò, äåí ìðïñåß íá åßíáé ìåãáëýôåñïò áðü ôï üñéï ôïõ óõóôÞìáôïò ðïõ ïñßæåôáé áðü ôï `kern.maxproc` sysctl(8). Åðßóçò óçìåéþóôå üôé èÝôïíôáò ðïëý ìéêñÞ ôéìÞ, ìðïñåß íá ðáñåìðïäßóåôå ôçí ðáñáãùãéêüôçôá åíüò ÷ñÞóôç: åßíáé óõ÷íÜ ÷ñÞóéìï íá óõíäÝåôáé êÜðïéïò ðïëëáðëÝò öïñÝò Þ íá åêôåëåß äéï÷åôåýóåéò (pipelines). ÊÜðïéåò åñãáóßåò, üðùò ç ìåôáãëþôôéóç åíüò ìåãÜëïõ ðñïãñÜììáôïò, äçìéïõñãïýí åðßóçò ðïëëÝò äéåñãáóßåò (ð.÷. make(1), cc(1), êáé Üëëïé åíäéÜìåóïé ðñïåðåîåñãáóôÝò).

`memorylocked`

Áõôü åßíáé ôï ìÝãéóôï ðïóü ìíÞìçò ðïõ ìðïñåß íá æçôÞóåé ìéá äéåñãáóßá íá êëåéäùèåß óôçí êýñéá ìíÞìç (ð.÷., âëÝðå mlock(2)). ÊÜðïéá êñßóéìá ðñïãñÜììáôá ôïõ óõóôÞìáôïò, üðùò ôï amd(8), êëåéäþíïõí óôçí êýñéá ìíÞìç Ýôóé þóôå óôçí ðåñßðôùóç ðïõ áíôéìåôáôåèïýí, äåí óõíåéóöÝñïõí óôçí åðéâÜñõíóç ôïõ óõóôÞìáôïò óå ðåñßðôùóç ðñïâëÞìáôïò.

`memoryuse`

Áõôü åßíáé ôï ìÝãéóôï ìÝãåèïò ìíÞìçò ðïõ ìðïñåß ìéá äéåñãáóßá íá êáôáíáëþóåé óå êÜèå ÷ñïíéêÞ óôéãìÞ. ÐåñéëáìâÜíåé óõíïëéêÜ ôçí êýñéá ìíÞìç êáé ôçí ÷ñÞóç ôçò áíôéìåôÜèåóçò (swap). Äåí ðñüêåéôáé ãéá êÜðïéï óõíïëéêü üñéï ãéá ôïí ðåñéïñéóìü ôçò êáôáíÜëùóçò ôçò ìíÞìçò, áëëÜ åßíáé ìéá êáëÞ áñ÷Þ.

`openfiles`

Áõôüò åßíáé ï ìÝãéóôïò áñéèìüò áñ÷åßùí ðïõ ìðïñåß íá Ý÷åé áíïéêôÜ ìéá äéåñãáóßá. Óôï FreeBSD, ôá áñ÷åßá åðßóçò ÷ñçóéìïðïéïýíôáé ãéá íá áðåéêïíßóïõí õðïäï÷Ýò (sockets) êáé êáíÜëéá IPC. ÐñïóÝîôå ëïéðüí íá ìçí èÝóåôå áõôü ôï üñéï ðïëý ÷áìçëÜ. Ôï óõíïëéêü üñéï ôïõ óõóôÞìáôïò êáèïñßæåôáé áðü ôï `kern.maxfiles` sysctl(8).

`sbsize`

Áõôü åßíáé ôï üñéï ôçò ìíÞìçò äéêôýïõ, êáé Üñá ôùí mbufs, ðïõ ìðïñåß íá êáôáíáëþóåé Ýíáò ÷ñÞóôçò. Îåêßíçóå ùò áðÜíôçóç óå ìéá ðáëéÜ DoS åðßèåóç ç ïðïßá äçìéïõñãïýóå ðïëëÜ sockets, áëëÜ ìðïñåß íá ÷ñçóéìïðïéçèåß ãåíéêÜ ãéá ôïí ðåñéïñéóìü ôùí åðéêïéíùíéþí äéêôýïõ.

`stacksize`

Áõôü åßíáé ôï ìÝãéóôï üñéï ðïõ ìðïñåß íá ìåãáëþóåé ç óôïßâá ìéáò äéåñãáóßáò. Áðü ìüíï ôïõ äåí åßíáé áñêåôü ãéá íá ðåñéïñßóåé ôï ìÝãåèïò ìíÞìçò ðïõ ìðïñåß íá ÷ñçóéìïðïéÞóåé Ýíá ðñüãñáììá. Óõíåðþò, ðñÝðåé íá ÷ñçóéìïðïéåßôáé óå óõíäõáóìü ìå Üëëá üñéá.

ÕðÜñ÷ïõí ìåñéêÜ áêüìá ðñÜãìáôá ðïõ ðñÝðåé íá èõìÜóôå üôáí èÝôåôå üñéá óå ðüñïõò. ÐáñáêÜôù åßíáé ìåñéêÝò ãåíéêÝò óõìâïõëÝò, ðñïôÜóåéò, êáé äéÜöïñá ó÷üëéá.

- Ïé äéåñãáóßåò ðïõ îåêéíïýí óôçí åêêßíçóç ôïõ óõóôÞìáôïò áðü ôï `/etc/rc` åê÷ùñïýíôáé óôçí êëÜóç óýíäåóçò `daemon`.
- Áí êáé ôï `/etc/login.conf` ðïõ Ýñ÷åôáé ìå ôï óýóôçìá åßíáé ìéá êáëÞ ðçãÞ ëïãéêþí ôéìþí ãéá ôá ðåñéóóüôåñá üñéá, ìüíï åóåßò, ï äéá÷åéñéóôÞò, ìðïñåß íá îÝñåôå ôé åßíáé êáôÜëëçëï ãéá ôï óýóôçìá óáò. ÈÝôïíôáò Ýíá üñéï ðïëý øçëÜ ìðïñåß íá äéåõêïëýíåôå ôçí êáôÜ÷ñçóç ôïõ óõóôÞìáôüò óáò, åíþ èÝôïíôáò ôï ðïëý ÷áìçëÜ ìðïñåß íá ðåñéïñßóåôå ôçí ðáñáãùãéêüôçôá.
- Óôïõò ÷ñÞóôåò ôïõ X Window System (X11) èá ðñÝðåé ìÜëëïí íá ðáñá÷ùñçèïýí ðåñéóóüôåñïé ðüñïé áðü üôé óå Üëëïõò ÷ñÞóôåò. Ôï X11 áðü ìüíï ôïõ êáôáíáëþíåé ðïëëïýò ðüñïõò, áëëÜ åðßóçò åíèáññýíåé ôïõò ÷ñÞóôåò íá ôñÝ÷ïõí ðåñéóóüôåñá ðñïãñÜììáôá ôáõôü÷ñïíá.
- Èõìçèåßôå üôé ðïëëÜ üñéá åöáñìüæïíôáé óå êÜèå äéåñãáóßá ÷ùñéóôÜ, ü÷é óôïí ÷ñÞóôç óõíïëéêÜ. Ãéá ðáñÜäåéãìá, èÝôïíôáò `openfiles` óå 50 óçìáßíåé üôé êÜèå äéåñãáóßá ðïõ åêôåëåß ï ÷ñÞóôçò ìðïñåß íá áíïßîåé Ýùò 50 áñ÷åßá. ¸ôóé, ï óõíïëéêüò áñéèìüò áñ÷åßùí ðïõ ìðïñåß íá áíïßîåé ï ÷ñÞóôçò åßíáé ç ôéìÞ ôïõ `openfiles` ðïëëáðëáóéáóìÝíç ìå ôçí ôéìÞ ôïõ `maxproc`. Áõôü åðßóçò éó÷ýåé ãéá ôçí êáôáíÜëùóç ìíÞìçò.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò óôá üñéá ðüñùí êáé ôéò êëÜóåéò óýíäåóçò êáé ôùí äõíáôïôÞôùí ãåíéêÜ, ðáñáêáëïýìå óõìâïõëåõôåßôå ôéò ó÷åôéêÝò óåëßäåò ôïõ åã÷åéñéäßïõ: cap_mkdb(1), getrlimit(2), login.conf(5).

14.8 ÏìÜäåò

Ìßá ïìÜäá åßíáé áðëÜ ìßá ëßóôá ÷ñçóôþí. Ïé ïìÜäåò áíáãíùñßæïíôáé áðü ôï üíïìÜ ôïõò êáé ôï GID (Group ID). Óôï FreeBSD (êáé óôá ðåñéóóüôåñá Üëëá üìïéá UNIX óõóôÞìáôá), ïé äýï ðáñÜãïíôåò ðïõ ï ðõñÞíáò ÷ñçóéìïðïéåß ãéá íá áðïöáóßóåé áí ìßá äéåñãáóßá åðéôñÝðåôáé íá êÜíåé êÜôé åßíáé ôï ID ôïõ ÷ñÞóôç ôçò êáé ç ëßóôá ìå ôéò ïìÜäåò ðïõ áíÞêåé. Óå áíôßèåóç ìå ôï ID ôïõ ÷ñÞóôç, ìéá äéåñãáóßá Ý÷åé ìéá ëßóôá ìå ôéò ïìÜäåò ðïõ ó÷åôßæïíôáé ìå áõôÞí. Ìðïñåß íá áêïýóåôå êÜðïéá ðñÜãìáôá íá áíáöÝñïíôáé óôï “group ID” åíüò ÷ñÞóôç Þ ìéáò äéåñãáóßáò. Ôéò ðåñéóóüôåñåò öïñÝò, áõôü óçìáßíåé áðëÜ ôçí ðñþôç ïìÜäá ôçò ëßóôáò.

Ç áíôéóôïß÷éóç ôïõ ïíüìáôïò ôçò ïìÜäáò óôï ID ôçò ïìÜäáò âñßóêåôáé óôï `/etc/group`. Áõôü åßíáé Ýíá áñ÷åßï áðëïý êåéìÝíïõ ìå ôÝóóåñá ðåäßá ÷ùñéóìÝíá ìå êüììáôá. Ôï ðñþôï ðåäßï åßíáé ôï üíïìá ôçò ïìÜäáò, ôï äåýôåñï åßíáé ï êñõðôïãñáöçìÝíïò êùäéêüò, ôï ôñßôï ôï ID ôçò ïìÜäáò, êáé ôï ôÝôáñôï ç ëßóôá ôùí ìåëþí, ÷ùñéóìÝíç ìå êüììáôá. Ìðïñåßôå íá ôçí åðåîåñãáóôåßôå Üöïâá ìå ôï ÷Ýñé (èåùñþíôáò, öõóéêÜ, üôé äåí êÜíåôå óõíôáêôéêÜ ëÜèç!). Ãéá ìéá ðéï ïëïêëçñùìÝíç ðåñéãñáöÞ ôçò óýíôáîçò, äåßôå ôçí óåëßäá manual group(5).

Áí äåí èÝëåôå íá åðåîåñãáóôåßôå ôï `/etc/group` ìå ôï ÷Ýñé, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí pw(8) åíôïëÞ ãéá íá ðñïóèÝóåôå êáé íá åðåîåñãáóôåßôå ïìÜäåò. Ãéá ðáñÜäåéãìá, ãéá íá ðñïóèÝóåôå ìéá ïìÜäá ðïõ ëÝãåôáé `teamtwo` êáé ìåôÜ íá åðéâåâáéþóåôå üôé õðÜñ÷åé, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå:

ÐáñÜäåéãìá 14-7. ÐñïóèÝôïíôáò ìéá ÏìÜäá ×ñçóéìïðïéþíôáò ôï pw(8)

```
# pw groupadd teamtwo
# pw groupshow teamtwo
teamtwo:*:1100:
```

Ï áñéèìüò `1100` ðáñáðÜíù åßíáé ôï ID ôçò ïìÜäáò `teamtwo`. ÁõôÞ ôçí óôéãìÞ, ç `teamtwo` äåí Ý÷åé ìÝëç, êáé ã’áõôü åßíáé ìÜëëïí Ü÷ñçóôç. Áò ôï áëëÜîïõìå áõôü ðñïóèÝôïíôáò ôïí `jru` óôçí ïìÜäá `teamtwo`.

ÐáñÜäåéãìá 14-8. Êáèïñéóìüò ôçò Ëßóôáò Ìåëþí ìéáò ÏìÜäáò ìå ×ñÞóç ôïõ pw(8)

```
# pw groupmod teamtwo -M jru
# pw groupshow teamtwo
teamtwo:*:1100:jru
```

Ç ðáñÜìåôñïò óôçí åðéëïãÞ `-M` åßíáé ìéá ëßóôá ÷ñçóôþí ðïõ ðñüêåéôáé íá ãßíïõí ìÝëç ôçò ïìÜäáò, ÷ùñéóìÝíç ìå êüììáôá. Áðü ôá ðñïçãïýìåíá ôìÞìáôá, ãíùñßæïõìå üôé êáé ôï áñ÷åßï êùäéêþí (password file) ðåñéÝ÷åé åðßóçò ìéá ïìÜäá ãéá êÜèå ÷ñÞóôç. Ï ÷ñÞóôçò åéóÜãåôáé áõôüìáôá (áðü ôï óýóôçìá) ùò ìÝëïò ôçò ïìÜäáò áõôÞò. Ï ÷ñÞóôçò äåí èá åìöáíßæåôáé ùò ìÝëïò ôçò áñ÷éêÞò áõôÞò ïìÜäáò üôáí ÷ñçóéìïðïéåßôáé ç åðéëïãÞ `groupshow` ìå ôçí pw(8), áëëÜ èá åìöáíßæåôáé üôáí ç ðëçñïöïñßá áíáæçôåßôáé ìÝóù ôçò id(1) Þ ðáñüìïéïõ åñãáëåßïõ. Ìå Üëëá ëüãéá, ç pw(8) ÷åéñßæåôáé ìüíï ôï áñ÷åßï `/etc/group`, êáé äåí èá ðñïóðáèÞóåé ðïôÝ íá äéáâÜóåé ðñüóèåôá äåäïìÝíá áðü ôï `/etc/passwd`.

ÐáñÜäåéãìá 14-9. ÐñïóèÞêç ÍÝïõ ÌÝëïõò óôçí ÏìÜäá ìå ×ñÞóç ôçò pw(8)

```
# pw groupmod teamtwo -m db
# pw groupshow teamtwo
teamtwo:*:1100:jru,db
```

Ç ðáñÜìåôñïò óôçí åðéëïãÞ `-m` åßíáé ìéá ëßóôá ÷ñçóôþí (÷ùñéóìÝíç ìå êüììáôá) ðïõ ðñüêåéôáé íá ðñïóôåèïýí óôá õðÜñ÷ïíôá ìÝëç ôçò ïìÜäáò. Óå áíôßèåóç ìå ôï ðñïçãïýìåíï ðáñÜäåéãìá, ïé ÷ñÞóôåò áõôïß ðñïóôßèåíôáé óôçí ïìÜäá, êáé äåí áíôéêáèéóôïýí ôïõò ÷ñÞóôåò ðïõ Þäç áíÞêïõí óå áõôÞ.

ÐáñÜäåéãìá 14-10. ×ñçóéìïðïéþíôáò ôçí id(1) ãéá Ðñïóäéïñéóìü Ìåëþí ìéáò ÏìÜäáò

```
% id jru
uid=1001(jru) gid=1001(jru) groups=1001(jru), 1100(teamtwo)
```

¼ðùò ìðïñåßôå íá äåßôå, ï `jru` åßíáé ìÝëïò ôùí ïìÜäùí `jru` êáé `teamtwo`.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí pw(8), äåßôå ôçí óåëßäá manual, êáé ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ìïñöïðïßçóç ôïõ `/etc/group`, óõìâïõëåõôåßôå ôçí óåëßäá manual group(5).

Óçìåéþóåéò

1. Åêôüò öõóéêÜ áí óõíäÝóïõìå ðïëëáðëÜ ôåñìáôéêÜ, áëëÜ èá ìéëÞóïõìå ãéá áõôü óôï ÊåöÜëáéï 27.
2. Åßíáé äõíáôüí íá ÷ñçóéìïðïéÞóåôå UID/GIDs üóï ìåãÜëá üóï ôï 4294967295, áëëÜ ôÝôïéá IDs ìðïñåß íá ðñïêáëÝóïõí óïâáñÜ ðñïâëÞìáôá ìå ëïãéóìéêü ðïõ êÜíåé õðïèÝóåéò ó÷åôéêÜ ìå ôéò ôéìÝò ôùí IDs.

ÊåöÜëáéï 15 ÁóöÜëåéá

Ôï ìåãáëýôåñï ìÝñïò áõôïý ôïõ êåöáëáßïõ ðñïÝñ÷åôáé áðü ôçí óåëßäá ôïõ manual ôçò security(7) áðü ôïí Matthew Dillon.

15.1 Óýíïøç

Ôï êåöÜëáéï áõôü ðáñÝ÷åé ìéá âáóéêÞ åéóáãùãÞ óôéò Ýííïéåò ôçò áóöÜëåéáò óõóôÞìáôïò, êÜðïéïõò ãåíéêÜ êáëïýò êáíüíåò, êáé ïñéóìÝíá ðñï÷ùñçìÝíá èÝìáôá ó÷åôéêÜ ìå ôï FreeBSD. ÁñêåôÜ áðü ôá èÝìáôá ðïõ êáëýðôïíôáé åäþ, ìðïñïýí íá åöáñìïóôïýí ôï ßäéï êáëÜ ôüóï óôï ßäéï ôï óýóôçìá, üóï êáé ãéá áóöÜëåéá ìÝóù Internet. Ôï Internet äåí åßíáé ðëÝïí Ýíá “öéëéêü” ìÝñïò óôï ïðïßï êáèÝíáò èÝëåé íá åßíáé ï åõãåíéêüò óáò ãåßôïíáò. Ç áíÜãêç áóöÜëéóçò ôïõ óõóôÞìáôïò óáò åßíáé åðéôáêôéêÞ ãéá íá ðñïóôáôÝøåôå ôá äåäïìÝíá óáò,ôçí ðíåõìáôéêÞ óáò éäéïêôçóßá, ôï ÷ñüíï óáò, êáé ðïëëÜ ðåñéóóüôåñá áðü ôá ÷Ýñéá ôùí ÷Üêåñò êáé ôùí ïìïßùí ôïõò.

Ôï FreeBSD ðáñÝ÷åé ìéá óåéñÜ áðü âïçèçôéêÜ ðñïãñÜììáôá êáé ìç÷áíéóìïýò ãéá íá åîáóöáëßóåé ôçí áêåñáéüôçôá êáé ôçí áóöÜëåéá ôïõ óõóôÞìáôïò óáò êáé ôïõ äéêôýïõ.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- ÂáóéêÝò Ýííïéåò ãéá ôçí áóöÜëåéá, óå ó÷Ýóç ìå ôï FreeBSD.
- Óôïé÷åßá ó÷åôéêÜ ìå ôïõò äéÜöïñïõò ìç÷áíéóìïýò êñõðôïãñÜöçóçò ðïõ åßíáé äéáèÝóéìïé óôï FreeBSD, üðùò ôï DES êáé ôï MD5.
- Ðùò íá ñõèìßóåôå ôï óýóôçìá óáò ãéá êùäéêïýò ìéáò ÷ñÞóçò.
- Ðùò íá ñõèìßóåôå TCP Wrappers ãéá ÷ñÞóç ìå ôçí `inetd`.
- Ðùò íá ñõèìßóåôå ôïí **KerberosIV** óå FreeBSD åêäüóåéò ðñéí ôç 5.0.
- Ðùò íá ñõèìßóåôå ôïí **Kerberos5** óôï FreeBSD.
- Ðùò íá ñõèìßóåôå ôï IPsec êáé íá äçìéïõñãÞóåôå Ýíá VPN ìåôáîý ìç÷áíçìÜôùí FreeBSD/Windows.
- Ðùò íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôçí êáôÜ FreeBSD õëïðïßçóç SSH ôïõ **OpenSSH**
- Ôé åßíáé ôá ACLs óôï óýóôçìá áñ÷åßùí êáé ðùò íá ôá ÷ñçóéìïðïéÞóåôå.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôï âïçèçôéêü ðñüãñáììá **Portaudit** ãéá íá åëÝãîåôå ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ ðïõ Ý÷åé åãêáôáóôáèåß ìÝóù ôçò óõëëïãÞò Ports.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôéò äçìïóéåýóåéò security advisories ôïõ FreeBSD.
- Èá Ý÷åôå ìéá éäÝá ãéá ôï ôé åßíáé ôï Process Accounting êáé ðùò íá ôï åíåñãïðïéÞóåôå óôï FreeBSD.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå âáóéêÝò Ýííïéåò ôïõ FreeBSD êáé ôïõ Internet.

Ðñüóèåôá èÝìáôá ó÷åôéêÜ ìå ôçí áóöÜëåéá êáëýðôïíôáé óå ïëüêëçñï ôï âéâëßï. Ãéá ðáñÜäåéãìá, ï Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò óõæçôåßôáé óôï ÊåöÜëáéï 17 êáé ôá Internet Firewalls óõæçôïýíôáé óôï ÊåöÜëáéï 31.

15.2 Introduction

Security is a function that begins and ends with the system administrator. While all BSD UNIX multi-user systems have some inherent security, the job of building and maintaining additional security mechanisms to keep those users "honest" is probably one of the single largest undertakings of the sysadmin. Machines are only as secure as you make them, and security concerns are ever competing with the human necessity for convenience. UNIX systems, in general, are capable of running a huge number of simultaneous processes and many of these processes operate as servers — meaning that external entities can connect and talk to them. As yesterday's mini-computers and mainframes become today's desktops, and as computers become networked and inter-networked, security becomes an even bigger issue.

System security also pertains to dealing with various forms of attack, including attacks that attempt to crash, or otherwise make a system unusable, but do not attempt to compromise the `root` account ("break root"). Security concerns can be split up into several categories:

1. Denial of service attacks.
2. User account compromises.
3. Root compromise through accessible servers.
4. Root compromise via user accounts.
5. Backdoor creation.

A denial of service attack is an action that deprives the machine of needed resources. Typically, DoS attacks are brute-force mechanisms that attempt to crash or otherwise make a machine unusable by overwhelming its servers or network stack. Some DoS attacks try to take advantage of bugs in the networking stack to crash a machine with a single packet. The latter can only be fixed by applying a bug fix to the kernel. Attacks on servers can often be fixed by properly specifying options to limit the load the servers incur on the system under adverse conditions. Brute-force network attacks are harder to deal with. A spoofed-packet attack, for example, is nearly impossible to stop, short of cutting your system off from the Internet. It may not be able to take your machine down, but it can saturate your Internet connection.

A user account compromise is even more common than a DoS attack. Many sysadmins still run standard **telnetd**, **rlogind**, **rshd**, and **ftpd** servers on their machines. These servers, by default, do not operate over encrypted connections. The result is that if you have any moderate-sized user base, one or more of your users logging into your system from a remote location (which is the most common and convenient way to login to a system) will have his or her password sniffed. The attentive system admin will analyze his remote access logs looking for suspicious source addresses even for successful logins.

One must always assume that once an attacker has access to a user account, the attacker can break `root`. However, the reality is that in a well secured and maintained system, access to a user account does not necessarily give the attacker access to `root`. The distinction is important because without access to `root` the attacker cannot generally hide his tracks and may, at best, be able to do nothing more than mess with the user's files, or crash the machine. User account compromises are very common because users tend not to take the precautions that sysadmins take.

System administrators must keep in mind that there are potentially many ways to break `root` on a machine. The attacker may know the `root` password, the attacker may find a bug in a root-run server and be able to break `root` over a network connection to that server, or the attacker may know of a bug in a suid-root program that allows the attacker to break `root` once he has broken into a user's account. If an attacker has found a way to break `root` on a machine, the attacker may not have a need to install a backdoor. Many of the `root` holes found and closed to date involve a considerable amount of work by the attacker to cleanup after himself, so most attackers install backdoors. A backdoor provides the attacker with a way to easily regain `root` access to the system, but it also gives the smart system administrator a convenient way to detect the intrusion. Making it impossible for an attacker to install a backdoor may actually be detrimental to your security, because it will not close off the hole the attacker found to break in the first place.

Security remedies should always be implemented with a multi-layered "onion peel" approach and can be categorized as follows:

1. Securing `root` and staff accounts.
2. Securing `root`–run servers and suid/sgid binaries.
3. Securing user accounts.
4. Securing the password file.
5. Securing the kernel core, raw devices, and file systems.
6. Quick detection of inappropriate changes made to the system.
7. Paranoia.

The next section of this chapter will cover the above bullet items in greater depth.

15.3 Securing FreeBSD

> **Command vs. Protocol:** Throughout this document, we will use **bold** text to refer to an application, and a `monospaced` font to refer to specific commands. Protocols will use a normal font. This typographical distinction is useful for instances such as ssh, since it is a protocol as well as command.

The sections that follow will cover the methods of securing your FreeBSD system that were mentioned in the last section of this chapter.

15.3.1 Securing the `root` Account and Staff Accounts

First off, do not bother securing staff accounts if you have not secured the `root` account. Most systems have a password assigned to the `root` account. The first thing you do is assume that the password is *always* compromised. This does not mean that you should remove the password. The password is almost always necessary for console access to the machine. What it does mean is that you should not make it possible to use the password outside of the console or possibly even with the su(1) command. For example, make sure that your ptys are specified as being insecure in the `/etc/ttys` file so that direct `root` logins via `telnet` or `rlogin` are disallowed. If using other login services such as **sshd**, make sure that direct `root` logins are disabled there as well. You can do this by editing your `/etc/ssh/sshd_config` file, and making sure that `PermitRootLogin` is set to `NO`. Consider every access method — services such as FTP often fall through the cracks. Direct `root` logins should only be allowed via the system console.

Of course, as a sysadmin you have to be able to get to `root`, so we open up a few holes. But we make sure these holes require additional password verification to operate. One way to make `root` accessible is to add appropriate staff accounts to the `wheel` group (in `/etc/group`). The staff members placed in the `wheel` group are allowed to `su` to `root`. You should never give staff members native `wheel` access by putting them in the `wheel` group in their password entry. Staff accounts should be placed in a `staff` group, and then added to the `wheel` group via the

`/etc/group` file. Only those staff members who actually need to have `root` access should be placed in the `wheel` group. It is also possible, when using an authentication method such as Kerberos, to use Kerberos' `.k5login` file in the `root` account to allow a ksu(1) to `root` without having to place anyone at all in the `wheel` group. This may be the better solution since the `wheel` mechanism still allows an intruder to break `root` if the intruder has gotten hold of your password file and can break into a staff account. While having the `wheel` mechanism is better than having nothing at all, it is not necessarily the safest option.

An indirect way to secure staff accounts, and ultimately `root` access is to use an alternative login access method and do what is known as "starring" out the encrypted password for the staff accounts. Using the vipw(8) command, one can replace each instance of an encrypted password with a single "`*`" character. This command will update the `/etc/master.passwd` file and user/password database to disable password-authenticated logins.

A staff account entry such as:

```
foobar:R9DT/Fa1/LV9U:1000:1000::0:0:Foo Bar:/home/foobar:/usr/local/bin/tcsh
```

Should be changed to this:

```
foobar:*:1000:1000::0:0:Foo Bar:/home/foobar:/usr/local/bin/tcsh
```

This change will prevent normal logins from occurring, since the encrypted password will never match "`*`". With this done, staff members must use another mechanism to authenticate themselves such as kerberos(1) or ssh(1) using a public/private key pair. When using something like Kerberos, one generally must secure the machines which run the Kerberos servers and your desktop workstation. When using a public/private key pair with ssh, one must generally secure the machine used to login *from* (typically one's workstation). An additional layer of protection can be added to the key pair by password protecting the key pair when creating it with ssh-keygen(1). Being able to "star" out the passwords for staff accounts also guarantees that staff members can only login through secure access methods that you have set up. This forces all staff members to use secure, encrypted connections for all of their sessions, which closes an important hole used by many intruders: sniffing the network from an unrelated, less secure machine.

The more indirect security mechanisms also assume that you are logging in from a more restrictive server to a less restrictive server. For example, if your main box is running all sorts of servers, your workstation should not be running any. In order for your workstation to be reasonably secure you should run as few servers as possible, up to and including no servers at all, and you should run a password-protected screen blanker. Of course, given physical access to a workstation an attacker can break any sort of security you put on it. This is definitely a problem that you should consider, but you should also consider the fact that the vast majority of break-ins occur remotely, over a network, from people who do not have physical access to your workstation or servers.

Using something like Kerberos also gives you the ability to disable or change the password for a staff account in one place, and have it immediately affect all the machines on which the staff member may have an account. If a staff member's account gets compromised, the ability to instantly change his password on all machines should not be underrated. With discrete passwords, changing a password on N machines can be a mess. You can also impose re-passwording restrictions with Kerberos: not only can a Kerberos ticket be made to timeout after a while, but the Kerberos system can require that the user choose a new password after a certain period of time (say, once a month).

15.3.2 Securing Root-run Servers and SUID/SGID Binaries

The prudent sysadmin only runs the servers he needs to, no more, no less. Be aware that third party servers are often the most bug-prone. For example, running an old version of **imapd** or **popper** is like giving a universal `root` ticket out to the entire world. Never run a server that you have not checked out carefully. Many servers do not need to be run as `root`. For example, the **ntalk**, **comsat**, and **finger** daemons can be run in special user *sandboxes*. A sandbox is not perfect, unless you go through a large amount of trouble, but the onion approach to security still stands: If someone is able to break in through a server running in a sandbox, they still have to break out of the sandbox. The more layers the attacker must break through, the lower the likelihood of his success. Root holes have historically been found in virtually every server ever run as `root`, including basic system servers. If you are running a machine through which people only login via **sshd** and never login via **telnetd** or **rshd** or **rlogind**, then turn off those services!

FreeBSD now defaults to running **ntalkd**, **comsat**, and **finger** in a sandbox. Another program which may be a candidate for running in a sandbox is named(8). `/etc/defaults/rc.conf` includes the arguments necessary to run **named** in a sandbox in a commented-out form. Depending on whether you are installing a new system or upgrading an existing system, the special user accounts used by these sandboxes may not be installed. The prudent sysadmin would research and implement sandboxes for servers whenever possible.

There are a number of other servers that typically do not run in sandboxes: **sendmail**, **popper**, **imapd**, **ftpd**, and others. There are alternatives to some of these, but installing them may require more work than you are willing to perform (the convenience factor strikes again). You may have to run these servers as `root` and rely on other mechanisms to detect break-ins that might occur through them.

The other big potential `root` holes in a system are the suid-root and sgid binaries installed on the system. Most of these binaries, such as **rlogin**, reside in `/bin`, `/sbin`, `/usr/bin`, or `/usr/sbin`. While nothing is 100% safe, the system-default suid and sgid binaries can be considered reasonably safe. Still, `root` holes are occasionally found in these binaries. A `root` hole was found in `Xlib` in 1998 that made **xterm** (which is typically suid) vulnerable. It is better to be safe than sorry and the prudent sysadmin will restrict suid binaries, that only staff should run, to a special group that only staff can access, and get rid of (`chmod 000`) any suid binaries that nobody uses. A server with no display generally does not need an **xterm** binary. Sgid binaries can be almost as dangerous. If an intruder can break an sgid-kmem binary, the intruder might be able to read `/dev/kmem` and thus read the encrypted password file, potentially compromising any passworded account. Alternatively an intruder who breaks group `kmem` can monitor keystrokes sent through ptys, including ptys used by users who login through secure methods. An intruder that breaks the `tty` group can write to almost any user's tty. If a user is running a terminal program or emulator with a keyboard-simulation feature, the intruder can potentially generate a data stream that causes the user's terminal to echo a command, which is then run as that user.

15.3.3 Securing User Accounts

User accounts are usually the most difficult to secure. While you can impose draconian access restrictions on your staff and "star" out their passwords, you may not be able to do so with any general user accounts you might have. If you do have sufficient control, then you may win out and be able to secure the user accounts properly. If not, you simply have to be more vigilant in your monitoring of those accounts. Use of ssh and Kerberos for user accounts is more problematic, due to the extra administration and technical support required, but still a very good solution compared to a encrypted password file.

15.3.4 Securing the Password File

The only sure fire way is to star out as many passwords as you can and use ssh or Kerberos for access to those accounts. Even though the encrypted password file (`/etc/spwd.db`) can only be read by `root`, it may be possible for an intruder to obtain read access to that file even if the attacker cannot obtain root-write access.

Your security scripts should always check for and report changes to the password file (see the Checking file integrity section below).

15.3.5 Securing the Kernel Core, Raw Devices, and File systems

If an attacker breaks `root` he can do just about anything, but there are certain conveniences. For example, most modern kernels have a packet sniffing device driver built in. Under FreeBSD it is called the `bpf` device. An intruder will commonly attempt to run a packet sniffer on a compromised machine. You do not need to give the intruder the capability and most systems do not have the need for the `bpf` device compiled in.

But even if you turn off the `bpf` device, you still have `/dev/mem` and `/dev/kmem` to worry about. For that matter, the intruder can still write to raw disk devices. Also, there is another kernel feature called the module loader, kldload(8). An enterprising intruder can use a KLD module to install his own `bpf` device, or other sniffing device, on a running kernel. To avoid these problems you have to run the kernel at a higher secure level, at least securelevel 1. The securelevel can be set with a `sysctl` on the `kern.securelevel` variable. Once you have set the securelevel to 1, write access to raw devices will be denied and special `chflags` flags, such as `schg`, will be enforced. You must also ensure that the `schg` flag is set on critical startup binaries, directories, and script files — everything that gets run up to the point where the securelevel is set. This might be overdoing it, and upgrading the system is much more difficult when you operate at a higher secure level. You may compromise and run the system at a higher secure level but not set the `schg` flag for every system file and directory under the sun. Another possibility is to simply mount `/` and `/usr` read-only. It should be noted that being too draconian in what you attempt to protect may prevent the all-important detection of an intrusion.

15.3.6 Checking File Integrity: Binaries, Configuration Files, Etc.

When it comes right down to it, you can only protect your core system configuration and control files so much before the convenience factor rears its ugly head. For example, using `chflags` to set the `schg` bit on most of the files in `/` and `/usr` is probably counterproductive, because while it may protect the files, it also closes a detection window. The last layer of your security onion is perhaps the most important — detection. The rest of your security is pretty much useless (or, worse, presents you with a false sense of security) if you cannot detect potential intrusions. Half the job of the onion is to slow down the attacker, rather than stop him, in order to be able to catch him in the act.

The best way to detect an intrusion is to look for modified, missing, or unexpected files. The best way to look for modified files is from another (often centralized) limited-access system. Writing your security scripts on the extra-secure limited-access system makes them mostly invisible to potential attackers, and this is important. In order to take maximum advantage you generally have to give the limited-access box significant access to the other machines in the business, usually either by doing a read-only NFS export of the other machines to the limited-access box, or by setting up ssh key-pairs to allow the limited-access box to ssh to the other machines. Except for its network traffic, NFS is the least visible method — allowing you to monitor the file systems on each client box virtually undetected. If your limited-access server is connected to the client boxes through a switch, the NFS method is often the better choice. If your limited-access server is connected to the client boxes through a hub, or through several layers of routing, the NFS method may be too insecure (network-wise) and using ssh may be the better choice even with the audit-trail tracks that ssh lays.

Once you have given a limited-access box at least read access to the client systems it is supposed to monitor, you must write scripts to do the actual monitoring. Given an NFS mount, you can write scripts out of simple system utilities such as find(1) and md5(1). It is best to physically md5 the client-box files at least once a day, and to test control files such as those found in `/etc` and `/usr/local/etc` even more often. When mismatches are found, relative to the base md5 information the limited-access machine knows is valid, it should scream at a sysadmin to go check it out. A good security script will also check for inappropriate suid binaries and for new or deleted files on system partitions such as `/` and `/usr`.

When using ssh rather than NFS, writing the security script is much more difficult. You essentially have to `scp` the scripts to the client box in order to run them, making them visible, and for safety you also need to `scp` the binaries (such as find) that those scripts use. The **ssh** client on the client box may already be compromised. All in all, using ssh may be necessary when running over insecure links, but it is also a lot harder to deal with.

A good security script will also check for changes to user and staff members access configuration files: `.rhosts`, `.shosts`, `.ssh/authorized_keys` and so forth, files that might fall outside the purview of the `MD5` check.

If you have a huge amount of user disk space, it may take too long to run through every file on those partitions. In this case, setting mount flags to disallow suid binaries and devices on those partitions is a good idea. The `nodev` and `nosuid` options (see mount(8)) are what you want to look into. You should probably scan them anyway, at least once a week, since the object of this layer is to detect a break-in attempt, whether or not the attempt succeeds.

Process accounting (see accton(8)) is a relatively low-overhead feature of the operating system which might help as a post-break-in evaluation mechanism. It is especially useful in tracking down how an intruder has actually broken into a system, assuming the file is still intact after the break-in has occured.

Finally, security scripts should process the log files, and the logs themselves should be generated in as secure a manner as possible — remote syslog can be very useful. An intruder will try to cover his tracks, and log files are critical to the sysadmin trying to track down the time and method of the initial break-in. One way to keep a permanent record of the log files is to run the system console to a serial port and collect the information to a secure machine monitoring the consoles.

15.3.7 Paranoia

A little paranoia never hurts. As a rule, a sysadmin can add any number of security features, as long as they do not affect convenience, and can add security features that *do* affect convenience with some added thought. Even more importantly, a security administrator should mix it up a bit — if you use recommendations such as those given by this document verbatim, you give away your methodologies to the prospective attacker who also has access to this document.

15.3.8 Denial of Service Attacks

This section covers Denial of Service attacks. A DoS attack is typically a packet attack. While there is not much you can do about modern spoofed packet attacks that saturate your network, you can generally limit the damage by ensuring that the attacks cannot take down your servers by:

1. Limiting server forks.
2. Limiting springboard attacks (ICMP response attacks, ping broadcast, etc.).
3. Overloading the Kernel Route Cache.

A common DoS attack scenario is attacking a forking server and making it spawning so many child processes that the host system eventually runs out of memory, file descriptors, etc. and then grinds to a halt. **inetd** (see inetd(8)) has several options to limit this sort of attack. It should be noted that while it is possible to prevent a machine from going down, it is not generally possible to prevent a service from being disrupted by the attack. Read the **inetd** manual page carefully and pay specific attention to the `-c`, `-C`, and `-R` options. Note that spoofed-IP attacks will circumvent the `-C` option to **inetd**, so typically a combination of options must be used. Some standalone servers have self-fork-limitation parameters.

Sendmail has its `-OMaxDaemonChildren` option, which tends to work much better than trying to use **Sendmail**'s load limiting options due to the load lag. You should specify a `MaxDaemonChildren` parameter, when you start **sendmail**; high enough to handle your expected load, but not so high that the computer cannot handle that number of **Sendmail** instances without falling on its face. It is also prudent to run **Sendmail** in queued mode (`-ODeliveryMode=queued`) and to run the daemon (`sendmail -bd`) separate from the queue-runs (`sendmail -q15m`). If you still want real-time delivery you can run the queue at a much lower interval, such as `-q1m`, but be sure to specify a reasonable `MaxDaemonChildren` option for *that* **Sendmail** to prevent cascade failures.

Syslogd can be attacked directly and it is strongly recommended that you use the `-s` option whenever possible, and the `-a` option otherwise.

You should also be fairly careful with connect-back services such as **TCP Wrapper**'s reverse-identd, which can be attacked directly. You generally do not want to use the reverse-ident feature of **TCP Wrapper** for this reason.

It is a very good idea to protect internal services from external access by firewalling them off at your border routers. The idea here is to prevent saturation attacks from outside your LAN, not so much to protect internal services from network-based `root` compromise. Always configure an exclusive firewall, i.e., "firewall everything *except* ports A, B, C, D, and M-Z". This way you can firewall off all of your low ports except for certain specific services such as **named** (if you are primary for a zone), **ntalkd**, **sendmail**, and other Internet-accessible services. If you try to configure the firewall the other way — as an inclusive or permissive firewall, there is a good chance that you will forget to "close" a couple of services, or that you will add a new internal service and forget to update the firewall. You can still open up the high-numbered port range on the firewall, to allow permissive-like operation, without compromising your low ports. Also take note that FreeBSD allows you to control the range of port numbers used for dynamic binding, via the various `net.inet.ip.portrange` `sysctl`'s (`sysctl -a | fgrep portrange`), which can also ease the complexity of your firewall's configuration. For example, you might use a normal first/last range of 4000 to 5000, and a hiport range of 49152 to 65535, then block off everything under 4000 in your firewall (except for certain specific Internet-accessible ports, of course).

Another common DoS attack is called a springboard attack — to attack a server in a manner that causes the server to generate responses which overloads the server, the local network, or some other machine. The most common attack of this nature is the *ICMP ping broadcast attack*. The attacker spoofs ping packets sent to your LAN's broadcast address with the source IP address set to the actual machine they wish to attack. If your border routers are not configured to stomp on ping packets to broadcast addresses, your LAN winds up generating sufficient responses to the spoofed source address to saturate the victim, especially when the attacker uses the same trick on several dozen broadcast addresses over several dozen different networks at once. Broadcast attacks of over a hundred and twenty megabits have been measured. A second common springboard attack is against the ICMP error reporting system. By constructing packets that generate ICMP error responses, an attacker can saturate a server's incoming network and cause the server to saturate its outgoing network with ICMP responses. This type of attack can also crash the server by running it out of memory, especially if the server cannot drain the ICMP responses it generates fast enough. Use the **sysctl** variable `net.inet.icmp.icmplim` to limit these attacks. The last major class of springboard attacks is related to certain internal **inetd** services such as the udp echo service. An attacker simply spoofs a UDP packet with the source address being server A's echo port, and the destination address being server B's echo port, where server A and B are both on your LAN. The two servers then bounce this one packet back and forth between each other. The attacker can overload both servers and their LANs simply by injecting a few packets in this manner. Similar problems exist with the internal **chargen** port. A competent sysadmin will turn off all of these inetd-internal test services.

Spoofed packet attacks may also be used to overload the kernel route cache. Refer to the `net.inet.ip.rtexpire`, `rtminexpire`, and `rtmaxcache` `sysctl` parameters. A spoofed packet attack that uses a random source IP will cause the kernel to generate a temporary cached route in the route table, viewable with `netstat -rna | fgrep W3`. These routes typically timeout in 1600 seconds or so. If the kernel detects that the cached route table has gotten too big it will dynamically reduce the `rtexpire` but will never decrease it to less than `rtminexpire`. There are two problems:

1. The kernel does not react quickly enough when a lightly loaded server is suddenly attacked.
2. The `rtminexpire` is not low enough for the kernel to survive a sustained attack.

If your servers are connected to the Internet via a T3 or better, it may be prudent to manually override both `rtexpire` and `rtminexpire` via sysctl(8). Never set either parameter to zero (unless you want to crash the machine). Setting both parameters to 2 seconds should be sufficient to protect the route table from attack.

15.3.9 Access Issues with Kerberos and SSH

There are a few issues with both Kerberos and ssh that need to be addressed if you intend to use them. Kerberos 5 is an excellent authentication protocol, but there are bugs in the kerberized **telnet** and **rlogin** applications that make them unsuitable for dealing with binary streams. Also, by default Kerberos does not encrypt a session unless you use the `-x` option. **ssh** encrypts everything by default.

Ssh works quite well in every respect except that it forwards encryption keys by default. What this means is that if you have a secure workstation holding keys that give you access to the rest of the system, and you ssh to an insecure machine, your keys are usable. The actual keys themselves are not exposed, but ssh installs a forwarding port for the duration of your login, and if an attacker has broken `root` on the insecure machine he can utilize that port to use your keys to gain access to any other machine that your keys unlock.

We recommend that you use ssh in combination with Kerberos whenever possible for staff logins. **Ssh** can be compiled with Kerberos support. This reduces your reliance on potentially exposed ssh keys while at the same time protecting passwords via Kerberos. Ssh keys should only be used for automated tasks from secure machines (something that Kerberos is unsuited to do). We also recommend that you either turn off key-forwarding in the ssh configuration, or that you make use of the `from=IP/DOMAIN` option that ssh allows in its `authorized_keys` file to make the key only usable to entities logging in from specific machines.

15.4 DES, MD5, and Crypt

Parts rewritten and updated by Bill Swingle.

Every user on a UNIX system has a password associated with their account. It seems obvious that these passwords need to be known only to the user and the actual operating system. In order to keep these passwords secret, they are encrypted with what is known as a “one-way hash”, that is, they can only be easily encrypted but not decrypted. In other words, what we told you a moment ago was obvious is not even true: the operating system itself does not *really* know the password. It only knows the *encrypted* form of the password. The only way to get the “plain-text” password is by a brute force search of the space of possible passwords.

Unfortunately the only secure way to encrypt passwords when UNIX came into being was based on DES, the Data Encryption Standard. This was not such a problem for users resident in the US, but since the source code for DES could not be exported outside the US, FreeBSD had to find a way to both comply with US law and retain compatibility with all the other UNIX variants that still used DES.

The solution was to divide up the encryption libraries so that US users could install the DES libraries and use DES but international users still had an encryption method that could be exported abroad. This is how FreeBSD came to use MD5 as its default encryption method. MD5 is believed to be more secure than DES, so installing DES is offered primarily for compatibility reasons.

15.4.1 Recognizing Your Crypt Mechanism

Currently the library supports DES, MD5 and Blowfish hash functions. By default FreeBSD uses MD5 to encrypt passwords.

It is pretty easy to identify which encryption method FreeBSD is set up to use. Examining the encrypted passwords in the `/etc/master.passwd` file is one way. Passwords encrypted with the MD5 hash are longer than those encrypted with the DES hash and also begin with the characters `$1$`. Passwords starting with `$2a$` are encrypted with the Blowfish hash function. DES password strings do not have any particular identifying characteristics, but they are shorter than MD5 passwords, and are coded in a 64-character alphabet which does not include the `$` character, so a relatively short string which does not begin with a dollar sign is very likely a DES password.

The password format used for new passwords is controlled by the `passwd_format` login capability in `/etc/login.conf`, which takes values of `des`, `md5` or `blf`. See the login.conf(5) manual page for more information about login capabilities.

15.5 One-time Passwords

By default, FreeBSD includes support for OPIE (One-time Passwords In Everything), which uses the MD5 hash by default.

There are three different sorts of passwords which we will discuss below. The first is your usual UNIX style or Kerberos password; we will call this a "UNIX password". The second sort is the one-time password which is generated by the OPIE opiekey(1) program and accepted by the opiepasswd(1) program and the login prompt; we will call this a "one-time password". The final sort of password is the secret password which you give to the `opiekey` program (and sometimes the `opiepasswd` programs) which it uses to generate one-time passwords; we will call it a "secret password" or just unqualified "password".

The secret password does not have anything to do with your UNIX password; they can be the same but this is not recommended. OPIE secret passwords are not limited to 8 characters like old UNIX passwords[1], they can be as long as you like. Passwords of six or seven word long phrases are fairly common. For the most part, the OPIE system operates completely independently of the UNIX password system.

Besides the password, there are two other pieces of data that are important to OPIE. One is what is known as the "seed" or "key", consisting of two letters and five digits. The other is what is called the "iteration count", a number between 1 and 100. OPIE creates the one-time password by concatenating the seed and the secret password, then applying the MD5 hash as many times as specified by the iteration count and turning the result into six short English words. These six English words are your one-time password. The authentication system (primarily PAM) keeps track of the last one-time password used, and the user is authenticated if the hash of the user-provided password is equal to the previous password. Because a one-way hash is used it is impossible to generate future one-time passwords if a successfully used password is captured; the iteration count is decremented after each successful login to keep the user and the login program in sync. When the iteration count gets down to 1, OPIE must be reinitialized.

There are a few programs involved in each system which we will discuss below. The `opiekey` program accepts an iteration count, a seed, and a secret password, and generates a one-time password or a consecutive list of one-time passwords. The `opiepasswd` program is used to initialize OPIE, and to change passwords, iteration counts, or seeds; it takes either a secret passphrase, or an iteration count, seed, and a one-time password. The `opieinfo` program will examine the relevant credentials files (`/etc/opiekeys`) and print out the invoking user's current iteration count and seed.

There are four different sorts of operations we will cover. The first is using `opiepasswd` over a secure connection to set up one-time-passwords for the first time, or to change your password or seed. The second operation is using `opiepasswd` over an insecure connection, in conjunction with `opiekey` over a secure connection, to do the same. The third is using `opiekey` to log in over an insecure connection. The fourth is using `opiekey` to generate a number of keys which can be written down or printed out to carry with you when going to some location without secure connections to anywhere.

15.5.1 Secure Connection Initialization

To initialize OPIE for the first time, execute the `opiepasswd` command:

```
% opiepasswd -c
[grimreaper] ~ $ opiepasswd -f -c
Adding unfurl:
Only use this method from the console; NEVER from remote. If you are using
telnet, xterm, or a dial-in, type ^C now or exit with no password.
Then run opiepasswd without the -c parameter.
Using MD5 to compute responses.
Enter new secret pass phrase:
Again new secret pass phrase:
ID unfurl OTP key is 499 to4268
MOS MALL GOAT ARM AVID COED
```

At the `Enter new secret pass phrase:` or `Enter secret password:` prompts, you should enter a password or phrase. Remember, this is not the password that you will use to login with, this is used to generate your one-time login keys. The "ID" line gives the parameters of your particular instance: your login name, the iteration count, and seed. When logging in the system will remember these parameters and present them back to you so you do not have to remember them. The last line gives the particular one-time password which corresponds to those parameters and your secret password; if you were to re-login immediately, this one-time password is the one you would use.

15.5.2 Insecure Connection Initialization

To initialize or change your secret password over an insecure connection, you will need to already have a secure connection to some place where you can run `opiekey`; this might be in the form of a shell prompt on a machine you trust. You will also need to make up an iteration count (100 is probably a good value), and you may make up your own seed or use a randomly-generated one. Over on the insecure connection (to the machine you are initializing), use `opiepasswd`:

```
% opiepasswd

Updating unfurl:
You need the response from an OTP generator.
Old secret pass phrase:
        otp-md5 498 to4268 ext
        Response: GAME GAG WELT OUT DOWN CHAT
New secret pass phrase:
        otp-md5 499 to4269
        Response: LINE PAP MILK NELL BUOY TROY

ID mark OTP key is 499 gr4269
LINE PAP MILK NELL BUOY TROY
```

To accept the default seed press **Return**. Then before entering an access password, move over to your secure connection and give it the same parameters:

```
% opiekey 498 to4268
Using the MD5 algorithm to compute response.
Reminder: Don’t use opiekey from telnet or dial-in sessions.
Enter secret pass phrase:
GAME GAG WELT OUT DOWN CHAT
```

Now switch back over to the insecure connection, and copy the one-time password generated over to the relevant program.

15.5.3 Generating a Single One-time Password

Once you have initialized OPIE and login, you will be presented with a prompt like this:

```
% telnet example.com
Trying 10.0.0.1...
Connected to example.com
Escape character is ’^]’.

FreeBSD/i386 (example.com) (ttypa)

login: <username>
otp-md5 498 gr4269 ext
Password:
```

As a side note, the OPIE prompts have a useful feature (not shown here): if you press **Return** at the password prompt, the prompter will turn echo on, so you can see what you are typing. This can be extremely useful if you are attempting to type in a password by hand, such as from a printout.

At this point you need to generate your one-time password to answer this login prompt. This must be done on a trusted system that you can run `opiekey` on. (There are versions of these for DOS, Windows and Mac OS as well.) They need the iteration count and the seed as command line options. You can cut-and-paste these right from the login prompt on the machine that you are logging in to.

On the trusted system:

```
% opiekey 498 to4268
Using the MD5 algorithm to compute response.
Reminder: Don’t use opiekey from telnet or dial-in sessions.
Enter secret pass phrase:
GAME GAG WELT OUT DOWN CHAT
```

Now that you have your one-time password you can continue logging in.

15.5.4 Generating Multiple One-time Passwords

Sometimes you have to go places where you do not have access to a trusted machine or secure connection. In this case, it is possible to use the `opiekey` command to generate a number of one-time passwords beforehand to be printed out and taken with you. For example:

```
% opiekey -n 5 30 zz99999
Using the MD5 algorithm to compute response.
Reminder: Don’t use opiekey from telnet or dial-in sessions.
Enter secret pass phrase: <secret password>
26: JOAN BORE FOSS DES NAY QUIT
27: LATE BIAS SLAY FOLK MUCH TRIG
28: SALT TIN ANTI LOON NEAL USE
29: RIO ODIN GO BYE FURY TIC
30: GREW JIVE SAN GIRD BOIL PHI
```

The `-n 5` requests five keys in sequence, the `30` specifies what the last iteration number should be. Note that these are printed out in *reverse* order of eventual use. If you are really paranoid, you might want to write the results down by hand; otherwise you can cut-and-paste into `lpr`. Note that each line shows both the iteration count and the one-time password; you may still find it handy to scratch off passwords as you use them.

15.5.5 Restricting Use of UNIX Passwords

OPIE can restrict the use of UNIX passwords based on the IP address of a login session. The relevant file is `/etc/opieaccess`, which is present by default. Please check opieaccess(5) for more information on this file and which security considerations you should be aware of when using it.

Here is a sample `opieaccess` file:

```
permit 192.168.0.0 255.255.0.0
```

This line allows users whose IP source address (which is vulnerable to spoofing) matches the specified value and mask, to use UNIX passwords at any time.

If no rules in `opieaccess` are matched, the default is to deny non-OPIE logins.

15.6 TCP Wrappers

Written by: Tom Rhodes.

Anyone familiar with inetd(8) has probably heard of TCP Wrappers at some point. But few individuals seem to fully comprehend its usefulness in a network environment. It seems that everyone wants to install a firewall to handle network connections. While a firewall has a wide variety of uses, there are some things that a firewall not handle such as sending text back to the connection originator. The TCP software does this and much more. In the next few sections many of the TCP Wrappers features will be discussed, and, when applicable, example configuration lines will be provided.

The TCP Wrappers software extends the abilities of `inetd` to provide support for every server daemon under its control. Using this method it is possible to provide logging support, return messages to connections, permit a daemon to only accept internal connections, etc. While some of these features can be provided by implementing a firewall, this will add not only an extra layer of protection but go beyond the amount of control a firewall can provide.

The added functionality of TCP Wrappers should not be considered a replacement for a good firewall. TCP Wrappers can be used in conjunction with a firewall or other security enhancements though and it can serve nicely as an extra layer of protection for the system.

Since this is an extension to the configuration of `inetd`, the reader is expected have read the inetd configuration section.

> **Óçìåßùóç:** While programs run by inetd(8) are not exactly “daemons”, they have traditionally been called daemons. This is the term we will use in this section too.

15.6.1 Initial Configuration

The only requirement of using TCP Wrappers in FreeBSD is to ensure the `inetd` server is started from `rc.conf` with the `-Ww` option; this is the default setting. Of course, proper configuration of `/etc/hosts.allow` is also expected, but syslogd(8) will throw messages in the system logs in these cases.

> **Óçìåßùóç:** Unlike other implementations of TCP Wrappers, the use of `hosts.deny` has been deprecated. All configuration options should be placed in `/etc/hosts.allow`.

In the simplest configuration, daemon connection policies are set to either be permitted or blocked depending on the options in `/etc/hosts.allow`. The default configuration in FreeBSD is to allow a connection to every daemon started with `inetd`. Changing this will be discussed only after the basic configuration is covered.

Basic configuration usually takes the form of `daemon : address : action`. Where `daemon` is the daemon name which `inetd` started. The `address` can be a valid hostname, an IP address or an IPv6 address enclosed in brackets ([ ]). The action field can be either allow or deny to grant or deny access appropriately. Keep in mind that configuration works off a first rule match semantic, meaning that the configuration file is scanned in ascending order for a matching rule. When a match is found the rule is applied and the search process will halt.

Several other options exist but they will be explained in a later section. A simple configuration line may easily be constructed from that information alone. For example, to allow POP3 connections via the `mail/qpopper` daemon, the following lines should be appended to `hosts.allow`:

```
# This line is required for POP3 connections:
qpopper : ALL : allow
```

After adding this line, `inetd` will need restarted. This can be accomplished by use of the kill(1) command, or with the *`restart`* parameter with `/etc/rc.d/inetd`.

15.6.2 Advanced Configuration

TCP Wrappers has advanced options too; they will allow for more control over the way connections are handled. In some cases it may be a good idea to return a comment to certain hosts or daemon connections. In other cases, perhaps a log file should be recorded or an email sent to the administrator. Other situations may require the use of a service for local connections only. This is all possible through the use of configuration options known as `wildcards`, expansion characters and external command execution. The next two sections are written to cover these situations.

15.6.2.1 External Commands

Suppose that a situation occurs where a connection should be denied yet a reason should be sent to the individual who attempted to establish that connection. How could it be done? That action can be made possible by using the `twist` option. When a connection attempt is made, `twist` will be called to execute a shell command or script. An example already exists in the `hosts.allow` file:

```
# The rest of the daemons are protected.
ALL : ALL \
        : severity auth.info \
        : twist /bin/echo "You are not welcome to use %d from %h."
```

This example shows that the message, “You are not allowed to use `daemon` from `hostname`.” will be returned for any daemon not previously configured in the access file. This is extremely useful for sending a reply back to the connection initiator right after the established connection is dropped. Note that any message returned *must* be wrapped in quote `"` characters; there are no exceptions to this rule.

> **Ðñïåéäïðïßçóç:** It may be possible to launch a denial of service attack on the server if an attacker, or group of attackers could flood these daemons with connection requests.

Another possibility is to use the `spawn` option in these cases. Like `twist`, the `spawn` implicitly denies the connection and may be used to run external shell commands or scripts. Unlike `twist`, `spawn` will not send a reply back to the individual who established the connection. For an example, consider the following configuration line:

```
# We do not allow connections from example.com:
ALL : .example.com \
        : spawn (/bin/echo %a from %h attempted to access %d >> \
          /var/log/connections.log) \
        : deny
```

This will deny all connection attempts from the `*.example.com` domain; simultaneously logging the hostname, IP address and the daemon which they attempted to access in the `/var/log/connections.log` file.

Aside from the already explained substitution characters above, e.g. %a, a few others exist. See the hosts_access(5) manual page for the complete list.

15.6.2.2 Wildcard Options

Thus far the `ALL` example has been used continuously throughout the examples. Other options exist which could extend the functionality a bit further. For instance, `ALL` may be used to match every instance of either a daemon, domain or an IP address. Another wildcard available is `PARANOID` which may be used to match any host which provides an IP address that may be forged. In other words, `paranoid` may be used to define an action to be taken whenever a connection is made from an IP address that differs from its hostname. The following example may shed some more light on this discussion:

```
# Block possibly spoofed requests to sendmail:
```

```
sendmail : PARANOID : deny
```

In that example all connection requests to `sendmail` which have an IP address that varies from its hostname will be denied.

> **Ðñïóï÷Þ:** Using the `PARANOID` may severely cripple servers if the client or server has a broken DNS setup. Administrator discretion is advised.

To learn more about wildcards and their associated functionality, see the hosts_access(5) manual page.

Before any of the specific configuration lines above will work, the first configuration line should be commented out in `hosts.allow`. This was noted at the beginning of this section.

15.7 KerberosIV

Contributed by Mark Murray. Based on a contribution by Mark Dapoz.

Kerberos is a network add-on system/protocol that allows users to authenticate themselves through the services of a secure server. Services such as remote login, remote copy, secure inter-system file copying and other high-risk tasks are made considerably safer and more controllable.

The following instructions can be used as a guide on how to set up Kerberos as distributed for FreeBSD. However, you should refer to the relevant manual pages for a complete description.

15.7.1 Installing KerberosIV

Kerberos is an optional component of FreeBSD. The easiest way to install this software is by selecting the `krb4` or `krb5` distribution in **sysinstall** during the initial installation of FreeBSD. This will install the "eBones" (KerberosIV) or "Heimdal" (Kerberos5) implementation of Kerberos. These implementations are included because they are developed outside the USA/Canada and were thus available to system owners outside those countries during the era of restrictive export controls on cryptographic code from the USA.

Alternatively, the MIT implementation of Kerberos is available from the Ports Collection as `security/krb5`.

15.7.2 Creating the Initial Database

This is done on the Kerberos server only. First make sure that you do not have any old Kerberos databases around. You should change to the directory `/etc/kerberosIV` and check that only the following files are present:

```
# cd /etc/kerberosIV
# ls
README          krb.conf        krb.realms
```

If any additional files (such as `principal.*` or `master_key`) exist, then use the `kdb_destroy` command to destroy the old Kerberos database, or if Kerberos is not running, simply delete the extra files.

You should now edit the `krb.conf` and `krb.realms` files to define your Kerberos realm. In this case the realm will be `EXAMPLE.COM` and the server is `grunt.example.com`. We edit or create the `krb.conf` file:

```
# cat krb.conf
EXAMPLE.COM
EXAMPLE.COM grunt.example.com admin server
CS.BERKELEY.EDU okeeffe.berkeley.edu
ATHENA.MIT.EDU kerberos.mit.edu
ATHENA.MIT.EDU kerberos-1.mit.edu
ATHENA.MIT.EDU kerberos-2.mit.edu
ATHENA.MIT.EDU kerberos-3.mit.edu
LCS.MIT.EDU kerberos.lcs.mit.edu
TELECOM.MIT.EDU bitsy.mit.edu
ARC.NASA.GOV trident.arc.nasa.gov
```

In this case, the other realms do not need to be there. They are here as an example of how a machine may be made aware of multiple realms. You may wish to not include them for simplicity.

The first line names the realm in which this system works. The other lines contain realm/host entries. The first item on a line is a realm, and the second is a host in that realm that is acting as a "key distribution center". The words `admin server` following a host's name means that host also provides an administrative database server. For further explanation of these terms, please consult the Kerberos manual pages.

Now we have to add `grunt.example.com` to the `EXAMPLE.COM` realm and also add an entry to put all hosts in the `.example.com` domain in the `EXAMPLE.COM` realm. The `krb.realms` file would be updated as follows:

```
# cat krb.realms
grunt.example.com EXAMPLE.COM
.example.com EXAMPLE.COM
.berkeley.edu CS.BERKELEY.EDU
.MIT.EDU ATHENA.MIT.EDU
.mit.edu ATHENA.MIT.EDU
```

Again, the other realms do not need to be there. They are here as an example of how a machine may be made aware of multiple realms. You may wish to remove them to simplify things.

The first line puts the *specific* system into the named realm. The rest of the lines show how to default systems of a particular subdomain to a named realm.

Now we are ready to create the database. This only needs to run on the Kerberos server (or Key Distribution Center). Issue the `kdb_init` command to do this:

```
# kdb_init
Realm name [default  ATHENA.MIT.EDU ]: EXAMPLE.COM
You will be prompted for the database Master Password.
It is important that you NOT FORGET this password.

Enter Kerberos master key:
```

Now we have to save the key so that servers on the local machine can pick it up. Use the `kstash` command to do this:

```
# kstash

Enter Kerberos master key:
```

```
Current Kerberos master key version is 1.

Master key entered. BEWARE!
```

This saves the encrypted master password in `/etc/kerberosIV/master_key`.

15.7.3 Making It All Run

Two principals need to be added to the database for *each* system that will be secured with Kerberos. Their names are `kpasswd` and `rcmd`. These two principals are made for each system, with the instance being the name of the individual system.

These daemons, **kpasswd** and **rcmd** allow other systems to change Kerberos passwords and run commands like rcp(1), rlogin(1) and rsh(1).

Now let us add these entries:

```
# kdb_edit
Opening database...

Enter Kerberos master key:

Current Kerberos master key version is 1.

Master key entered.  BEWARE!
Previous or default values are in [brackets] ,
enter return to leave the same, or new value.

Principal name: passwd
Instance: grunt

<Not found>, Create [y] ? y

Principal: passwd, Instance: grunt, kdc_key_ver: 1
New Password:                     <---- enter RANDOM here
Verifying password

New Password: <---- enter RANDOM here

Random password [y] ? y

Principal's new key version = 1
Expiration date (enter yyyy-mm-dd) [ 2000-01-01 ] ?
Max ticket lifetime (*5 minutes) [ 255 ] ?
Attributes [ 0 ] ?
Edit O.K.
Principal name: rcmd
Instance: grunt

<Not found>, Create [y] ?

Principal: rcmd, Instance: grunt, kdc_key_ver: 1
New Password:            <---- enter RANDOM here
```

```
Verifying password

New Password:            <---- enter RANDOM here

Random password [y] ?

Principal’s new key version = 1
Expiration date (enter yyyy-mm-dd) [ 2000-01-01 ] ?
Max ticket lifetime (*5 minutes) [ 255 ] ?
Attributes [ 0 ] ?
Edit O.K.
Principal name:          <---- null entry here will cause an exit
```

15.7.4 Creating the Server File

We now have to extract all the instances which define the services on each machine. For this we use the `ext_srvtab` command. This will create a file which must be copied or moved *by secure means* to each Kerberos client’s `/etc` directory. This file must be present on each server and client, and is crucial to the operation of Kerberos.

```
# ext_srvtab grunt
Enter Kerberos master key:

Current Kerberos master key version is 1.

Master key entered. BEWARE!
Generating ’grunt-new-srvtab’....
```

Now, this command only generates a temporary file which must be renamed to `srvtab` so that all the servers can pick it up. Use the mv(1) command to move it into place on the original system:

```
# mv grunt-new-srvtab srvtab
```

If the file is for a client system, and the network is not deemed safe, then copy the `client-new-srvtab` to removable media and transport it by secure physical means. Be sure to rename it to `srvtab` in the client’s `/etc` directory, and make sure it is mode 600:

```
# mv grumble-new-srvtab srvtab
# chmod 600 srvtab
```

15.7.5 Populating the Database

We now have to add some user entries into the database. First let us create an entry for the user `jane`. Use the `kdb_edit` command to do this:

```
# kdb_edit
Opening database...

Enter Kerberos master key:

Current Kerberos master key version is 1.
```

```
Master key entered.  BEWARE!
Previous or default values are in [brackets] ,
enter return to leave the same, or new value.

Principal name: jane
Instance:

<Not found>, Create [y] ? y

Principal: jane, Instance: , kdc_key_ver: 1
New Password:                <---- enter a secure password here
Verifying password

New Password:                <---- re-enter the password here
Principal's new key version = 1
Expiration date (enter yyyy-mm-dd) [ 2000-01-01 ] ?
Max ticket lifetime (*5 minutes) [ 255 ] ?
Attributes [ 0 ] ?
Edit O.K.
Principal name:            <---- null entry here will cause an exit
```

15.7.6 Testing It All Out

First we have to start the Kerberos daemons. Note that if you have correctly edited your `/etc/rc.conf` then this will happen automatically when you reboot. This is only necessary on the Kerberos server. Kerberos clients will automatically get what they need from the `/etc/kerberosIV` directory.

```
# kerberos &
Kerberos server starting
Sleep forever on error
Log file is /var/log/kerberos.log
Current Kerberos master key version is 1.

Master key entered. BEWARE!

Current Kerberos master key version is 1
Local realm: EXAMPLE.COM
# kadmind -n &
KADM Server KADM0.0A initializing
Please do not use 'kill -9' to kill this job, use a
regular kill instead

Current Kerberos master key version is 1.

Master key entered.  BEWARE!
```

Now we can try using the `kinit` command to get a ticket for the ID `jane` that we created above:

```
% kinit jane
MIT Project Athena (grunt.example.com)
Kerberos Initialization for "jane"
```

```
Password:
```

Try listing the tokens using `klist` to see if we really have them:

```
% klist
Ticket file:    /tmp/tkt245
Principal:      jane@EXAMPLE.COM

  Issued           Expires          Principal
Apr 30 11:23:22  Apr 30 19:23:22  krbtgt.EXAMPLE.COM@EXAMPLE.COM
```

Now try changing the password using passwd(1) to check if the **kpasswd** daemon can get authorization to the Kerberos database:

```
% passwd
realm EXAMPLE.COM
Old password for jane:
New Password for jane:
Verifying password
New Password for jane:
Password changed.
```

15.7.7 Adding su Privileges

Kerberos allows us to give *each* user who needs `root` privileges their own *separate* su(1) password. We could now add an ID which is authorized to su(1) to `root`. This is controlled by having an instance of `root` associated with a principal. Using `kdb_edit` we can create the entry `jane.root` in the Kerberos database:

```
# kdb_edit
Opening database...

Enter Kerberos master key:

Current Kerberos master key version is 1.

Master key entered.  BEWARE!
Previous or default values are in [brackets] ,
enter return to leave the same, or new value.

Principal name: jane
Instance: root

<Not found>, Create [y] ? y

Principal: jane, Instance: root, kdc_key_ver: 1
New Password:                    <---- enter a SECURE password here
Verifying password

New Password:                    <---- re-enter the password here

Principal's new key version = 1
Expiration date (enter yyyy-mm-dd) [ 2000-01-01 ] ?
```

```
Max ticket lifetime (*5 minutes) [ 255 ] ? 12 <--- Keep this short!
Attributes [ 0 ] ?
Edit O.K.
Principal name:                    <---- null entry here will cause an exit
```

Now try getting tokens for it to make sure it works:

```
# kinit jane.root
MIT Project Athena (grunt.example.com)
Kerberos Initialization for "jane.root"
Password:
```

Now we need to add the user to `root`'s `.klogin` file:

```
# cat /root/.klogin
jane.root@EXAMPLE.COM
```

Now try doing the su(1):

```
% su
Password:
```

and take a look at what tokens we have:

```
# klist
Ticket file:    /tmp/tkt_root_245
Principal:      jane.root@EXAMPLE.COM

  Issued           Expires          Principal
May  2 20:43:12  May  3 04:43:12  krbtgt.EXAMPLE.COM@EXAMPLE.COM
```

15.7.8 Using Other Commands

In an earlier example, we created a principal called `jane` with an instance `root`. This was based on a user with the same name as the principal, and this is a Kerberos default; that a <`principal`>.<`instance`> of the form <`username`>`.root` will allow that <`username`> to su(1) to `root` if the necessary entries are in the `.klogin` file in `root`'s home directory:

```
# cat /root/.klogin
jane.root@EXAMPLE.COM
```

Likewise, if a user has in their own home directory lines of the form:

```
% cat ~/.klogin
jane@EXAMPLE.COM
jack@EXAMPLE.COM
```

This allows anyone in the `EXAMPLE.COM` realm who has authenticated themselves as `jane` or `jack` (via `kinit`, see above) to access to `jane`'s account or files on this system (`grunt`) via rlogin(1), rsh(1) or rcp(1).

For example, `jane` now logs into another system using Kerberos:

```
% kinit
```

```
MIT Project Athena (grunt.example.com)
Password:
% rlogin grunt
Last login: Mon May  1 21:14:47 from grumble
Copyright (c) 1980, 1983, 1986, 1988, 1990, 1991, 1993, 1994
        The Regents of the University of California.   All rights reserved.

FreeBSD BUILT-19950429 (GR386) #0: Sat Apr 29 17:50:09 SAT 1995
```

Or `jack` logs into `jane`’s account on the same machine (`jane` having set up the `.klogin` file as above, and the person in charge of Kerberos having set up principal *jack* with a null instance):

```
% kinit
% rlogin grunt -l jane
MIT Project Athena (grunt.example.com)
Password:
Last login: Mon May  1 21:16:55 from grumble
Copyright (c) 1980, 1983, 1986, 1988, 1990, 1991, 1993, 1994
        The Regents of the University of California.   All rights reserved.
FreeBSD BUILT-19950429 (GR386) #0: Sat Apr 29 17:50:09 SAT 1995
```

15.8 Kerberos5

Contributed by Tillman Hodgson. Based on a contribution by Mark Murray.

Every FreeBSD release beyond FreeBSD-5.1 includes support only for **Kerberos5**. Hence **Kerberos5** is the only version included, and its configuration is similar in many aspects to that of **KerberosIV**. The following information only applies to **Kerberos5** in post FreeBSD-5.0 releases. Users who wish to use the **KerberosIV** package may install the `security/krb4` port.

Kerberos is a network add-on system/protocol that allows users to authenticate themselves through the services of a secure server. Services such as remote login, remote copy, secure inter-system file copying and other high-risk tasks are made considerably safer and more controllable.

Kerberos can be described as an identity-verifying proxy system. It can also be described as a trusted third-party authentication system. **Kerberos** provides only one function — the secure authentication of users on the network. It does not provide authorization functions (what users are allowed to do) or auditing functions (what those users did). After a client and server have used **Kerberos** to prove their identity, they can also encrypt all of their communications to assure privacy and data integrity as they go about their business.

Therefore it is highly recommended that **Kerberos** be used with other security methods which provide authorization and audit services.

The following instructions can be used as a guide on how to set up **Kerberos** as distributed for FreeBSD. However, you should refer to the relevant manual pages for a complete description.

For purposes of demonstrating a **Kerberos** installation, the various name spaces will be handled as follows:

- The DNS domain (“zone”) will be example.org.
- The **Kerberos** realm will be EXAMPLE.ORG.

> **Óçìåßùóç:** Please use real domain names when setting up **Kerberos** even if you intend to run it internally. This avoids DNS problems and assures inter-operation with other **Kerberos** realms.

15.8.1 History

Kerberos was created by MIT as a solution to network security problems. The **Kerberos** protocol uses strong cryptography so that a client can prove its identity to a server (and vice versa) across an insecure network connection.

Kerberos is both the name of a network authentication protocol and an adjective to describe programs that implement the program (**Kerberos** telnet, for example). The current version of the protocol is version 5, described in RFC 1510.

Several free implementations of this protocol are available, covering a wide range of operating systems. The Massachusetts Institute of Technology (MIT), where **Kerberos** was originally developed, continues to develop their **Kerberos** package. It is commonly used in the US as a cryptography product, as such it has historically been affected by US export regulations. The MIT **Kerberos** is available as a port (`security/krb5`). Heimdal **Kerberos** is another version 5 implementation, and was explicitly developed outside of the US to avoid export regulations (and is thus often included in non-commercial UNIX variants). The Heimdal **Kerberos** distribution is available as a port (`security/heimdal`), and a minimal installation of it is included in the base FreeBSD install.

In order to reach the widest audience, these instructions assume the use of the Heimdal distribution included in FreeBSD.

15.8.2 Setting up a Heimdal KDC

The Key Distribution Center (KDC) is the centralized authentication service that **Kerberos** provides — it is the computer that issues **Kerberos** tickets. The KDC is considered “trusted” by all other computers in the **Kerberos** realm, and thus has heightened security concerns.

Note that while running the **Kerberos** server requires very few computing resources, a dedicated machine acting only as a KDC is recommended for security reasons.

To begin setting up a KDC, ensure that your `/etc/rc.conf` file contains the correct settings to act as a KDC (you may need to adjust paths to reflect your own system):

```
kerberos5_server_enable="YES"
kadmind5_server_enable="YES"
```

Next we will set up your **Kerberos** config file, `/etc/krb5.conf`:

```
[libdefaults]
    default_realm = EXAMPLE.ORG
[realms]
    EXAMPLE.ORG = {
        kdc = kerberos.example.org
        admin_server = kerberos.example.org
    }
[domain_realm]
    .example.org = EXAMPLE.ORG
```

Note that this `/etc/krb5.conf` file implies that your KDC will have the fully-qualified hostname of `kerberos.example.org`. You will need to add a CNAME (alias) entry to your zone file to accomplish this if your KDC has a different hostname.

> **Óçìåßùóç:** For large networks with a properly configured BIND DNS server, the above example could be trimmed to:
>
> ```
> [libdefaults]
>       default_realm = EXAMPLE.ORG
> ```
>
> With the following lines being appended to the `example.org` zonefile:
>
> ```
> _kerberos._udp      IN  SRV     01 00 88 kerberos.example.org.
> _kerberos._tcp      IN  SRV     01 00 88 kerberos.example.org.
> _kpasswd._udp       IN  SRV     01 00 464 kerberos.example.org.
> _kerberos-adm._tcp  IN  SRV     01 00 749 kerberos.example.org.
> _kerberos           IN  TXT     EXAMPLE.ORG
> ```

> **Óçìåßùóç:** For clients to be able to find the **Kerberos** services, you *must* have either a fully configured `/etc/krb5.conf` or a minimally configured `/etc/krb5.conf` *and* a properly configured DNS server.

Next we will create the **Kerberos** database. This database contains the keys of all principals encrypted with a master password. You are not required to remember this password, it will be stored in a file (`/var/heimdal/m-key`). To create the master key, run `kstash` and enter a password.

Once the master key has been created, you can initialize the database using the `kadmin` program with the `-l` option (standing for “local”). This option instructs `kadmin` to modify the database files directly rather than going through the `kadmind` network service. This handles the chicken-and-egg problem of trying to connect to the database before it is created. Once you have the `kadmin` prompt, use the `init` command to create your realms initial database.

Lastly, while still in `kadmin`, create your first principal using the `add` command. Stick to the defaults options for the principal for now, you can always change them later with the `modify` command. Note that you can use the `?` command at any prompt to see the available options.

A sample database creation session is shown below:

```
# kstash
Master key: xxxxxxxx
Verifying password - Master key: xxxxxxxx

# kadmin -l
kadmin> init EXAMPLE.ORG
Realm max ticket life [unlimited]:
kadmin> add tillman
Max ticket life [unlimited]:
Max renewable life [unlimited]:
Attributes []:
Password: xxxxxxxx
Verifying password - Password: xxxxxxxx
```

Now it is time to start up the KDC services. Run `/etc/rc.d/kerberos start` and `/etc/rc.d/kadmind start` to bring up the services. Note that you will not have any kerberized daemons running at this point but you should be able to confirm the that the KDC is functioning by obtaining and listing a ticket for the principal (user) that you just created from the command-line of the KDC itself:

```
% kinit tillman
tillman@EXAMPLE.ORG’s Password:

% klist
Credentials cache: FILE:/tmp/krb5cc_500
        Principal: tillman@EXAMPLE.ORG

  Issued           Expires          Principal
Aug 27 15:37:58  Aug 28 01:37:58  krbtgt/EXAMPLE.ORG@EXAMPLE.ORG
```

The ticket can then be revoked when you have finished:

```
% k5destroy
```

15.8.3 Kerberos enabling a server with Heimdal services

First, we need a copy of the **Kerberos** configuration file, `/etc/krb5.conf`. To do so, simply copy it over to the client computer from the KDC in a secure fashion (using network utilities, such as scp(1), or physically via a floppy disk).

Next you need a `/etc/krb5.keytab` file. This is the major difference between a server providing **Kerberos** enabled daemons and a workstation — the server must have a `keytab` file. This file contains the server’s host key, which allows it and the KDC to verify each others identity. It must be transmitted to the server in a secure fashion, as the security of the server can be broken if the key is made public. This explicitly means that transferring it via a clear text channel, such as FTP, is a very bad idea.

Typically, you transfer to the `keytab` to the server using the `kadmin` program. This is handy because you also need to create the host principal (the KDC end of the `krb5.keytab`) using `kadmin`.

Note that you must have already obtained a ticket and that this ticket must be allowed to use the `kadmin` interface in the `kadmind.acl`. See the section titled “Remote administration” in the Heimdal info pages (`info heimdal`) for details on designing access control lists. If you do not want to enable remote `kadmin` access, you can simply securely connect to the KDC (via local console, ssh(1) or **Kerberos** telnet(1)) and perform administration locally using `kadmin -l`.

After installing the `/etc/krb5.conf` file, you can use `kadmin` from the **Kerberos** server. The `add --random-key` command will let you add the server’s host principal, and the `ext` command will allow you to extract the server’s host principal to its own keytab. For example:

```
# kadmin
kadmin> add --random-key host/myserver.example.org
Max ticket life [unlimited]:
Max renewable life [unlimited]:
Attributes []:
kadmin> ext host/myserver.example.org
kadmin> exit
```

Note that the `ext` command (short for “extract”) stores the extracted key in `/etc/krb5.keytab` by default.

If you do not have `kadmind` running on the KDC (possibly for security reasons) and thus do not have access to `kadmin` remotely, you can add the host principal (`host/myserver.EXAMPLE.ORG`) directly on the KDC and then extract it to a temporary file (to avoid over-writing the `/etc/krb5.keytab` on the KDC) using something like this:

```
# kadmin
kadmin> ext --keytab=/tmp/example.keytab host/myserver.example.org
kadmin> exit
```

You can then securely copy the keytab to the server computer (using `scp` or a floppy, for example). Be sure to specify a non-default keytab name to avoid over-writing the keytab on the KDC.

At this point your server can communicate with the KDC (due to its `krb5.conf` file) and it can prove its own identity (due to the `krb5.keytab` file). It is now ready for you to enable some **Kerberos** services. For this example we will enable the `telnet` service by putting a line like this into your `/etc/inetd.conf` and then restarting the inetd(8) service with `/etc/rc.d/inetd restart`:

```
telnet    stream  tcp     nowait  root    /usr/libexec/telnetd  telnetd -a user
```

The critical bit is that the `-a` (for authentication) type is set to user. Consult the telnetd(8) manual page for more details.

15.8.4 Kerberos enabling a client with Heimdal

Setting up a client computer is almost trivially easy. As far as **Kerberos** configuration goes, you only need the **Kerberos** configuration file, located at `/etc/krb5.conf`. Simply securely copy it over to the client computer from the KDC.

Test your client computer by attempting to use `kinit`, `klist`, and `kdestroy` from the client to obtain, show, and then delete a ticket for the principal you created above. You should also be able to use **Kerberos** applications to connect to **Kerberos** enabled servers, though if that does not work and obtaining a ticket does the problem is likely with the server and not with the client or the KDC.

When testing an application like `telnet`, try using a packet sniffer (such as tcpdump(1)) to confirm that your password is not sent in the clear. Try using `telnet` with the `-x` option, which encrypts the entire data stream (similar to `ssh`).

Various non-core **Kerberos** client applications are also installed by default. This is where the “minimal” nature of the base Heimdal installation is felt: `telnet` is the only **Kerberos** enabled service.

The Heimdal port adds some of the missing client applications: **Kerberos** enabled versions of `ftp`, `rsh`, `rcp`, `rlogin`, and a few other less common programs. The MIT port also contains a full suite of **Kerberos** client applications.

15.8.5 User configuration files: `.k5login` and `.k5users`

Users within a realm typically have their **Kerberos** principal (such as `tillman@EXAMPLE.ORG`) mapped to a local user account (such as a local account named `tillman`). Client applications such as `telnet` usually do not require a user name or a principal.

Occasionally, however, you want to grant access to a local user account to someone who does not have a matching **Kerberos** principal. For example, `tillman@EXAMPLE.ORG` may need access to the local user account `webdevelopers`. Other principals may also need access to that local account.

The `.k5login` and `.k5users` files, placed in a users home directory, can be used similar to a powerful combination of `.hosts` and `.rhosts`, solving this problem. For example, if a `.k5login` with the following contents:

```
tillman@example.org
jdoe@example.org
```

Were to be placed into the home directory of the local user `webdevelopers` then both principals listed would have access to that account without requiring a shared password.

Reading the manual pages for these commands is recommended. Note that the `ksu` manual page covers `.k5users`.

15.8.6 Kerberos Tips, Tricks, and Troubleshooting

- When using either the Heimdal or MIT **Kerberos** ports ensure that your `PATH` environment variable lists the **Kerberos** versions of the client applications before the system versions.
- Do all the computers in your realm have synchronized time settings? If not, authentication may fail. ÔìÞìá 30.10 describes how to synchronize clocks using NTP.
- MIT and Heimdal inter-operate nicely. Except for `kadmin`, the protocol for which is not standardized.
- If you change your hostname, you also need to change your `host/` principal and update your keytab. This also applies to special keytab entries like the `www/` principal used for Apache's `www/mod_auth_kerb`.
- All hosts in your realm must be resolvable (both forwards and reverse) in DNS (or `/etc/hosts` as a minimum). CNAMEs will work, but the A and PTR records must be correct and in place. The error message is not very intuitive: `Kerberos5 refuses authentication because Read req failed: Key table entry not found`.
- Some operating systems that may being acting as clients to your KDC do not set the permissions for `ksu` to be setuid `root`. This means that `ksu` does not work, which is a good security idea but annoying. This is not a KDC error.
- With MIT **Kerberos**, if you want to allow a principal to have a ticket life longer than the default ten hours, you must use `modify_principal` in `kadmin` to change the maxlife of both the principal in question and the `krbtgt` principal. Then the principal can use the `-l` option with `kinit` to request a ticket with a longer lifetime.
-

> **Óçìåßùóç:** If you run a packet sniffer on your KDC to add in troubleshooting and then run `kinit` from a workstation, you will notice that your TGT is sent immediately upon running `kinit` — even before you type your password! The explanation is that the **Kerberos** server freely transmits a TGT (Ticket Granting Ticket) to any unauthorized request; however, every TGT is encrypted in a key derived from the user's password. Therefore, when a user types their password it is not being sent to the KDC, it is being used to decrypt the TGT that `kinit` already obtained. If the decryption process results in a valid ticket with a valid time stamp, the user has valid **Kerberos** credentials. These credentials include a session key for establishing secure communications with the **Kerberos** server in the future, as well as the actual ticket-granting ticket, which is actually encrypted with the **Kerberos** server's own key. This second layer of encryption is unknown to the user, but it is what allows the **Kerberos** server to verify the authenticity of each TGT.

- If you want to use long ticket lifetimes (a week, for example) and you are using **OpenSSH** to connect to the machine where your ticket is stored, make sure that **Kerberos** `TicketCleanup` is set to `no` in your `sshd_config` or else your tickets will be deleted when you log out.
- Remember that host principals can have a longer ticket lifetime as well. If your user principal has a lifetime of a week but the host you are connecting to has a lifetime of nine hours, you will have an expired host principal in your cache and the ticket cache will not work as expected.
- When setting up a `krb5.dict` file to prevent specific bad passwords from being used (the manual page for `kadmind` covers this briefly), remember that it only applies to principals that have a password policy assigned to them. The `krb5.dict` files format is simple: one string per line. Creating a symbolic link to `/usr/share/dict/words` might be useful.

15.8.7 Differences with the MIT port

The major difference between the MIT and Heimdal installs relates to the `kadmin` program which has a different (but equivalent) set of commands and uses a different protocol. This has a large implications if your KDC is MIT as you will not be able to use the Heimdal `kadmin` program to administer your KDC remotely (or vice versa, for that matter).

The client applications may also take slightly different command line options to accomplish the same tasks. Following the instructions on the MIT **Kerberos** web site (http://web.mit.edu/Kerberos/www/) is recommended. Be careful of path issues: the MIT port installs into `/usr/local/` by default, and the “normal” system applications may be run instead of MIT if your `PATH` environment variable lists the system directories first.

> **Óçìåßùóç:** With the MIT `security/krb5` port that is provided by FreeBSD, be sure to read the `/usr/local/share/doc/krb5/README.FreeBSD` file installed by the port if you want to understand why logins via `telnetd` and `klogind` behave somewhat oddly. Most importantly, correcting the “incorrect permissions on cache file” behavior requires that the `login.krb5` binary be used for authentication so that it can properly change ownership for the forwarded credentials.

The `rc.conf` must also be modified to contain the following configuration:

```
kerberos5_server="/usr/local/sbin/krb5kdc"
kadmind5_server="/usr/local/sbin/kadmind"
kerberos5_server_enable="YES"
kadmind5_server_enable="YES"
```

This is done because the applications for MIT kerberos installs binaries in the `/usr/local` hierarchy.

15.8.8 Mitigating limitations found in Kerberos

15.8.8.1 Kerberos is an all-or-nothing approach

Every service enabled on the network must be modified to work with **Kerberos** (or be otherwise secured against network attacks) or else the users credentials could be stolen and re-used. An example of this would be **Kerberos** enabling all remote shells (via `rsh` and `telnet`, for example) but not converting the POP3 mail server which sends passwords in plain text.

15.8.8.2 Kerberos is intended for single-user workstations

In a multi-user environment, **Kerberos** is less secure. This is because it stores the tickets in the `/tmp` directory, which is readable by all users. If a user is sharing a computer with several other people simultaneously (i.e. multi-user), it is possible that the user’s tickets can be stolen (copied) by another user.

This can be overcome with the `-c` filename command-line option or (preferably) the `KRB5CCNAME` environment variable, but this is rarely done. In principal, storing the ticket in the users home directory and using simple file permissions can mitigate this problem.

15.8.8.3 The KDC is a single point of failure

By design, the KDC must be as secure as the master password database is contained on it. The KDC should have absolutely no other services running on it and should be physically secured. The danger is high because **Kerberos** stores all passwords encrypted with the same key (the “master” key), which in turn is stored as a file on the KDC.

As a side note, a compromised master key is not quite as bad as one might normally fear. The master key is only used to encrypt the **Kerberos** database and as a seed for the random number generator. As long as access to your KDC is secure, an attacker cannot do much with the master key.

Additionally, if the KDC is unavailable (perhaps due to a denial of service attack or network problems) the network services are unusable as authentication can not be performed, a recipe for a denial-of-service attack. This can alleviated with multiple KDCs (a single master and one or more slaves) and with careful implementation of secondary or fall-back authentication (PAM is excellent for this).

15.8.8.4 Kerberos Shortcomings

Kerberos allows users, hosts and services to authenticate between themselves. It does not have a mechanism to authenticate the KDC to the users, hosts or services. This means that a trojanned `kinit` (for example) could record all user names and passwords. Something like `security/tripwire` or other file system integrity checking tools can alleviate this.

15.8.9 Resources and further information

- The **Kerberos** FAQ (http://www.faqs.org/faqs/Kerberos-faq/general/preamble.html)
- Designing an Authentication System: a Dialog in Four Scenes (http://web.mit.edu/Kerberos/www/dialogue.html)

- RFC 1510, The **Kerberos** Network Authentication Service (V5) (http://www.ietf.org/rfc/rfc1510.txt?number=1510)
- MIT **Kerberos** home page (http://web.mit.edu/Kerberos/www/)
- Heimdal **Kerberos** home page (http://www.pdc.kth.se/heimdal/)

15.9 OpenSSL

Written by: Tom Rhodes.

One feature that many users overlook is the **OpenSSL** toolkit included in FreeBSD. **OpenSSL** provides an encryption transport layer on top of the normal communications layer; thus allowing it to be intertwined with many network applications and services.

Some uses of **OpenSSL** may include encrypted authentication of mail clients, web based transactions such as credit card payments and more. Many ports such as `www/apache13-ssl`, and `mail/sylpheed-claws` will offer compilation support for building with **OpenSSL**.

> **Óçìåßùóç:** In most cases the Ports Collection will attempt to build the `security/openssl` port unless the `WITH_OPENSSL_BASE` make variable is explicitly set to “yes”.

The version of **OpenSSL** included in FreeBSD supports Secure Sockets Layer v2/v3 (SSLv2/SSLv3), Transport Layer Security v1 (TLSv1) network security protocols and can be used as a general cryptographic library.

> **Óçìåßùóç:** While **OpenSSL** supports the IDEA algorithm, it is disabled by default due to United States patents. To use it, the license should be reviewed and, if the restrictions are acceptable, the `MAKE_IDEA` variable must be set in `make.conf`.

One of the most common uses of **OpenSSL** is to provide certificates for use with software applications. These certificates ensure that the credentials of the company or individual are valid and not fraudulent. If the certificate in question has not been verified by one of the several “Certificate Authorities”, or CAs, a warning is usually produced. A Certificate Authority is a company, such as VeriSign (http://www.verisign.com), which will sign certificates in order to validate credentials of individuals or companies. This process has a cost associated with it and is definitely not a requirement for using certificates; however, it can put some of the more paranoid users at ease.

15.9.1 Generating Certificates

To generate a certificate, the following command is available:

```
# openssl req -new -nodes -out req.pem -keyout cert.pem
Generating a 1024 bit RSA private key
................++++++
.......................................++++++
writing new private key to ’cert.pem’
-----
You are about to be asked to enter information that will be incorporated
```

```
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter ’.’, the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:PA
Locality Name (eg, city) []:Pittsburgh
Organization Name (eg, company) [Internet Widgits Pty Ltd]:My Company
Organizational Unit Name (eg, section) []:Systems Administrator
Common Name (eg, YOUR name) []:localhost.example.org
Email Address []:trhodes@FreeBSD.org

Please enter the following ’extra’ attributes
to be sent with your certificate request
A challenge password []:SOME PASSWORD
An optional company name []:Another Name
```

Notice the response directly after the “Common Name” prompt shows a domain name. This prompt requires a server name to be entered for verification purposes; placing anything but a domain name would yield a useless certificate. Other options, for instance expire time, alternate encryption algorithms, etc. are available. A complete list may be obtained by viewing the openssl(1) manual page.

Two files should now exist in the directory in which the aforementioned command was issued. The certificate request, `req.pem`, may be sent to a certificate authority who will validate the credentials that you entered, sign the request and return the certificate to you. The second file created will be named `cert.pem` and is the private key for the certificate and should be protected at all costs; if this falls in the hands of others it can be used to impersonate you (or your server).

In cases where a signature from a CA is not required, a self signed certificate can be created. First, generate the RSA key:

```
# openssl dsaparam -rand -genkey -out myRSA.key 1024
```

Next, generate the CA key:

```
# openssl gendsa -des3 -out myca.key myRSA.key
```

Use this key to create the certificate:

```
# openssl req -new -x509 -days 365 -key myca.key -out new.crt
```

Two new files should appear in the directory: a certificate authority signature file, `myca.key` and the certificate itself, `new.crt`. These should be placed in a directory, preferably under `/etc`, which is readable only by `root`. Permissions of 0700 should be fine for this and they can be set with the `chmod` utility.

15.9.2 Using Certificates, an Example

So what can these files do? A good use would be to encrypt connections to the **Sendmail** MTA. This would dissolve the use of clear text authentication for users who send mail via the local MTA.

> **Óçìåßùóç:** This is not the best use in the world as some MUAs will present the user with an error if they have not installed the certificate locally. Refer to the documentation included with the software for more information on certificate installation.

The following lines should be placed inside the local `.mc` file:

```
dnl SSL Options
define(‘confCACERT_PATH’,‘/etc/certs’)dnl
define(‘confCACERT’,‘/etc/certs/new.crt’)dnl
define(‘confSERVER_CERT’,‘/etc/certs/new.crt’)dnl
define(‘confSERVER_KEY’,‘/etc/certs/myca.key’)dnl
define(‘confTLS_SRV_OPTIONS’, ‘V’)dnl
```

Where `/etc/certs/` is the directory to be used for storing the certificate and key files locally. The last few requirements are a rebuild of the local `.cf` file. This is easily achieved by typing `make` *`install`* within the `/etc/mail` directory. Follow that up with `make` *`restart`* which should start the **Sendmail** daemon.

If all went well there will be no error messages in the `/var/log/maillog` file and **Sendmail** will show up in the process list.

For a simple test, simply connect to the mail server using the telnet(1) utility:

```
# telnet example.com 25
Trying 192.0.34.166...
Connected to example.com.
Escape character is ’^]’.
220 example.com ESMTP Sendmail 8.12.10/8.12.10; Tue, 31 Aug 2004 03:41:22 -0400 (EDT)
ehlo example.com
250-example.com Hello example.com [192.0.34.166], pleased to meet you
250-ENHANCEDSTATUSCODES
250-PIPELINING
250-8BITMIME
250-SIZE
250-DSN
250-ETRN
250-AUTH LOGIN PLAIN
250-STARTTLS
250-DELIVERBY
250 HELP
quit
221 2.0.0 example.com closing connection
Connection closed by foreign host.
```

If the “STARTTLS” line appears in the output then everything is working correctly.

15.10 VPN over IPsec

Written by Nik Clayton.

Creating a VPN between two networks, separated by the Internet, using FreeBSD gateways.

15.10.1 Understanding IPsec

Written by Hiten M. Pandya.

This section will guide you through the process of setting up IPsec, and to use it in an environment which consists of FreeBSD and **Microsoft Windows 2000/XP** machines, to make them communicate securely. In order to set up IPsec, it is necessary that you are familiar with the concepts of building a custom kernel (see ÊåöÜëáéï 9).

IPsec is a protocol which sits on top of the Internet Protocol (IP) layer. It allows two or more hosts to communicate in a secure manner (hence the name). The FreeBSD IPsec “network stack” is based on the KAME (http://www.kame.net/) implementation, which has support for both protocol families, IPv4 and IPv6.

> **Óçìåßùóç:** FreeBSD contains a “hardware accelerated” IPsec stack, known as “Fast IPsec”, that was obtained from OpenBSD. It employs cryptographic hardware (whenever possible) via the crypto(4) subsystem to optimize the performance of IPsec. This subsystem is new, and does not support all the features that are available in the KAME version of IPsec. However, in order to enable hardware-accelerated IPsec, the following kernel option has to be added to your kernel configuration file:
>
> ```
> options   FAST_IPSEC  # new IPsec (cannot define w/ IPSEC)
> ```
>
> Note, that it is not currently possible to use the “Fast IPsec” subsystem in lieu of the KAME implementation of IPsec. Consult the fast_ipsec(4) manual page for more information.

> **Óçìåßùóç:** To let firewalls properly track state for gif(4) tunnels too, you have to enable the `IPSEC_FILTERGIF` in your kernel configuration:
>
> ```
> options   IPSEC_FILTERGIF  #filter ipsec packets from a tunnel
> ```

IPsec consists of two sub-protocols:

- *Encapsulated Security Payload (ESP)*, protects the IP packet data from third party interference, by encrypting the contents using symmetric cryptography algorithms (like Blowfish, 3DES).
- *Authentication Header (AH)*, protects the IP packet header from third party interference and spoofing, by computing a cryptographic checksum and hashing the IP packet header fields with a secure hashing function. This is then followed by an additional header that contains the hash, to allow the information in the packet to be authenticated.

ESP and AH can either be used together or separately, depending on the environment.

IPsec can either be used to directly encrypt the traffic between two hosts (known as *Transport Mode*); or to build “virtual tunnels” between two subnets, which could be used for secure communication between two corporate networks (known as *Tunnel Mode*). The latter is more commonly known as a *Virtual Private Network (VPN)*. The ipsec(4) manual page should be consulted for detailed information on the IPsec subsystem in FreeBSD.

To add IPsec support to your kernel, add the following options to your kernel configuration file:

```
options   IPSEC        #IP security
options   IPSEC_ESP    #IP security (crypto; define w/ IPSEC)
```

If IPsec debugging support is desired, the following kernel option should also be added:

```
options   IPSEC_DEBUG  #debug for IP security
```

15.10.2 The Problem

There is no standard for what constitutes a VPN. VPNs can be implemented using a number of different technologies, each of which have their own strengths and weaknesses. This section presents a scenario, and the strategies used for implementing a VPN for this scenario.

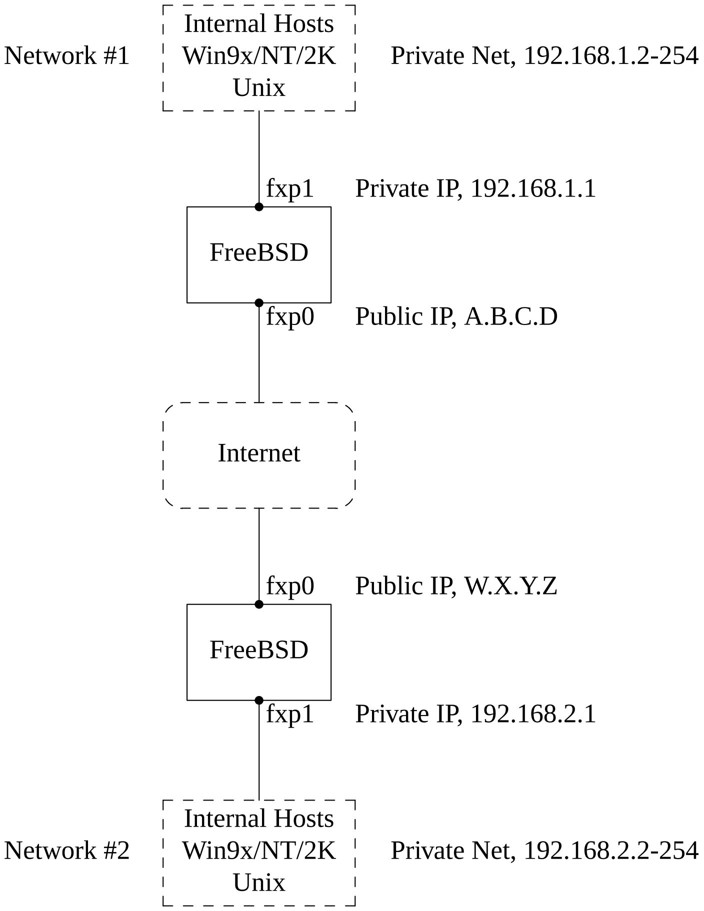
15.10.3 The Scenario: Two networks, connected to the Internet, to behave as one

The premise is as follows:

- You have at least two sites
- Both sites are using IP internally
- Both sites are connected to the Internet, through a gateway that is running FreeBSD.
- The gateway on each network has at least one public IP address.
- The internal addresses of the two networks can be public or private IP addresses, it does not matter. You can be running NAT on the gateway machine if necessary.
- The internal IP addresses of the two networks *do not collide*. While I expect it is theoretically possible to use a combination of VPN technology and NAT to get this to work, I expect it to be a configuration nightmare.

If you find that you are trying to connect two networks, both of which, internally, use the same private IP address range (e.g. both of them use `192.168.1.x`), then one of the networks will have to be renumbered.

The network topology might look something like this:


Internal Hosts
Win9x/NT/2K
Unix
Network #1
Private Net, 192.168.1.2-254
fxp1
Private IP, 192.168.1.1
FreeBSD
fxp0
Public IP, A.B.C.D
Internet
fxp0
Public IP, W.X.Y.Z
FreeBSD
fxp1
Private IP, 192.168.2.1
Internal Hosts
Win9x/NT/2K
Unix
Network #2
Private Net, 192.168.2.2-254

Notice the two public IP addresses. I will use the letters to refer to them in the rest of this article. Anywhere you see those letters in this article, replace them with your own public IP addresses. Note also that internally, the two gateway machines have .1 IP addresses, and that the two networks have different private IP addresses (`192.168.1.x` and `192.168.2.x` respectively). All the machines on the private networks have been configured to use the `.1` machine as their default gateway.

The intention is that, from a network point of view, each network should view the machines on the other network as though they were directly attached the same router -- albeit a slightly slow router with an occasional tendency to drop packets.

This means that (for example), machine `192.168.1.20` should be able to run

```
ping 192.168.2.34
```

and have it work, transparently. Windows machines should be able to see the machines on the other network, browse file shares, and so on, in exactly the same way that they can browse machines on the local network.

And the whole thing has to be secure. This means that traffic between the two networks has to be encrypted.

Creating a VPN between these two networks is a multi-step process. The stages are as follows:

1. Create a “virtual” network link between the two networks, across the Internet. Test it, using tools like ping(8), to make sure it works.

2. Apply security policies to ensure that traffic between the two networks is transparently encrypted and decrypted as necessary. Test this, using tools like tcpdump(1), to ensure that traffic is encrypted.
3. Configure additional software on the FreeBSD gateways, to allow Windows machines to see one another across the VPN.

15.10.3.1 Step 1: Creating and testing a “virtual” network link

Suppose that you were logged in to the gateway machine on network #1 (with public IP address `A.B.C.D`, private IP address `192.168.1.1`), and you ran `ping 192.168.2.1`, which is the private address of the machine with IP address `W.X.Y.Z`. What needs to happen in order for this to work?

1. The gateway machine needs to know how to reach `192.168.2.1`. In other words, it needs to have a route to `192.168.2.1`.
2. Private IP addresses, such as those in the `192.168.x` range are not supposed to appear on the Internet at large. Instead, each packet you send to `192.168.2.1` will need to be wrapped up inside another packet. This packet will need to appear to be from `A.B.C.D`, and it will have to be sent to `W.X.Y.Z`. This process is called *encapsulation*.
3. Once this packet arrives at `W.X.Y.Z` it will need to “unencapsulated”, and delivered to `192.168.2.1`.

You can think of this as requiring a “tunnel” between the two networks. The two “tunnel mouths” are the IP addresses `A.B.C.D` and `W.X.Y.Z`, and the tunnel must be told the addresses of the private IP addresses that will be allowed to pass through it. The tunnel is used to transfer traffic with private IP addresses across the public Internet.

This tunnel is created by using the generic interface, or `gif` devices on FreeBSD. As you can imagine, the `gif` interface on each gateway host must be configured with four IP addresses; two for the public IP addresses, and two for the private IP addresses.

Support for the gif device must be compiled in to the FreeBSD kernel on both machines. You can do this by adding the line:

```
device gif
```

to the kernel configuration files on both machines, and then compile, install, and reboot as normal.

Configuring the tunnel is a two step process. First the tunnel must be told what the outside (or public) IP addresses are, using ifconfig(8). Then the private IP addresses must be configured using ifconfig(8).

On the gateway machine on network #1 you would run the following commands to configure the tunnel.

```
# ifconfig gif0 create
# ifconfig gif0 tunnel A.B.C.D W.X.Y.Z
# ifconfig gif0 inet 192.168.1.1 192.168.2.1 netmask 0xffffffff
```

On the other gateway machine you run the same commands, but with the order of the IP addresses reversed.

```
# ifconfig gif0 create
# ifconfig gif0 tunnel W.X.Y.Z A.B.C.D
# ifconfig gif0 inet 192.168.2.1 192.168.1.1 netmask 0xffffffff
```

You can then run:

```
ifconfig gif0
```

to see the configuration. For example, on the network #1 gateway, you would see this:

```
# ifconfig gif0
gif0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1280
        tunnel inet A.B.C.D --> W.X.Y.Z
        inet 192.168.1.1 --> 192.168.2.1 netmask 0xffffffff
```

As you can see, a tunnel has been created between the physical addresses `A.B.C.D` and `W.X.Y.Z`, and the traffic allowed through the tunnel is that between `192.168.1.1` and `192.168.2.1`.

This will also have added an entry to the routing table on both machines, which you can examine with the command `netstat -rn`. This output is from the gateway host on network #1.

```
# netstat -rn
Routing tables

Internet:
Destination      Gateway       Flags    Refs    Use    Netif  Expire
...
192.168.2.1      192.168.1.1   UH        0        0    gif0
...
```

As the “Flags” value indicates, this is a host route, which means that each gateway knows how to reach the other gateway, but they do not know how to reach the rest of their respective networks. That problem will be fixed shortly.

It is likely that you are running a firewall on both machines. This will need to be circumvented for your VPN traffic. You might want to allow all traffic between both networks, or you might want to include firewall rules that protect both ends of the VPN from one another.

It greatly simplifies testing if you configure the firewall to allow all traffic through the VPN. You can always tighten things up later. If you are using ipfw(8) on the gateway machines then a command like

```
ipfw add 1 allow ip from any to any via gif0
```

will allow all traffic between the two end points of the VPN, without affecting your other firewall rules. Obviously you will need to run this command on both gateway hosts.

This is sufficient to allow each gateway machine to ping the other. On `192.168.1.1`, you should be able to run

```
ping 192.168.2.1
```

and get a response, and you should be able to do the same thing on the other gateway machine.

However, you will not be able to reach internal machines on either network yet. This is because of the routing -- although the gateway machines know how to reach one another, they do not know how to reach the network behind each one.

To solve this problem you must add a static route on each gateway machine. The command to do this on the first gateway would be:

```
route add 192.168.2.0 192.168.2.1 netmask 0xffffff00
```

This says “In order to reach the hosts on the network `192.168.2.0`, send the packets to the host `192.168.2.1`”. You will need to run a similar command on the other gateway, but with the `192.168.1.x` addresses instead.

IP traffic from hosts on one network will now be able to reach hosts on the other network.

That has now created two thirds of a VPN between the two networks, in as much as it is “virtual” and it is a “network”. It is not private yet. You can test this using ping(8) and tcpdump(1). Log in to the gateway host and run

```
tcpdump dst host 192.168.2.1
```

In another log in session on the same host run

```
ping 192.168.2.1
```

You will see output that looks something like this:

```
16:10:24.018080 192.168.1.1 > 192.168.2.1: icmp: echo request
16:10:24.018109 192.168.1.1 > 192.168.2.1: icmp: echo reply
16:10:25.018814 192.168.1.1 > 192.168.2.1: icmp: echo request
16:10:25.018847 192.168.1.1 > 192.168.2.1: icmp: echo reply
16:10:26.028896 192.168.1.1 > 192.168.2.1: icmp: echo request
16:10:26.029112 192.168.1.1 > 192.168.2.1: icmp: echo reply
```

As you can see, the ICMP messages are going back and forth unencrypted. If you had used the `-s` parameter to tcpdump(1) to grab more bytes of data from the packets you would see more information.

Obviously this is unacceptable. The next section will discuss securing the link between the two networks so that all traffic is automatically encrypted.

Summary:

- Configure both kernels with “device gif”.
- Edit `/etc/rc.conf` on gateway host #1 and add the following lines (replacing IP addresses as necessary).

  ```
  gif_interfaces="gif0"
  gifconfig_gif0="A.B.C.D W.X.Y.Z"
  ifconfig_gif0="inet 192.168.1.1 192.168.2.1 netmask 0xffffffff"
  static_routes="vpn"
  route_vpn="192.168.2.0 192.168.2.1 netmask 0xffffff00"
  ```

- Edit your firewall script (`/etc/rc.firewall`, or similar) on both hosts, and add

  ```
  ipfw add 1 allow ip from any to any via gif0
  ```

- Make similar changes to `/etc/rc.conf` on gateway host #2, reversing the order of IP addresses.

15.10.3.2 Step 2: Securing the link

To secure the link we will be using IPsec. IPsec provides a mechanism for two hosts to agree on an encryption key, and to then use this key in order to encrypt data between the two hosts.

The are two areas of configuration to be considered here.

1. There must be a mechanism for two hosts to agree on the encryption mechanism to use. Once two hosts have agreed on this mechanism there is said to be a “security association” between them.
2. There must be a mechanism for specifying which traffic should be encrypted. Obviously, you do not want to encrypt all your outgoing traffic -- you only want to encrypt the traffic that is part of the VPN. The rules that you put in place to determine what traffic will be encrypted are called “security policies”.

Security associations and security policies are both maintained by the kernel, and can be modified by userland programs. However, before you can do this you must configure the kernel to support IPsec and the Encapsulated Security Payload (ESP) protocol. This is done by configuring a kernel with:

```
options IPSEC
options IPSEC_ESP
```

and recompiling, reinstalling, and rebooting. As before you will need to do this to the kernels on both of the gateway hosts.

You have two choices when it comes to setting up security associations. You can configure them by hand between two hosts, which entails choosing the encryption algorithm, encryption keys, and so forth, or you can use daemons that implement the Internet Key Exchange protocol (IKE) to do this for you.

I recommend the latter. Apart from anything else, it is easier to set up.

Editing and displaying security policies is carried out using setkey(8). By analogy, `setkey` is to the kernel’s security policy tables as route(8) is to the kernel’s routing tables. `setkey` can also display the current security associations, and to continue the analogy further, is akin to `netstat -r` in that respect.

There are a number of choices for daemons to manage security associations with FreeBSD. This article will describe how to use one of these, racoon — which is available from `security/ipsec-tools` in the FreeBSD Ports collection.

The **racoon** software must be run on both gateway hosts. On each host it is configured with the IP address of the other end of the VPN, and a secret key (which you choose, and must be the same on both gateways).

The two daemons then contact one another, confirm that they are who they say they are (by using the secret key that you configured). The daemons then generate a new secret key, and use this to encrypt the traffic over the VPN. They periodically change this secret, so that even if an attacker were to crack one of the keys (which is as theoretically close to unfeasible as it gets) it will not do them much good -- by the time they have cracked the key the two daemons have chosen another one.

The configuration file for racoon is stored in `${PREFIX}/etc/racoon`. You should find a configuration file there, which should not need to be changed too much. The other component of racoon’s configuration, which you will need to change, is the “pre-shared key”.

The default racoon configuration expects to find this in the file `${PREFIX}/etc/racoon/psk.txt`. It is important to note that the pre-shared key is *not* the key that will be used to encrypt your traffic across the VPN link, it is simply a token that allows the key management daemons to trust one another.

`psk.txt` contains a line for each remote site you are dealing with. In this example, where there are two sites, each `psk.txt` file will contain one line (because each end of the VPN is only dealing with one other end).

On gateway host #1 this line should look like this:

```
W.X.Y.Z            secret
```

That is, the *public* IP address of the remote end, whitespace, and a text string that provides the secret. Obviously, you should not use “secret” as your key -- the normal rules for choosing a password apply.

On gateway host #2 the line would look like this

```
A.B.C.D            secret
```

That is, the public IP address of the remote end, and the same secret key. `psk.txt` must be mode `0600` (i.e., only read/write to `root`) before racoon will run.

You must run racoon on both gateway machines. You will also need to add some firewall rules to allow the IKE traffic, which is carried over UDP to the ISAKMP (Internet Security Association Key Management Protocol) port. Again, this should be fairly early in your firewall ruleset.

```
ipfw add 1 allow udp from A.B.C.D to W.X.Y.Z isakmp
ipfw add 1 allow udp from W.X.Y.Z to A.B.C.D isakmp
```

Once racoon is running you can try pinging one gateway host from the other. The connection is still not encrypted, but racoon will then set up the security associations between the two hosts -- this might take a moment, and you may see this as a short delay before the ping commands start responding.

Once the security association has been set up you can view it using setkey(8). Run

```
setkey -D
```

on either host to view the security association information.

That’s one half of the problem. The other half is setting your security policies.

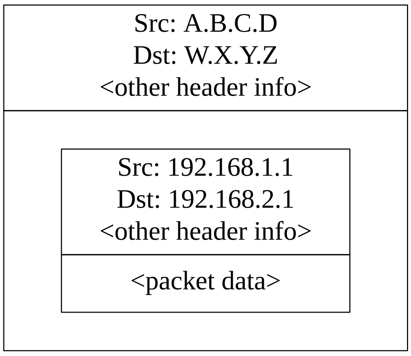
To create a sensible security policy, let’s review what’s been set up so far. This discussions hold for both ends of the link.

Each IP packet that you send out has a header that contains data about the packet. The header includes the IP addresses of both the source and destination. As we already know, private IP addresses, such as the `192.168.x.y` range are not supposed to appear on the public Internet. Instead, they must first be encapsulated inside another packet. This packet must have the public source and destination IP addresses substituted for the private addresses.

So if your outgoing packet started looking like this:

Src: 192.168.1.1 Dst: 192.168.2.1 <other header info>
<packet data>

Then it will be encapsulated inside another packet, looking something like this:



This encapsulation is carried out by the `gif` device. As you can see, the packet now has real IP addresses on the outside, and our original packet has been wrapped up as data inside the packet that will be put out on the Internet.

Obviously, we want all traffic between the VPNs to be encrypted. You might try putting this in to words, as:

“If a packet leaves from `A.B.C.D`, and it is destined for `W.X.Y.Z`, then encrypt it, using the necessary security associations.”

“If a packet arrives from `W.X.Y.Z`, and it is destined for `A.B.C.D`, then decrypt it, using the necessary security associations.”

That’s close, but not quite right. If you did this, all traffic to and from `W.X.Y.Z`, even traffic that was not part of the VPN, would be encrypted. That’s not quite what you want. The correct policy is as follows

“If a packet leaves from `A.B.C.D`, and that packet is encapsulating another packet, and it is destined for `W.X.Y.Z`, then encrypt it, using the necessary security associations.”

“If a packet arrives from `W.X.Y.Z`, and that packet is encapsulating another packet, and it is destined for `A.B.C.D`, then decrypt it, using the necessary security associations.”

A subtle change, but a necessary one.

Security policies are also set using setkey(8). setkey(8) features a configuration language for defining the policy. You can either enter configuration instructions via stdin, or you can use the `-f` option to specify a filename that contains configuration instructions.

The configuration on gateway host #1 (which has the public IP address `A.B.C.D`) to force all outbound traffic to `W.X.Y.Z` to be encrypted is:

```
spdadd A.B.C.D/32 W.X.Y.Z/32 ipencap -P out ipsec esp/tunnel/A.B.C.D-W.X.Y.Z/require;
```

Put these commands in a file (e.g. `/etc/ipsec.conf`) and then run

```
# setkey -f /etc/ipsec.conf
```

`spdadd` tells setkey(8) that we want to add a rule to the secure policy database. The rest of this line specifies which packets will match this policy. `A.B.C.D/32` and `W.X.Y.Z/32` are the IP addresses and netmasks that identify the network or hosts that this policy will apply to. In this case, we want it to apply to traffic between these two hosts. `ipencap` tells the kernel that this policy should only apply to packets that encapsulate other packets. `-P out` says that this policy applies to outgoing packets, and `ipsec` says that the packet will be secured.

The second line specifies how this packet will be encrypted. `esp` is the protocol that will be used, while `tunnel` indicates that the packet will be further encapsulated in an IPsec packet. The repeated use of `A.B.C.D` and `W.X.Y.Z` is used to select the security association to use, and the final `require` mandates that packets must be encrypted if they match this rule.

This rule only matches outgoing packets. You will need a similar rule to match incoming packets.

```
spdadd W.X.Y.Z/32 A.B.C.D/32 ipencap -P in ipsec esp/tunnel/W.X.Y.Z-A.B.C.D/require;
```

Note the `in` instead of `out` in this case, and the necessary reversal of the IP addresses.

The other gateway host (which has the public IP address `W.X.Y.Z`) will need similar rules.

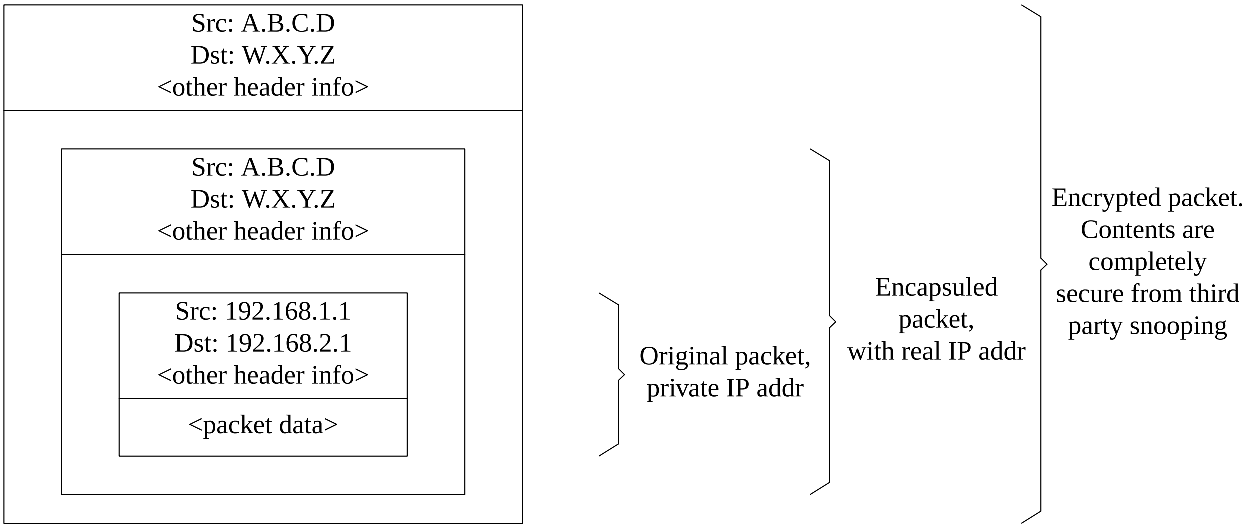
```
spdadd W.X.Y.Z/32 A.B.C.D/32 ipencap -P out ipsec esp/tunnel/W.X.Y.Z-A.B.C.D/require;
spdadd A.B.C.D/32 W.X.Y.Z/32 ipencap -P in ipsec esp/tunnel/A.B.C.D-W.X.Y.Z/require;
```

Finally, you need to add firewall rules to allow ESP and IPENCAP packets back and forth. These rules will need to be added to both hosts.

```
ipfw add 1 allow esp from A.B.C.D to W.X.Y.Z
ipfw add 1 allow esp from W.X.Y.Z to A.B.C.D
ipfw add 1 allow ipencap from A.B.C.D to W.X.Y.Z
ipfw add 1 allow ipencap from W.X.Y.Z to A.B.C.D
```

Because the rules are symmetric you can use the same rules on each gateway host.

Outgoing packets will now look something like this:


Src: A.B.C.D
Dst: W.X.Y.Z
<other header info>
Src: A.B.C.D
Dst: W.X.Y.Z
<other header info>
Src: 192.168.1.1
Dst: 192.168.2.1
<other header info>
<packet data>
Original packet, private IP addr
Encapsuled packet, with real IP addr
Encrypted packet. Contents are completely secure from third party snooping

When they are received by the far end of the VPN they will first be decrypted (using the security associations that have been negotiated by racoon). Then they will enter the `gif` interface, which will unwrap the second layer, until you are left with the innermost packet, which can then travel in to the inner network.

You can check the security using the same ping(8) test from earlier. First, log in to the `A.B.C.D` gateway machine, and run:

```
tcpdump dst host 192.168.2.1
```

In another log in session on the same host run

```
ping 192.168.2.1
```

This time you should see output like the following:

```
XXX tcpdump output
```

Now, as you can see, tcpdump(1) shows the ESP packets. If you try to examine them with the `-s` option you will see (apparently) gibberish, because of the encryption.

Congratulations. You have just set up a VPN between two remote sites.

Summary

- Configure both kernels with:

  ```
  options IPSEC
  options IPSEC_ESP
  ```

- Install `security/ipsec-tools`. Edit `${PREFIX}/etc/racoon/psk.txt` on both gateway hosts, adding an entry for the remote host's IP address and a secret key that they both know. Make sure this file is mode 0600.
- Add the following lines to `/etc/rc.conf` on each host:

  ```
  ipsec_enable="YES"
  ipsec_file="/etc/ipsec.conf"
  ```

- Create an `/etc/ipsec.conf` on each host that contains the necessary spdadd lines. On gateway host #1 this would be:

  ```
  spdadd A.B.C.D/32 W.X.Y.Z/32 ipencap -P out ipsec
    esp/tunnel/A.B.C.D-W.X.Y.Z/require;
  spdadd W.X.Y.Z/32 A.B.C.D/32 ipencap -P in ipsec
    esp/tunnel/W.X.Y.Z-A.B.C.D/require;
  ```

  On gateway host #2 this would be:

  ```
  spdadd W.X.Y.Z/32 A.B.C.D/32 ipencap -P out ipsec
    esp/tunnel/W.X.Y.Z-A.B.C.D/require;
  spdadd A.B.C.D/32 W.X.Y.Z/32 ipencap -P in ipsec
    esp/tunnel/A.B.C.D-W.X.Y.Z/require;
  ```

- Add firewall rules to allow IKE, ESP, and IPENCAP traffic to both hosts:

  ```
  ipfw add 1 allow udp from A.B.C.D to W.X.Y.Z isakmp
  ipfw add 1 allow udp from W.X.Y.Z to A.B.C.D isakmp
  ipfw add 1 allow esp from A.B.C.D to W.X.Y.Z
  ipfw add 1 allow esp from W.X.Y.Z to A.B.C.D
  ipfw add 1 allow ipencap from A.B.C.D to W.X.Y.Z
  ipfw add 1 allow ipencap from W.X.Y.Z to A.B.C.D
  ```

The previous two steps should suffice to get the VPN up and running. Machines on each network will be able to refer to one another using IP addresses, and all traffic across the link will be automatically and securely encrypted.

15.11 OpenSSH

Contributed by Chern Lee.

OpenSSH is a set of network connectivity tools used to access remote machines securely. It can be used as a direct replacement for `rlogin`, `rsh`, `rcp`, and `telnet`. Additionally, TCP/IP connections can be tunneled/forwarded securely through SSH. **OpenSSH** encrypts all traffic to effectively eliminate eavesdropping, connection hijacking, and other network-level attacks.

OpenSSH is maintained by the OpenBSD project, and is based upon SSH v1.2.12 with all the recent bug fixes and updates. It is compatible with both SSH protocols 1 and 2.

15.11.1 Advantages of Using OpenSSH

Normally, when using telnet(1) or rlogin(1), data is sent over the network in an clear, un-encrypted form. Network sniffers anywhere in between the client and server can steal your user/password information or data transferred in your session. **OpenSSH** offers a variety of authentication and encryption methods to prevent this from happening.

15.11.2 Enabling sshd

The **sshd** is an option presented during a `Standard` install of FreeBSD. To see if **sshd** is enabled, check the `rc.conf` file for:

```
sshd_enable="YES"
```

This will load sshd(8), the daemon program for **OpenSSH**, the next time your system initializes. Alternatively, it is possible to use `/etc/rc.d/sshd` rc(8) script to start **OpenSSH**:

```
/etc/rc.d/sshd start
```

15.11.3 SSH Client

The ssh(1) utility works similarly to rlogin(1).

```
# ssh user@example.com
Host key not found from the list of known hosts.
Are you sure you want to continue connecting (yes/no)? yes
Host ’example.com’ added to the list of known hosts.
user@example.com’s password: *******
```

The login will continue just as it would have if a session was created using `rlogin` or `telnet`. SSH utilizes a key fingerprint system for verifying the authenticity of the server when the client connects. The user is prompted to enter `yes` only when connecting for the first time. Future attempts to login are all verified against the saved fingerprint key. The SSH client will alert you if the saved fingerprint differs from the received fingerprint on future login attempts. The fingerprints are saved in `~/.ssh/known_hosts`, or `~/.ssh/known_hosts2` for SSH v2 fingerprints.

By default, recent versions of the **OpenSSH** servers only accept SSH v2 connections. The client will use version 2 if possible and will fall back to version 1. The client can also be forced to use one or the other by passing it the `-1` or `-2` for version 1 or version 2, respectively. The version 1 compatibility is maintained in the client for backwards compatibility with older versions.

15.11.4 Secure Copy

The scp(1) command works similarly to rcp(1); it copies a file to or from a remote machine, except in a secure fashion.

```
#  scp user@example.com:/COPYRIGHT COPYRIGHT
user@example.com's password: *******
COPYRIGHT            100% |*****************************|  4735
00:00
#
```

Since the fingerprint was already saved for this host in the previous example, it is verified when using scp(1) here.

The arguments passed to scp(1) are similar to cp(1), with the file or files in the first argument, and the destination in the second. Since the file is fetched over the network, through SSH, one or more of the file arguments takes on the form `user@host:<path_to_remote_file>`.

15.11.5 Configuration

The system-wide configuration files for both the **OpenSSH** daemon and client reside within the `/etc/ssh` directory.

`ssh_config` configures the client settings, while `sshd_config` configures the daemon.

Additionally, the `sshd_program` (`/usr/sbin/sshd` by default), and `sshd_flags` `rc.conf` options can provide more levels of configuration.

15.11.6 ssh-keygen

Instead of using passwords, ssh-keygen(1) can be used to generate DSA or RSA keys to authenticate a user:

```
% ssh-keygen -t dsa
Generating public/private dsa key pair.
Enter file in which to save the key (/home/user/.ssh/id_dsa):
Created directory '/home/user/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/user/.ssh/id_dsa.
Your public key has been saved in /home/user/.ssh/id_dsa.pub.
The key fingerprint is:
bb:48:db:f2:93:57:80:b6:aa:bc:f5:d5:ba:8f:79:17 user@host.example.com
```

ssh-keygen(1) will create a public and private key pair for use in authentication. The private key is stored in `~/.ssh/id_dsa` or `~/.ssh/id_rsa`, whereas the public key is stored in `~/.ssh/id_dsa.pub` or `~/.ssh/id_rsa.pub`, respectively for DSA and RSA key types. The public key must be placed in `~/.ssh/authorized_keys` of the remote machine in order for the setup to work. Similarly, RSA version 1 public keys should be placed in `~/.ssh/authorized_keys`.

This will allow connection to the remote machine based upon SSH keys instead of passwords.

If a passphrase is used in ssh-keygen(1), the user will be prompted for a password each time in order to use the private key. ssh-agent(1) can alleviate the strain of repeatedly entering long passphrases, and is explored in the ÔìÞìá 15.11.7 section below.

> **Ðñïåéäïðïßçóç:** The various options and files can be different according to the **OpenSSH** version you have on your system; to avoid problems you should consult the ssh-keygen(1) manual page.

15.11.7 ssh-agent and ssh-add

The ssh-agent(1) and ssh-add(1) utilities provide methods for **SSH** keys to be loaded into memory for use, without needing to type the passphrase each time.

The ssh-agent(1) utility will handle the authentication using the private key(s) that are loaded into it. ssh-agent(1) should be used to launch another application. At the most basic level, it could spawn a shell or at a more advanced level, a window manager.

To use ssh-agent(1) in a shell, first it will need to be spawned with a shell as an argument. Secondly, the identity needs to be added by running ssh-add(1) and providing it the passphrase for the private key. Once these steps have been completed the user will be able to ssh(1) to any host that has the corresponding public key installed. For example:

```
% ssh-agent csh
% ssh-add
Enter passphrase for /home/user/.ssh/id_dsa:
Identity added: /home/user/.ssh/id_dsa (/home/user/.ssh/id_dsa)
%
```

To use ssh-agent(1) in X11, a call to ssh-agent(1) will need to be placed in `~/.xinitrc`. This will provide the ssh-agent(1) services to all programs launched in X11. An example `~/.xinitrc` file might look like this:

```
exec ssh-agent startxfce4
```

This would launch ssh-agent(1), which would in turn launch **XFCE**, every time X11 starts. Then once that is done and X11 has been restarted so that the changes can take effect, simply run ssh-add(1) to load all of your SSH keys.

15.11.8 SSH Tunneling

OpenSSH has the ability to create a tunnel to encapsulate another protocol in an encrypted session.

The following command tells ssh(1) to create a tunnel for **telnet**:

```
% ssh -2 -N -f -L 5023:localhost:23 user@foo.example.com
%
```

The `ssh` command is used with the following options:

`-2`

> Forces `ssh` to use version 2 of the protocol. (Do not use if you are working with older SSH servers)

`-N`

> Indicates no command, or tunnel only. If omitted, `ssh` would initiate a normal session.

`-f`

Forces `ssh` to run in the background.

`-L`

Indicates a local tunnel in *`localport:remotehost:remoteport`* fashion.

`user@foo.example.com`

The remote SSH server.

An SSH tunnel works by creating a listen socket on `localhost` on the specified port. It then forwards any connection received on the local host/port via the SSH connection to the specified remote host and port.

In the example, port *`5023`* on `localhost` is being forwarded to port *`23`* on `localhost` of the remote machine. Since *`23`* is **telnet**, this would create a secure **telnet** session through an SSH tunnel.

This can be used to wrap any number of insecure TCP protocols such as SMTP, POP3, FTP, etc.

ÐáñÜäåéãìá 15-1. Using SSH to Create a Secure Tunnel for SMTP

```
% ssh -2 -N -f -L 5025:localhost:25 user@mailserver.example.com
user@mailserver.example.com's password: *****
% telnet localhost 5025
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
220 mailserver.example.com ESMTP
```

This can be used in conjunction with an ssh-keygen(1) and additional user accounts to create a more seamless/hassle-free SSH tunneling environment. Keys can be used in place of typing a password, and the tunnels can be run as a separate user.

15.11.8.1 Practical SSH Tunneling Examples

15.11.8.1.1 Secure Access of a POP3 Server

At work, there is an SSH server that accepts connections from the outside. On the same office network resides a mail server running a POP3 server. The network, or network path between your home and office may or may not be completely trustable. Because of this, you need to check your e-mail in a secure manner. The solution is to create an SSH connection to your office's SSH server, and tunnel through to the mail server.

```
% ssh -2 -N -f -L 2110:mail.example.com:110 user@ssh-server.example.com
user@ssh-server.example.com's password: ******
```

When the tunnel is up and running, you can point your mail client to send POP3 requests to `localhost` port 2110. A connection here will be forwarded securely across the tunnel to `mail.example.com`.

15.11.8.1.2 Bypassing a Draconian Firewall

Some network administrators impose extremely draconian firewall rules, filtering not only incoming connections, but outgoing connections. You may be only given access to contact remote machines on ports 22 and 80 for SSH and web surfing.

You may wish to access another (perhaps non-work related) service, such as an Ogg Vorbis server to stream music. If this Ogg Vorbis server is streaming on some other port than 22 or 80, you will not be able to access it.

The solution is to create an SSH connection to a machine outside of your network's firewall, and use it to tunnel to the Ogg Vorbis server.

```
% ssh -2 -N -f -L 8888:music.example.com:8000 user@unfirewalled-system.example.org
user@unfirewalled-system.example.org's password: *******
```

Your streaming client can now be pointed to `localhost` port 8888, which will be forwarded over to `music.example.com` port 8000, successfully evading the firewall.

15.11.9 The `AllowUsers` Users Option

It is often a good idea to limit which users can log in and from where. The `AllowUsers` option is a good way to accomplish this. For example, to only allow the `root` user to log in from `192.168.1.32`, something like this would be appropriate in the `/etc/ssh/sshd_config` file:

```
AllowUsers root@192.168.1.32
```

To allow the user `admin` to log in from anywhere, just list the username by itself:

```
AllowUsers admin
```

Multiple users should be listed on the same line, like so:

```
AllowUsers root@192.168.1.32 admin
```

> **Óçìåßùóç:** It is important that you list each user that needs to log in to this machine; otherwise they will be locked out.

After making changes to `/etc/ssh/sshd_config` you must tell sshd(8) to reload its config files, by running:

```
# /etc/rc.d/sshd reload
```

15.11.10 Further Reading

OpenSSH (http://www.openssh.com/)

ssh(1) scp(1) ssh-keygen(1) ssh-agent(1) ssh-add(1) ssh_config(5)

sshd(8) sftp-server(8) sshd_config(5)

15.12 File System Access Control Lists

Contributed by Tom Rhodes.

In conjunction with file system enhancements like snapshots, FreeBSD 5.0 and later offers the security of File System Access Control Lists (ACLs).

Access Control Lists extend the standard UNIX permission model in a highly compatible (POSIX.1e) way. This feature permits an administrator to make use of and take advantage of a more sophisticated security model.

To enable ACL support for UFS file systems, the following:

```
options UFS_ACL
```

must be compiled into the kernel. If this option has not been compiled in, a warning message will be displayed when attempting to mount a file system supporting ACLs. This option is included in the `GENERIC` kernel. ACLs rely on extended attributes being enabled on the file system. Extended attributes are natively supported in the next generation UNIX file system, UFS2.

> **Óçìåßùóç:** A higher level of administrative overhead is required to configure extended attributes on UFS1 than on UFS2. The performance of extended attributes on UFS2 is also substantially higher. As a result, UFS2 is generally recommended in preference to UFS1 for use with access control lists.

ACLs are enabled by the mount-time administrative flag, `acls`, which may be added to `/etc/fstab`. The mount-time flag can also be automatically set in a persistent manner using tunefs(8) to modify a superblock ACLs flag in the file system header. In general, it is preferred to use the superblock flag for several reasons:

- The mount-time ACLs flag cannot be changed by a remount (mount(8) `-u`), only by means of a complete umount(8) and fresh mount(8). This means that ACLs cannot be enabled on the root file system after boot. It also means that you cannot change the disposition of a file system once it is in use.
- Setting the superblock flag will cause the file system to always be mounted with ACLs enabled even if there is not an `fstab` entry or if the devices re-order. This prevents accidental mounting of the file system without ACLs enabled, which can result in ACLs being improperly enforced, and hence security problems.

> **Óçìåßùóç:** We may change the ACLs behavior to allow the flag to be enabled without a complete fresh mount(8), but we consider it desirable to discourage accidental mounting without ACLs enabled, because you can shoot your feet quite nastily if you enable ACLs, then disable them, then re-enable them without flushing the extended attributes. In general, once you have enabled ACLs on a file system, they should not be disabled, as the resulting file protections may not be compatible with those intended by the users of the system, and re-enabling ACLs may re-attach the previous ACLs to files that have since had their permissions changed, resulting in other unpredictable behavior.

File systems with ACLs enabled will show a `+` (plus) sign in their permission settings when viewed. For example:

```
drwx------  2 robert  robert  512 Dec 27 11:54 private
drwxrwx---+ 2 robert  robert  512 Dec 23 10:57 directory1
drwxrwx---+ 2 robert  robert  512 Dec 22 10:20 directory2
drwxrwx---+ 2 robert  robert  512 Dec 27 11:57 directory3
drwxr-xr-x  2 robert  robert  512 Nov 10 11:54 public_html
```

Here we see that the `directory1`, `directory2`, and `directory3` directories are all taking advantage of ACLs. The `public_html` directory is not.

15.12.1 Making Use of ACLs

The file system ACLs can be viewed by the getfacl(1) utility. For instance, to view the ACL settings on the `test` file, one would use the command:

```
% getfacl test
        #file:test
        #owner:1001
        #group:1001
        user::rw-
        group::r--
        other::r--
```

To change the ACL settings on this file, invoke the setfacl(1) utility. Observe:

```
% setfacl -k test
```

The `-k` flag will remove all of the currently defined ACLs from a file or file system. The more preferable method would be to use `-b` as it leaves the basic fields required for ACLs to work.

```
% setfacl -m u:trhodes:rwx,group:web:r--,o::--- test
```

In the aforementioned command, the `-m` option was used to modify the default ACL entries. Since there were no pre-defined entries, as they were removed by the previous command, this will restore the default options and assign the options listed. Take care to notice that if you add a user or group which does not exist on the system, an `Invalid argument` error will be printed to `stdout`.

15.13 Monitoring Third Party Security Issues

Contributed by Tom Rhodes.

In recent years, the security world has made many improvements to how vulnerability assessment is handled. The threat of system intrusion increases as third party utilities are installed and configured for virtually any operating system available today.

Vulnerability assessment is a key factor in security, and while FreeBSD releases advisories for the base system, doing so for every third party utility is beyond the FreeBSD Project's capability. There is a way to mitigate third party vulnerabilities and warn administrators of known security issues. A FreeBSD add on utility known as **Portaudit** exists solely for this purpose.

The `ports-mgmt/portaudit` port polls a database, updated and maintained by the FreeBSD Security Team and ports developers, for known security issues.

To begin using **Portaudit**, one must install it from the Ports Collection:

```
# cd /usr/ports/ports-mgmt/portaudit && make install clean
```

During the install process, the configuration files for periodic(8) will be updated, permitting **Portaudit** output in the daily security runs. Ensure the daily security run emails, which are sent to `root`'s email account, are being read. No more configuration will be required here.

After installation, an administrator can update the database and view known vulnerabilities in installed packages by invoking the following command:

```
# portaudit -Fda
```

> **Óçìåßùóç:** The database will automatically be updated during the periodic(8) run; thus, the previous command is completely optional. It is only required for the following examples.

To audit the third party utilities installed as part of the Ports Collection at anytime, an administrator need only run the following command:

```
# portaudit -a
```

Portaudit will produce something like this for vulnerable packages:

```
Affected package: cups-base-1.1.22.0_1
Type of problem: cups-base -- HPGL buffer overflow vulnerability.
Reference: <http://www.FreeBSD.org/ports/portaudit/40a3bca2-6809-11d9-a9e7-0001020eed82.html>

1 problem(s) in your installed packages found.

You are advised to update or deinstall the affected package(s) immediately.
```

By pointing a web browser to the URL shown, an administrator may obtain more information about the vulnerability in question. This will include versions affected, by FreeBSD Port version, along with other web sites which may contain security advisories.

In short, **Portaudit** is a powerful utility and extremely useful when coupled with the **Portupgrade** port.

15.14 FreeBSD Security Advisories

Contributed by Tom Rhodes.

Like many production quality operating systems, FreeBSD publishes "Security Advisories". These advisories are usually mailed to the security lists and noted in the Errata only after the appropriate releases have been patched. This section will work to explain what an advisory is, how to understand it, and what measures to take in order to patch a system.

15.14.1 What does an advisory look like?

The FreeBSD security advisories look similar to the one below, taken from the freebsd-security-notifications (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security-notifications) mailing list.

```
=============================================================================
FreeBSD-SA-XX:XX.UTIL                                     Security Advisory
```

```
                                                 The FreeBSD Project

Topic:          denial of service due to some problem❶

Category:       core❷
Module:         sys❸
Announced:      2003-09-23❹
Credits:        Person@EMAIL-ADDRESS❺
Affects:        All releases of FreeBSD❻
                FreeBSD 4-STABLE prior to the correction date
Corrected:      2003-09-23 16:42:59 UTC (RELENG_4, 4.9-PRERELEASE)
                2003-09-23 20:08:42 UTC (RELENG_5_1, 5.1-RELEASE-p6)
                2003-09-23 20:07:06 UTC (RELENG_5_0, 5.0-RELEASE-p15)
                2003-09-23 16:44:58 UTC (RELENG_4_8, 4.8-RELEASE-p8)
                2003-09-23 16:47:34 UTC (RELENG_4_7, 4.7-RELEASE-p18)
                2003-09-23 16:49:46 UTC (RELENG_4_6, 4.6-RELEASE-p21)
                2003-09-23 16:51:24 UTC (RELENG_4_5, 4.5-RELEASE-p33)
                2003-09-23 16:52:45 UTC (RELENG_4_4, 4.4-RELEASE-p43)
                2003-09-23 16:54:39 UTC (RELENG_4_3, 4.3-RELEASE-p39)❼
CVE Name:       CVE-XXXX-XXXX❽

For general information regarding FreeBSD Security Advisories,
including descriptions of the fields above, security branches, and the
following sections, please visit
http://www.FreeBSD.org/security/.

I.   Background❾


II.  Problem Description(10)


III. Impact(11)


IV.  Workaround(12)


V.   Solution(13)


VI.  Correction details(14)


VII. References(15)
```

❶ The `Topic` field indicates exactly what the problem is. It is basically an introduction to the current security advisory and notes the utility with the vulnerability.

❷ The `Category` refers to the affected part of the system which may be one of `core`, `contrib`, or `ports`. The `core` category means that the vulnerability affects a core component of the FreeBSD operating system. The `contrib` category means that the vulnerability affects software contributed to the FreeBSD Project, such as

sendmail. Finally the `ports` category indicates that the vulnerability affects add on software available as part of the Ports Collection.

❸ The `Module` field refers to the component location, for instance `sys`. In this example, we see that the module, `sys`, is affected; therefore, this vulnerability affects a component used within the kernel.

❹ The `Announced` field reflects the date said security advisory was published, or announced to the world. This means that the security team has verified that the problem does exist and that a patch has been committed to the FreeBSD source code repository.

❺ The `Credits` field gives credit to the individual or organization who noticed the vulnerability and reported it.

❻ The `Affects` field explains which releases of FreeBSD are affected by this vulnerability. For the kernel, a quick look over the output from `ident` on the affected files will help in determining the revision. For ports, the version number is listed after the port name in `/var/db/pkg`. If the system does not sync with the FreeBSD CVS repository and rebuild daily, chances are that it is affected.

❼ The `Corrected` field indicates the date, time, time offset, and release that was corrected.

❽ Reserved for the identification information used to look up vulnerabilities in the Common Vulnerabilities Database system.

❾ The `Background` field gives information on exactly what the affected utility is. Most of the time this is why the utility exists in FreeBSD, what it is used for, and a bit of information on how the utility came to be.

(10) The `Problem Description` field explains the security hole in depth. This can include information on flawed code, or even how the utility could be maliciously used to open a security hole.

(11) The `Impact` field describes what type of impact the problem could have on a system. For example, this could be anything from a denial of service attack, to extra privileges available to users, or even giving the attacker superuser access.

(12) The `Workaround` field offers a feasible workaround to system administrators who may be incapable of upgrading the system. This may be due to time constraints, network availability, or a slew of other reasons. Regardless, security should not be taken lightly, and an affected system should either be patched or the security hole workaround should be implemented.

(13) The `Solution` field offers instructions on patching the affected system. This is a step by step tested and verified method for getting a system patched and working securely.

(14) The `Correction Details` field displays the CVS branch or release name with the periods changed to underscore characters. It also shows the revision number of the affected files within each branch.

(15) The `References` field usually offers sources of other information. This can include web URLs, books, mailing lists, and newsgroups.

15.15 Process Accounting

Contributed by Tom Rhodes.

Process accounting is a security method in which an administrator may keep track of system resources used, their allocation among users, provide for system monitoring, and minimally track a user's commands.

This indeed has its own positive and negative points. One of the positives is that an intrusion may be narrowed down to the point of entry. A negative is the amount of logs generated by process accounting, and the disk space they may require. This section will walk an administrator through the basics of process accounting.

15.15.1 Enable and Utilizing Process Accounting

Before making use of process accounting, it must be enabled. To do this, execute the following commands:

```
# touch /var/account/acct

# accton /var/account/acct

# echo ’accounting_enable="YES"’ >> /etc/rc.conf
```

Once enabled, accounting will begin to track CPU stats, commands, etc. All accounting logs are in a non-human readable format and may be viewed using the sa(8) utility. If issued without any options, `sa` will print information relating to the number of per user calls, the total elapsed time in minutes, total CPU and user time in minutes, average number of I/O operations, etc.

To view information about commands being issued, one would use the lastcomm(1) utility. The `lastcomm` may be used to print out commands issued by users on specific ttys(5), for example:

```
# lastcomm ls
 trhodes ttyp1
```

Would print out all known usage of the `ls` by `trhodes` on the ttyp1 terminal.

Many other useful options exist and are explained in the lastcomm(1), acct(5) and sa(8) manual pages.

Óçìåéþóåéò

1. Under FreeBSD the standard login password may be up to 128 characters in length.

ÊåöÜëáéï 16 Jails

ÓõíåéóöïñÜ áðü ôïí Matteo Riondato.

16.1 Óýíïøç

Ôï êåöÜëáéï áõôü åîçãåß ôé åßíáé ôá jails (öõëáêÝò) ôïõ FreeBSD êáé ðùò ÷ñçóéìïðïéïýíôáé. Ôá jails, ðïõ áíáöÝñïíôáé ïñéóìÝíåò öïñÝò óáí ìéá åíéó÷õìÝíç åíáëëáêôéêÞ ëýóç ãéá *ðåñéâÜëëïíôá chroot*, åßíáé Ýíá éó÷õñü åñãáëåßï ãéá äéá÷åéñéóôÝò óõóôçìÜôùí, áëëÜ ç âáóéêÞ ôïõò ÷ñÞóç ìðïñåß åðßóçò íá åßíáé ÷ñÞóéìç óå ðñï÷ùñçìÝíïõò ÷ñÞóôåò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôé åßíáé Ýíá jail êáé ôé óêïðü ìðïñåß íá åîõðçñåôÞóåé óå åãêáôáóôÜóåéò FreeBSD.
- Ðùò íá öôéÜîåôå, íá îåêéíÞóåôå, êáé íá óôáìáôÞóåôå Ýíá jail.
- Ôá âáóéêÜ ôçò äéá÷åßñéóçò åíüò jail, ôüóï ìÝóá, üóï êáé Ýîù áðü áõôü.

¶ëëåò ðçãÝò ÷ñÞóéìùí ðëçñïöïñéþí ó÷åôéêÜ ìå ôá jails åßíáé:

- Ç óåëßäá manual ôïõ jail(8). ÐåñéÝ÷åé ðëÞñç áíáöïñÜ ôïõ âïçèçôéêïý ðñïãñÜììáôïò `jail` — ôïõ äéá÷åéñéóôéêïý åñãáëåßïõ ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß óôï FreeBSD ãéá ôçí åêêßíçóç, äéáêïðÞ, êáé Ýëåã÷ï ôùí jails.
- Ïé ëßóôåò ôá÷õäñïìåßïõ êáé ôá áñ÷åßá ôïõò. Ôá áñ÷åßá áðü ôçí ãåíéêÞ ëßóôá ãåíéêþí åñùôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions) êáé Üëëåò ëßóôåò ðïõ åîõðçñåôïýíôáé áðü ôïí åîõðçñåôçôÞ ãéá çëåêôñïíéêÝò ëßóôåò ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo) ðåñéÝ÷ïõí ðëÞñç ïäçãü ãéá ôá jails. Åßíáé ðÜíôïôå åíäéáöÝñïí íá øÜ÷íåôå ôá áñ÷åßá Þ íá äçìïóéåýóåôå íÝåò åñùôÞóåéò óôç ëßóôá freebsd-questions (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions).

16.2 ¼ñïé ôùí Jails

Ãéá íá êáôáíïÞóåôå êáëýôåñá ôï ðùò ïé åóùôåñéêÝò ëåéôïõñãßåò ôïõ FreeBSD ó÷åôßæïíôáé ìå ôá jails êáé ðùò áõôÝò áëëçëåðéäñïýí ìå ôá õðüëïéðá ìÝñç ôïõ FreeBSD, èá ÷ñçóéìïðïéÞóïõìå åêôåíþò ôïõò ðáñáêÜôù üñïõò:

chroot(8) (åíôïëÞ)

> ¸íá âïçèçôéêü ðñüãñáììá, ôï ïðïßï ÷ñçóéìïðïéåß ôçí êëÞóç óõóôÞìáôïò chroot(2) ôïõ FreeBSD ãéá íá áëëÜîåé ôïí ãïíéêü êáôÜëïãï (root directory) ìéáò äéåñãáóßáò êáé üëùí ôùí Üëëùí äéåñãáóéþí ðïõ åîáñôþíôáé áðü áõôÞ.

chroot(2) (ðåñéâÜëëïí)

> Ôï ðåñéâÜëëïí ìéá äéåñãáóßáò ðïõ ôñÝ÷åé ìÝóá óå Ýíá “chroot”. Áõôü ðåñéëáìâÜíåé ðüñïõò üðùò ôï ôìÞìá ôïõ óõóôÞìáôïò áñ÷åßùí ðïõ åßíáé ïñáôü, ôá ID ôïõ ÷ñÞóôç êáé ôçò ïìÜäáò ðïõ åßíáé äéáèÝóéìá, êáèþò êáé ôéò äéåðáöÝò äéêôýïõ (network interfaces), ôïõò ìç÷áíéóìïýò IPC êëð.

jail(8) (åíôïëÞ)

> Ôï ðñüãñáììá ðïõ óáò åðéôñÝðåé íá äéá÷åéñßæåóôå ôï óýóôçìá óáò êáé íá îåêéíÜôå äéåñãáóßåò óå ðåñéâÜëëïí jail.

host (óýóôçìá (system), äéåñãáóßá (process), ÷ñÞóôçò (user), êëð.)

> Ôï öõóéêü óýóôçìá ðïõ öéëïîåíåß êáé åëÝã÷åé Ýíá ðåñéâÜëëïí jail. Ôï host system Ý÷åé ðñüóâáóç óå üëï ôï äéáèÝóéìï õëéêü, êáé ìðïñåß íá åëÝãîåé äéåñãáóßåò ôüóï ìÝóá üóï êáé Ýîù áðü ôï ðåñéâÜëëïí ôïõ jail. Ìßá áðü ôéò óçìáíôéêüôåñåò äéáöïñÝò ìåôáîý ôïõ host system êáé ôïõ jail åßíáé üôé ïé ðåñéïñéóìïß ðïõ åöáñìüæïíôáé óôéò äéåñãáóßåò ôïõ ÷ñÞóôç root ìÝóá óôï ðåñéâÜëëïí jail, äåí éó÷ýïõí ãéá ôéò äéåñãáóßåò óôï host system.

hosted (óýóôçìá (system), äéåñãáóßá (process), ÷ñÞóôçò (user), êëð.)

> Ìéá äéåñãáóßá, Ýíáò ÷ñÞóôçò Þ êÜðïéá Üëëç ïíôüôçôá, ôçò ïðïßáò ç ðñüóâáóç óôïõò ðüñïõò ôïõ óõóôÞìáôïò ðåñéïñßæåôáé ìÝóá áðü Ýíá jail.

16.3 ÅéóáãùãÞ

Ìéá êáé ç äéá÷åßñéóç åíüò óõóôÞìáôïò ìðïñåß íá åßíáé äýóêïëç êáé ðåñßðëïêç, áíáðôý÷èçêáí áñêåôÜ åñãáëåßá ôá ïðïßá ìðïñïýí íá êÜíïõí ôç æùÞ åíüò äéá÷åéñéóôÞ ðïëý ðéï åýêïëç. Ôá åñãáëåßá áõôÜ ðñïóöÝñïõí êÜðïéåò ðñüóèåôåò äõíáôüôçôåò üóï áöïñÜ ôïí ôñüðï åãêáôÜóôáóçò, ñýèìéóçò êáé õðïóôÞñéîçò åíüò óõóôÞìáôïò. Ìéá áðü ôéò åñãáóßåò ðïõ áíáìÝíåôáé íá åêôåëÝóåé êÜèå äéá÷åéñéóôÞò óõóôÞìáôïò, åßíáé íá ñõèìßóåé óùóôÜ ôçí áóöÜëåéá ôïõ óõóôÞìáôïò, ðñïêåéìÝíïõ íá ðñïóöÝñåé ôéò õðçñåóßåò ãéá ôéò ïðïßåò Ý÷åé ðñïãñáììáôéóôåß, ÷ùñßò íá åðéôñÝðåé óõìâéâáóìïýò óôçí áóöÜëåéá.

¸íá áðü ôá åñãáëåßá ðïõ ìðïñïýí íá åíéó÷ýóïõí ôçí áóöÜëåéá åíüò óõóôÞìáôïò FreeBSD åßíáé ôá *jails*. Ôá Jails ðñùôïåìöáíßóôçêáí óôï FreeBSD 4.X áðü ôïí Poul-Henning Kamp <`phk@FreeBSD.org`>, áëëÜ âåëôéþèçêáí ðïëý ðåñéóóüôåñï óôçí Ýêäïóç FreeBSD 5.X, ðñïêåéìÝíïõ íá ðñïóöÝñïõí ðåñéóóüôåñåò äõíáôüôçôåò êáé íá åßíáé ðåñéóóüôåñï åõÝëéêôá. Ç áíÜðôõîÞ ôïõò óõíå÷ßæåôáé áêüìç, ìå âåëôéþóåéò óôïõò ôïìåßò ôçò åõ÷ñçóôßáò, ôçò áðüäïóçò, ôçò áîéïðéóôßáò êáé ôçò áóöÜëåéáò ðïõ ðñÝðåé íá ðáñÝ÷ïõí.

16.3.1 Ôé Åßíáé ¸íá Jail

Ôá ëåéôïõñãéêÜ óõóôÞìáôá ôýðïõ BSD, ðáñåß÷áí ôï chroot(2) áðü ôçí åðï÷Þ ôïõ 4.2BSD. Ç åíôïëÞ chroot(8) ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá áëëÜîåé ôïí âáóéêü êáôÜëïãï ìéáò ïìÜäáò äéåñãáóéþí, äçìéïõñãþíôáò Ýíá áóöáëÝò ðåñéâÜëëïí, îå÷ùñéóôü áðü ôï õðüëïéðï óýóôçìá. ¼óåò äéåñãáóßåò äçìéïõñãïýíôáé óå Ýíáí ôÝôïéï ðåñéâÜëëïí, äåí Ý÷ïõí ðñüóâáóç óå áñ÷åßá êáé ðüñïõò Ýîù áðü áõôü. Ãéá áõôü ôï ëüãï, áí ìéá õðçñåóßá ôñÝ÷åé ìÝóá óå Ýíá ôÝôïéï ðåñéâÜëëïí, êáé êÜðïéïò åéóâïëÝáò êáôáöÝñåé íá äéåéóäýóåé óå áõôÞ, äå èá ôïõ åðéôñáðåß ç ðñüóâáóç óôï õðüëïéðï óýóôçìá. Ç åíôïëÞ chroot(8) åßíáé ðïëý êáëÞ ãéá áðëÝò åñãáóßåò ïé ïðïßåò äå ÷ñåéÜæïíôáé íá åßíáé ðïëý åõÝëéêôåò Þ íá äéáèÝôïõí ðïëýðëïêá êáé ðñïçãìÝíá ÷áñáêôçñéóôéêÜ. Ùóôüóï, áðü ôçí áñ÷Þ ôçò éäÝáò ôïõ chroot, âñÝèçêáí áñêåôïß ôñüðïé ãéá íá ìðïñÝóåé êÜðïéïò íá îåöýãåé áðü ôï ðåñéâÜëëïí áõôü. Ðáñ' üëï ðïõ Ý÷ïõí äéïñèùèåß ðïëëÜ óöÜëìáôá óôéò ðñüóöáôåò åêäüóåéò ôïõ ðõñÞíá ôïõ FreeBSD, Þôáí îåêÜèáñï üôé ç chroot(2) äåí Þôáí ç éäáíéêÞ ëýóç ãéá ôçí áóöÜëéóç õðçñåóéþí. ¸ðñåðå íá õëïðïéçèåß Ýíá íÝï õðïóýóôçìá.

Áõôüò åßíáé Ýíáò áðü ôïõò êýñéïõò ëüãïõò ãéá ôçí áíÜðôõîç ôùí *jails*.

Ôá jails âåëôéþíïõí ìå äéÜöïñïõò ôñüðïõò ôçí éäÝá ôïõ ðáñáäïóéáêïý ðåñéâÜëëïíôïò ôïõ chroot(2). Óôï ôõðéêü ðåñéâÜëëïí ôïõ chroot(2), ïé äéåñãáóßåò ðåñéïñßæïíôáé ìüíï ùò ðñïò ôï ìÝñïò ôïõ óõóôÞìáôïò áñ÷åßùí üðïõ ìðïñïýí íá Ý÷ïõí ðñüóâáóç. Ïé õðüëïéðïé ðüñïé ôïõ óõóôÞìáôïò (üðùò ïé ÷ñÞóôåò, ïé ôñÝ÷ïõóåò äéåñãáóßåò, ôï õðïóýóôçìá äéêôýùóçò) åßíáé êïéíü÷ñçóôïé ìåôáîý ôùí äéåñãáóéþí ôïõ ðåñéâÜëëïíôïò chroot êáé ôùí äéåñãáóéþí ôïõ host system. Ôá jails åðåêôåßíïõí áõôü ôï ìïíôÝëï, ìå ôçí åéêïíéêïðïßçóç ü÷é ìüíï ôçò ðñüóâáóçò óôï óýóôçìá áñ÷åßùí, áëëÜ åðßóçò ôùí ÷ñçóôþí, ôïõ õðïóõóôÞìáôïò äéêôýùóçò ôïõ ðõñÞíá ôïõ FreeBSD êáé ìåñéêþí áêüìç ðñáãìÜôùí. Ðåñéóóüôåñá ãéá ôéò äéáèÝóéìåò åíôïëÝò ðïõ ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá ôç ñýèìéóç êáé ôïí Ýëåã÷ï åíüò ðåñéâÜëëïíôïò jail ìðïñåßôå íá âñåßôå óôï ÔìÞìá 16.5.

Ôï Jail Ý÷åé ôÝóóåñá êýñéá óôïé÷åßá:

- ¸íáí êáôÜëïãï ìå äéêÞ ôïõ äïìÞ — ôï áñ÷éêü óçìåßï óôï ïðïßï åéóÝñ÷åôáé Ýíá jail. Áðü ôç óôéãìÞ ðïõ ìéá äéåñãáóßá âñßóêåôáé ìÝóá óå Ýíá jail, äåí åðéôñÝðåôáé íá âãåé Ýîù áðü ôïí êáôÜëïãï áõôü. Ôá ðñïâëÞìáôá ðïõ ôáëáéðùñïýóáí ôïí ó÷åäéáóìü ôïõ chroot(2) äåí åðçñåÜæïõí ôá jails ôïõ FreeBSD.
- ¸íá hostname (üíïìá óõóôÞìáôïò) — ôï hostname ôï ïðïßï èá ÷ñçóéìïðïéçèåß ìÝóá óôï jail. Ôá jails ÷ñçóéìïðïéïýíôáé êõñßùò ãéá ôçí åîõðçñÝôçóç äéêôõáêþí õðçñåóéþí, åðïìÝíùò ç ýðáñîç åíüò ÷áñáêôçñéóôéêïý hostname ðïõ íá ðåñéãñÜöåé ôáõôü÷ñïíá êáé ôç ÷ñÞóç ôïõ, ìðïñåß íá âïçèÞóåé áñêåôÜ ôïí äéá÷åéñéóôÞ óõóôÞìáôïò.
- Ìéá äéåýèõíóç IP — áõôÞ ç äéåýèõíóç áíôéóôïé÷åß óå Ýíá jail êáé äåí ìðïñåß íá áëëÜîåé êáôÜ ôç äéÜñêåéá ôçò æùÞò ôïõ. Ç äéåýèõíóç IP åíüò jail åßíáé óõíÞèùò ìßá äéåýèõíóç ôýðïõ alias ãéá ìéá Þäç õðÜñ÷ïõóá äéåðáöÞ äéêôýïõ (network interface), áëëÜ êÜôé ôÝôïéï äåí åßíáé áðáñáßôçôï.
- Ìßá åíôïëÞ — ç äéáäñïìÞ ðñïò Ýíá åêôåëÝóéìï ôï ïðïßï èá åêôåëåßôáé ìÝóá óôï jail. Ç äéáäñïìÞ áõôÞ åßíáé ó÷åôéêÞ ùò ðñïò ôïí áñ÷éêü êáôÜëïãï ôïõ ðåñéâÜëëïíôïò ôïõ jail, êáé ìðïñåß íá äéáöÝñåé ðïëý áðü jail óå jail áíÜëïãá ìå ôï óõãêåêñéìÝíï ðåñéâÜëëïí.

Åêôüò áõôþí, ôá jails ìðïñïýí íá Ý÷ïõí ôéò äéêÝò ôïõò ïìÜäåò ÷ñçóôþí êáé ôïí äéêü ôïõò ÷ñÞóôç `root`. ÖõóéêÜ, ï Ýëåã÷ïò ðïõ Ý÷åé ï ÷ñÞóôçò `root` ôïõ jail, ðåñéïñßæåôáé ìÝóá óôï ðåñéâÜëëïí ôïõ jail, êáé áðü ôçí ïðôéêÞ ãùíßá ôïõ host system, ï ÷ñÞóôçò áõôüò äåí åßíáé ðáíôïäýíáìïò. ÅðéðëÝïí, ï ÷ñÞóôçò `root` ôïõ jail, äåí ìðïñåß íá åêôåëÝóåé êñßóéìåò åñãáóßåò óôï óýóôçìá Ýîù áðü ôï ðåñéâÜëëïí ôïõ jail(8). Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò äõíáôüôçôåò êáé ôïõò ðåñéïñéóìïýò ôïõ `root` èá âñåßôå óôï ÔìÞìá 16.5.

16.4 Äçìéïõñãþíôáò êáé ÅëÝã÷ïíôáò Jails

Ìåñéêïß äéá÷åéñéóôÝò óõóôçìÜôùí êáôçãïñéïðïéïýí ôá jails óå äýï åíüôçôåò: ôá “complete (ðëÞñç)” jails, ôá ïðïßá ìéìïýíôáé Ýíá ðñáãìáôéêü óýóôçìá FreeBSD, êáé ôá “service” jails, ôá ïðïßá ÷ñçóéìïðïéïýíôáé ãéá ìéá åöáñìïãÞ Þ õðçñåóßá, ðïõ ðéèáíüí åêôåëåßôáé ìå åéäéêÜ ðñïíüìéá. Áõôüò åßíáé Ýíáò íïçôéêüò äéá÷ùñéóìüò êáé äåí åðéáñÜ óôç äéáäéêáóßá äçìéïõñãßáò åíüò jail. Ç óåëßäá manual ôïõ jail(8) ðåñéÝ÷åé êáôáôïðéóôéêÝò ðëçñïöïñßåò ãéá ôç äéáäéêáóßá äçìéïõñãßáò åíüò jail:

```
# setenv D /here/is/the/jail
# mkdir -p $D ❶
# cd /usr/src
# make buildworld ❷
# make installworld DESTDIR=$D ❸
# make distribution DESTDIR=$D ❹
# mount -t devfs devfs $D/dev ❺
```

❶ Ï êáëýôåñïò ôñüðïò ãéá íá îåêéíÞóåôå åßíáé ìå ôçí åðéëïãÞ ìéáò èÝóçò (äéáäñïìÞò) ãéá ôï jail óáò. Åêåß èá âñßóêïíôáé áðïèçêåõìÝíá ôá áñ÷åßá ôïõ jail üóï áöïñÜ ôï óýóôçìá óáò. Ìéá êáëÞ éäÝá åßíáé ôï `/usr/jail/jailname`, üðïõ `jailname` ôï hostname ìå ôï ïðïßï èá áíáãíùñßæåôáé ôï jail. Ôï óýóôçìá áñ÷åßùí `/usr/` Ý÷åé óõíÞèùò áñêåôü ÷þñï ãéá ôï óýóôçìá áñ÷åßùí ôïõ jail, ôï ïðïßï, ãéá Ýíá “complete” jail åßíáé ïõóéáóôéêÜ Ýíáò êëþíïò êÜèå áñ÷åßïõ ôïõ âáóéêïý óõóôÞìáôïò ìéá ðñïåðéëåãìÝíçò åãêáôÜóôáóçò ôïõ FreeBSD.

❷ Ôï âÞìá áõôü äåí áðáéôåßôáé áí Ý÷åôå ìåôáãëùôôßóåé óôï ðáñåëèüí ôï âáóéêü óýóôçìá ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `make world` Þ `make buildworld`. Ìðïñåßôå áðëþò íá åãêáôáóôÞóåôå ôï õðÜñ÷ïí óýóôçìá óáò óôï íÝï jail.

❸ Ç åíôïëÞ áõôÞ èá åìðëïõôßóåé ôïí êáôÜëïãï ðïõ åðéëÝîáôå ãéá ôï jail ìå üëá ôá áðáñáßôçôá áñ÷åßá, âéâëéïèÞêåò, óåëßäåò âïÞèåéáò êëð.

❹ Ôï `distribution` target ôïõ **make** åãêáèéóôÜ üëá ôá áñ÷åßá ñõèìßóåùí ðïõ ÷ñåéÜæïíôáé. Ìå áðëÜ ëüãéá, åãêáèéóôÜ êÜèå áñ÷åßï áðü ôï `/usr/src/etc/` óôïí êáôÜëïãï `/etc` ôïõ ðåñéâÜëëïíôïò jail: `$D/etc/`.

❺ Äå ÷ñåéÜæåôáé íá ðñïóáñôÞóåôå ôï devfs(8) óôï ðåñéâÜëëïí ôïõ jail. Áðü ôçí Üëëç ìåñéÜ, üëåò, Þ ó÷åäüí üëåò ïé åöáñìïãÝò ÷ñåéÜæïíôáé ðñüóâáóç óå ôïõëÜ÷éóôïí ìßá óõóêåõÞ, áíÜëïãá ìå ôïí óêïðü ôçò åöáñìïãÞò. Åßíáé ðïëý óçìáíôéêü íá åëÝã÷åôáé ç ðñüóâáóç óôéò óõóêåõÝò ìÝóá óå Ýíá jail, êáèþò ëáíèáóìÝíåò ñõèìßóåéò ìðïñåß íá åðéôñÝøïõí óå êÜðïéïí åéóâïëÝá íá êÜíåé "Üó÷çìá ðñÜãìáôá" ìÝóá óôï jail. Ï Ýëåã÷ïò ôïõ devfs(8) ãßíåôáé ìÝóù åíüò óõíüëïõ êáíüíùí ïé ïðïßïé ðåñéãñÜöïíôáé óôéò óåëßäåò manual ôïõ devfs(8) êáé ôïõ devfs.conf(5).

Áðü ôçí óôéãìÞ ðïõ Ý÷åé åãêáôáóôáèåß Ýíá jail, ìðïñåß íá åêêéíçèåß ìå ôç ÷ñÞóç ôçò åíôïëÞò jail(8). Ç jail(8) äÝ÷åôáé ôÝóóåñéò õðï÷ñåùôéêÝò ðáñáìÝôñïõò ïé ïðïßåò ðåñéãñÜöïíôáé óôï ÔìÞìá 16.3.1. Ìðïñåßôå íá äþóåôå êáé Üëëåò ðáñáìÝôñïõò, ð.÷., ãéá íá åêôåëÝóåôå ìéá äéåñãáóßá óôï ðåñéâÜëëïí ôïõ jail ìå ôéò Üäåéåò åíüò óõãêåêñéìÝíïõ ÷ñÞóôç. Ç ðáñÜìåôñïò *command* åîáñôÜôáé áðü ôïí ôýðï ôïõ jail. Ãéá Ýíá *åéêïíéêü óýóôçìá*, ôï `/etc/rc` åßíáé ìéá êáëÞ åðéëïãÞ, ìéá êáé óôçí ïõóßá èá êëùíïðïéÞóåé ôçí äéáäéêáóßá åêêßíçóçò åíüò ðñáãìáôéêïý óõóôÞìáôïò FreeBSD. Ãéá Ýíá *service* jail, ç ðáñÜìåôñïò åîáñôÜôáé áðü ôçí õðçñåóßá Þ ôçí åöáñìïãÞ ðïõ èá ôñÝ÷åé ìÝóá óôï jail.

Ôá jails óõíÞèùò îåêéíïýí êáôÜ ôçí åêêßíçóç êáé ï ìç÷áíéóìüò `rc` ôïõ FreeBSD ðáñÝ÷åé Ýíáí åýêïëï ôñüðï ãéá íá ãßíåé êÜôé ôÝôïéï.

1. Ç ëßóôá ìå ôá jails ðïõ èÝëåôå íá îåêéíÜíå êáôÜ ôçí åêêßíçóç èá ðñÝðåé íá ðñïóôåèïýí óôï áñ÷åßï rc.conf(5):

   ```
   jail_enable="YES"   # Set to NO to disable starting of any jails
   jail_list="www"     # Space separated list of names of jails
   ```

   > **Óçìåßùóç:** Ôï üíïìá ðïõ Ý÷åé êÜèå jail óôç ëßóôá `jail_list` åðéôñÝðåôáé íá ðåñéÝ÷åé ìüíï áëöáñéèìçôéêïýò ÷áñáêôÞñåò.

2. Ãéá êÜèå jail ðïõ õðÜñ÷åé óôï `jail_list`, èá ðñÝðåé íá ðñïóôåèåß ìéá ïìÜäá áðü ñõèìßóåéò óôï rc.conf(5), ïé ïðïßåò èá ôï ðåñéãñÜöïõí:

   ```
   jail_www_rootdir="/usr/jail/www"     # jail’s root directory
   jail_www_hostname="www.example.org"  # jail’s hostname
   jail_www_ip="192.168.0.10"           # jail’s IP address
   jail_www_devfs_enable="YES"          # mount devfs in the jail
   jail_www_devfs_ruleset="www_ruleset" # devfs ruleset to apply to jail
   ```

   Ç ðñïåðéëåãìÝíç åêêßíçóç ôïõ jail ìÝóù ôïõ rc.conf(5), èá îåêéíÞóåé ôï script ôïõ jail `/etc/rc`, ôï ïðïßï õðïèÝôåé üôé ôï jail åßíáé Ýíá ïëïêëçñùìÝíï åéêïíéêü óýóôçìá. Ãéá service jails, ç ðñïåðéëåãìÝíç åêêßíçóç ðñÝðåé íá áëëÜîåé, ïñßæïíôáò êáôÜëëçëá ôçí åðéëïãÞ `jail_jailname_exec_start`.

   > **Óçìåßùóç:** Ãéá ðëÞñç ëßóôá ôùí äéáèÝóéìùí åðéëïãþí, äåßôå ôï rc.conf(5).

Ôï script `/etc/rc.d/jail` ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá îåêéíÞóåé Þ íá óôáìáôÞóåé êÜðïéï jail ÷åéñïêßíçôá. ÐñÝðåé üìùò íá õðÜñ÷åé ç áíôßóôïé÷ç êáôá÷þñçóç óôï `rc.conf`:

```
# /etc/rc.d/jail start www
```

```
# /etc/rc.d/jail stop www
```

Ãéá ôçí þñá äåí õðÜñ÷åé êÜðïéïò áõôüìáôïò ôñüðïò ãéá íá ôåñìáôßóåôå êÜðïéï jail(8). Áõôü óõìâáßíåé, äéüôé ïé åíôïëÝò ðïõ ÷ñçóéìïðïéïýíôáé óõíÞèùò ãéá íá ôåñìáôßóïõí ìå áóöÜëåéá Ýíá óýóôçìá, äåí ìðïñïýí íá ÷ñçóéìïðïéçèïýí ìÝóá óôï ðåñéâÜëëïí åíüò jail. Ï êáëýôåñïò ôñüðïò ãéá íá ôåñìáôßóåôå Ýíá jail åßíáé ìå ôçí åêôÝëåóç ôçò áêüëïõèçò åíôïëÞò ìÝóá áðü ôï ßäéï ôï jail Þ ìå ÷ñÞóç ôïõ âïçèçôéêïý ðñïãñÜììáôïò jexec(8) Ýîù áðü áõôü:

```
# sh /etc/rc.shutdown
```

Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÞ ôç äéáäéêáóßá ìðïñåßôå íá âñåßôå óôç óåëßäá âïçèåßáò ôïõ jail(8)

16.5 ËåðôïìåñÞò Ñýèìéóç êáé Äéá÷åßñéóç

ÕðÜñ÷ïõí áñêåôÝò åðéëïãÝò ðïõ ìðïñïýí íá åöáñìïóôïýí óå Ýíá jail, êáèþò êáé äéÜöïñïé ôñüðïé ãéá íá óõíäõáóôåß Ýíá óýóôçìá FreeBSD ìå jails ðñïêåéìÝíïõ íá ðáñÜãïõí åöáñìïãÝò õøçëüôåñïõ åðéðÝäïõ. Ç åíüôçôá áõôÞ ðáñïõóéÜæåé:

- ÌåñéêÝò áðü ôéò äéáèÝóéìåò åðéëïãÝò ãéá ôçí ñýèìéóç ôçò óõìðåñéöïñÜò êáé ôùí ðåñéïñéóìþí áóöáëåßáò ðïõ õëïðïéïýíôáé áðü ôçí åãêáôÜóôáóç åíüò jail.
- ÌåñéêÝò åöáñìïãÝò õøçëïý åðéðÝäïõ ãéá ôç äéá÷åßñéóç jails, ïé ïðïßåò åßíáé äéáèÝóéìåò ìÝóù ôçò óõëëïãÞò ôùí Ports ôïõ FreeBSD êáé ìðïñïýí íá ÷ñçóéìïðïéçèïýí óôçí õëïðïßçóç ïëïêëçñùìÝíùí ëýóåùí ìå ôç ÷ñÞóç jails.

16.5.1 Åñãáëåßá óõóôÞìáôïò ôïõ FreeBSD ãéá ôç ñýèìéóç jails

ËåðôïìåñÞò ñýèìéóç åíüò jail ãßíåôáé êáôÜ êýñéï ëüãï ìÝóù ôùí ìåôáâëçôþí ôïõ sysctl(8). ÕðÜñ÷åé Ýíá åéäéêü subtree ôïõ sysctl ôï ïðïßï áðïôåëåß ôç âÜóç ãéá ôçí ïñãÜíùóç üëùí ôùí ó÷åôéêþí åðéëïãþí: ðñüêåéôáé ãéá ôçí éåñáñ÷ßá åðéëïãþí ðõñÞíá `security.jail.*`. ÐáñáêÜôù èá âñåßôå ìéá ëßóôá ìå ôá êýñéá sysctl ðïõ ó÷åôßæïíôáé ìå êÜðïéï jail êáèþò êáé ôéò ðñïåðéëåãìÝíåò ôéìÝò ôïõò. Ôá ïíüìáôá ìÜëëïí åîçãïýí áðü ìüíá ôïõò ôçí áíôßóôïé÷ç ëåéôïõñãßá, áëëÜ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ìðïñåßôå íá äåßôå ôéò óåëßäåò âïÞèåéáò ôùí jail(8) êáé sysctl(8).

- `security.jail.set_hostname_allowed: 1`
- `security.jail.socket_unixiproute_only: 1`
- `security.jail.sysvipc_allowed: 0`
- `security.jail.enforce_statfs: 2`
- `security.jail.allow_raw_sockets: 0`
- `security.jail.chflags_allowed: 0`
- `security.jail.jailed: 0`

Ïé ìåôáâëçôÝò áõôÝò ìðïñïýí íá ÷ñçóéìïðïéçèïýí áðü ôïí äéá÷åéñéóôÞ ôïõ *host system* ðñïêåéìÝíïõ íá ðñïóèÝóåé Þ íá áöáéñÝóåé ðåñéïñéóìïýò ïé ïðïßïé õðÜñ÷ïõí áñ÷éêÜ óôïí ÷ñÞóôç `root`. ÕðÜñ÷ïõí üìùò êáé êÜðïéïé ðåñéïñéóìïß ïé ïðïßïé äåí ìðïñïýí íá áöáéñåèïýí. Ï ÷ñÞóôçò `root` äåí åðéôñÝðåôáé íá ðñïóáñôÜ Þ íá áðï-ðñïóáñôÜ óõóôÞìáôá áñ÷åßùí ìÝóá áðü Ýíá jail(8). Ï `root` ìÝóá óå Ýíá jail äåí åðéôñÝðåôáé íá öïñôþóåé Þ íá áðïöïñôþóåé ôïõò êáíüíåò (rulesets) ôïõ devfs(8), ôï firewall, êáé äéÜöïñåò Üëëåò åñãáóßåò äéá÷åßñéóçò ïé ïðïßåò ÷ñåéÜæïíôáé ôñïðïðïßçóç ôùí äåäïìÝíùí ôïõ ðõñÞíá, üðùò ãéá ðáñÜäåéãìá ï ïñéóìüò ôïõ `securelevel` ôïõ ðõñÞíá.

Ôï âáóéêü óýóôçìá ôïõ FreeBSD ðåñéÝ÷åé ôá âáóéêÜ åñãáëåßá ãéá ôç ðñïâïëÞ ðëçñïöïñéþí ó÷åôéêÜ ìå ôá åíåñãÜ jails, êáé åðßóçò ãéá ôçí áíÜèåóç óõãêåêñéìÝíùí åíôïëþí äéá÷åßñéóçò óå êÜðïéï jail. Ïé åíôïëÝò jls(8) êáé jexec(8) áðïôåëïýí ìÝñïò ôïõ âáóéêïý óõóôÞìáôïò ôïõ FreeBSD, êáé ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá íá ôéò ðáñáêÜôù áðëÝò åñãáóßåò:

- ÐñïâïëÞ ëßóôáò ôùí åíåñãþí jails êáé ôïí áíôßóôïé÷ùí ÷áñáêôçñéóôéêþí ôïõò - jail identifier (JID), äéåýèõíóç IP, hostname êáé path.
- Ðñïóêüëëçóç óå êÜðïéï åíåñãü jail, áðü ôï host system, êáé åêôÝëåóç êÜðïéáò åíôïëÞò ìÝóá óôï jail Þ åêôÝëåóç åñãáóéþí äéá÷åßñéóçò ìÝóá óôï jail. ÊÜôé ôÝôïéï åßíáé éäéáßôåñá ÷ñÞóéìï üôáí ï ÷ñÞóôçò `root` åðéèõìåß íá ôåñìáôßóåé ìå áóöÜëåéá êÜðïéï jail. Ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ç åíôïëÞ jexec(8) ãéá ôçí åêôÝëåóç êÜðïéïõ shell ìÝóá óôï jail ðñïêåéìÝíïõ íá åêôåëåóôïýí åñãáóßåò äéá÷åßñéóçò, ãéá ðáñÜäåéãìá:

```
# jexec 1 tcsh
```

16.5.2 Åñãáëåßá äéá÷åßñéóçò õøçëïý åðéðÝäïõ óôç óõëëïãÞ Ports ôïõ FreeBSD

ÁíÜìåóá óôéò äéÜöïñåò åöáñìïãÝò ôñßôùí êáôáóêåõáóôþí ãéá ôç äéá÷åßñéóç ôùí jails, Ýíá áðü ôá ðéï ïëïêëçñùìÝíá êáé ÷ñÞóéìá ðáêÝôá åßíáé ôï `sysutils/jailutils`. Áðïôåëåß Ýíá óýíïëï ìéêñþí åöáñìïãþí ïé ïðïßåò óõíåéóöÝñïõí óôç äéá÷åßñéóç ôïõ jail(8). Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå óôïí äéêôõáêü ôïõ ôüðï.

16.6 ÅöáñìïãÞ ôùí Jails

16.6.1 Service Jails

ÓõíåéóöïñÜ ôïõ Daniel Gerzo.

Ç åíüôçôá áõôÞ åßíáé âáóéóìÝíç óôçí éäÝá ðïõ ðáñïõóéÜóôçêå áñ÷éêÜ áðü ôïí Simon L. Nielsen <`simon@FreeBSD.org`> óôï http://simon.nitro.dk/service-jails.html, êáèþò êáé óå Ýíá áíáíåùìÝíï Üñèñï ôïõ Ken Tom <`locals@gmail.com`>. Óôçí åíüôçôá áõôÞ èá óáò äåßîïõìå ðùò íá óôÞóåôå Ýíá óýóôçìá FreeBSD ôï ïðïßï íá äéáèÝôåé Ýíá åðéðëÝïí åðßðåäï áóöÜëåéáò, ìå ôç ÷ñÞóç ôïõ jail(8). ÕðïèÝôïõìå üôé ôï óýóôçìá ôñÝ÷åé ôïõëÜ÷éóôïí RELENG_6_0 êáé üôé Ý÷åôå êáôáíïÞóåé üëåò ôéò ðñïçãïýìåíåò ðëçñïöïñßåò ôïõ êåöáëáßïõ.

16.6.1.1 Ó÷åäéáóìüò

¸íá áðü ôá óçìáíôéêüôåñá ðñïâëÞìáôá ìå ôá jails åßíáé ç äéá÷åßñéóç ôçò äéáäéêáóßáò áíáâáèìßóåùí. Áõôü ôåßíåé íá åßíáé ðñüâëçìá äéüôé ôï êÜèå jail ðñÝðåé íá äçìéïõñãçèåß áðü ôçí áñ÷Þ óå êÜèå áíáâÜèìéóç. ÓõíÞèùò äåí åßíáé ðñüâëçìá áí Ý÷åôå Ýíá ìüíï jail, ìéá êáé ðñüêåéôáé ãéá ó÷åôéêÜ áðëÞ äéáäéêáóßá, áëëÜ ãßíåôáé êïõñáóôéêÞ êáé ÷ñïíïâüñá áí Ý÷åôå ðïëëÜ jails.

> **Ðñïåéäïðïßçóç:** Ïé ðáñáêÜôù ñõèìßóåéò ðñïûðïèÝôïõí åìðåéñßá ìå ôï FreeBSD êáé ôç ÷ñÞóç ôùí äéÜöïñùí ÷áñáêôçñéóôéêþí ôïõ. ÅÜí ôá ðáñáêÜôù âÞìáôá óáò öáßíïíôáé ðïëý ðåñßðëïêá, åßíáé êáëýôåñá íá ñßîåôå ìéá ìáôéÜ óå êÜôé ðéï áðëü üðùò ôï `sysutils/ezjail`, ôï ïðïßï ðáñÝ÷åé Ýíáí åõêïëüôåñï ôñüðï äéá÷åßñéóçò ôùí jails ôïõ FreeBSD êáé äåí åßíáé ôüóï åîåéäéêåõìÝíï üóï ïé ðáñáêÜôù ñõèìßóåéò.

Ç éäÝá áõôÞ Ý÷åé ðáñïõóéáóôåß ãéá íá ëýóåé ôÝôïéïõ åßäïõò ðñïâëÞìáôá, ìå ôçí äéáìïßñáóç ôçò ìåãÜëçò ðïóüôçôáò äåäïìÝíùí ðïõ åßíáé êïéíÞ ìåôáîý ôùí jails, ìå Ýíáí áóöáëÞ üìùò ôñüðï — ÷ñçóéìïðïéþíôáò ðñïóáñôÞóåéò ôýðïõ mount_nullfs(8) êáé ìüíï ãéá áíÜãíùóç (read only) Ýôóé þóôå ç áíáâÜèìéóç íá åßíáé åõêïëüôåñç, êáé ç ÷ñÞóç ìåìïíùìÝíùí jails ãéá êÜèå õðçñåóßá íá êáèßóôáôáé åðéèõìçôÞ. ÅðéðëÝïí, ðáñÝ÷åé Ýíáí áðëü ôñüðï ãéá íá ðñïóèÝóåôå êáé íá áöáéñÝóåôå jails üðùò åðßóçò êáé íá ôá áíáâáèìßóåôå.

Óçìåßùóç: Ðáñáäåßãìáôá õðçñåóéþí ôÝôïéïõ ôýðïõ: Ýíáò HTTP server, Ýíáò DNS server, Ýíáò SMTP server, êëð.

Ïé óôü÷ïé ôùí ðáñáêÜôù ñõèìßóåùí åßíáé:

- Äçìéïõñãßá áðëþí êáé êáôáíïçôþí jails. Áõôü óçìáßíåé üôé *äåí* èá ôñÝîïõìå Ýíá ðëÞñåò installworld óå êÜèå jail.
- Åýêïëç ðñïóèÞêç êáé äéáãñáöÞ jails.
- Åýêïëç áíáâÜèìéóç õðáñ÷üíôùí jails.
- Äõíáôüôçôá äçìéïõñãßáò ðñïóáñìïóìÝíïõ ôìÞìáôïò ôïõ FreeBSD.
- ¼óï ðåñéóóüôåñç áóöÜëåéá åßíáé äõíáôüí, ìå åëá÷éóôïðïßçóç ôçò ðéèáíüôçôáò êáêüâïõëçò ÷ñÞóçò.
- Åîïéêïíüìçóç ÷þñïõ êáé inodes.

¼ðùò Ý÷ïõìå Þäç ðåé, ï ó÷åäéáóìüò áõôüò åîáñôÜôáé éäéáßôåñá áðü ôçí ýðáñîç åíüò áñ÷éêïý template óôï ïðïßï äåí åðéôñÝðåôáé ç åããñáöÞ äåäïìÝíùí (ãíùóôü ùò **nullfs**) êáé ôï ïðïßï ðñÝðåé íá Ý÷åé ðñïóáñôçèåß óå êÜèå jail, üðùò åðßóçò êáé óôçí ýðáñîç ãéá êÜèå jail ìéáò óõóêåõÞò ðïõ íá åðéôñÝðåé ôüóï ôçí áíÜãíùóç üóï êáé ôçí åããñáöÞ. Ìéá ôÝôïéá óõóêåõÞ ìðïñåß íá åßíáé êÜðïéïò îå÷ùñéóôüò öõóéêüò äßóêïò, ìéá êáôÜôìçóç, Þ êÜðïéá óõóêåõÞ vnode md(4). Óôï ðáñáêÜôù ðáñÜäåéãìá, èá ÷ñçóéìïðïéÞóïõìå ðñïóáñôÞóåéò ôýðïõ **nullfs** óôéò ïðïßåò èá åðéôñÝðåôáé åããñáöÞ êáé áíÜãíùóç.

Ç äïìÞ ôïõ óõóôÞìáôïò áñ÷åßùí ðåñéãñÜöåôáé óôçí ðáñáêÜôù ëßóôá:

- ÊÜèå jail èá ðñïóáñôÜôáé êÜôù áðü ôïí êáôÜëïãï `/home/j`.
- Ôï `/home/j/mroot` åßíáé ôï template ãéá ôï êÜèå jail êáé ç êáôÜôìçóç ìüíï áíÜãíùóçò ãéá üëá ôá jails.
- Èá äçìéïõñãçèåß Ýíáò êåíüò êáôÜëïãïò ãéá êÜèå jail êÜôù áðü ôïí êáôÜëïãï `/home/j`.
- ÊÜèå jail èá Ý÷åé Ýíáí êáôÜëïãï `/s`, ï ïðïßïò èá åßíáé óýíäåóìïò ðñïò ôï åããñÜøéìï ìÝñïò ôïõ óõóôÞìáôïò.
- ÊÜèå jail èá Ý÷åé ôï äéêü åããñÜøéìï ìÝñïò ôï ïðïßï èá âáóßæåôáé óôï `/home/j/skel`.
- ÊÜèå jailspace (ôï åããñÜøéìï ìÝñïò êÜèå jail) èá ðñÝðåé íá äçìéïõñãçèåß óôïí êáôÜëïãï `/home/js`.

Óçìåßùóç: ¼ëá áõôÜ ðñïûðïèÝôïõí üôé ôá jails âñßóêïíôáé êÜôù áðü ôïí êáôÜëïãï `/home`. Áõôü âÝâáéá ìðïñåß íá áëëÜîåé óå ïôéäÞðïôå åóåßò èÝëåôå, áëëÜ èá åðçñåÜóåé üëá ôá ðáñáêÜôù ðáñáäåßãìáôá.

16.6.1.2 Äçìéïõñãþíôáò ôï Template

Ç åíüôçôá áõôÞ èá ðåñéãñÜøåé ôá âÞìáôá ðïõ ÷ñåéÜæïíôáé ðñïêåéìÝíïõ íá äçìéïõñãÞóåôå ôï ðñùôáñ÷éêü template ôï ïðïßï èá ðåñéÝ÷åé ôï ôìÞìá ôùí jails ðïõ åßíáé ìüíï ãéá áíÜãíùóç.

Åßíáé ðÜíôïôå êáëÞ éäÝá íá áíáâáèìßæåôå ôï FreeBSD óôç ôåëåõôáßá Ýêäïóç -RELEASE. Ãéá ôï óêïðü áõôü, äéáâÜóôå ôï áíôßóôïé÷ï êåöÜëáéï (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/handbook/makeworld.html) óôï Åã÷åéñßäéï. Óôç ðåñßðôùóç ðïõ ç áíáâÜèìéóç äåí åßíáé åöéêôÞ, èá ÷ñåéáóôåßôå buildworld ãéá íá ìðïñÝóåôå íá óõíå÷ßóåôå. ÅðéðëÝïí èá ÷ñåéáóôåßôå ôï ðáêÝôï `sysutils/cpdup`. Èá ÷ñçóéìïðïéÞóïõìå ôï âïçèçôéêü ðñüãñáììá portsnap(8) ãéá íá êáôåâÜóïõìå ôç óõëëïãÞ ôùí Ports. Ãéá ôïõò íåï-åéóåñ÷üìåíïõò, óõíßóôáôáé ç áíÜãíùóç ôïõ êåöáëáßïõ ãéá ôï Portsnap (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/handbook/portsnap.html) óôï Åã÷åéñßäéï ôïõ FreeBSD.

1. Áñ÷éêÜ, äçìéïõñãÞóôå ìéá äïìÞ êáôáëüãùí ãéá ôï óýóôçìá áñ÷åßùí ôï ïðïßï èá åßíáé ìüíï ãéá áíÜãíùóç, êáé ôï ïðïßï èá ðåñéÝ÷åé ôá åêôåëÝóéìá (binaries) ôïõ FreeBSD ãéá ôá jails. Óôç óõíÝ÷åéá ðçãáßíåôå óôïí êáôÜëïãï üðïõ âñßóêïíôáé ôá áñ÷åßá ðçãáßïõ êþäéêá (source tree) ôïõ FreeBSD êáé åãêáôáóôÞóôå ôá áíôßóôïé÷á áñ÷åßá óôï jail template:

   ```
   # mkdir /home/j /home/j/mroot
   # cd /usr/src
   # make installworld DESTDIR=/home/j/mroot
   ```

2. Åðüìåíï âÞìá åßíáé íá ðñïåôïéìÜóåôå ôç óõëëïãÞ ôùí Ports ôïõ FreeBSD ãéá ôá jails üðùò åðßóçò êáé Ýíá FreeBSD source tree, ôï ïðïßï èá ÷ñåéáóôåß ãéá ôï **mergemaster**:

   ```
   # cd /home/j/mroot
   # mkdir usr/ports
   # portsnap -p /home/j/mroot/usr/ports fetch extract
   # cpdup /usr/src /home/j/mroot/usr/src
   ```

3. ÄçìéïõñãÞóôå ôï óêåëåôü ãéá ôï ôìÞìá ôïõ óõóôÞìáôïò üðïõ ðñïïñßæåôáé ãéá áíÜãíùóç êáé åããñáöÞ:

   ```
   # mkdir /home/j/skel /home/j/skel/home /home/j/skel/usr-X11R6 /home/j/skel/distfiles
   # mv etc /home/j/skel
   # mv usr/local /home/j/skel/usr-local
   # mv tmp /home/j/skel
   # mv var /home/j/skel
   # mv root /home/j/skel
   ```

4. ×ñçóéìïðïéÞóôå ôï **mergemaster** ãéá íá åãêáôáóôÞóåôå ôá áñ÷åßá ñõèìßóåùí ðïõ ëåßðïõí. Óôç óõíÝ÷åéá äéáãñÜøôå üëïõò ôïõò Ýîôñá êáôáëüãïõò ðïõ äçìéïõñãåß ôï **mergemaster**:

   ```
   # mergemaster -t /home/j/skel/var/tmp/temproot -D /home/j/skel -i
   # cd /home/j/skel
   # rm -R bin boot lib libexec mnt proc rescue sbin sys usr dev
   ```

5. Ôþñá, äçìéïõñãÞóôå óõíäÝóìïõò áðü ôï óýóôçìá áñ÷åßùí óôï ïðïßï åðéôñÝðåôáé ç åããñáöÞ, ðñïò ôï óýóôçìá áñ÷åßùí ðïõ åßíáé ìüíï ãéá áíÜãíùóç. Âåâáéùèåßôå üôé ïé óýíäåóìïé Ý÷ïõí äçìéïõñãçèåß óôéò óùóôÝò èÝóåéò `s/`. Ç ýðáñîç ðñáãìáôéêþí êáôáëüãùí Þ ç äçìéïõñãßá êáôáëüãùí óå ëÜèïò èÝóåéò èá ïäçãÞóïõí ôçí åãêáôÜóôáóç óå áðïôõ÷ßá.

   ```
   # cd /home/j/mroot
   # mkdir s
   # ln -s s/etc etc
   # ln -s s/home home
   # ln -s s/root root
   # ln -s ../s/usr-local usr/local
   # ln -s ../s/usr-X11R6 usr/X11R6
   # ln -s ../../s/distfiles usr/ports/distfiles
   # ln -s s/tmp tmp
   # ln -s s/var var
   ```

6. Óáí ôåëåõôáßï âÞìá, äçìéïõñãÞóôå Ýíá íÝï áñ÷åßï `/home/j/skel/etc/make.conf` ìå ôá ðáñáêÜôù äåäïìÝíá:

   ```
   WRKDIRPREFIX?=  /s/portbuild
   ```

   ¸÷ïíôáò ïñßóåé ôï `WRKDIRPREFIX` ìå áõôüí ôïí ôñüðï, èá ìðïñåßôå íá ìåôáãëùôôßóåôå ports ôïõ FreeBSD ìÝóá óå êÜèå jail. Èõìçèåßôå üôé ï êáôÜëïãïò ôùí ports åßíáé ìÝñïò ôïõ óõóôÞìáôïò áñ÷åßùí ðïõ Ý÷åé ðñïóáñôçèåß ìüíï ãéá áíÜãíùóç. Ç ðñïóáñìïóìÝíç äéáäñïìÞ ãéá ôï `WRKDIRPREFIX` åðéôñÝðåé ôçí ìåôáãëþôôéóç ôùí ports óôï åããñÜøéìï ìÝñïò ôïõ êÜèå jail.

16.6.1.3 Äçìéïõñãþíôáò Jails

Ôþñá ðïõ Ý÷ïõìå Ýíá ïëïêëçñùìÝíï FreeBSD jail template, ìðïñïýìå íá åãêáôáóôÞóïõìå êáé íá ñõèìßóïõìå ôá jails óôï `/etc/rc.conf`. Ôï ðáñÜäåéãìá áõôü äåß÷íåé ôç äçìéïõñãßá ôñéþí jails: “NS”, “MAIL” êáé “WWW”.

1. ÅéóÜãåôå ôéò ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/etc/fstab`, þóôå ôï ìüíï ãéá áíÜãíùóç template ãéá ôá jails êáé ï åããñÜøéìïò ÷þñïò íá åßíáé äéáèÝóéìá óôá áíôßóôïé÷á jails:

   ```
   /home/j/mroot   /home/j/ns     nullfs  ro  0   0
   /home/j/mroot   /home/j/mail   nullfs  ro  0   0
   /home/j/mroot   /home/j/www    nullfs  ro  0   0
   /home/js/ns     /home/j/ns/s   nullfs  rw  0   0
   /home/js/mail   /home/j/mail/s nullfs  rw  0   0
   /home/js/www    /home/j/www/s  nullfs  rw  0   0
   ```

   > **Óçìåßùóç:** Ïé êáôáôìÞóåéò ðïõ åßíáé óçìåéùìÝíåò ìå 0 pass number äåí åëÝã÷ïíôáé êáôÜ ôçí åêêßíçóç áðü ôï fsck(8), åíþ ãéá ôéò êáôáôìÞóåéò ìå 0 dump number, ç dump(8) äåí èá äçìéïõñãåß áíôßãñáöá áóöáëåßáò. Ðñïöáíþò, äåí èÝëïõìå ôï **fsck** íá åëÝã÷åé ôéò ðñïóáñôÞóåéò ôýðïõ **nullfs**, ïýôå êáé ôï **dump** íá êñáôÜ áíôßãñáöá áðü ôá ìüíï ãéá áíÜãíùóç nullfs óõóôÞìáôá áñ÷åßùí ôùí jails. Áõôüò åßíáé êáé ï ëüãïò ðïõ âÜëáìå “0 0” óôéò äýï ôåëåõôáßåò óôÞëåò êÜèå åããñáöÞò ôïõ `fstab`.

2. Ñõèìßóôå ôá jails óôï `/etc/rc.conf`:

   ```
   jail_enable="YES"
   jail_set_hostname_allow="NO"
   jail_list="ns mail www"
   jail_ns_hostname="ns.example.org"
   jail_ns_ip="192.168.3.17"
   jail_ns_rootdir="/home/j/ns"
   jail_ns_devfs_enable="YES"
   jail_mail_hostname="mail.example.org"
   jail_mail_ip="192.168.3.18"
   jail_mail_rootdir="/home/j/mail"
   jail_mail_devfs_enable="YES"
   jail_www_hostname="www.example.org"
   jail_www_ip="62.123.43.14"
   jail_www_rootdir="/home/j/www"
   jail_www_devfs_enable="YES"
   ```

Ðñïåéäïðïßçóç: Ï ëüãïò ãéá ôïí ïðïßï èÝôïõìå ôç ìåôáâëçôÞ `jail_name_rootdir` íá äåß÷íåé óôï `/usr/home` áíôß ãéá ôï `/home` åßíáé üôé ç öõóéêÞ äéáäñïìÞ ãéá ôïí êáôÜëïãï `/home` óå ìéá ôõðéêÞ åãêáôÜóôáóç ôïõ FreeBSD åßíáé ôï `/usr/home`. Ç ìåôáâëçôÞ `jail_name_rootdir` *äåí* äåí ðñÝðåé íá äåß÷íåé ðñïò äéáäñïìÞ ðïõ ðåñéëáìâÜíåé óõìâïëéêü äåóìü, äéáöïñåôéêÜ ôá jails èá áñíçèïýí íá îåêéíÞóïõí. ×ñçóéìïðïéÞóôå ôï âïçèçôéêü ðñüãñáììá realpath(1) ãéá íá ðñïóäéïñßóåôå ôçí ôéìÞ ðïõ èá ðñÝðåé íá ëÜâåé áõôÞ ç ìåôáâëçôÞ. Äåßôå ôï FreeBSD-SA-07:01.jail Security Advisory ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

3. ÄçìéïõñãÞóôå ôá áðáñáßôçôá óçìåßá ðñïóáñôÞóåùí ãéá ôï óýóôçìá áñ÷åßùí ìüíï áíÜãíùóçò ôïõ êÜèå jail:

```
# mkdir /home/j/ns /home/j/mail /home/j/www
```

4. ÅãêáôáóôÞóôå ôï áñ÷éêü template ìÝóá óôï êÜèå jail. ÐñïóÝîôå åäþ ôç ÷ñÞóç ôïõ `sysutils/cpdup`, ôï ïðïßï åðéâåâáéþíåé üôé äçìéïõñãåßôáé ôï óùóôü áíôßãñáöï ôïõ êÜèå êáôáëüãïõ:

```
# mkdir /home/js
# cpdup /home/j/skel /home/js/ns
# cpdup /home/j/skel /home/js/mail
# cpdup /home/j/skel /home/js/www
```

5. Óå áõôÞ ôç öÜóç, ôá jails Ý÷ïõí äçìéïõñãçèåß êáé åßíáé Ýôïéìá íá îåêéíÞóïõí. ÐñïóáñôÞóôå ôï óùóôü óýóôçìá áñ÷åßùí ãéá ôï êÜèå jail, êáé óôç óõíÝ÷åéá åêêéíÞóôå ôá, ÷ñçóéìïðïéþíôáò ôï script `/etc/rc.d/jail`:

```
# mount -a
# /etc/rc.d/jail start
```

Ôá jails èá ðñÝðåé ôþñá íá åêôåëïýíôáé êáíïíéêÜ. Ãéá íá åëÝãîåôå áí Ý÷ïõí îåêéíÞóåé óùóôÜ, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ jls(8). Èá ðñÝðåé íá äåßôå êÜôé áíôßóôïé÷ï ìå ôï ðáñáêÜôù:

```
# jls
   JID  IP Address      Hostname                      Path
     3  192.168.3.17    ns.example.org                /home/j/ns
     2  192.168.3.18    mail.example.org              /home/j/mail
     1  62.123.43.14    www.example.org               /home/j/www
```

Óå áõôü ôï óçìåßï, èá ðñÝðåé íá ìðïñåßôå íá óõíäåèåßôå óå êÜèå jail, íá ðñïóèÝóåôå íÝïõò ÷ñÞóôåò Þ íá ñõèìßóåôå õðçñåóßåò. Ç óôÞëç `JID` äçëþíåé ôï ÷áñáêôçñéóôéêü áíáãíùñéóôéêü áñéèìü êÜèå åíåñãïý jail. ×ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ ðñïêåéìÝíïõ íá åêôåëÝóåôå åñãáóßåò äéá÷åßñéóçò ôïõ jail, ìå `JID` 3:

```
# jexec 3 tcsh
```

16.6.1.4 ÁíáâÜèìéóç

ÊÜðïéá óôéãìÞ, èá ÷ñåéáóôåß íá áíáâáèìßóåôå ôï óýóôçìÜ óáò óå ìéá íÝá Ýêäïóç ôïõ FreeBSD, åßôå ãéá ëüãïõò áóöÜëåéáò, åßôå ãéáôß õðÜñ÷ïõí íÝåò äõíáôüôçôåò óôçí íåþôåñç Ýêäïóç ïé ïðïßåò åßíáé ÷ñÞóéìåò ãéá ôá jails ðïõ Þäç Ý÷åôå. Ï ôñüðïò ðïõ ÷ñçóéìïðïéÞóáìå ãéá ôçí äçìéïõñãßá ôùí jails, åðéôñÝðåé ôçí åýêïëç áíáâÜèìéóç ôïõò. ÅðéðëÝïí, åëá÷éóôïðïéåß ôï ÷ñüíï äéáêïðÞò ôçò ëåéôïõñãßáò ôïõò, ìéá êáé èá ÷ñåéáóôåß íá ôá óôáìáôÞóåôå ìüíï êáôÜ ôá ëßãá ôåëåõôáßá ëåðôÜ. Åðßóçò, ðáñÝ÷åé Ýíáí ôñüðï íá åðéóôñÝøåôå óå ðáëáéüôåñåò åêäüóåéò åÜí ðñïêýøïõí ïðïéáäÞðïôå óöÜëìáôá.

1. Ôï ðñþôï âÞìá åßíáé íá áíáâáèìßóåôå ôï óýóôçìá óôï ïðïßï öéëïîåíïýíôáé ôá jails, ìå ôï óõíÞèç ôñüðï. Óôç óõíÝ÷åéá äçìéïõñãÞóôå Ýíá íÝï ðñïóùñéíü template êáôÜëïãï, ìüíï ãéá áíÜãíùóç, óôï `/home/j/mroot2`.

```
# mkdir /home/j/mroot2
# cd /usr/src
# make installworld DESTDIR=/home/j/mroot2
# cd /home/j/mroot2
# cpdup /usr/src usr/src
# mkdir s
```

Ôï `installworld` äçìéïõñãåß ìåñéêïýò êáôáëüãïõò ðïõ äå ÷ñåéÜæïíôáé, êáé èá ðñÝðåé íá äéáãñáöïýí:

```
# chflags -R 0 var
# rm -R etc var root usr/local tmp
```

2. Äçìéïõñãåßóôå îáíÜ ôïõò óõíäÝóìïõò ãéá ôï óýóôçìá áñ÷åßùí áíÜãíùóçò - åããñáöÞò:

```
# ln -s s/etc etc
# ln -s s/root root
# ln -s s/home home
# ln -s ../s/usr-local usr/local
# ln -s ../s/usr-X11R6 usr/X11R6
# ln -s s/tmp tmp
# ln -s s/var var
```

3. Ôþñá åßíáé ç óùóôÞ óôéãìÞ ãéá íá óôáìáôÞóåôå ôá jails:

```
# /etc/rc.d/jail stop
```

4. ÁðïðñïóáñôÞóôå ôá áñ÷éêÜ óõóôÞìáôá áñ÷åßùí:

```
# umount /home/j/ns/s
# umount /home/j/ns
# umount /home/j/mail/s
# umount /home/j/mail
# umount /home/j/www/s
# umount /home/j/www
```

> **Óçìåßùóç:** Ôá óõóôÞìáôá áñ÷åßùí áíÜãíùóçò - åããñáöÞò åßíáé ðñïóáñôçìÝíá óôï óýóôçìá áñ÷åßùí ìüíï áíÜãíùóçò (`/s`) êáé ðñÝðåé íá åßíáé ôá ðñþôá ðïõ èá áðïðñïóáñôçèïýí.

5. ÌåôáêéíÞóôå ôïí ðáëéü ìüíï ãéá áíÜãíùóç êáôÜëïãï, êáé áíôéêáôáóôÞóôå ôïí ìå ôïí êáéíïýñãéï. Ï ðáëéüò èá ðáñáìåßíåé ùò áíôßãñáöï áóöáëåßáò ôïõ ðáëéïý óõóôÞìáôïò óå ðåñßðôùóç ðñïâëÞìáôïò. Ï ôñüðïò ïíïìáóßáò ðïõ áêïëïõèÞóáìå åäþ áíôéóôïé÷åß óôç ÷ñïíéêÞ óôéãìÞ äçìéïõñãßáò ôïõ íÝïõ óõóôÞìáôïò áñ÷åßùí ìüíï áíÜãíùóçò. ÌåôáêéíÞóôå åðßóçò ôçí áñ÷éêÞ óõëëïãÞ ôùí Ports ôïõ FreeBSD óôï íÝï óýóôçìá, áñ÷åßùí ðñïêåéìÝíïõ íá åîïéêïíïìÞóåôå ÷þñï êáé inodes:

```
# cd /home/j
# mv mroot mroot.20060601
# mv mroot2 mroot
# mv mroot.20060601/usr/ports mroot/usr
```

6. Óå áõôü ôï óçìåßï ôï ìüíï ãéá áíÜãíùóç template åßíáé Ýôïéìï, ïðüôå ôï ìüíï ðïõ áðïìÝíåé åßíáé íá ðñïóáñôÞóåôå îáíÜ ôá óõóôÞìáôá áñ÷åßùí êáé íá îåêéíÞóåôå ôá jails:

```
# mount -a
# /etc/rc.d/jail start
```

×ñçóéìïðïéåßôå ôçí åíôïëÞ jls(8) ãéá íá åëÝãîåôå åÜí ôá jails îåêßíçóáí óùóôÜ. Ìçí îå÷Üóåôå íá åêôåëÝóåôå ôï mergemaster ãéá ôï êÜèå jail. Èá ÷ñåéáóôåß íá áíáâáèìßóåôå ôüóï ôá áñ÷åßá ñõèìßóåùí, üóï êáé ôá rc.d scripts.

ÊåöÜëáéï 17 Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò

ÃñÜöôçêå áðü ôïí Tom Rhodes.

17.1 Óýíïøç

Ôï FreeBSD 5.X åéóÞãáãå íÝåò åðåêôÜóåéò áóöáëåßáò áðü ôï TrustedBSD project, ðïõ âáóßæïíôáé óôï ðñïó÷Ýäéï POSIX.1e. Äýï áðü ôïõò ðéï óçìáíôéêïýò íÝïõò ìç÷áíéóìïýò áóöáëåßáò, åßíáé ïé Ëßóôåò ÅëÝã÷ïõ Ðñüóâáóçò (Access Control Lists, ACLs) óôï óýóôçìá áñ÷åßùí êáé ï Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò (Mandatory Access Control, MAC). Ï Õðï÷ñåùôéêüò ¸ëåã÷ïò Ðñüóâáóçò äßíåé ôçí äõíáôüôçôá öüñôùóçò áñèñùìÜôùí (modules) åëÝã÷ïõ ôá ïðïßá õëïðïéïýí íÝåò ðïëéôéêÝò áóöáëåßáò. ÌåñéêÜ ðáñÝ÷ïõí ðñïóôáóßá óå Ýíá óôåíü õðïóýíïëï ôïõ óõóôÞìáôïò, åíéó÷ýïíôáò ôçí áóöÜëåéá ìéáò óõãêåêñéìÝíçò õðçñåóßáò. ¶ëëá ðáñÝ÷ïõí óõíïëéêÞ áóöÜëåéá ðñïò üëåò ôéò õðçñåóßåò êáé ôï óýóôçìá. Ï Ýëåã÷ïò ïíïìÜæåôáé õðï÷ñåùôéêüò áðü ôï ãåãïíüò üôé ç åðéâïëÞ ãßíåôáé áðü ôïõò äéá÷åéñéóôÝò êáé ôï óýóôçìá, êáé äåí áöÞíåôáé óôç äéáêñéôéêÞ åõ÷Ýñåéá ôùí ÷ñçóôþí üðùò ãßíåôáé ìå ôï äéáêñéôéêü Ýëåã÷ï ðñüóâáóçò (Discretionary Access Control, DAC, ôéò ôõðïðïéçìÝíåò Üäåéåò áñ÷åßùí êáé IPC ôïõ System V óôï FreeBSD).

Ôï êåöÜëáéï áõôü åóôéÜæåé óôï ðëáßóéï ôïõ Õðï÷ñåùôéêïý ÅëÝã÷ïõ Ðñüóâáóçò (MAC Framework), êáé óå Ýíá óýíïëï ðñüóèåôùí áñèñùìÜôùí ãéá ðïëéôéêÝò áóöÜëåéáò, ðïõ åíåñãïðïéïýí äéÜöïñïõò ìç÷áíéóìïýò áóöÜëåéáò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôé MAC áñèñþìáôá ðïëéôéêþí áóöáëåßáò ðåñéëáìâÜíïíôáé áõôÞ ôç óôéãìÞ óôï FreeBSD êáé ôïõò ó÷åôéêïýò ìç÷áíéóìïýò ôïõò.
- Ôé õëïðïéïýí ôá MAC áñèñþìáôá ðïëéôéêþí áóöáëåßáò êáèþò êáé ôç äéáöïñÜ ìåôáîý ìéá ÷áñáêôçñéóìÝíçò (labeled) êáé ìç ÷áñáêôçñéóìÝíçò (non-labeled) ðïëéôéêÞò.
- Ðùò íá ñõèìßóåôå áðïäïôéêÜ Ýíá óýóôçìá ãéá ÷ñÞóç ôïõ ðëáéóßïõ ëåéôïõñãßáò MAC.
- Ðùò íá ñõèìßóåôå ôá äéáöïñåôéêÜ áñèñþìáôá ðïëéôéêþí áóöÜëåéáò ôá ïðïßá ðåñéëáìâÜíïíôáé óôï ðëáßóéï ëåéôïõñãßáò MAC .
- Ðùò íá õëïðïéÞóåôå Ýíá ðéï áóöáëÝò ðåñéâÜëëïí, ÷ñçóéìïðïéþíôáò ôï ðëáßóéï ëåéôïõñãßáò MAC êáé ôá ðáñáäåßãìáôá ðïõ öáßíïíôáé.
- Ðùò íá åëÝãîåôå ôç ñýèìéóç ôïõ MAC ãéá íá åîáóöáëßóåôå üôé Ý÷åé ãßíåé óùóôÞ õëïðïßçóç ôïõ ðëáéóßïõ ëåéôïõñãßáò.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD. (ÊåöÜëáéï 4).
- Íá åßóôå åîïéêåéùìÝíïò ìå ôéò âáóéêÝò Ýííïéåò ôçò ñýèìéóçò êáé ìåôáãëþôôéóçò ôïõ ðõñÞíá (ÊåöÜëáéï 9).
- Íá Ý÷åôå êÜðïéá åîïéêåßùóç ìå ôçí áóöÜëåéá êáé ðùò áõôÞ ó÷åôßæåôáé ìå ôï FreeBSD (ÊåöÜëáéï 15).

> **Ðñïåéäïðïßçóç:** Ç êáêÞ ÷ñÞóç ôùí ðëçñïöïñéþí ðïõ ðáñÝ÷ïíôáé åäþ ìðïñåß íá ðñïêáëÝóåé áðþëåéá ðñüóâáóçò óôï óýóôçìá, åêíåõñéóìü óôïõò ÷ñÞóôåò Þ áäõíáìßá ðñüóâáóçò óôéò õðçñåóßåò ðïõ ðáñÝ÷ïíôáé áðü ôï ×11. Áêüìá ðéï óçìáíôéêü åßíáé üôé äåí ðñÝðåé íá âáóßæåóôå óôï MAC ãéá ôçí ðëÞñç áóöÜëéóç åíüò óõóôÞìáôïò.

Ôï ðëáßóéï ëåéôïõñãéþí MAC ðáñÝ÷åé áðëþò åðéðëÝïí õðïóôÞñéîç óå ìéá õðÜñ÷ïõóá ðïëéôéêÞ áóöáëåßáò. ×ùñßò óùóôÝò ðñáêôéêÝò êáé ôáêôéêïýò åëÝã÷ïõò áóöáëåßáò, ôï óýóôçìá äåí èá åßíáé ðïôÝ áðüëõôá áóöáëÝò.

Èá ðñÝðåé åðßóçò íá óçìåéùèåß üôé ôá ðáñáäåßãìáôá ðïõ ðåñéÝ÷ïíôáé óå áõôü ôï êåöÜëáéï åßíáé áêñéâþò êáé ìüíï áõôü: ðáñáäåßãìáôá. Äåí óõíßóôáôáé íá ÷ñçóéìïðïéçèïýí áêñéâþò áõôÝò ïé ñõèìßóåéò óå Ýíá óýóôçìá ðáñáãùãÞò. Ç õëïðïßçóç ôùí äéÜöïñùí áñèñùìÜôùí ðïëéôéêþí áóöáëåßáò áðáéôåß áñêåôÞ óêÝøç êáé äïêéìÝò. Áí äåí êáôáíïåßôå ôçí áêñéâÞ ëåéôïõñãßá ôïõò, ìðïñåß íá âñåèåßôå óôç èÝóç íá åëÝã÷åôå îáíÜ ïëüêëçñï ôï óýóôçìá êáé íá áëëÜæåôå ñõèìßóåéò óå ðïëëÜ áñ÷åßá êáé êáôáëüãïõò.

17.1.1 Ôé äåí Ðåñéëáìâܽåôáé óôï ÊåöÜëáéï

Ôï êåöÜëáéï áõôü êáëýðôåé ìéá åõñåßá ðåñéï÷Þ ðñïâëçìÜôùí áóöáëåßáò ðïõ ó÷åôßæïíôáé ìå ôï ðëáßóéï ëåéôïõñãéþí MAC. Äåí èá êáëõöèåß ç áíÜðôõîç íÝùí áñèñùìÜôùí ðïëéôéêþí áóöáëåßáò MAC. ¸íáò áñéèìüò áðü áñèñþìáôá ðïõ ðåñéëáìâÜíïíôáé óôï ðëáßóéï MAC, Ý÷ïõí åéäéêÜ ÷áñáêôçñéóôéêÜ ðïõ ðáñÝ÷ïíôáé ôüóï ãéá äïêéìÝò üóï êáé ãéá áíÜðôõîç íÝùí áñèñùìÜôùí. ÁõôÜ ðåñéëáìâÜíïõí ôá mac_test(4), mac_stub(4) êáé mac_none(4). Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÜ ôá áñèñþìáôá êáé ôïõò äéÜöïñïõò ìç÷áíéóìïýò ðïõ ðáñÝ÷ïõí, ðáñáêáëïýìå áíáôñÝîôå óôéò áíôßóôïé÷åò óåëßäåò manual.

17.2 Key Terms in this Chapter

Before reading this chapter, a few key terms must be explained. This will hopefully clear up any confusion that may occur and avoid the abrupt introduction of new terms and information.

- *compartment*: A compartment is a set of programs and data to be partitioned or separated, where users are given explicit access to specific components of a system. Also, a compartment represents a grouping, such as a work group, department, project, or topic. Using compartments, it is possible to implement a need-to-know security policy.
- *high water mark*: A high water mark policy is one which permits the raising of security levels for the purpose of accessing higher level information. In most cases, the original level is restored after the process is complete. Currently, the FreeBSD MAC framework does not have a policy for this, but the definition is included for completeness.
- *integrity*: Integrity, as a key concept, is the level of trust which can be placed on data. As the integrity of the data is elevated, so does the ability to trust that data.
- *label*: A label is a security attribute which can be applied to files, directories, or other items in the system. It could be considered a confidentiality stamp; when a label is placed on a file it describes the security properties for that specific file and will only permit access by files, users, resources, etc. with a similar security setting. The meaning and interpretation of label values depends on the policy configuration: while some policies might treat a label as representing the integrity or secrecy of an object, other policies might use labels to hold rules for access.
- *level*: The increased or decreased setting of a security attribute. As the level increases, its security is considered to elevate as well.
- *low water mark*: A low water mark policy is one which permits lowering of the security levels for the purpose of accessing information which is less secure. In most cases, the original security level of the user is restored after the process is complete. The only security policy module in FreeBSD to use this is mac_lomac(4).

- *multilabel*: The `multilabel` property is a file system option which can be set in single user mode using the tunefs(8) utility, during the boot operation using the fstab(5) file, or during the creation of a new file system. This option will permit an administrator to apply different MAC labels on different objects. This option only applies to security policy modules which support labeling.
- *object*: An object or system object is an entity through which information flows under the direction of a *subject*. This includes directories, files, fields, screens, keyboards, memory, magnetic storage, printers or any other data storage/moving device. Basically, an object is a data container or a system resource; access to an *object* effectively means access to the data.
- *policy*: A collection of rules which defines how objectives are to be achieved. A *policy* usually documents how certain items are to be handled. This chapter will consider the term *policy* in this context as a *security policy*; i.e. a collection of rules which will control the flow of data and information and define whom will have access to that data and information.
- *sensitivity*: Usually used when discussing MLS. A sensitivity level is a term used to describe how important or secret the data should be. As the sensitivity level increases, so does the importance of the secrecy, or confidentiality of the data.
- *single label*: A single label is when the entire file system uses one label to enforce access control over the flow of data. When a file system has this set, which is any time when the `multilabel` option is not set, all files will conform to the same label setting.
- *subject*: a subject is any active entity that causes information to flow between *objects*; e.g. a user, user processor, system process, etc. On FreeBSD, this is almost always a thread acting in a process on behalf of a user.

17.3 Explanation of MAC

With all of these new terms in mind, consider how the MAC framework augments the security of the system as a whole. The various security policy modules provided by the MAC framework could be used to protect the network and file systems, block users from accessing certain ports and sockets, and more. Perhaps the best use of the policy modules is to blend them together, by loading several security policy modules at a time for a multi-layered security environment. In a multi-layered security environment, multiple policy modules are in effect to keep security in check. This is different to a hardening policy, which typically hardens elements of a system that is used only for specific purposes. The only downside is administrative overhead in cases of multiple file system labels, setting network access control user by user, etc.

These downsides are minimal when compared to the lasting effect of the framework; for instance, the ability to pick and choose which policies are required for a specific configuration keeps performance overhead down. The reduction of support for unneeded policies can increase the overall performance of the system as well as offer flexibility of choice. A good implementation would consider the overall security requirements and effectively implement the various security policy modules offered by the framework.

Thus a system utilizing MAC features should at least guarantee that a user will not be permitted to change security attributes at will; all user utilities, programs and scripts must work within the constraints of the access rules provided by the selected security policy modules; and that total control of the MAC access rules are in the hands of the system administrator.

It is the sole duty of the system administrator to carefully select the correct security policy modules. Some environments may need to limit access control over the network; in these cases, the mac_portacl(4), mac_ifoff(4) and even mac_biba(4) policy modules might make good starting points. In other cases, strict confidentiality of file system objects might be required. Policy modules such as mac_bsdextended(4) and mac_mls(4) exist for this purpose.

Policy decisions could be made based on network configuration. Perhaps only certain users should be permitted access to facilities provided by ssh(1) to access the network or the Internet. The mac_portacl(4) would be the policy module of choice for these situations. But what should be done in the case of file systems? Should all access to certain directories be severed from other groups or specific users? Or should we limit user or utility access to specific files by setting certain objects as classified?

In the file system case, access to objects might be considered confidential to some users, but not to others. For an example, a large development team might be broken off into smaller groups of individuals. Developers in project A might not be permitted to access objects written by developers in project B. Yet they might need to access objects created by developers in project C; that is quite a situation indeed. Using the different security policy modules provided by the MAC framework; users could be divided into these groups and then given access to the appropriate areas without fear of information leakage.

Thus, each security policy module has a unique way of dealing with the overall security of a system. Module selection should be based on a well thought out security policy. In many cases, the overall policy may need to be revised and reimplemented on the system. Understanding the different security policy modules offered by the MAC framework will help administrators choose the best policies for their situations.

The default FreeBSD kernel does not include the option for the MAC framework; thus the following kernel option must be added before trying any of the examples or information in this chapter:

```
options MAC
```

And the kernel will require a rebuild and a reinstall.

> **Ðñïóï÷Þ:** While the various manual pages for MAC policy modules state that they may be built into the kernel, it is possible to lock the system out of the network and more. Implementing MAC is much like implementing a firewall, care must be taken to prevent being completely locked out of the system. The ability to revert back to a previous configuration should be considered while the implementation of MAC remotely should be done with extreme caution.

17.4 Understanding MAC Labels

A MAC label is a security attribute which may be applied to subjects and objects throughout the system.

When setting a label, the user must be able to comprehend what it is, exactly, that is being done. The attributes available on an object depend on the policy module loaded, and that policy modules interpret their attributes in different ways. If improperly configured due to lack of comprehension, or the inability to understand the implications, the result will be the unexpected and perhaps, undesired, behavior of the system.

The security label on an object is used as a part of a security access control decision by a policy. With some policies, the label by itself contains all information necessary to make a decision; in other models, the labels may be processed as part of a larger rule set, etc.

For instance, setting the label of `biba/low` on a file will represent a label maintained by the Biba security policy module, with a value of “low”.

A few policy modules which support the labeling feature in FreeBSD offer three specific predefined labels. These are the low, high, and equal labels. Although they enforce access control in a different manner with each policy module, you can be sure that the low label will be the lowest setting, the equal label will set the subject or object to be disabled or unaffected, and the high label will enforce the highest setting available in the Biba and MLS policy modules.

Within single label file system environments, only one label may be used on objects. This will enforce one set of access permissions across the entire system and in many environments may be all that is required. There are a few cases where multiple labels may be set on objects or subjects in the file system. For those cases, the `multilabel` option may be passed to tunefs(8).

In the case of Biba and MLS, a numeric label may be set to indicate the precise level of hierarchical control. This numeric level is used to partition or sort information into different groups of say, classification only permitting access to that group or a higher group level.

In most cases the administrator will only be setting up a single label to use throughout the file system.

Hey wait, this is similar to DAC! I thought MAC gave control strictly to the administrator. That statement still holds true, to some extent as `root` is the one in control and who configures the policies so that users are placed in the appropriate categories/access levels. Alas, many policy modules can restrict the `root` user as well. Basic control over objects will then be released to the group, but `root` may revoke or modify the settings at any time. This is the hierarchal/clearance model covered by policies such as Biba and MLS.

17.4.1 Label Configuration

Virtually all aspects of label policy module configuration will be performed using the base system utilities. These commands provide a simple interface for object or subject configuration or the manipulation and verification of the configuration.

All configuration may be done by use of the setfmac(8) and setpmac(8) utilities. The `setfmac` command is used to set MAC labels on system objects while the `setpmac` command is used to set the labels on system subjects. Observe:

```
# setfmac biba/high test
```

If no errors occurred with the command above, a prompt will be returned. The only time these commands are not quiescent is when an error occurred; similarly to the chmod(1) and chown(8) commands. In some cases this error may be a `Permission denied` and is usually obtained when the label is being set or modified on an object which is restricted.[1] The system administrator may use the following commands to overcome this:

```
# setfmac biba/high test
Permission denied
# setpmac biba/low setfmac biba/high test
# getfmac test
test: biba/high
```

As we see above, `setpmac` can be used to override the policy module's settings by assigning a different label to the invoked process. The `getpmac` utility is usually used with currently running processes, such as **sendmail**: although it takes a process ID in place of a command the logic is extremely similar. If users attempt to manipulate a file not in their access, subject to the rules of the loaded policy modules, the `Operation not permitted` error will be displayed by the `mac_set_link` function.

17.4.1.1 Common Label Types

For the mac_biba(4), mac_mls(4) and mac_lomac(4) policy modules, the ability to assign simple labels is provided. These take the form of high, equal and low, what follows is a brief description of what these labels provide:

- The `low` label is considered the lowest label setting an object or subject may have. Setting this on objects or subjects will block their access to objects or subjects marked high.
- The `equal` label should only be placed on objects considered to be exempt from the policy.
- The `high` label grants an object or subject the highest possible setting.

With respect to each policy module, each of those settings will instate a different information flow directive. Reading the proper manual pages will further explain the traits of these generic label configurations.

17.4.1.1.1 Advanced Label Configuration

Numeric grade labels are used for `comparison:compartment+compartment`; thus the following:

```
biba/10:2+3+6(5:2+3-20:2+3+4+5+6)
```

May be interpreted as:

“Biba Policy Label”/“Grade 10” :“Compartments 2, 3 and 6”: (“grade 5 ...”)

In this example, the first grade would be considered the “effective grade” with “effective compartments”, the second grade is the low grade and the last one is the high grade. In most configurations these settings will not be used; indeed, they offered for more advanced configurations.

When applied to system objects, they will only have a current grade/compartments as opposed to system subjects as they reflect the range of available rights in the system, and network interfaces, where they are used for access control.

The grade and compartments in a subject and object pair are used to construct a relationship referred to as “dominance”, in which a subject dominates an object, the object dominates the subject, neither dominates the other, or both dominate each other. The “both dominate” case occurs when the two labels are equal. Due to the information flow nature of Biba, you have rights to a set of compartments, “need to know”, that might correspond to projects, but objects also have a set of compartments. Users may have to subset their rights using `su` or `setpmac` in order to access objects in a compartment from which they are not restricted.

17.4.1.2 Users and Label Settings

Users themselves are required to have labels so that their files and processes may properly interact with the security policy defined on the system. This is configured through the `login.conf` file by use of login classes. Every policy module that uses labels will implement the user class setting.

An example entry containing every policy module setting is displayed below:

```
default:\
        :copyright=/etc/COPYRIGHT:\
        :welcome=/etc/motd:\
        :setenv=MAIL=/var/mail/$,BLOCKSIZE=K:\
        :path=~/bin:/sbin:/bin:/usr/sbin:/usr/bin:/usr/local/sbin:/usr/local/bin:\
        :manpath=/usr/share/man /usr/local/man:\
        :nologin=/usr/sbin/nologin:\
        :cputime=1h30m:\
        :datasize=8M:\
        :vmemoryuse=100M:\
        :stacksize=2M:\
        :memorylocked=4M:\
        :memoryuse=8M:\
        :filesize=8M:\
        :coredumpsize=8M:\
        :openfiles=24:\
        :maxproc=32:\
        :priority=0:\
        :requirehome:\
        :passwordtime=91d:\
        :umask=022:\
        :ignoretime@:\
        :label=partition/13,mls/5,biba/10(5-15),lomac/10[2]:
```

The `label` option is used to set the user class default label which will be enforced by MAC. Users will never be permitted to modify this value, thus it can be considered not optional in the user case. In a real configuration, however, the administrator will never wish to enable every policy module. It is recommended that the rest of this chapter be reviewed before any of this configuration is implemented.

> **Óçìåßùóç:** Users may change their label after the initial login; however, this change is subject constraints of the policy. The example above tells the Biba policy that a process's minimum integrity is 5, its maximum is 15, but the default effective label is 10. The process will run at 10 until it chooses to change label, perhaps due to the user using the setpmac command, which will be constrained by Biba to the range set at login.

In all cases, after a change to `login.conf`, the login class capability database must be rebuilt using `cap_mkdb` and this will be reflected throughout every forthcoming example or discussion.

It is useful to note that many sites may have a particularly large number of users requiring several different user classes. In depth planning is required as this may get extremely difficult to manage.

Future versions of FreeBSD will include a new way to deal with mapping users to labels; however, this will not be available until some time after FreeBSD 5.3.

17.4.1.3 Network Interfaces and Label Settings

Labels may also be set on network interfaces to help control the flow of data across the network. In all cases they function in the same way the policies function with respect to objects. Users at high settings in `biba`, for example, will not be permitted to access network interfaces with a label of low.

The `maclabel` may be passed to `ifconfig` when setting the MAC label on network interfaces. For example:

```
# ifconfig bge0 maclabel biba/equal
```

will set the MAC label of `biba/equal` on the bge(4) interface. When using a setting similar to `biba/high(low-high)` the entire label should be quoted; otherwise an error will be returned.

Each policy module which supports labeling has a tunable which may be used to disable the MAC label on network interfaces. Setting the label to `equal` will have a similar effect. Review the output from `sysctl`, the policy manual pages, or even the information found later in this chapter for those tunables.

17.4.2 Singlelabel or Multilabel?

By default the system will use the `singlelabel` option. But what does this mean to the administrator? There are several differences which, in their own right, offer pros and cons to the flexibility in the systems security model.

The `singlelabel` only permits for one label, for instance `biba/high` to be used for each subject or object. It provides for lower administration overhead but decreases the flexibility of policies which support labeling. Many administrators may want to use the `multilabel` option in their security policy.

The `multilabel` option will permit each subject or object to have its own independent MAC label in place of the standard `singlelabel` option which will allow only one label throughout the partition. The `multilabel` and `single` label options are only required for the policies which implement the labeling feature, including the Biba, Lomac, MLS and SEBSD policies.

In many cases, the `multilabel` may not need to be set at all. Consider the following situation and security model:

- FreeBSD web-server using the MAC framework and a mix of the various policies.
- This machine only requires one label, `biba/high`, for everything in the system. Here the file system would not require the `multilabel` option as a single label will always be in effect.
- But, this machine will be a web server and should have the web server run at `biba/low` to prevent write up capabilities. The Biba policy and how it works will be discussed later, so if the previous comment was difficult to interpret just continue reading and return. The server could use a separate partition set at `biba/low` for most if not all of its runtime state. Much is lacking from this example, for instance the restrictions on data, configuration and user settings; however, this is just a quick example to prove the aforementioned point.

If any of the non-labeling policies are to be used, then the `multilabel` option would never be required. These include the `seeotheruids`, `portacl` and `partition` policies.

It should also be noted that using `multilabel` with a partition and establishing a security model based on `multilabel` functionality could open the doors for higher administrative overhead as everything in the file system would have a label. This includes directories, files, and even device nodes.

The following command will set `multilabel` on the file systems to have multiple labels. This may only be done in single user mode:

```
# tunefs -l enable /
```

This is not a requirement for the swap file system.

> **Óçìåßùóç:** Some users have experienced problems with setting the `multilabel` flag on the root partition. If this is the case, please review the ÔìÞìá 17.16 of this chapter.

17.5 Planning the Security Configuration

Whenever a new technology is implemented, a planning phase is always a good idea. During the planning stages, an administrator should in general look at the “big picture”, trying to keep in view at least the following:

- The implementation requirements;

- The implementation goals;

For MAC installations, these include:

- How to classify information and resources available on the target systems.
- What sorts of information or resources to restrict access to along with the type of restrictions that should be applied.
- Which MAC module or modules will be required to achieve this goal.

It is always possible to reconfigure and change the system resources and security settings, it is quite often very inconvenient to search through the system and fix existing files and user accounts. Planning helps to ensure a trouble-free and efficient trusted system implementation. A trial run of the trusted system, including the configuration, is often vital and definitely beneficial *before* a MAC implementation is used on production systems. The idea of just letting loose on a system with MAC is like setting up for failure.

Different environments may have explicit needs and requirements. Establishing an in depth and complete security profile will decrease the need of changes once the system goes live. As such, the future sections will cover the different modules available to administrators; describe their use and configuration; and in some cases provide insight on what situations they would be most suitable for. For instance, a web server might roll out the mac_biba(4) and mac_bsdextended(4) policies. In other cases, a machine with very few local users, the mac_partition(4) might be a good choice.

17.6 Module Configuration

Every module included with the MAC framework may be either compiled into the kernel as noted above or loaded as a run-time kernel module. The recommended method is to add the module name to the `/boot/loader.conf` file so that it will load during the initial boot operation.

The following sections will discuss the various MAC modules and cover their features. Implementing them into a specific environment will also be a consideration of this chapter. Some modules support the use of labeling, which is controlling access by enforcing a label such as “this is allowed and this is not”. A label configuration file may control how files may be accessed, network communication can be exchanged, and more. The previous section showed how the `multilabel` flag could be set on file systems to enable per-file or per-partition access control.

A single label configuration would enforce only one label across the system, that is why the `tunefs` option is called `multilabel`.

17.6.1 The MAC seeotheruids Module

Module name: `mac_seeotheruids.ko`

Kernel configuration line: `options MAC_SEEOTHERUIDS`

Boot option: `mac_seeotheruids_load="YES"`

The mac_seeotheruids(4) module mimics and extends the `security.bsd.see_other_uids` and `security.bsd.see_other_gids` `sysctl` tunables. This option does not require any labels to be set before configuration and can operate transparently with the other modules.

After loading the module, the following `sysctl` tunables may be used to control the features:

- `security.mac.seeotheruids.enabled` will enable the module's features and use the default settings. These default settings will deny users the ability to view processes and sockets owned by other users.
- `security.mac.seeotheruids.specificgid_enabled` will allow a certain group to be exempt from this policy. To exempt specific groups from this policy, use the `security.mac.seeotheruids.specificgid=XXX` `sysctl` tunable. In the above example, the `XXX` should be replaced with the numeric group ID to be exempted.
- `security.mac.seeotheruids.primarygroup_enabled` is used to exempt specific primary groups from this policy. When using this tunable, the `security.mac.seeotheruids.specificgid_enabled` may not be set.

17.7 The MAC bsdextended Module

Module name: `mac_bsdextended.ko`

Kernel configuration line: `options MAC_BSDEXTENDED`

Boot option: `mac_bsdextended_load="YES"`

The mac_bsdextended(4) module enforces the file system firewall. This module's policy provides an extension to the standard file system permissions model, permitting an administrator to create a firewall-like ruleset to protect files, utilities, and directories in the file system hierarchy. When access to a file system object is attempted, the list of rules is iterated until either a matching rule is located or the end is reached. This behavior may be changed by the use of a sysctl(8) parameter, security.mac.bsdextended.firstmatch_enabled. Similar to other firewall modules in FreeBSD, a file containing access control rules can be created and read by the system at boot time using an rc.conf(5) variable.

The rule list may be entered using a utility, ugidfw(8), that has a syntax similar to that of ipfw(8). More tools can be written by using the functions in the libugidfw(3) library.

Extreme caution should be taken when working with this module; incorrect use could block access to certain parts of the file system.

17.7.1 Examples

After the mac_bsdextended(4) module has been loaded, the following command may be used to list the current rule configuration:

```
# ugidfw list
0 slots, 0 rules
```

As expected, there are no rules defined. This means that everything is still completely accessible. To create a rule which will block all access by users but leave `root` unaffected, simply run the following command:

```
# ugidfw add subject not uid root new object not uid root mode n
```

> **Óçìåßùóç:** In releases prior to FreeBSD 5.3, the `add` parameter did not exist. In those cases the `set` should be used instead. See below for a command example.

This is a very bad idea as it will block all users from issuing even the most simple commands, such as `ls`. A more patriotic list of rules might be:

```
# ugidfw set 2 subject uid user1 object uid user2 mode n
# ugidfw set 3 subject uid user1 object gid user2 mode n
```

This will block any and all access, including directory listings, to *`user2`*’s home directory from the username `user1`.

In place of `user1`, the `not uid` *`user2`* could be passed. This will enforce the same access restrictions above for all users in place of just one user.

> **Óçìåßùóç:** The `root` user will be unaffected by these changes.

This should provide a general idea of how the mac_bsdextended(4) module may be used to help fortify a file system. For more information, see the mac_bsdextended(4) and the ugidfw(8) manual pages.

17.8 The MAC ifoff Module

Module name: `mac_ifoff.ko`

Kernel configuration line: `options MAC_IFOFF`

Boot option: `mac_ifoff_load="YES"`

The mac_ifoff(4) module exists solely to disable network interfaces on the fly and keep network interfaces from being brought up during the initial system boot. It does not require any labels to be set up on the system, nor does it have a dependency on other MAC modules.

Most of the control is done through the `sysctl` tunables listed below.

- `security.mac.ifoff.lo_enabled` will enable/disable all traffic on the loopback (lo(4)) interface.
- `security.mac.ifoff.bpfrecv_enabled` will enable/disable all traffic on the Berkeley Packet Filter interface (bpf(4))
- `security.mac.ifoff.other_enabled` will enable/disable traffic on all other interfaces.

One of the most common uses of mac_ifoff(4) is network monitoring in an environment where network traffic should not be permitted during the boot sequence. Another suggested use would be to write a script which uses `security/aide` to automatically block network traffic if it finds new or altered files in protected directories.

17.9 The MAC portacl Module

Module name: `mac_portacl.ko`

Kernel configuration line: `MAC_PORTACL`

Boot option: `mac_portacl_load="YES"`

The mac_portacl(4) module is used to limit binding to local TCP and UDP ports using a variety of `sysctl` variables. In essence mac_portacl(4) makes it possible to allow non-`root` users to bind to specified privileged ports, i.e. ports fewer than 1024.

Once loaded, this module will enable the MAC policy on all sockets. The following tunables are available:

- `security.mac.portacl.enabled` will enable/disable the policy completely.[2]
- `security.mac.portacl.port_high` will set the highest port number that mac_portacl(4) will enable protection for.
- `security.mac.portacl.suser_exempt` will, when set to a non-zero value, exempt the `root` user from this policy.
- `security.mac.portacl.rules` will specify the actual mac_portacl policy; see below.

The actual `mac_portacl` policy, as specified in the `security.mac.portacl.rules` sysctl, is a text string of the form: `rule[,rule,...]` with as many rules as needed. Each rule is of the form: `idtype:id:protocol:port`. The *`idtype`* parameter can be `uid` or `gid` and used to interpret the *`id`* parameter as either a user id or group id, respectively. The *`protocol`* parameter is used to determine if the rule should apply to TCP or UDP by setting the parameter to `tcp` or `udp`. The final *`port`* parameter is the port number to allow the specified user or group to bind to.

> **Óçìåßùóç:** Since the ruleset is interpreted directly by the kernel only numeric values can be used for the user ID, group ID, and port parameters. I.e. user, group, and port service names cannot be used.

By default, on UNIX-like systems, ports fewer than 1024 can only be used by/bound to privileged processes, i.e. those run as `root`. For mac_portacl(4) to allow non-privileged processes to bind to ports below 1024 this standard UNIX restriction has to be disabled. This can be accomplished by setting the sysctl(8) variables `net.inet.ip.portrange.reservedlow` and `net.inet.ip.portrange.reservedhigh` to zero.

See the examples below or review the mac_portacl(4) manual page for further information.

17.9.1 Examples

The following examples should illuminate the above discussion a little better:

```
# sysctl security.mac.portacl.port_high=1023
# sysctl net.inet.ip.portrange.reservedlow=0 net.inet.ip.portrange.reservedhigh=0
```

First we set mac_portacl(4) to cover the standard privileged ports and disable the normal UNIX bind restrictions.

```
# sysctl security.mac.portacl.suser_exempt=1
```

The `root` user should not be crippled by this policy, thus set the `security.mac.portacl.suser_exempt` to a non-zero value. The mac_portacl(4) module has now been set up to behave the same way UNIX-like systems behave by default.

```
# sysctl security.mac.portacl.rules=uid:80:tcp:80
```

Allow the user with UID 80 (normally the `www` user) to bind to port 80. This can be used to allow the `www` user to run a web server without ever having `root` privilege.

```
# sysctl security.mac.portacl.rules=uid:1001:tcp:110,uid:1001:tcp:995
```

Permit the user with the UID of 1001 to bind to the TCP ports 110 (“pop3”) and 995 (“pop3s”). This will permit this user to start a server that accepts connections on ports 110 and 995.

17.10 The MAC partition Module

Module name: `mac_partition.ko`

Kernel configuration line: `options MAC_PARTITION`

Boot option: `mac_partition_load="YES"`

The mac_partition(4) policy will drop processes into specific “partitions” based on their MAC label. Think of it as a special type of jail(8), though that is hardly a worthy comparison.

This is one module that should be added to the loader.conf(5) file so that it loads and enables the policy during the boot process.

Most configuration for this policy is done using the setpmac(8) utility which will be explained below. The following `sysctl` tunable is available for this policy:

- `security.mac.partition.enabled` will enable the enforcement of MAC process partitions.

When this policy is enabled, users will only be permitted to see their processes, and any others within their partition, but will not be permitted to work with utilities outside the scope of this partition. For instance, a user in the `insecure` class above will not be permitted to access the `top` command as well as many other commands that must spawn a process.

To set or drop utilities into a partition label, use the `setpmac` utility:

```
# setpmac partition/13 top
```

This will add the `top` command to the label set on users in the `insecure` class. Note that all processes spawned by users in the `insecure` class will stay in the `partition/13` label.

17.10.1 Examples

The following command will show you the partition label and the process list:

```
# ps Zax
```

This next command will allow the viewing of another user’s process partition label and that user’s currently running processes:

```
# ps -ZU trhodes
```

> **Óçìåßùóç:** Users can see processes in `root`’s label unless the mac_seeotheruids(4) policy is loaded.

A really crafty implementation could have all of the services disabled in `/etc/rc.conf` and started by a script that starts them with the proper labeling set.

> **Óçìåßùóç:** The following policies support integer settings in place of the three default labels offered. These options, including their limitations, are further explained in the module manual pages.

17.11 The MAC Multi-Level Security Module

Module name: `mac_mls.ko`

Kernel configuration line: `options MAC_MLS`

Boot option: `mac_mls_load="YES"`

The mac_mls(4) policy controls access between subjects and objects in the system by enforcing a strict information flow policy.

In MLS environments, a “clearance” level is set in each subject or objects label, along with compartments. Since these clearance or sensibility levels can reach numbers greater than six thousand; it would be a daunting task for any system administrator to thoroughly configure each subject or object. Thankfully, three “instant” labels are already included in this policy.

These labels are `mls/low`, `mls/equal` and `mls/high`. Since these labels are described in depth in the manual page, they will only get a brief description here:

- The `mls/low` label contains a low configuration which permits it to be dominated by all other objects. Anything labeled with `mls/low` will have a low clearance level and not be permitted to access information of a higher level. In addition, this label will prevent objects of a higher clearance level from writing or passing information on to them.
- The `mls/equal` label should be placed on objects considered to be exempt from the policy.
- The `mls/high` label is the highest level of clearance possible. Objects assigned this label will hold dominance over all other objects in the system; however, they will not permit the leaking of information to objects of a lower class.

MLS provides for:

- A hierarchical security level with a set of non hierarchical categories;
- Fixed rules: no read up, no write down (a subject can have read access to objects on its own level or below, but not above. Similarly, a subject can have write access to objects on its own level or above but not beneath.);
- Secrecy (preventing inappropriate disclosure of data);
- Basis for the design of systems that concurrently handle data at multiple sensitivity levels (without leaking information between secret and confidential).

The following `sysctl` tunables are available for the configuration of special services and interfaces:

- `security.mac.mls.enabled` is used to enable/disable the MLS policy.
- `security.mac.mls.ptys_equal` will label all pty(4) devices as `mls/equal` during creation.
- `security.mac.mls.revocation_enabled` is used to revoke access to objects after their label changes to a label of a lower grade.
- `security.mac.mls.max_compartments` is used to set the maximum number of compartment levels with objects; basically the maximum compartment number allowed on a system.

To manipulate the MLS labels, the setfmac(8) command has been provided. To assign a label to an object, issue the following command:

```
# setfmac mls/5 test
```

To get the MLS label for the file `test` issue the following command:

```
# getfmac test
```

This is a summary of the MLS policy’s features. Another approach is to create a master policy file in `/etc` which specifies the MLS policy information and to feed that file into the `setfmac` command. This method will be explained after all policies are covered.

17.11.1 Planning Mandatory Sensitivity

With the Multi-Level Security Policy Module, an administrator plans for controlling the flow of sensitive information. By default, with its block read up block write down nature, the system defaults everything to a low state. Everything is accessible and an administrator slowly changes this during the configuration stage; augmenting the confidentiality of the information.

Beyond the three basic label options above, an administrator may group users and groups as required to block the information flow between them. It might be easier to look at the information in clearance levels familiarized with words, for instance classifications such as `Confidential`, `Secret`, and `Top Secret`. Some administrators might just create different groups based on project levels. Regardless of classification method, a well thought out plan must exist before implementing such a restrictive policy.

Some example situations for this security policy module could be an e-commerce web server, a file server holding critical company information, and financial institution environments. The most unlikely place would be a personal workstation with only two or three users.

17.12 The MAC Biba Module

Module name: `mac_biba.ko`

Kernel configuration line: `options MAC_BIBA`

Boot option: `mac_biba_load="YES"`

The mac_biba(4) module loads the MAC Biba policy. This policy works much like that of the MLS policy with the exception that the rules for information flow are slightly reversed. This is said to prevent the downward flow of sensitive information whereas the MLS policy prevents the upward flow of sensitive information; thus, much of this section can apply to both policies.

In Biba environments, an “integrity” label is set on each subject or object. These labels are made up of hierarchal grades, and non-hierarchal components. As an object’s or subject’s grade ascends, so does its integrity.

Supported labels are `biba/low`, `biba/equal`, and `biba/high`; as explained below:

- The `biba/low` label is considered the lowest integrity an object or subject may have. Setting this on objects or subjects will block their write access to objects or subjects marked high. They still have read access though.
- The `biba/equal` label should only be placed on objects considered to be exempt from the policy.
- The `biba/high` label will permit writing to objects set at a lower label, but not permit reading that object. It is recommended that this label be placed on objects that affect the integrity of the entire system.

Biba provides for:

- Hierarchical integrity level with a set of non hierarchical integrity categories;
- Fixed rules: no write up, no read down (opposite of MLS). A subject can have write access to objects on its own level or below, but not above. Similarly, a subject can have read access to objects on its own level or above, but not below;
- Integrity (preventing inappropriate modification of data);
- Integrity levels (instead of MLS sensitivity levels).

The following `sysctl` tunables can be used to manipulate the Biba policy.

- `security.mac.biba.enabled` may be used to enable/disable enforcement of the Biba policy on the target machine.
- `security.mac.biba.ptys_equal` may be used to disable the Biba policy on pty(4) devices.
- `security.mac.biba.revocation_enabled` will force the revocation of access to objects if the label is changed to dominate the subject.

To access the Biba policy setting on system objects, use the `setfmac` and `getfmac` commands:

```
# setfmac biba/low test
# getfmac test
test: biba/low
```

17.12.1 Planning Mandatory Integrity

Integrity, different from sensitivity, guarantees that the information will never be manipulated by untrusted parties. This includes information passed between subjects, objects, and both. It ensures that users will only be able to modify and in some cases even access information they explicitly need to.

The mac_biba(4) security policy module permits an administrator to address which files and programs a user or users may see and invoke while assuring that the programs and files are free from threats and trusted by the system for that user, or group of users.

During the initial planning phase, an administrator must be prepared to partition users into grades, levels, and areas. Users will be blocked access not only to data but programs and utilities both before and after they start. The system will default to a high label once this policy module is enabled, and it is up to the administrator to configure the different grades and levels for users. Instead of using clearance levels as described above, a good planning method could include topics. For instance, only allow developers modification access to the source code repository, source code compiler, and other development utilities. While other users would be grouped into other categories such as testers, designers, or just ordinary users and would only be permitted read access.

With its natural security control, a lower integrity subject is unable to write to a higher integrity subject; a higher integrity subject cannot observe or read a lower integrity object. Setting a label at the lowest possible grade could make it inaccessible to subjects. Some prospective environments for this security policy module would include a constrained web server, development and test machine, and source code repository. A less useful implementation would be a personal workstation, a machine used as a router, or a network firewall.

17.13 The MAC LOMAC Module

Module name: `mac_lomac.ko`

Kernel configuration line: `options MAC_LOMAC`

Boot option: `mac_lomac_load="YES"`

Unlike the MAC Biba policy, the mac_lomac(4) policy permits access to lower integrity objects only after decreasing the integrity level to not disrupt any integrity rules.

The MAC version of the Low-watermark integrity policy, not to be confused with the older lomac(4) implementation, works almost identically to Biba, but with the exception of using floating labels to support subject demotion via an auxiliary grade compartment. This secondary compartment takes the form of `[auxgrade]`. When assigning a lomac policy with an auxiliary grade, it should look a little bit like: `lomac/10[2]` where the number two (2) is the auxiliary grade.

The MAC LOMAC policy relies on the ubiquitous labeling of all system objects with integrity labels, permitting subjects to read from low integrity objects and then downgrading the label on the subject to prevent future writes to high integrity objects. This is the `[auxgrade]` option discussed above, thus the policy may provide for greater compatibility and require less initial configuration than Biba.

17.13.1 Examples

Like the Biba and MLS policies; the `setfmac` and `setpmac` utilities may be used to place labels on system objects:

```
# setfmac /usr/home/trhodes lomac/high[low]
# getfmac /usr/home/trhodes lomac/high[low]
```

Notice the auxiliary grade here is `low`, this is a feature provided only by the MAC LOMAC policy.

17.14 Nagios in a MAC Jail

The following demonstration will implement a secure environment using various MAC modules with properly configured policies. This is only a test and should not be considered the complete answer to everyone’s security woes. Just implementing a policy and ignoring it never works and could be disastrous in a production environment.

Before beginning this process, the `multilabel` option must be set on each file system as stated at the beginning of this chapter. Not doing so will result in errors. While at it, ensure that the `net-mngt/nagios-plugins`, `net-mngt/nagios`, and `www/apache13` ports are all installed, configured, and working correctly.

17.14.1 Create an insecure User Class

Begin the procedure by adding the following user class to the `/etc/login.conf` file:

```
insecure:\
:copyright=/etc/COPYRIGHT:\
:welcome=/etc/motd:\
:setenv=MAIL=/var/mail/$,BLOCKSIZE=K:\
:path=~/bin:/sbin:/bin:/usr/sbin:/usr/bin:/usr/local/sbin:/usr/local/bin
:manpath=/usr/share/man /usr/local/man:\
:nologin=/usr/sbin/nologin:\
:cputime=1h30m:\
:datasize=8M:\
:vmemoryuse=100M:\
:stacksize=2M:\
:memorylocked=4M:\
:memoryuse=8M:\
:filesize=8M:\
:coredumpsize=8M:\
:openfiles=24:\
:maxproc=32:\
:priority=0:\
:requirehome:\
:passwordtime=91d:\
:umask=022:\
:ignoretime@:\
:label=biba/10(10-10):
```

And adding the following line to the default user class:

```
:label=biba/high:
```

Once this is completed, the following command must be issued to rebuild the database:

```
# cap_mkdb /etc/login.conf
```

17.14.2 Boot Configuration

Do not reboot yet, just add the following lines to `/boot/loader.conf` so the required modules will load during system initialization:

```
mac_biba_load="YES"
mac_seeotheruids_load="YES"
```

17.14.3 Configure Users

Set the `root` user to the default class using:

```
# pw usermod root -L default
```

All user accounts that are not `root` or system users will now require a login class. The login class is required otherwise users will be refused access to common commands such as vi(1). The following `sh` script should do the trick:

```
# for x in ‘awk -F: ’($3 >= 1001) && ($3 != 65534) { print $1 }’ \
        /etc/passwd‘; do pw usermod $x -L default; done;
```

Drop the `nagios` and `www` users into the insecure class:

```
# pw usermod nagios -L insecure
# pw usermod www -L insecure
```

17.14.4 Create the Contexts File

A contexts file should now be created; the following example file should be placed in `/etc/policy.contexts`.

```
# This is the default BIBA policy for this system.

# System:
/var/run                        biba/equal
/var/run/*                      biba/equal

/dev                            biba/equal
/dev/*                          biba/equal

/var                            biba/equal
/var/spool                      biba/equal
/var/spool/*                    biba/equal

/var/log                        biba/equal
/var/log/*                      biba/equal

/tmp                            biba/equal
/tmp/*                          biba/equal
/var/tmp                        biba/equal
/var/tmp/*                      biba/equal

/var/spool/mqueue               biba/equal
/var/spool/clientmqueue         biba/equal

# For Nagios:
/usr/local/etc/nagios
/usr/local/etc/nagios/*         biba/10

/var/spool/nagios               biba/10
/var/spool/nagios/*             biba/10

# For apache
/usr/local/etc/apache           biba/10
/usr/local/etc/apache/*         biba/10
```

This policy will enforce security by setting restrictions on the flow of information. In this specific configuration, users, `root` and others, should never be allowed to access **Nagios**. Configuration files and processes that are a part of **Nagios** will be completely self contained or jailed.

This file may now be read into our system by issuing the following command:

```
# setfsmac -ef /etc/policy.contexts /
# setfsmac -ef /etc/policy.contexts /
```

> **Óçìåßùóç:** The above file system layout may be different depending on environment; however, it must be run on every single file system.

The `/etc/mac.conf` file requires the following modifications in the main section:

```
default_labels file ?biba
default_labels ifnet ?biba
default_labels process ?biba
default_labels socket ?biba
```

17.14.5 Enable Networking

Add the following line to `/boot/loader.conf`:

```
security.mac.biba.trust_all_interfaces=1
```

And the following to the network card configuration stored in `rc.conf`. If the primary Internet configuration is done via DHCP, this may need to be configured manually after every system boot:

```
maclabel biba/equal
```

17.14.6 Testing the Configuration

Ensure that the web server and **Nagios** will not be started on system initialization, and reboot. Ensure the `root` user cannot access any of the files in the **Nagios** configuration directory. If `root` can issue an ls(1) command on `/var/spool/nagios`, then something is wrong. Otherwise a “permission denied” error should be returned.

If all seems well, **Nagios**, **Apache**, and **Sendmail** can now be started in a way fitting of the security policy. The following commands will make this happen:

```
# cd /etc/mail && make stop && \
setpmac biba/equal make start && setpmac biba/10\(10-10\) apachectl start && \
setpmac biba/10\(10-10\) /usr/local/etc/rc.d/nagios.sh forcestart
```

Double check to ensure that everything is working properly. If not, check the log files or error messages. Use the sysctl(8) utility to disable the mac_biba(4) security policy module enforcement and try starting everything again, like normal.

> **Óçìåßùóç:** The `root` user can change the security enforcement and edit the configuration files without fear. The following command will permit the degradation of the security policy to a lower grade for a newly spawned shell:
>
> ```
> # setpmac biba/10 csh
> ```
>
> To block this from happening, force the user into a range via login.conf(5). If setpmac(8) attempts to run a command outside of the compartment’s range, an error will be returned and the command will not be executed. In this case, setting root to `biba/high(high-high)`.

17.15 User Lock Down

This example considers a relatively small, fewer than fifty users, storage system. Users would have login capabilities, and be permitted to not only store data but access resources as well.

For this scenario, the mac_bsdextended(4) mixed with mac_seeotheruids(4) could co-exist and block access not only to system objects but to hide user processes as well.

Begin by adding the following lines to `/boot/loader.conf`:

```
mac_seeotheruids_enabled="YES"
```

The mac_bsdextended(4) security policy module may be activated through the use of the following rc.conf variable:

```
ugidfw_enable="YES"
```

Default rules stored in `/etc/rc.bsdextended` will be loaded at system initialization; however, the default entries may need modification. Since this machine is expected only to service users, everything may be left commented out except the last two. These will force the loading of user owned system objects by default.

Add the required users to this machine and reboot. For testing purposes, try logging in as a different user across two consoles. Run the `ps aux` command to see if processes of other users are visible. Try to run ls(1) on another users home directory, it should fail.

Do not try to test with the `root` user unless the specific `sysctl`s have been modified to block super user access.

> **Óçìåßùóç:** When a new user is added, their mac_bsdextended(4) rule will not be in the ruleset list. To update the ruleset quickly, simply unload the security policy module and reload it again using the kldunload(8) and kldload(8) utilities.

17.16 Troubleshooting the MAC Framework

During the development stage, a few users reported problems with normal configuration. Some of these problems are listed below:

17.16.1 The `multilabel` option cannot be enabled on `/`

The `multilabel` flag does not stay enabled on my root (`/`) partition!

It seems that one out of every fifty users has this problem, indeed, we had this problem during our initial configuration. Further observation of this so called “bug” has lead me to believe that it is a result of either incorrect documentation or misinterpretation of the documentation. Regardless of why it happened, the following steps may be taken to resolve it:

1. Edit `/etc/fstab` and set the root partition at `ro` for read-only.
2. Reboot into single user mode.
3. Run `tunefs -l enable` on `/`.
4. Reboot the system into normal mode.

5. Run `mount -urw /` and change the `ro` back to `rw` in `/etc/fstab` and reboot the system again.
6. Double-check the output from the `mount` to ensure that `multilabel` has been properly set on the root file system.

17.16.2 Cannot start a X11 server after MAC

After establishing a secure environment with MAC, I am no longer able to start X!

This could be caused by the MAC `partition` policy or by a mislabeling in one of the MAC labeling policies. To debug, try the following:

1. Check the error message; if the user is in the `insecure` class, the `partition` policy may be the culprit. Try setting the user's class back to the `default` class and rebuild the database with the `cap_mkdb` command. If this does not alleviate the problem, go to step two.
2. Double-check the label policies. Ensure that the policies are set correctly for the user in question, the X11 application, and the `/dev` entries.
3. If neither of these resolve the problem, send the error message and a description of your environment to the TrustedBSD discussion lists located at the TrustedBSD (http://www.TrustedBSD.org) website or to the çëåêôñïíéêÞ ëßóôá ãåíéêþí åñùôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions) mailing list.

17.16.3 Error: _secure_path(3) cannot stat `.login_conf`

When I attempt to switch from the `root` to another user in the system, the error message `_secure_path: unable to state .login_conf`.

This message is usually shown when the user has a higher label setting then that of the user whom they are attempting to become. For instance a user on the system, `joe`, has a default label of `biba/low`. The `root` user, who has a label of `biba/high`, cannot view `joe`'s home directory. This will happen regardless if `root` has used the `su` command to become `joe`, or not. In this scenario, the Biba integrity model will not permit `root` to view objects set at a lower integrity level.

17.16.4 The `root` username is broken!

In normal or even single user mode, the `root` is not recognized. The `whoami` command returns 0 (zero) and `su` returns `who are you?`. What could be going on?

This can happen if a labeling policy has been disabled, either by a sysctl(8) or the policy module was unloaded. If the policy is being disabled or has been temporarily disabled, then the login capabilities database needs to be reconfigured with the `label` option being removed. Double check the `login.conf` file to ensure that all `label` options have been removed and rebuild the database with the `cap_mkdb` command.

This may also happen if a policy restricts access to the `master.passwd` file or database. Usually caused by an administrator altering the file under a label which conflicts with the general policy being used by the system. In these cases, the user information would be read by the system and access would be blocked as the file has inherited the new label. Disable the policy via a sysctl(8) and everything should return to normal.

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1. Other conditions may produce different failures. For instance, the file may not be owned by the user attempting to relabel the object, the object may not exist or may be read only. A mandatory policy will not allow the process to relabel the file, maybe because of a property of the file, a property of the process, or a property of the proposed new label value. For example: a user running at low integrity tries to change the label of a high integrity file. Or perhaps a user running at low integrity tries to change the label of a low integrity file to a high integrity label.
2. Due to a bug the `security.mac.portacl.enabled` `sysctl` variable will not work on FreeBSD 5.2.1 or previous releases.

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ÃñÜöôçêå áðü ôïí Tom Rhodes êáé Robert Watson.

18.1 Óýíïøç

Ïé åêäüóåéò ôïõ FreeBSD áðü ôçí 6.2-RELEASE êáé ìåôÜ ðåñéëáìâÜíïõí õðïóôÞñéîç ãéá ëåðôïìåñÞ Ýëåã÷ï óõìâÜíôùí áóöáëåßáò. Ï Ýëåã÷ïò óõìâÜíôùí åðéôñÝðåé áîéüðéóôç, ëåðôïìåñÞ êáé ðáñáìåôñïðïéÞóéìç êáôáãñáöÞ ðëÞèïõò óõìâÜíôùí ó÷åôéêþí ìå ôçí áóöÜëåéá, óõìðåñéëáìâáíïìÝíùí ôùí logins, ôùí áëëáãþí ñõèìßóåùí, êáèþò êáé ôçò ðñüóâáóçò óå áñ÷åßá êáé óôï äßêôõï. Ïé êáôáãñáöÝò áõôÝò åßíáé ðïëýôéìåò ãéá áðåõèåßáò ðáñáêïëïýèçóç ôïõ óõóôÞìáôïò, áíß÷íåõóç åéóâïëÝùí, êáèþò êáé ãéá áíÜëõóç ìåôÜ áðü êÜðïéá åðßèåóç. Ôï FreeBSD õëïðïéåß ôç ìïñöÞ áñ÷åßùí êáé ôï BSM API üðùò Ý÷ïõí äçìïóéåõôåß áðü ôçí Sun, êáé åðéôñÝðåé äéáëåéôïõñãéêüôçôá ìå ôéò õëïðïéÞóåéò åëÝã÷ïõ ôüóï ôïõ Solaris ôçò Sun üóï ôïõ Mac OS ôçò Apple.

Ôï êåöÜëáéï áõôü åóôéÜæåé óôçí åãêáôÜóôáóç êáé ñýèìéóç ôïõ ÅëÝã÷ïõ ÓõìâÜíôùí. Åîçãåß ôéò ðïëéôéêÝò åëÝã÷ïõ, êáé ðáñÝ÷åé Ýíá ðáñÜäåéãìá ñõèìßóåùí åëÝã÷ïõ.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôé åßíáé ï Ýëåã÷ïò óõìâÜíôùí êáé ðùò ëåéôïõñãåß.
- Ðùò íá ñõèìßóåôå ôïí Ýëåã÷ï óõìâÜíôùí óôï FreeBSD ãéá ÷ñÞóôåò êáé ðñïãñÜììáôá (processes).
- Ðùò íá áíáëýóåôå ôá ß÷íç ôïõ åëÝã÷ïõ ÷ñçóéìïðïéþíôáò ôá åñãáëåßá ìåßùóçò üãêïõ äåäïìÝíùí êáé áíÜëõóçò.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).
- Íá åßóôå åîïéêåéùìÝíïò ìå ôéò âáóéêÝò Ýííïéåò ôçò ñýèìéóçò êáé ìåôáãëþôôéóçò ôïõ ðõñÞíá. (ÊåöÜëáéï 9).
- Íá Ý÷åôå êÜðïéá åîïéêåßùóç ìå ôçí áóöÜëåéá êáé ðùò áõôÞ ó÷åôßæåôáé ìå ôï FreeBSD (ÊåöÜëáéï 15).

> **Ðñïåéäïðïßçóç:** Ïé ëåéôïõñãßåò åëÝã÷ïõ óôï FreeBSD 6.2 åßíáé óå ðåéñáìáôéêü óôÜäéï êáé ç åãêáôÜóôáóç ôïõò óå ìç÷áíÞìáôá ðáñáãùãÞò èá ðñÝðåé íá ãßíåôáé ìüíï áöïý ëçöèïýí óïâáñÜ õðüøéí ïé êßíäõíïé áðü ôçí åãêáôÜóôáóç ðåéñáìáôéêïý ëïãéóìéêïý. Ïé ãíùóôïß áõôÞ ôç óôéãìÞ ôñÝ÷ïíôåò ðåñéïñéóìïß ðåñéëáìâÜíïõí ôçí áäõíáìßá åëÝã÷ïõ üëùí ôùí óõìâÜíôùí ðïõ ó÷åôßæïíôáé ìå ôçí áóöÜëåéá. Åðßóçò êÜðïéïé ìç÷áíéóìïß åéóüäïõ (logins), üðùò ïé ãñáöéêïß (X11-âáóéóìÝíïé) display managers, êáèþò êáé ïñéóìÝíåò õðçñåóßåò ôñßôùí êáôáóêåõáóôþí äåí åßíáé óùóôÜ ñõèìéóìÝíåò ãéá ôïí Ýëåã÷ï åéóüäïõ ÷ñçóôþí.

> **Ðñïåéäïðïßçóç:** Ï Ýëåã÷ïò óõìâÜíôùí áóöáëåßáò ìðïñåß íá äçìéïõñãÞóåé ðïëý ëåðôïìåñåßò êáôáãñáöÝò ôçò äñáóôçñéüôçôáò ôïõ óõóôÞìáôïò: óå Ýíá óýóôçìá ìå õøçëü öüñôï, ôá áñ÷åßá êáôáãñáöÞò ìðïñåß íá ãßíïõí ðïëý ìåãÜëá, áí Ý÷ïõí ñõèìéóôåß ãéá ëåðôïìåñÞ êáôáãñáöÞ, êáé íá îåðåñÜóïõí ôá áñêåôÜ gigabytes ôçí åâäïìÜäá óå êÜðïéåò ðåñéðôþóåéò. Ïé äéá÷åéñéóôÝò èá ðñÝðåé íá ëáìâÜíïõí õðüøéí ôïõò ôéò ðéèáíÝò áðáéôÞóåéò óå ÷þñï äßóêïõ óå ðåñßðôùóç ñõèìßóåùí ëåðôïìåñïýò êáôáãñáöÞò. Ãéá ðáñÜäåéãìá, ßóùò åßíáé èåìéôü íá áöéåñùèåß Ýíá óýóôçìá áñ÷åßùí óôï `/var/audit` þóôå ôá õðüëïéðá óõóôÞìáôá áñ÷åßùí íá ìçí åðçñåáóôïýí áí ï ÷þñïò áõôüò åîáíôëçèåß.

18.2 Key Terms in this Chapter

Before reading this chapter, a few key audit-related terms must be explained:

- *event*: An auditable event is any event that can be logged using the audit subsystem. Examples of security-relevant events include the creation of a file, the building of a network connection, or a user logging in. Events are either "attributable", meaning that they can be traced to an authenticated user, or "non-attributable" if they cannot be. Examples of non-attributable events are any events that occur before authentication in the login process, such as bad password attempts.
- *class*: Event classes are named sets of related events, and are used in selection expressions. Commonly used classes of events include "file creation" (fc), "exec" (ex) and "login_logout" (lo).
- *record*: A record is an audit log entry describing a security event. Records contain a record event type, information on the subject (user) performing the action, date and time information, information on any objects or arguments, and a success or failure condition.
- *trail*: An audit trail, or log file, consists of a series of audit records describing security events. Typically, trails are in roughly chronological order with respect to the time events completed. Only authorized processes are allowed to commit records to the audit trail.
- *selection expression*: A selection expression is a string containing a list of prefixes and audit event class names used to match events.
- *preselection*: The process by which the system identifies which events are of interest to the administrator in order to avoid generating audit records describing events that are not of interest. The preselection configuration uses a series of selection expressions to identify which classes of events to audit for which users, as well as global settings that apply to both authenticated and unauthenticated processes.
- *reduction*: The process by which records from existing audit trails are selected for preservation, printing, or analysis. Likewise, the process by which undesired audit records are removed from the audit trail. Using reduction, administrators can implement policies for the preservation of audit data. For example, detailed audit trails might be kept for one month, but after that, trails might be reduced in order to preserve only login information for archival purposes.

18.3 Installing Audit Support

User space support for Event Auditing is installed as part of the base FreeBSD operating system as of 6.2-RELEASE. However, Event Auditing support must be explicitly compiled into the kernel by adding the following lines to the kernel configuration file:

```
options AUDIT
```

Rebuild and reinstall the kernel via the normal process explained in ÊåöÜëáéï 9.

Once the kernel is built, installed, and the system has been rebooted, enable the audit daemon by adding the following line to rc.conf(5):

```
auditd_enable="YES"
```

Audit support must then be started by a reboot, or by manually starting the audit daemon:

```
/etc/rc.d/auditd start
```

18.4 Audit Configuration

All configuration files for security audit are found in `/etc/security`. The following files must be present before the audit daemon is started:

- `audit_class` - Contains the definitions of the audit classes.
- `audit_control` - Controls aspects of the audit subsystem, such as default audit classes, minimum disk space to leave on the audit log volume, maximum audit trail size, etc.
- `audit_event` - Textual names and descriptions of system audit events, as well as a list of which classes each event in in.
- `audit_user` - User-specific audit requirements, which are combined with the global defaults at login.
- `audit_warn` - A customizable shell script used by auditd to generate warning messages in exceptional situations, such as when space for audit records is running low or when the audit trail file has been rotated.

> **Ðñïåéäïðïßçóç:** Audit configuration files should be edited and maintained carefully, as errors in configuration may result in improper logging of events.

18.4.1 Event Selection Expressions

Selection expressions are used in a number of places in the audit configuration to determine which events should be audited. Expressions contain a list of event classes to match, each with a prefix indicating whether matching records should be accepted or ignored, and optionally to indicate if the entry is intended to match successful or failed operations. Selection expressions are evaluated from left to right, and two expressions are combined by appending one onto the other.

The following list contains the default audit event classes present in `audit_class`:

- `all` - `all` - Match all event classes.
- `ad` - `administrative` - Administrative actions performed on the system as a whole.
- `ap` - `application` - Application defined action.
- `cl` - `file_close` - Audit calls to the `close` system call.
- `ex` - `exec` - Audit program execution. Auditing of command line arguments and environmental variables is controlled via audit_control(5) using the `argv` and `envv` parameters to the `policy` setting.
- `fa` - `file_attr_acc` - Audit the access of object attributes such as stat(1), pathconf(2) and similar events.
- `fc` - `file_creation` - Audit events where a file is created as a result.
- `fd` - `file_deletion` - Audit events where file deletion occurs.
- `fm` - `file_attr_mod` - Audit events where file attribute modification occurs, such as chown(8), chflags(1), flock(2), etc.
- `fr` - `file_read` - Audit events in which data is read, files are opened for reading, etc.
- `fw` - `file_write` - Audit events in which data is written, files are written or modified, etc.
- `io` - `ioctl` - Audit use of the ioctl(2) system call.

- `ip` - `ipc` - Audit various forms of Inter-Process Communication, including POSIX pipes and System V IPC operations.
- `lo` - `login_logout` - Audit login(1) and logout(1) events occurring on the system.
- `na` - `non_attrib` - Audit non-attributable events.
- `no` - `no_class` - Match no audit events.
- `nt` - `network` - Audit events related to network actions, such as connect(2) and accept(2).
- `ot` - `other` - Audit miscellaneous events.
- `pc` - `process` - Audit process operations, such as exec(3) and exit(3).

These audit event classes may be customized by modifying the `audit_class` and `audit_event` configuration files.

Each audit class in the list is combined with a prefix indicating whether successful/failed operations are matched, and whether the entry is adding or removing matching for the class and type.

- (none) Audit both successful and failed instances of the event.
- `+` Audit successful events in this class.
- `-` Audit failed events in this class.
- `^` Audit neither successful nor failed events in this class.
- `^+` Don't audit successful events in this class.
- `^-` Don't audit failed events in this class.

The following example selection string selects both successful and failed login/logout events, but only successful execution events:

```
lo,+ex
```

18.4.2 Configuration Files

In most cases, administrators will need to modify only two files when configuring the audit system: `audit_control` and `audit_user`. The first controls system-wide audit properties and policies; the second may be used to fine-tune auditing by user.

18.4.2.1 The `audit_control` File

The `audit_control` file specifies a number of defaults for the audit subsystem. Viewing the contents of this file, we see the following:

```
dir:/var/audit
flags:lo
minfree:20
naflags:lo
policy:cnt
filesz:0
```

The `dir` option is used to set one or more directories where audit logs will be stored. If more than one directory entry appears, they will be used in order as they fill. It is common to configure audit so that audit logs are stored on a dedicated file system, in order to prevent interference between the audit subsystem and other subsystems if the file system fills.

The `flags` field sets the system-wide default preselection mask for attributable events. In the example above, successful and failed login and logout events are audited for all users.

The `minfree` option defines the minimum percentage of free space for the file system where the audit trail is stored. When this threshold is exceeded, a warning will be generated. The above example sets the minimum free space to twenty percent.

The `naflags` option specifies audit classes to be audited for non-attributed events, such as the login process and system daemons.

The `policy` option specifies a comma-separated list of policy flags controlling various aspects of audit behavior. The default `cnt` flag indicates that the system should continue running despite an auditing failure (this flag is highly recommended). Another commonly used flag is `argv`, which causes command line arguments to the execve(2) system call to audited as part of command execution.

The `filesz` option specifies the maximum size in bytes to allow an audit trail file to grow to before automatically terminating and rotating the trail file. The default, 0, disables automatic log rotation. If the requested file size is non-zero and below the minimum 512k, it will be ignored and a log message will be generated.

18.4.2.2 The `audit_user` File

The `audit_user` file permits the administrator to specify further audit requirements for specific users. Each line configures auditing for a user via two fields: the first is the `alwaysaudit` field, which specifies a set of events that should always be audited for the user, and the second is the `neveraudit` field, which specifies a set of events that should never be audited for the user.

The following example `audit_user` file audits login/logout events and successful command execution for the root user, and audits file creation and successful command execution for the www user. If used with the example `audit_control` file above, the `lo` entry for `root` is redundant, and login/logout events will also be audited for the `www` user.

```
root:lo,+ex:no
www:fc,+ex:no
```

18.5 Administering the Audit Subsystem

18.5.1 Viewing Audit Trails

Audit trails are stored in the BSM binary format, so tools must be used to modify or convert to text. The `praudit` command convert trail files to a simple text format; the `auditreduce` command may be used to reduce the audit trail file for analysis, archiving, or printing purposes. `auditreduce` supports a variety of selection parameters, including event type, event class, user, date or time of the event, and the file path or object acted on.

For example, the `praudit` utility will dump the entire contents of a specified audit log in plain text:

```
# praudit /var/audit/AUDITFILE
```

Where *`AUDITFILE`* is the audit log to dump.

Audit trails consist of a series of audit records made up of tokens, which `praudit` prints sequentially one per line. Each token is of a specific type, such as `header` holding an audit record header, or `path` holding a file path from a name lookup. The following is an example of an `execve` event:

```
header,133,10,execve(2),0,Mon Sep 25 15:58:03 2006, + 384 msec
exec arg,finger,doug
path,/usr/bin/finger
attribute,555,root,wheel,90,24918,104944
subject,robert,root,wheel,root,wheel,38439,38032,42086,128.232.9.100
return,success,0
trailer,133
```

This audit represents a successful `execve` call, in which the command `finger doug` has been run. The arguments token contains both the processed command line presented by the shell to the kernel. The path token holds the path to the executable as looked up by the kernel. The attribute token describes the binary, and in particular, includes the file mode which can be used to determine if the application was setuid. The subject token describes the subject process, and stores in sequence the audit user ID, effective user ID and group ID, real user ID and group ID, process ID, session ID, port ID, and login address. Notice that the audit user ID and real user ID differ: the user `robert` has switched to the `root` account before running this command, but it is audited using the original authenticated user. Finally, the return token indicates the successful execution, and the trailer concludes the record.

18.5.2 Reducing Audit Trails

Since audit logs may be very large, an administrator will likely want to select a subset of records for using, such as records associated with a specific user:

```
# auditreduce -u trhodes /var/audit/AUDITFILE | praudit
```

This will select all audit records produced for the user `trhodes` stored in the *`AUDITFILE`* file.

18.5.3 Delegating Audit Review Rights

Members of the `audit` group are given permission to read audit trails in `/var/audit`; by default, this group is empty, so only the `root` user may read audit trails. Users may be added to the `audit` group in order to delegate audit review rights to the user. As the ability to track audit log contents provides significant insight into the behavior of users and processes, it is recommended that the delegation of audit review rights be performed with caution.

18.5.4 Live Monitoring Using Audit Pipes

Audit pipes are cloning pseudo-devices in the device file system which allow applications to tap the live audit record stream. This is primarily of interest to authors of intrusion detection and system monitoring applications. However, for the administrator the audit pipe device is a convenient way to allow live monitoring without running into problems with audit trail file ownership or log rotation interrupting the event stream. To track the live audit event stream, use the following command line

```
# praudit /dev/auditpipe
```

By default, audit pipe device nodes are accessible only to the `root` user. To make them accessible to the members of the `audit` group, add a `devfs` rule to `devfs.rules`:

```
add path 'auditpipe*' mode 0440 group audit
```

See devfs.rules(5) for more information on configuring the devfs file system.

> **Ðñïåéäïðïßçóç:** It is easy to produce audit event feedback cycles, in which the viewing of each audit event results in the generation of more audit events. For example, if all network I/O is audited, and praudit is run from an SSH session, then a continuous stream of audit events will be generated at a high rate, as each event being printed will generate another event. It is advisable to run praudit on an audit pipe device from sessions without fine-grained I/O auditing in order to avoid this happening.

18.5.5 Rotating Audit Trail Files

Audit trails are written to only by the kernel, and managed only by the audit daemon, **auditd**. Administrators should not attempt to use newsyslog.conf(5) or other tools to directly rotate audit logs. Instead, the `audit` management tool may be used to shut down auditing, reconfigure the audit system, and perform log rotation. The following command causes the audit daemon to create a new audit log and signal the kernel to switch to using the new log. The old log will be terminated and renamed, at which point it may then be manipulated by the administrator.

```
# audit -n
```

> **Ðñïåéäïðïßçóç:** If the **auditd** daemon is not currently running, this command will fail and an error message will be produced.

Adding the following line to `/etc/crontab` will force the rotation every twelve hours from cron(8):

```
0     */12       *       *       *       root    /usr/sbin/audit -n
```

The change will take effect once you have saved the new `/etc/crontab`.

Automatic rotation of the audit trail file based on file size is possible via the `filesz` option in audit_control(5), and is described in the configuration files section of this chapter.

18.5.6 Compressing Audit Trails

As audit trail files can become very large, it is often desirable to compress or otherwise archive trails once they have been closed by the audit daemon. The `audit_warn` script can be used to perform customized operations for a variety of audit-related events, including the clean termination of audit trails when they are rotated. For example, the following may be added to the `audit_warn` script to compress audit trails on close:

```
#
# Compress audit trail files on close.
#
if [ "$1" = closefile ]; then
```

```
        gzip -9 $2
fi
```

Other archiving activities might include copying trail files to a centralized server, deleting old trail files, or reducing the audit trail to remove unneeded records. The script will be run only when audit trail files are cleanly terminated, so will not be run on trails left unterminated following an improper shutdown.

ÊåöÜëáéï 19 ÁðïèçêåõôéêÜ ÌÝóá

19.1 Óýíïøç

Ôï êåöÜëáéï áõôü êáëýðôåé ôçí ÷ñÞóç ôùí äßóêùí óôï FreeBSD. Ðåñéëáìâܱíåé äßóêïõò ðïõ õðïóôçñßæïíôáé áðü ìíÞìç, äßóêïõò óõíäåäåìÝíïõò áðåõèåßáò óôï äßêôõï, ôéò ôõðéêÝò óõóêåõÝò áðïèÞêåõóçò SCSI/IDE, êáèþò êáé óõóêåõÝò ðïõ ÷ñçóéìïðïéïýí äéåðáöÞ USB.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôçí ïñïëïãßá ðïõ ÷ñçóéìïðïéåß ôï FreeBSD ãéá íá ðåñéãñÜøåé ôçí ïñãÜíùóç ôùí äåäïìÝíùí óôï öõóéêü ìÝóï ôïõ äßóêïõ (partitions - êáôáôìÞóåéò - êáé slices).
- Ðùò íá ðñïóèÝóåôå íÝïõò óêëçñïýò äßóêïõò óôï óýóôçìá óáò.
- Ðùò íá ñõèìßóåôå ôï FreeBSD íá ÷ñçóéìïðïéåß óõóêåõÝò áðïèÞêåõóçò USB.
- Ðùò íá ñõèìßóåôå åéêïíéêÜ óõóôÞìáôá áñ÷åßùí, üðùò äßóêïõò ðïõ áðïèçêåýïíôáé óå ìíÞìç RAM.
- Ðùò íá ÷ñçóéìïðïéÞóåôå quotas ãéá íá ðåñéïñßóåôå ôç ÷ñÞóç ÷þñïõ óôï äßóêï.
- Ðùò íá êñõðôïãñáöÞóåôå äßóêïõò ãéá íá ôïõò áóöáëßóåôå áðü åðéèÝóåéò.
- Ðùò íá äçìéïõñãÞóåôå êáé íá ãñÜøåôå CD êáé DVD óôï FreeBSD.
- Ôá äéÜöïñá äéáèÝóéìá ìÝóá áðïèÞêåõóçò ãéá áíôßãñáöá áóöáëåßáò.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ðñïãñÜììáôá ëÞøçò áíôéãñÜöùí áóöáëåßáò óôï FreeBSD.
- Ðùò íá ðÜñåôå áíôßãñáöá áóöáëåßáò óå äéóêÝôôåò.
- Ôé åßíáé ïé åéêüíåò (snapshots) óå Ýíá óýóôçìá áñ÷åßùí êáé ðùò íá ôéò ÷ñçóéìïðïéÞóåôå áðïäïôéêÜ.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá îÝñåôå ðùò èá ñõèìßóåôå êáé èá åãêáôáóôÞóåôå Ýíá íÝï ðõñÞíá ôïõ FreeBSD (ÊåöÜëáéï 9).

19.2 Device Names

The following is a list of physical storage devices supported in FreeBSD, and the device names associated with them.

Ðßíáêáò 19-1. Physical Disk Naming Conventions

Drive type	Drive device name
IDE hard drives	`ad`
IDE CDROM drives	`acd`
SCSI hard drives and USB Mass storage devices	`da`
SCSI CDROM drives	`cd`
Assorted non-standard CDROM drives	`mcd` for Mitsumi CD-ROM and `scd` for Sony CD-ROM devices
Floppy drives	`fd`

Drive type	Drive device name
SCSI tape drives	`sa`
IDE tape drives	`ast`
Flash drives	`fla` for DiskOnChip® Flash device
RAID drives	`aacd` for Adaptec® AdvancedRAID, `mlxd` and `mlyd` for Mylex®, `amrd` for AMI MegaRAID®, `idad` for Compaq Smart RAID, `twed` for 3ware® RAID.

19.3 Adding Disks

Originally contributed by David O'Brien.

Lets say we want to add a new SCSI disk to a machine that currently only has a single drive. First turn off the computer and install the drive in the computer following the instructions of the computer, controller, and drive manufacturer. Due to the wide variations of procedures to do this, the details are beyond the scope of this document.

Login as user `root`. After you have installed the drive, inspect `/var/run/dmesg.boot` to ensure the new disk was found. Continuing with our example, the newly added drive will be `da1` and we want to mount it on `/1` (if you are adding an IDE drive, the device name will be `ad1`).

FreeBSD runs on IBM-PC compatible computers, therefore it must take into account the PC BIOS partitions. These are different from the traditional BSD partitions. A PC disk has up to four BIOS partition entries. If the disk is going to be truly dedicated to FreeBSD, you can use the *dedicated* mode. Otherwise, FreeBSD will have to live within one of the PC BIOS partitions. FreeBSD calls the PC BIOS partitions *slices* so as not to confuse them with traditional BSD partitions. You may also use slices on a disk that is dedicated to FreeBSD, but used in a computer that also has another operating system installed. This is a good way to avoid confusing the `fdisk` utility of other, non-FreeBSD operating systems.

In the slice case the drive will be added as `/dev/da1s1e`. This is read as: SCSI disk, unit number 1 (second SCSI disk), slice 1 (PC BIOS partition 1), and `e` BSD partition. In the dedicated case, the drive will be added simply as `/dev/da1e`.

Due to the use of 32-bit integers to store the number of sectors, bsdlabel(8) is limited to 2^32-1 sectors per disk or 2TB in most cases. The fdisk(8) format allows a starting sector of no more than 2^32-1 and a length of no more than 2^32-1, limiting partitions to 2TB and disks to 4TB in most cases. The sunlabel(8) format is limited to 2^32-1 sectors per partition and 8 partitions for a total of 16TB. For larger disks, gpt(8) partitions may be used.

19.3.1 Using sysinstall(8)

1. Navigating **Sysinstall**

   You may use `sysinstall` to partition and label a new disk using its easy to use menus. Either login as user `root` or use the `su` command. Run `sysinstall` and enter the `Configure` menu. Within the `FreeBSD Configuration Menu`, scroll down and select the `Fdisk` option.

2. **fdisk** Partition Editor

   Once inside **fdisk**, typing **`A`** will use the entire disk for FreeBSD. When asked if you want to "remain cooperative with any future possible operating systems", answer `YES`. Write the changes to the disk using **`W`**.

Now exit the FDISK editor by typing **`q`**. Next you will be asked about the "Master Boot Record". Since you are adding a disk to an already running system, choose `None`.

3. Disk Label Editor

   Next, you need to exit **sysinstall** and start it again. Follow the directions above, although this time choose the `Label` option. This will enter the `Disk Label Editor`. This is where you will create the traditional BSD partitions. A disk can have up to eight partitions, labeled `a-h`. A few of the partition labels have special uses. The `a` partition is used for the root partition (`/`). Thus only your system disk (e.g, the disk you boot from) should have an `a` partition. The `b` partition is used for swap partitions, and you may have many disks with swap partitions. The `c` partition addresses the entire disk in dedicated mode, or the entire FreeBSD slice in slice mode. The other partitions are for general use.

   sysinstall's Label editor favors the `e` partition for non-root, non-swap partitions. Within the Label editor, create a single file system by typing **`C`**. When prompted if this will be a FS (file system) or swap, choose `FS` and type in a mount point (e.g, `/mnt`). When adding a disk in post-install mode, **sysinstall** will not create entries in `/etc/fstab` for you, so the mount point you specify is not important.

   You are now ready to write the new label to the disk and create a file system on it. Do this by typing **`W`**. Ignore any errors from **sysinstall** that it could not mount the new partition. Exit the Label Editor and **sysinstall** completely.

4. Finish

   The last step is to edit `/etc/fstab` to add an entry for your new disk.

19.3.2 Using Command Line Utilities

19.3.2.1 Using Slices

This setup will allow your disk to work correctly with other operating systems that might be installed on your computer and will not confuse other operating systems' `fdisk` utilities. It is recommended to use this method for new disk installs. Only use `dedicated` mode if you have a good reason to do so!

```
# dd if=/dev/zero of=/dev/da1 bs=1k count=1
# fdisk -BI da1 #Initialize your new disk
# bsdlabel -B -w -r da1s1 auto #Label it.
# bsdlabel -e da1s1 # Edit the bsdlabel just created and add any partitions.
# mkdir -p /1
# newfs /dev/da1s1e # Repeat this for every partition you created.
# mount /dev/da1s1e /1 # Mount the partition(s)
# vi /etc/fstab # Add the appropriate entry/entries to your /etc/fstab.
```

If you have an IDE disk, substitute `ad` for `da`.

19.3.2.2 Dedicated

If you will not be sharing the new drive with another operating system, you may use the `dedicated` mode. Remember this mode can confuse Microsoft operating systems; however, no damage will be done by them. IBM's OS/2 however, will "appropriate" any partition it finds which it does not understand.

```
# dd if=/dev/zero of=/dev/da1 bs=1k count=1
# bsdlabel -Brw da1 auto
# bsdlabel -e da1                          # create the ‘e’ partition
# newfs -d0 /dev/da1e
# mkdir -p /1
# vi /etc/fstab                           # add an entry for /dev/da1e
# mount /1
```

An alternate method is:

```
# dd if=/dev/zero of=/dev/da1 count=2
# bsdlabel /dev/da1 | bsdlabel -BrR da1 /dev/stdin
# newfs /dev/da1e
# mkdir -p /1
# vi /etc/fstab                                    # add an entry for /dev/da1e
# mount /1
```

19.4 RAID

19.4.1 Software RAID

19.4.1.1 Concatenated Disk Driver (CCD) Configuration

Original work by Christopher Shumway. Revised by Jim Brown.

When choosing a mass storage solution the most important factors to consider are speed, reliability, and cost. It is rare to have all three in balance; normally a fast, reliable mass storage device is expensive, and to cut back on cost either speed or reliability must be sacrificed.

In designing the system described below, cost was chosen as the most important factor, followed by speed, then reliability. Data transfer speed for this system is ultimately constrained by the network. And while reliability is very important, the CCD drive described below serves online data that is already fully backed up on CD-R’s and can easily be replaced.

Defining your own requirements is the first step in choosing a mass storage solution. If your requirements prefer speed or reliability over cost, your solution will differ from the system described in this section.

19.4.1.1.1 Installing the Hardware

In addition to the IDE system disk, three Western Digital 30GB, 5400 RPM IDE disks form the core of the CCD disk described below providing approximately 90GB of online storage. Ideally, each IDE disk would have its own IDE controller and cable, but to minimize cost, additional IDE controllers were not used. Instead the disks were configured with jumpers so that each IDE controller has one master, and one slave.

Upon reboot, the system BIOS was configured to automatically detect the disks attached. More importantly, FreeBSD detected them on reboot:

```
ad0: 19574MB <WDC WD205BA> [39770/16/63] at ata0-master UDMA33
ad1: 29333MB <WDC WD307AA> [59598/16/63] at ata0-slave UDMA33
ad2: 29333MB <WDC WD307AA> [59598/16/63] at ata1-master UDMA33
ad3: 29333MB <WDC WD307AA> [59598/16/63] at ata1-slave UDMA33
```

> **Óçìåßùóç:** If FreeBSD does not detect all the disks, ensure that you have jumpered them correctly. Most IDE drives also have a “Cable Select” jumper. This is *not* the jumper for the master/slave relationship. Consult the drive documentation for help in identifying the correct jumper.

Next, consider how to attach them as part of the file system. You should research both vinum(8) (ÊåöÜëáéï 22) and ccd(4). In this particular configuration, ccd(4) was chosen.

19.4.1.1.2 Setting Up the CCD

The ccd(4) driver allows you to take several identical disks and concatenate them into one logical file system. In order to use ccd(4), you need a kernel with ccd(4) support built in. Add this line to your kernel configuration file, rebuild, and reinstall the kernel:

```
device   ccd
```

The ccd(4) support can also be loaded as a kernel loadable module.

To set up ccd(4), you must first use bsdlabel(8) to label the disks:

```
bsdlabel -r -w ad1 auto
bsdlabel -r -w ad2 auto
bsdlabel -r -w ad3 auto
```

This creates a bsdlabel for `ad1c`, `ad2c` and `ad3c` that spans the entire disk.

The next step is to change the disk label type. You can use bsdlabel(8) to edit the disks:

```
bsdlabel -e ad1
bsdlabel -e ad2
bsdlabel -e ad3
```

This opens up the current disk label on each disk with the editor specified by the `EDITOR` environment variable, typically vi(1).

An unmodified disk label will look something like this:

```
8 partitions:
#        size   offset    fstype   [fsize bsize bps/cpg]
  c: 60074784        0    unused        0     0     0   # (Cyl.    0 - 59597)
```

Add a new `e` partition for ccd(4) to use. This can usually be copied from the `c` partition, but the `fstype` *must* be **`4.2BSD`**. The disk label should now look something like this:

```
8 partitions:
#        size   offset    fstype   [fsize bsize bps/cpg]
  c: 60074784        0    unused        0     0     0   # (Cyl.    0 - 59597)
  e: 60074784        0    4.2BSD        0     0     0   # (Cyl.    0 - 59597)
```

19.4.1.1.3 Building the File System

Now that you have all the disks labeled, you must build the ccd(4). To do that, use ccdconfig(8), with options similar to the following:

```
ccdconfig ccd0❶ 32❷ 0❸ /dev/ad1e❹ /dev/ad2e /dev/ad3e
```

The use and meaning of each option is shown below:

❶ The first argument is the device to configure, in this case, `/dev/ccd0c`. The `/dev/` portion is optional.

❷ The interleave for the file system. The interleave defines the size of a stripe in disk blocks, each normally 512 bytes. So, an interleave of 32 would be 16,384 bytes.

❸ Flags for ccdconfig(8). If you want to enable drive mirroring, you can specify a flag here. This configuration does not provide mirroring for ccd(4), so it is set at 0 (zero).

❹ The final arguments to ccdconfig(8) are the devices to place into the array. Use the complete pathname for each device.

After running ccdconfig(8) the ccd(4) is configured. A file system can be installed. Refer to newfs(8) for options, or simply run:

```
newfs /dev/ccd0c
```

19.4.1.1.4 Making it All Automatic

Generally, you will want to mount the ccd(4) upon each reboot. To do this, you must configure it first. Write out your current configuration to `/etc/ccd.conf` using the following command:

```
ccdconfig -g > /etc/ccd.conf
```

During reboot, the script `/etc/rc` runs `ccdconfig -C` if `/etc/ccd.conf` exists. This automatically configures the ccd(4) so it can be mounted.

> **Óçìåßùóç:** If you are booting into single user mode, before you can mount(8) the ccd(4), you need to issue the following command to configure the array:
>
> ```
> ccdconfig -C
> ```

To automatically mount the ccd(4), place an entry for the ccd(4) in `/etc/fstab` so it will be mounted at boot time:

```
/dev/ccd0c              /media       ufs     rw      2       2
```

19.4.1.2 The Vinum Volume Manager

The Vinum Volume Manager is a block device driver which implements virtual disk drives. It isolates disk hardware from the block device interface and maps data in ways which result in an increase in flexibility, performance and reliability compared to the traditional slice view of disk storage. vinum(8) implements the RAID-0, RAID-1 and RAID-5 models, both individually and in combination.

See ÊåöÜëáéï 22 for more information about vinum(8).

19.4.2 Hardware RAID

FreeBSD also supports a variety of hardware RAID controllers. These devices control a RAID subsystem without the need for FreeBSD specific software to manage the array.

Using an on-card BIOS, the card controls most of the disk operations itself. The following is a brief setup description using a Promise IDE RAID controller. When this card is installed and the system is started up, it displays a prompt requesting information. Follow the instructions to enter the card's setup screen. From here, you have the ability to combine all the attached drives. After doing so, the disk(s) will look like a single drive to FreeBSD. Other RAID levels can be set up accordingly.

19.4.3 Rebuilding ATA RAID1 Arrays

FreeBSD allows you to hot-replace a failed disk in an array. This requires that you catch it before you reboot.

You will probably see something like the following in `/var/log/messages` or in the dmesg(8) output:

```
ad6 on monster1 suffered a hard error.
ad6: READ command timeout tag=0 serv=0 - resetting
ad6: trying fallback to PIO mode
ata3: resetting devices .. done
ad6: hard error reading fsbn 1116119 of 0-7 (ad6 bn 1116119; cn 1107 tn 4 sn 11)\\
status=59 error=40
ar0: WARNING - mirror lost
```

Using atacontrol(8), check for further information:

```
# atacontrol list
ATA channel 0:
        Master:      no device present
        Slave:   acd0 <HL-DT-ST CD-ROM GCR-8520B/1.00> ATA/ATAPI rev 0

ATA channel 1:
        Master:      no device present
        Slave:       no device present

ATA channel 2:
        Master:  ad4 <MAXTOR 6L080J4/A93.0500> ATA/ATAPI rev 5
        Slave:       no device present

ATA channel 3:
        Master:  ad6 <MAXTOR 6L080J4/A93.0500> ATA/ATAPI rev 5
        Slave:       no device present

# atacontrol status ar0
ar0: ATA RAID1 subdisks: ad4 ad6 status: DEGRADED
```

1. You will first need to detach the ata channel with the failed disk so you can safely remove it:

```
# atacontrol detach ata3
```

2. Replace the disk.
3. Reattach the ata channel:

   ```
   # atacontrol attach ata3
   Master:  ad6 <MAXTOR 6L080J4/A93.0500> ATA/ATAPI rev 5
   Slave:   no device present
   ```

4. Add the new disk to the array as a spare:

   ```
   # atacontrol addspare ar0 ad6
   ```

5. Rebuild the array:

   ```
   # atacontrol rebuild ar0
   ```

6. It is possible to check on the progress by issuing the following command:

   ```
   # dmesg | tail -10
   [output removed]
   ad6: removed from configuration
   ad6: deleted from ar0 disk1
   ad6: inserted into ar0 disk1 as spare

   # atacontrol status ar0
   ar0: ATA RAID1 subdisks: ad4 ad6 status: REBUILDING 0% completed
   ```

7. Wait until this operation completes.

19.5 USB Storage Devices

Contributed by Marc Fonvieille.

A lot of external storage solutions, nowadays, use the Universal Serial Bus (USB): hard drives, USB thumbdrives, CD-R burners, etc. FreeBSD provides support for these devices.

19.5.1 Configuration

The USB mass storage devices driver, umass(4), provides the support for USB storage devices. If you use the `GENERIC` kernel, you do not have to change anything in your configuration. If you use a custom kernel, be sure that the following lines are present in your kernel configuration file:

```
device scbus
device da
device pass
device uhci
device ohci
device usb
device umass
```

The umass(4) driver uses the SCSI subsystem to access to the USB storage devices, your USB device will be seen as a SCSI device by the system. Depending on the USB chipset on your motherboard, you only need either `device` `uhci` or `device ohci`, however having both in the kernel configuration file is harmless. Do not forget to compile and install the new kernel if you added any lines.

> **Óçìåßùóç:** If your USB device is a CD-R or DVD burner, the SCSI CD-ROM driver, cd(4), must be added to the kernel via the line:
>
> ```
> device cd
> ```
>
> Since the burner is seen as a SCSI drive, the driver atapicam(4) should not be used in the kernel configuration.

Support for USB 2.0 controllers is provided on FreeBSD; however, you must add:

```
device ehci
```

to your configuration file for USB 2.0 support. Note uhci(4) and ohci(4) drivers are still needed if you want USB 1.X support.

19.5.2 Testing the Configuration

The configuration is ready to be tested: plug in your USB device, and in the system message buffer (dmesg(8)), the drive should appear as something like:

```
umass0: USB Solid state disk, rev 1.10/1.00, addr 2
GEOM: create disk da0 dp=0xc2d74850
da0 at umass-sim0 bus 0 target 0 lun 0
da0: <Generic Traveling Disk 1.11> Removable Direct Access SCSI-2 device
da0: 1.000MB/s transfers
da0: 126MB (258048 512 byte sectors: 64H 32S/T 126C)
```

Of course, the brand, the device node (`da0`) and other details can differ according to your configuration.

Since the USB device is seen as a SCSI one, the `camcontrol` command can be used to list the USB storage devices attached to the system:

```
# camcontrol devlist
<Generic Traveling Disk 1.11>      at scbus0 target 0 lun 0 (da0,pass0)
```

If the drive comes with a file system, you should be able to mount it. The ÔìÞìá 19.3 will help you to format and create partitions on the USB drive if needed.

To make this device mountable as a normal user, certain steps have to be taken. First, the devices that are created when a USB storage device is connected need to be accessible by the user. A solution is to make all users of these devices a member of the `operator` group. This is done with pw(8). Second, when the devices are created, the `operator` group should be able to read and write them. This is accomplished by adding these lines to `/etc/devfs.rules`:

```
[localrules=1]
add path 'da*' mode 0660 group operator
```

> **Óçìåßùóç:** If there already are SCSI disks in the system, it must be done a bit different. E.g., if the system already contains disks `da0` through `da2` attached to the system, change the second line as follows:
>
> ```
> add path 'da[3-9]*' mode 0660 group operator
> ```
>
> This will exclude the already existing disks from belonging to the `operator` group.

You also have to enable your devfs.rules(5) ruleset in your `/etc/rc.conf` file:

```
devfs_system_ruleset="localrules"
```

Next, the kernel has to be configured to allow regular users to mount file systems. The easiest way is to add the following line to `/etc/sysctl.conf`:

```
vfs.usermount=1
```

Note that this only takes effect after the next reboot. Alternatively, one can also use sysctl(8) to set this variable.

The final step is to create a directory where the file system is to be mounted. This directory needs to be owned by the user that is to mount the file system. One way to do that is for `root` to create a subdirectory owned by that user as `/mnt/$USER` (replace *$USER* by the login name of the actual user):

```
# mkdir /mnt/$USER
# chown $USER:$USER /mnt/$USER
```

Suppose a USB thumbdrive is plugged in, and a device `/dev/da0s1` appears. Since these devices usually come preformatted with a FAT file system, one can mount them like this:

```
% mount_msdosfs -m 644 -M 755 /dev/da0s1 /mnt/$USER
```

If you unplug the device (the disk must be unmounted before), you should see, in the system message buffer, something like the following:

```
umass0: at uhub0 port 1 (addr 2) disconnected
(da0:umass-sim0:0:0:0): lost device
(da0:umass-sim0:0:0:0): removing device entry
GEOM: destroy disk da0 dp=0xc2d74850
umass0: detached
```

19.5.3 Further Reading

Beside the Adding Disks and Mounting and Unmounting File Systems sections, reading various manual pages may be also useful: umass(4), camcontrol(8), and usbdevs(8).

19.6 Creating and Using Optical Media (CDs)

Contributed by Mike Meyer.

19.6.1 Introduction

CDs have a number of features that differentiate them from conventional disks. Initially, they were not writable by the user. They are designed so that they can be read continuously without delays to move the head between tracks. They are also much easier to transport between systems than similarly sized media were at the time.

CDs do have tracks, but this refers to a section of data to be read continuously and not a physical property of the disk. To produce a CD on FreeBSD, you prepare the data files that are going to make up the tracks on the CD, then write the tracks to the CD.

The ISO 9660 file system was designed to deal with these differences. It unfortunately codifies file system limits that were common then. Fortunately, it provides an extension mechanism that allows properly written CDs to exceed those limits while still working with systems that do not support those extensions.

The `sysutils/cdrtools` port includes mkisofs(8), a program that you can use to produce a data file containing an ISO 9660 file system. It has options that support various extensions, and is described below.

Which tool to use to burn the CD depends on whether your CD burner is ATAPI or something else. ATAPI CD burners use the `burncd` program that is part of the base system. SCSI and USB CD burners should use `cdrecord` from the `sysutils/cdrtools` port. It is also possible to use `cdrecord` and other tools for SCSI drives on ATAPI hardware with the ATAPI/CAM module.

If you want CD burning software with a graphical user interface, you may wish to take a look at either **X-CD-Roast** or **K3b**. These tools are available as packages or from the `sysutils/xcdroast` and `sysutils/k3b` ports. **X-CD-Roast** and **K3b** require the ATAPI/CAM module with ATAPI hardware.

19.6.2 mkisofs

The mkisofs(8) program, which is part of the `sysutils/cdrtools` port, produces an ISO 9660 file system that is an image of a directory tree in the UNIX file system name space. The simplest usage is:

```
# mkisofs -o imagefile.iso /path/to/tree
```

This command will create an *`imagefile.iso`* containing an ISO 9660 file system that is a copy of the tree at *`/path/to/tree`*. In the process, it will map the file names to names that fit the limitations of the standard ISO 9660 file system, and will exclude files that have names uncharacteristic of ISO file systems.

A number of options are available to overcome those restrictions. In particular, `-R` enables the Rock Ridge extensions common to UNIX systems, `-J` enables Joliet extensions used by Microsoft systems, and `-hfs` can be used to create HFS file systems used by Mac OS.

For CDs that are going to be used only on FreeBSD systems, `-U` can be used to disable all filename restrictions. When used with `-R`, it produces a file system image that is identical to the FreeBSD tree you started from, though it may violate the ISO 9660 standard in a number of ways.

The last option of general use is `-b`. This is used to specify the location of the boot image for use in producing an “El Torito” bootable CD. This option takes an argument which is the path to a boot image from the top of the tree being written to the CD. By default, mkisofs(8) creates an ISO image in the so-called “floppy disk emulation” mode, and thus expects the boot image to be exactly 1200, 1440 or 2880 KB in size. Some boot loaders, like the one used by the

FreeBSD distribution disks, do not use emulation mode; in this case, the `-no-emul-boot` option should be used. So, if `/tmp/myboot` holds a bootable FreeBSD system with the boot image in `/tmp/myboot/boot/cdboot`, you could produce the image of an ISO 9660 file system in `/tmp/bootable.iso` like so:

```
# mkisofs -R -no-emul-boot -b boot/cdboot -o /tmp/bootable.iso /tmp/myboot
```

Having done that, if you have `md` configured in your kernel, you can mount the file system with:

```
# mdconfig -a -t vnode -f /tmp/bootable.iso -u 0
# mount -t cd9660 /dev/md0 /mnt
```

At which point you can verify that `/mnt` and `/tmp/myboot` are identical.

There are many other options you can use with mkisofs(8) to fine-tune its behavior. In particular: modifications to an ISO 9660 layout and the creation of Joliet and HFS discs. See the mkisofs(8) manual page for details.

19.6.3 burncd

If you have an ATAPI CD burner, you can use the `burncd` command to burn an ISO image onto a CD. `burncd` is part of the base system, installed as `/usr/sbin/burncd`. Usage is very simple, as it has few options:

```
# burncd -f cddevice data imagefile.iso fixate
```

Will burn a copy of *`imagefile.iso`* on *`cddevice`*. The default device is `/dev/acd0`. See burncd(8) for options to set the write speed, eject the CD after burning, and write audio data.

19.6.4 cdrecord

If you do not have an ATAPI CD burner, you will have to use `cdrecord` to burn your CDs. `cdrecord` is not part of the base system; you must install it from either the port at `sysutils/cdrtools` or the appropriate package. Changes to the base system can cause binary versions of this program to fail, possibly resulting in a “coaster”. You should therefore either upgrade the port when you upgrade your system, or if you are tracking -STABLE, upgrade the port when a new version becomes available.

While `cdrecord` has many options, basic usage is even simpler than `burncd`. Burning an ISO 9660 image is done with:

```
# cdrecord dev=device imagefile.iso
```

The tricky part of using `cdrecord` is finding the `dev` to use. To find the proper setting, use the `-scanbus` flag of `cdrecord`, which might produce results like this:

```
# cdrecord -scanbus
Cdrecord-Clone 2.01 (i386-unknown-freebsd7.0) Copyright (C) 1995-2004 Jörg Schilling
Using libscg version ’schily-0.1’
scsibus0:
        0,0,0     0) ’SEAGATE ’ ’ST39236LW       ’ ’0004’ Disk
        0,1,0     1) ’SEAGATE ’ ’ST39173W        ’ ’5958’ Disk
        0,2,0     2) *
        0,3,0     3) ’iomega  ’ ’jaz 1GB         ’ ’J.86’ Removable Disk
        0,4,0     4) ’NEC     ’ ’CD-ROM DRIVE:466’ ’1.26’ Removable CD-ROM
        0,5,0     5) *
        0,6,0     6) *
        0,7,0     7) *
scsibus1:
        1,0,0   100) *
        1,1,0   101) *
        1,2,0   102) *
        1,3,0   103) *
        1,4,0   104) *
        1,5,0   105) 'YAMAHA  ' 'CRW4260         ' '1.0q' Removable CD-ROM
        1,6,0   106) 'ARTEC   ' 'AM12S           ' '1.06' Scanner
        1,7,0   107) *
```

This lists the appropriate `dev` value for the devices on the list. Locate your CD burner, and use the three numbers separated by commas as the value for `dev`. In this case, the CRW device is 1,5,0, so the appropriate input would be `dev=1,5,0`. There are easier ways to specify this value; see cdrecord(1) for details. That is also the place to look for information on writing audio tracks, controlling the speed, and other things.

19.6.5 Duplicating Audio CDs

You can duplicate an audio CD by extracting the audio data from the CD to a series of files, and then writing these files to a blank CD. The process is slightly different for ATAPI and SCSI drives.

SCSI Drives

1. Use `cdda2wav` to extract the audio.

   ```
   % cdda2wav -v255 -D2,0 -B -Owav
   ```

2. Use `cdrecord` to write the `.wav` files.

   ```
   % cdrecord -v dev=2,0 -dao -useinfo  *.wav
   ```

   Make sure that *`2,0`* is set appropriately, as described in ÔìÞìá 19.6.4.

ATAPI Drives

1. The ATAPI CD driver makes each track available as `/dev/acd`*`d`*`t`*`nn`*, where *`d`* is the drive number, and *`nn`* is the track number written with two decimal digits, prefixed with zero as needed. So the first track on the first disk is `/dev/acd0t01`, the second is `/dev/acd0t02`, the third is `/dev/acd0t03`, and so on.

   Make sure the appropriate files exist in `/dev`. If the entries are missing, force the system to retaste the media:

   ```
   # dd if=/dev/acd0 of=/dev/null count=1
   ```

2. Extract each track using dd(1). You must also use a specific block size when extracting the files.

   ```
   # dd if=/dev/acd0t01 of=track1.cdr bs=2352
   # dd if=/dev/acd0t02 of=track2.cdr bs=2352
   ...
   ```

3. Burn the extracted files to disk using `burncd`. You must specify that these are audio files, and that `burncd` should fixate the disk when finished.

   ```
   # burncd -f /dev/acd0 audio track1.cdr track2.cdr ... fixate
   ```

19.6.6 Duplicating Data CDs

You can copy a data CD to a image file that is functionally equivalent to the image file created with mkisofs(8), and you can use it to duplicate any data CD. The example given here assumes that your CDROM device is `acd0`. Substitute your correct CDROM device.

```
# dd if=/dev/acd0 of=file.iso bs=2048
```

Now that you have an image, you can burn it to CD as described above.

19.6.7 Using Data CDs

Now that you have created a standard data CDROM, you probably want to mount it and read the data on it. By default, mount(8) assumes that a file system is of type `ufs`. If you try something like:

```
# mount /dev/cd0 /mnt
```

you will get a complaint about `Incorrect super block`, and no mount. The CDROM is not a `UFS` file system, so attempts to mount it as such will fail. You just need to tell mount(8) that the file system is of type `ISO9660`, and everything will work. You do this by specifying the `-t cd9660` option mount(8). For example, if you want to mount the CDROM device, `/dev/cd0`, under `/mnt`, you would execute:

```
# mount -t cd9660 /dev/cd0 /mnt
```

Note that your device name (`/dev/cd0` in this example) could be different, depending on the interface your CDROM uses. Also, the `-t cd9660` option just executes mount_cd9660(8). The above example could be shortened to:

```
# mount_cd9660 /dev/cd0 /mnt
```

You can generally use data CDROMs from any vendor in this way. Disks with certain ISO 9660 extensions might behave oddly, however. For example, Joliet disks store all filenames in two-byte Unicode characters. The FreeBSD kernel does not speak Unicode, but the FreeBSD CD9660 driver is able to convert Unicode characters on the fly. If some non-English characters show up as question marks you will need to specify the local charset you use with the `-C` option. For more information, consult the mount_cd9660(8) manual page.

> **Óçìåßùóç:** To be able to do this character conversion with the help of the `-C` option, the kernel will require the `cd9660_iconv.ko` module to be loaded. This can be done either by adding this line to `loader.conf`:
>
> ```
> cd9660_iconv_load="YES"
> ```
>
> and then rebooting the machine, or by directly loading the module with kldload(8).

Occasionally, you might get `Device not configured` when trying to mount a CDROM. This usually means that the CDROM drive thinks that there is no disk in the tray, or that the drive is not visible on the bus. It can take a couple of seconds for a CDROM drive to realize that it has been fed, so be patient.

Sometimes, a SCSI CDROM may be missed because it did not have enough time to answer the bus reset. If you have a SCSI CDROM please add the following option to your kernel configuration and rebuild your kernel.

```
options SCSI_DELAY=15000
```

This tells your SCSI bus to pause 15 seconds during boot, to give your CDROM drive every possible chance to answer the bus reset.

19.6.8 Burning Raw Data CDs

You can choose to burn a file directly to CD, without creating an ISO 9660 file system. Some people do this for backup purposes. This runs more quickly than burning a standard CD:

```
# burncd -f /dev/acd1 -s 12 data archive.tar.gz fixate
```

In order to retrieve the data burned to such a CD, you must read data from the raw device node:

```
# tar xzvf /dev/acd1
```

You cannot mount this disk as you would a normal CDROM. Such a CDROM cannot be read under any operating system except FreeBSD. If you want to be able to mount the CD, or share data with another operating system, you must use mkisofs(8) as described above.

19.6.9 Using the ATAPI/CAM Driver

Contributed by Marc Fonvieille.

This driver allows ATAPI devices (CD-ROM, CD-RW, DVD drives etc...) to be accessed through the SCSI subsystem, and so allows the use of applications like `sysutils/cdrdao` or cdrecord(1).

To use this driver, you will need to add the following line to the `/boot/loader.conf` file:

```
atapicam_load="YES"
```

then, reboot your machine.

> **Óçìåßùóç:** If you prefer to statically compile the atapicam(4) support in your kernel, you will have to add this line to your kernel configuration file:
>
> ```
> device atapicam
> ```
>
> You also need the following lines in your kernel configuration file:
>
> ```
> device ata
> device scbus
> device cd
> device pass
> ```
>
> which should already be present. Then rebuild, install your new kernel, and reboot your machine.

During the boot process, your burner should show up, like so:

```
acd0: CD-RW <MATSHITA CD-RW/DVD-ROM UJDA740> at ata1-master PIO4
cd0 at ata1 bus 0 target 0 lun 0
cd0: <MATSHITA CDRW/DVD UJDA740 1.00> Removable CD-ROM SCSI-0 device
cd0: 16.000MB/s transfers
```

```
cd0: Attempt to query device size failed: NOT READY, Medium not present - tray closed
```

The drive could now be accessed via the `/dev/cd0` device name, for example to mount a CD-ROM on `/mnt`, just type the following:

```
# mount -t cd9660 /dev/cd0 /mnt
```

As `root`, you can run the following command to get the SCSI address of the burner:

```
# camcontrol devlist
<MATSHITA CDRW/DVD UJDA740 1.00>   at scbus1 target 0 lun 0 (pass0,cd0)
```

So `1,0,0` will be the SCSI address to use with cdrecord(1) and other SCSI application.

For more information about ATAPI/CAM and SCSI system, refer to the atapicam(4) and cam(4) manual pages.

19.7 Creating and Using Optical Media (DVDs)

Contributed by Marc Fonvieille. With inputs from Andy Polyakov.

19.7.1 Introduction

Compared to the CD, the DVD is the next generation of optical media storage technology. The DVD can hold more data than any CD and is nowadays the standard for video publishing.

Five physical recordable formats can be defined for what we will call a recordable DVD:

- DVD-R: This was the first DVD recordable format available. The DVD-R standard is defined by the DVD Forum (http://www.dvdforum.com/forum.shtml). This format is write once.
- DVD-RW: This is the rewritable version of the DVD-R standard. A DVD-RW can be rewritten about 1000 times.
- DVD-RAM: This is also a rewritable format supported by the DVD Forum. A DVD-RAM can be seen as a removable hard drive. However, this media is not compatible with most DVD-ROM drives and DVD-Video players; only a few DVD writers support the DVD-RAM format. Read the ÔìÞìá 19.7.9 for more information on DVD-RAM use.
- DVD+RW: This is a rewritable format defined by the DVD+RW Alliance (http://www.dvdrw.com/). A DVD+RW can be rewritten about 1000 times.
- DVD+R: This format is the write once variation of the DVD+RW format.

A single layer recordable DVD can hold up to 4,700,000,000 bytes which is actually 4.38 GB or 4485 MB (1 kilobyte is 1024 bytes).

> **Óçìåßùóç:** A distinction must be made between the physical media and the application. For example, a DVD-Video is a specific file layout that can be written on any recordable DVD physical media: DVD-R, DVD+R, DVD-RW etc. Before choosing the type of media, you must be sure that both the burner and the DVD-Video player (a standalone player or a DVD-ROM drive on a computer) are compatible with the media under consideration.

19.7.2 Configuration

The program growisofs(1) will be used to perform DVD recording. This command is part of the **dvd+rw-tools** utilities (`sysutils/dvd+rw-tools`). The **dvd+rw-tools** support all DVD media types.

These tools use the SCSI subsystem to access to the devices, therefore the ATAPI/CAM support must be added to your kernel. If your burner uses the USB interface this addition is useless, and you should read the ÔìÞìá 19.5 for more details on USB devices configuration.

You also have to enable DMA access for ATAPI devices, this can be done in adding the following line to the `/boot/loader.conf` file:

```
hw.ata.atapi_dma="1"
```

Before attempting to use the **dvd+rw-tools** you should consult the dvd+rw-tools' hardware compatibility notes (http://fy.chalmers.se/~appro/linux/DVD+RW/hcn.html) for any information related to your DVD burner.

> **Óçìåßùóç:** If you want a graphical user interface, you should have a look to **K3b** (`sysutils/k3b`) which provides a user friendly interface to growisofs(1) and many other burning tools.

19.7.3 Burning Data DVDs

The growisofs(1) command is a frontend to mkisofs, it will invoke mkisofs(8) to create the file system layout and will perform the write on the DVD. This means you do not need to create an image of the data before the burning process.

To burn onto a DVD+R or a DVD-R the data from the `/path/to/data` directory, use the following command:

```
# growisofs -dvd-compat -Z /dev/cd0 -J -R /path/to/data
```

The options `-J -R` are passed to mkisofs(8) for the file system creation (in this case: an ISO 9660 file system with Joliet and Rock Ridge extensions), consult the mkisofs(8) manual page for more details.

The option `-Z` is used for the initial session recording in any case: multiple sessions or not. The DVD device, *`/dev/cd0`*, must be changed according to your configuration. The `-dvd-compat` parameter will close the disk, the recording will be unappendable. In return this should provide better media compatibility with DVD-ROM drives.

It is also possible to burn a pre-mastered image, for example to burn the image *`imagefile.iso`*, we will run:

```
# growisofs -dvd-compat -Z /dev/cd0=imagefile.iso
```

The write speed should be detected and automatically set according to the media and the drive being used. If you want to force the write speed, use the `-speed=` parameter. For more information, read the growisofs(1) manual page.

19.7.4 Burning a DVD-Video

A DVD-Video is a specific file layout based on ISO 9660 and the micro-UDF (M-UDF) specifications. The DVD-Video also presents a specific data structure hierarchy, it is the reason why you need a particular program such as `multimedia/dvdauthor` to author the DVD.

If you already have an image of the DVD-Video file system, just burn it in the same way as for any image, see the previous section for an example. If you have made the DVD authoring and the result is in, for example, the directory `/path/to/video`, the following command should be used to burn the DVD-Video:

```
# growisofs -Z /dev/cd0 -dvd-video /path/to/video
```

The `-dvd-video` option will be passed down to mkisofs(8) and will instruct it to create a DVD-Video file system layout. Beside this, the `-dvd-video` option implies `-dvd-compat` growisofs(1) option.

19.7.5 Using a DVD+RW

Unlike CD-RW, a virgin DVD+RW needs to be formatted before first use. The growisofs(1) program will take care of it automatically whenever appropriate, which is the *recommended* way. However you can use the `dvd+rw-format` command to format the DVD+RW:

```
# dvd+rw-format /dev/cd0
```

You need to perform this operation just once, keep in mind that only virgin DVD+RW medias need to be formatted. Then you can burn the DVD+RW in the way seen in previous sections.

If you want to burn new data (burn a totally new file system not append some data) onto a DVD+RW, you do not need to blank it, you just have to write over the previous recording (in performing a new initial session), like this:

```
# growisofs -Z /dev/cd0 -J -R /path/to/newdata
```

DVD+RW format offers the possibility to easily append data to a previous recording. The operation consists in merging a new session to the existing one, it is not multisession writing, growisofs(1) will *grow* the ISO 9660 file system present on the media.

For example, if we want to append data to our previous DVD+RW, we have to use the following:

```
# growisofs -M /dev/cd0 -J -R /path/to/nextdata
```

The same mkisofs(8) options we used to burn the initial session should be used during next writes.

> **Óçìåßùóç:** You may want to use the `-dvd-compat` option if you want better media compatibility with DVD-ROM drives. In the DVD+RW case, this will not prevent you from adding data.

If for any reason you really want to blank the media, do the following:

```
# growisofs -Z /dev/cd0=/dev/zero
```

19.7.6 Using a DVD-RW

A DVD-RW accepts two disc formats: the incremental sequential one and the restricted overwrite. By default DVD-RW discs are in sequential format.

A virgin DVD-RW can be directly written without the need of a formatting operation, however a non-virgin DVD-RW in sequential format needs to be blanked before to be able to write a new initial session.

To blank a DVD-RW in sequential mode, run:

```
# dvd+rw-format -blank=full /dev/cd0
```

> **Óçìåßùóç:** A full blanking (`-blank=full`) will take about one hour on a 1x media. A fast blanking can be performed using the `-blank` option if the DVD-RW will be recorded in Disk-At-Once (DAO) mode. To burn the DVD-RW in DAO mode, use the command:
>
> ```
> # growisofs -use-the-force-luke=dao -Z /dev/cd0=imagefile.iso
> ```
>
> The `-use-the-force-luke=dao` option should not be required since growisofs(1) attempts to detect minimally (fast blanked) media and engage DAO write.
>
> In fact one should use restricted overwrite mode with any DVD-RW, this format is more flexible than the default incremental sequential one.

To write data on a sequential DVD-RW, use the same instructions as for the other DVD formats:

```
# growisofs -Z /dev/cd0 -J -R /path/to/data
```

If you want to append some data to your previous recording, you will have to use the growisofs(1) `-M` option. However, if you perform data addition on a DVD-RW in incremental sequential mode, a new session will be created on the disc and the result will be a multi-session disc.

A DVD-RW in restricted overwrite format does not need to be blanked before a new initial session, you just have to overwrite the disc with the `-Z` option, this is similar to the DVD+RW case. It is also possible to grow an existing ISO 9660 file system written on the disc in a same way as for a DVD+RW with the `-M` option. The result will be a one-session DVD.

To put a DVD-RW in the restricted overwrite format, the following command must be used:

```
# dvd+rw-format /dev/cd0
```

To change back to the sequential format use:

```
# dvd+rw-format -blank=full /dev/cd0
```

19.7.7 Multisession

Very few DVD-ROM drives support multisession DVDs, they will most of time, hopefully, only read the first session. DVD+R, DVD-R and DVD-RW in sequential format can accept multiple sessions, the notion of multiple sessions does not exist for the DVD+RW and the DVD-RW restricted overwrite formats.

Using the following command after an initial (non-closed) session on a DVD+R, DVD-R, or DVD-RW in sequential format, will add a new session to the disc:

```
# growisofs -M /dev/cd0 -J -R /path/to/nextdata
```

Using this command line with a DVD+RW or a DVD-RW in restricted overwrite mode, will append data in merging the new session to the existing one. The result will be a single-session disc. This is the way used to add data after an initial write on these medias.

> **Óçìåßùóç:** Some space on the media is used between each session for end and start of sessions. Therefore, one should add sessions with large amount of data to optimize media space. The number of sessions is limited to 154 for a DVD+R, about 2000 for a DVD-R, and 127 for a DVD+R Double Layer.

19.7.8 For More Information

To obtain more information about a DVD, the `dvd+rw-mediainfo /dev/cd0` command can be ran with the disc in the drive.

More information about the **dvd+rw-tools** can be found in the growisofs(1) manual page, on the dvd+rw-tools web site (http://fy.chalmers.se/~appro/linux/DVD+RW/) and in the cdwrite mailing list (http://lists.debian.org/cdwrite/) archives.

> **Óçìåßùóç:** The `dvd+rw-mediainfo` output of the resulting recording or the media with issues is mandatory for any problem report. Without this output, it will be quite impossible to help you.

19.7.9 Using a DVD-RAM

19.7.9.1 Configuration

DVD-RAM writers come with either SCSI or ATAPI interface. DMA access for ATAPI devices has to be enabled, this can be done by adding the following line to the `/boot/loader.conf` file:

```
hw.ata.atapi_dma="1"
```

19.7.9.2 Preparing the Medium

As previously mentioned in the chapter introduction, a DVD-RAM can be seen as a removable hard drive. As any other hard drive the DVD-RAM must be “prepared” before the first use. In the example, the whole disk space will be used with a standard UFS2 file system:

```
# dd if=/dev/zero of=/dev/acd0 count=2
# bsdlabel -Bw acd0
# newfs /dev/acd0
```

The DVD device, `acd0`, must be changed according to the configuration.

19.7.9.3 Using the Medium

Once the previous operations have been performed on the DVD-RAM, it can be mounted as a normal hard drive:

```
# mount /dev/acd0 /mnt
```

After this the DVD-RAM will be both readable and writeable.

19.8 Creating and Using Floppy Disks

Original work by Julio Merino. Rewritten by Martin Karlsson.

Storing data on floppy disks is sometimes useful, for example when one does not have any other removable storage media or when one needs to transfer small amounts of data to another computer.

This section will explain how to use floppy disks in FreeBSD. It will primarily cover formatting and usage of 3.5inch DOS floppies, but the concepts are similar for other floppy disk formats.

19.8.1 Formatting Floppies

19.8.1.1 The Device

Floppy disks are accessed through entries in `/dev`, just like other devices. To access the raw floppy disk, simply use `/dev/fdN`.

19.8.1.2 Formatting

A floppy disk needs to be low-level formated before it can be used. This is usually done by the vendor, but formatting is a good way to check media integrity. Although it is possible to force larger (or smaller) disk sizes, 1440kB is what most floppy disks are designed for.

To low-level format the floppy disk you need to use fdformat(1). This utility expects the device name as an argument.

Make note of any error messages, as these can help determine if the disk is good or bad.

19.8.1.2.1 Formatting Floppy Disks

Use the `/dev/fdN` devices to format the floppy. Insert a new 3.5inch floppy disk in your drive and issue:

```
# /usr/sbin/fdformat -f 1440 /dev/fd0
```

19.8.2 The Disk Label

After low-level formatting the disk, you will need to place a disk label on it. This disk label will be destroyed later, but it is needed by the system to determine the size of the disk and its geometry later.

The new disk label will take over the whole disk, and will contain all the proper information about the geometry of the floppy. The geometry values for the disk label are listed in `/etc/disktab`.

You can run now bsdlabel(8) like so:

```
# /sbin/bsdlabel -B -r -w /dev/fd0 fd1440
```

19.8.3 The File System

Now the floppy is ready to be high-level formated. This will place a new file system on it, which will let FreeBSD read and write to the disk. After creating the new file system, the disk label is destroyed, so if you want to reformat the disk, you will have to recreate the disk label.

The floppy’s file system can be either UFS or FAT. FAT is generally a better choice for floppies.

To put a new file system on the floppy, issue:

```
# /sbin/newfs_msdos /dev/fd0
```

The disk is now ready for use.

19.8.4 Using the Floppy

To use the floppy, mount it with mount_msdosfs(8). One can also use `emulators/mtools` from the ports collection.

19.9 Creating and Using Data Tapes

The major tape media are the 4mm, 8mm, QIC, mini-cartridge and DLT.

19.9.1 4mm (DDS: Digital Data Storage)

4mm tapes are replacing QIC as the workstation backup media of choice. This trend accelerated greatly when Conner purchased Archive, a leading manufacturer of QIC drives, and then stopped production of QIC drives. 4mm drives are small and quiet but do not have the reputation for reliability that is enjoyed by 8mm drives. The cartridges are less expensive and smaller (3 x 2 x 0.5 inches, 76 x 51 x 12 mm) than 8mm cartridges. 4mm, like 8mm, has comparatively short head life for the same reason, both use helical scan.

Data throughput on these drives starts ~150 kB/s, peaking at ~500 kB/s. Data capacity starts at 1.3 GB and ends at 2.0 GB. Hardware compression, available with most of these drives, approximately doubles the capacity. Multi-drive tape library units can have 6 drives in a single cabinet with automatic tape changing. Library capacities reach 240 GB.

The DDS-3 standard now supports tape capacities up to 12 GB (or 24 GB compressed).

4mm drives, like 8mm drives, use helical-scan. All the benefits and drawbacks of helical-scan apply to both 4mm and 8mm drives.

Tapes should be retired from use after 2,000 passes or 100 full backups.

19.9.2 8mm (Exabyte)

8mm tapes are the most common SCSI tape drives; they are the best choice of exchanging tapes. Nearly every site has an Exabyte 2 GB 8mm tape drive. 8mm drives are reliable, convenient and quiet. Cartridges are inexpensive and small (4.8 x 3.3 x 0.6 inches; 122 x 84 x 15 mm). One downside of 8mm tape is relatively short head and tape life due to the high rate of relative motion of the tape across the heads.

Data throughput ranges from ~250 kB/s to ~500 kB/s. Data sizes start at 300 MB and go up to 7 GB. Hardware compression, available with most of these drives, approximately doubles the capacity. These drives are available as single units or multi-drive tape libraries with 6 drives and 120 tapes in a single cabinet. Tapes are changed automatically by the unit. Library capacities reach 840+ GB.

The Exabyte “Mammoth” model supports 12 GB on one tape (24 GB with compression) and costs approximately twice as much as conventional tape drives.

Data is recorded onto the tape using helical-scan, the heads are positioned at an angle to the media (approximately 6 degrees). The tape wraps around 270 degrees of the spool that holds the heads. The spool spins while the tape slides over the spool. The result is a high density of data and closely packed tracks that angle across the tape from one edge to the other.

19.9.3 QIC

QIC-150 tapes and drives are, perhaps, the most common tape drive and media around. QIC tape drives are the least expensive “serious” backup drives. The downside is the cost of media. QIC tapes are expensive compared to 8mm or 4mm tapes, up to 5 times the price per GB data storage. But, if your needs can be satisfied with a half-dozen tapes, QIC may be the correct choice. QIC is the *most* common tape drive. Every site has a QIC drive of some density or another. Therein lies the rub, QIC has a large number of densities on physically similar (sometimes identical) tapes. QIC drives are not quiet. These drives audibly seek before they begin to record data and are clearly audible whenever reading, writing or seeking. QIC tapes measure 6 x 4 x 0.7 inches (152 x 102 x 17 mm).

Data throughput ranges from ~150 kB/s to ~500 kB/s. Data capacity ranges from 40 MB to 15 GB. Hardware compression is available on many of the newer QIC drives. QIC drives are less frequently installed; they are being supplanted by DAT drives.

Data is recorded onto the tape in tracks. The tracks run along the long axis of the tape media from one end to the other. The number of tracks, and therefore the width of a track, varies with the tape’s capacity. Most if not all newer drives provide backward-compatibility at least for reading (but often also for writing). QIC has a good reputation regarding the safety of the data (the mechanics are simpler and more robust than for helical scan drives).

Tapes should be retired from use after 5,000 backups.

19.9.4 DLT

DLT has the fastest data transfer rate of all the drive types listed here. The 1/2" (12.5mm) tape is contained in a single spool cartridge (4 x 4 x 1 inches; 100 x 100 x 25 mm). The cartridge has a swinging gate along one entire side of the cartridge. The drive mechanism opens this gate to extract the tape leader. The tape leader has an oval hole in it which the drive uses to “hook” the tape. The take-up spool is located inside the tape drive. All the other tape cartridges listed here (9 track tapes are the only exception) have both the supply and take-up spools located inside the tape cartridge itself.

Data throughput is approximately 1.5 MB/s, three times the throughput of 4mm, 8mm, or QIC tape drives. Data capacities range from 10 GB to 20 GB for a single drive. Drives are available in both multi-tape changers and multi-tape, multi-drive tape libraries containing from 5 to 900 tapes over 1 to 20 drives, providing from 50 GB to 9 TB of storage.

With compression, DLT Type IV format supports up to 70 GB capacity.

Data is recorded onto the tape in tracks parallel to the direction of travel (just like QIC tapes). Two tracks are written at once. Read/write head lifetimes are relatively long; once the tape stops moving, there is no relative motion between the heads and the tape.

19.9.5 AIT

AIT is a new format from Sony, and can hold up to 50 GB (with compression) per tape. The tapes contain memory chips which retain an index of the tape's contents. This index can be rapidly read by the tape drive to determine the position of files on the tape, instead of the several minutes that would be required for other tapes. Software such as **SAMS:Alexandria** can operate forty or more AIT tape libraries, communicating directly with the tape's memory chip to display the contents on screen, determine what files were backed up to which tape, locate the correct tape, load it, and restore the data from the tape.

Libraries like this cost in the region of $20,000, pricing them a little out of the hobbyist market.

19.9.6 Using a New Tape for the First Time

The first time that you try to read or write a new, completely blank tape, the operation will fail. The console messages should be similar to:

```
sa0(ncr1:4:0): NOT READY asc:4,1
sa0(ncr1:4:0):  Logical unit is in process of becoming ready
```

The tape does not contain an Identifier Block (block number 0). All QIC tape drives since the adoption of QIC-525 standard write an Identifier Block to the tape. There are two solutions:

- `mt fsf 1` causes the tape drive to write an Identifier Block to the tape.
- Use the front panel button to eject the tape.

  Re-insert the tape and `dump` data to the tape.

  `dump` will report `DUMP: End of tape detected` and the console will show: `HARDWARE FAILURE info:280 asc:80,96`.

  rewind the tape using: `mt rewind`.

  Subsequent tape operations are successful.

19.10 Backups to Floppies

19.10.1 Can I Use Floppies for Backing Up My Data?

Floppy disks are not really a suitable media for making backups as:

- The media is unreliable, especially over long periods of time.
- Backing up and restoring is very slow.

- They have a very limited capacity (the days of backing up an entire hard disk onto a dozen or so floppies has long since passed).

However, if you have no other method of backing up your data then floppy disks are better than no backup at all.

If you do have to use floppy disks then ensure that you use good quality ones. Floppies that have been lying around the office for a couple of years are a bad choice. Ideally use new ones from a reputable manufacturer.

19.10.2 So How Do I Backup My Data to Floppies?

The best way to backup to floppy disk is to use tar(1) with the `-M` (multi volume) option, which allows backups to span multiple floppies.

To backup all the files in the current directory and sub-directory use this (as `root`):

```
# tar Mcvf /dev/fd0 *
```

When the first floppy is full tar(1) will prompt you to insert the next volume (because tar(1) is media independent it refers to volumes; in this context it means floppy disk).

```
Prepare volume #2 for /dev/fd0 and hit return:
```

This is repeated (with the volume number incrementing) until all the specified files have been archived.

19.10.3 Can I Compress My Backups?

Unfortunately, tar(1) will not allow the `-z` option to be used for multi-volume archives. You could, of course, gzip(1) all the files, tar(1) them to the floppies, then gunzip(1) the files again!

19.10.4 How Do I Restore My Backups?

To restore the entire archive use:

```
# tar Mxvf /dev/fd0
```

There are two ways that you can use to restore only specific files. First, you can start with the first floppy and use:

```
# tar Mxvf /dev/fd0 filename
```

The utility tar(1) will prompt you to insert subsequent floppies until it finds the required file.

Alternatively, if you know which floppy the file is on then you can simply insert that floppy and use the same command as above. Note that if the first file on the floppy is a continuation from the previous one then tar(1) will warn you that it cannot restore it, even if you have not asked it to!

19.11 Backup Strategies

Original work by Lowell Gilbert.

The first requirement in devising a backup plan is to make sure that all of the following problems are covered:

- Disk failure
- Accidental file deletion
- Random file corruption
- Complete machine destruction (e.g. fire), including destruction of any on-site backups.

It is perfectly possible that some systems will be best served by having each of these problems covered by a completely different technique. Except for strictly personal systems with very low-value data, it is unlikely that one technique would cover all of them.

Some of the techniques in the toolbox are:

- Archives of the whole system, backed up onto permanent media offsite. This actually provides protection against all of the possible problems listed above, but is slow and inconvenient to restore from. You can keep copies of the backups onsite and/or online, but there will still be inconveniences in restoring files, especially for non-privileged users.
- Filesystem snapshots. This is really only helpful in the accidental file deletion scenario, but it can be *very* helpful in that case, and is quick and easy to deal with.
- Copies of whole filesystems and/or disks (e.g. periodic rsync(1) of the whole machine). This is generally most useful in networks with unique requirements. For general protection against disk failure, it is usually inferior to RAID. For restoring accidentally deleted files, it can be comparable to UFS snapshots, but that depends on your preferences.
- RAID. Minimizes or avoids downtime when a disk fails. At the expense of having to deal with disk failures more often (because you have more disks), albeit at a much lower urgency.
- Checking fingerprints of files. The mtree(8) utility is very useful for this. Although it is not a backup technique, it helps guarantee that you will notice when you need to resort to your backups. This is particularly important for offline backups, and should be checked periodically.

It is quite easy to come up with even more techniques, many of them variations on the ones listed above. Specialized requirements will usually lead to specialized techniques (for example, backing up a live database usually requires a method particular to the database software as an intermediate step). The important thing is to know what dangers you want to protect against, and how you will handle each.

19.12 Backup Basics

The three major backup programs are dump(8), tar(1), and cpio(1).

19.12.1 Dump and Restore

The traditional UNIX backup programs are `dump` and `restore`. They operate on the drive as a collection of disk blocks, below the abstractions of files, links and directories that are created by the file systems. `dump` backs up an entire file system on a device. It is unable to backup only part of a file system or a directory tree that spans more than one file system. `dump` does not write files and directories to tape, but rather writes the raw data blocks that comprise files and directories.

> **Óçìåßùóç:** If you use `dump` on your root directory, you would not back up `/home`, `/usr` or many other directories since these are typically mount points for other file systems or symbolic links into those file systems.

`dump` has quirks that remain from its early days in Version 6 of AT&T UNIX (circa 1975). The default parameters are suitable for 9-track tapes (6250 bpi), not the high-density media available today (up to 62,182 ftpi). These defaults must be overridden on the command line to utilize the capacity of current tape drives.

It is also possible to backup data across the network to a tape drive attached to another computer with `rdump` and `rrestore`. Both programs rely upon rcmd(3) and ruserok(3) to access the remote tape drive. Therefore, the user performing the backup must be listed in the `.rhosts` file on the remote computer. The arguments to `rdump` and `rrestore` must be suitable to use on the remote computer. When `rdump`ing from a FreeBSD computer to an Exabyte tape drive connected to a Sun called `komodo`, use:

```
# /sbin/rdump 0dsbfu 54000 13000 126 komodo:/dev/nsa8 /dev/da0a 2>&1
```

Beware: there are security implications to allowing `.rhosts` authentication. Evaluate your situation carefully.

It is also possible to use `dump` and `restore` in a more secure fashion over `ssh`.

ÐáñÜäåéãìá 19-1. Using dump over ssh

```
# /sbin/dump -0uan -f - /usr | gzip -2 | ssh -c blowfish \
          targetuser@targetmachine.example.com dd of=/mybigfiles/dump-usr-l0.gz
```

Or using `dump`'s built-in method, setting the environment variable `RSH`:

ÐáñÜäåéãìá 19-2. Using dump over ssh with RSH set

```
# RSH=/usr/bin/ssh /sbin/dump -0uan -f targetuser@targetmachine.example.com:/dev/sa0 /usr
```

19.12.2 `tar`

tar(1) also dates back to Version 6 of AT&T UNIX (circa 1975). `tar` operates in cooperation with the file system; it writes files and directories to tape. `tar` does not support the full range of options that are available from cpio(1), but it does not require the unusual command pipeline that `cpio` uses.

On FreeBSD 5.3 and later, both GNU `tar` and the default `bsdtar` are available. The GNU version can be invoked with `gtar`. It supports remote devices using the same syntax as `rdump`. To `tar` to an Exabyte tape drive connected to a Sun called `komodo`, use:

```
# /usr/bin/gtar cf komodo:/dev/nsa8 . 2>&1
```

The same could be accomplished with `bsdtar` by using a pipeline and `rsh` to send the data to a remote tape drive.

```
# tar cf - . | rsh hostname dd of=tape-device obs=20b
```

If you are worried about the security of backing up over a network you should use the `ssh` command instead of `rsh`.

19.12.3 `cpio`

cpio(1) is the original UNIX file interchange tape program for magnetic media. `cpio` has options (among many others) to perform byte-swapping, write a number of different archive formats, and pipe the data to other programs. This last feature makes `cpio` an excellent choice for installation media. `cpio` does not know how to walk the directory tree and a list of files must be provided through `stdin`.

`cpio` does not support backups across the network. You can use a pipeline and `rsh` to send the data to a remote tape drive.

```
# for f in directory_list; do
find $f >> backup.list
done
# cpio -v -o --format=newc < backup.list | ssh user@host "cat > backup_device"
```

Where *`directory_list`* is the list of directories you want to back up, *`user@host`* is the user/hostname combination that will be performing the backups, and *`backup_device`* is where the backups should be written to (e.g., `/dev/nsa0`).

19.12.4 `pax`

pax(1) is IEEE/POSIX's answer to `tar` and `cpio`. Over the years the various versions of `tar` and `cpio` have gotten slightly incompatible. So rather than fight it out to fully standardize them, POSIX created a new archive utility. `pax` attempts to read and write many of the various `cpio` and `tar` formats, plus new formats of its own. Its command set more resembles `cpio` than `tar`.

19.12.5 Amanda

Amanda (Advanced Maryland Network Disk Archiver) is a client/server backup system, rather than a single program. An **Amanda** server will backup to a single tape drive any number of computers that have **Amanda** clients and a network connection to the **Amanda** server. A common problem at sites with a number of large disks is that the length of time required to backup to data directly to tape exceeds the amount of time available for the task. **Amanda** solves this problem. **Amanda** can use a "holding disk" to backup several file systems at the same time. **Amanda** creates "archive sets": a group of tapes used over a period of time to create full backups of all the file systems listed in **Amanda**'s configuration file. The "archive set" also contains nightly incremental (or differential) backups of all the file systems. Restoring a damaged file system requires the most recent full backup and the incremental backups.

The configuration file provides fine control of backups and the network traffic that **Amanda** generates. **Amanda** will use any of the above backup programs to write the data to tape. **Amanda** is available as either a port or a package, it is not installed by default.

19.12.6 Do Nothing

"Do nothing" is not a computer program, but it is the most widely used backup strategy. There are no initial costs. There is no backup schedule to follow. Just say no. If something happens to your data, grin and bear it!

If your time and your data is worth little to nothing, then “Do nothing” is the most suitable backup program for your computer. But beware, UNIX is a useful tool, you may find that within six months you have a collection of files that are valuable to you.

“Do nothing” is the correct backup method for `/usr/obj` and other directory trees that can be exactly recreated by your computer. An example is the files that comprise the HTML or PostScript version of this Handbook. These document formats have been created from SGML input files. Creating backups of the HTML or PostScript files is not necessary. The SGML files are backed up regularly.

19.12.7 Which Backup Program Is Best?

dump(8) *Period.* Elizabeth D. Zwicky torture tested all the backup programs discussed here. The clear choice for preserving all your data and all the peculiarities of UNIX file systems is `dump`. Elizabeth created file systems containing a large variety of unusual conditions (and some not so unusual ones) and tested each program by doing a backup and restore of those file systems. The peculiarities included: files with holes, files with holes and a block of nulls, files with funny characters in their names, unreadable and unwritable files, devices, files that change size during the backup, files that are created/deleted during the backup and more. She presented the results at LISA V in Oct. 1991. See torture-testing Backup and Archive Programs (http://berdmann.dyndns.org/zwicky/testdump.doc.html).

19.12.8 Emergency Restore Procedure

19.12.8.1 Before the Disaster

There are only four steps that you need to perform in preparation for any disaster that may occur.

First, print the bsdlabel from each of your disks (e.g. `bsdlabel da0 | lpr`), your file system table (`/etc/fstab`) and all boot messages, two copies of each.

Second, determine that the boot and fix-it floppies (`boot.flp` and `fixit.flp`) have all your devices. The easiest way to check is to reboot your machine with the boot floppy in the floppy drive and check the boot messages. If all your devices are listed and functional, skip on to step three.

Otherwise, you have to create two custom bootable floppies which have a kernel that can mount all of your disks and access your tape drive. These floppies must contain: `fdisk`, `bsdlabel`, `newfs`, `mount`, and whichever backup program you use. These programs must be statically linked. If you use `dump`, the floppy must contain `restore`.

Third, create backup tapes regularly. Any changes that you make after your last backup may be irretrievably lost. Write-protect the backup tapes.

Fourth, test the floppies (either `boot.flp` and `fixit.flp` or the two custom bootable floppies you made in step two.) and backup tapes. Make notes of the procedure. Store these notes with the bootable floppy, the printouts and the backup tapes. You will be so distraught when restoring that the notes may prevent you from destroying your backup tapes (How? In place of `tar xvf /dev/sa0`, you might accidentally type `tar cvf /dev/sa0` and over-write your backup tape).

For an added measure of security, make bootable floppies and two backup tapes each time. Store one of each at a remote location. A remote location is NOT the basement of the same office building. A number of firms in the World Trade Center learned this lesson the hard way. A remote location should be physically separated from your computers and disk drives by a significant distance.

ÐáñÜäåéãìá 19-3. A Script for Creating a Bootable Floppy

```
#!/bin/sh
#
# create a restore floppy
#
# format the floppy
#
PATH=/bin:/sbin:/usr/sbin:/usr/bin

fdformat -q fd0
if [ $? -ne 0 ]
then
         echo "Bad floppy, please use a new one"
         exit 1
fi

# place boot blocks on the floppy
#
bsdlabel -w -B /dev/fd0c fd1440

#
# newfs the one and only partition
#
newfs -t 2 -u 18 -l 1 -c 40 -i 5120 -m 5 -o space /dev/fd0a

#
# mount the new floppy
#
mount /dev/fd0a /mnt

#
# create required directories
#
mkdir /mnt/dev
mkdir /mnt/bin
mkdir /mnt/sbin
mkdir /mnt/etc
mkdir /mnt/root
mkdir /mnt/mnt                  # for the root partition
mkdir /mnt/tmp
mkdir /mnt/var

#
# populate the directories
#
if [ ! -x /sys/compile/MINI/kernel ]
then
         cat << EOM
The MINI kernel does not exist, please create one.
Here is an example config file:
#
# MINI -- A kernel to get FreeBSD onto a disk.
```

```
#
machine         "i386"
cpu             "I486_CPU"
ident           MINI
maxusers        5

options         INET                    # needed for _tcp _icmpstat _ipstat
                                        #            _udpstat _tcpstat _udb
options         FFS                     #Berkeley Fast File System
options         FAT_CURSOR              #block cursor in syscons or pccons
options         SCSI_DELAY=15           #Be pessimistic about Joe SCSI device
options         NCONS=2                 #1 virtual consoles
options         USERCONFIG              #Allow user configuration with -c XXX

config          kernel  root on da0 swap on da0 and da1 dumps on da0

device          isa0
device          pci0

device          fdc0    at isa? port "IO_FD1" bio irq 6 drq 2 vector fdintr
device          fd0     at fdc0 drive 0

device          ncr0

device          scbus0

device          sc0     at isa? port "IO_KBD" tty irq 1 vector scintr
device          npx0    at isa? port "IO_NPX" irq 13 vector npxintr

device          da0
device          da1
device          da2

device          sa0

pseudo-device   loop            # required by INET
pseudo-device   gzip            # Exec gzipped a.out's
EOM
         exit 1
fi

cp -f /sys/compile/MINI/kernel /mnt

gzip -c -best /sbin/init > /mnt/sbin/init
gzip -c -best /sbin/fsck > /mnt/sbin/fsck
gzip -c -best /sbin/mount > /mnt/sbin/mount
gzip -c -best /sbin/halt > /mnt/sbin/halt
gzip -c -best /sbin/restore > /mnt/sbin/restore

gzip -c -best /bin/sh > /mnt/bin/sh
gzip -c -best /bin/sync > /mnt/bin/sync

cp /root/.profile /mnt/root
cp -f /dev/MAKEDEV /mnt/dev
chmod 755 /mnt/dev/MAKEDEV

chmod 500 /mnt/sbin/init
chmod 555 /mnt/sbin/fsck /mnt/sbin/mount /mnt/sbin/halt
chmod 555 /mnt/bin/sh /mnt/bin/sync
chmod 6555 /mnt/sbin/restore

#
# create the devices nodes
#
cd /mnt/dev
./MAKEDEV std
./MAKEDEV da0
./MAKEDEV da1
./MAKEDEV da2
./MAKEDEV sa0
./MAKEDEV pty0
cd /

#
# create minimum file system table
#
cat > /mnt/etc/fstab <<EOM
/dev/fd0a    /    ufs    rw  1  1
EOM

#
# create minimum passwd file
#
cat > /mnt/etc/passwd <<EOM
root:*:0:0:Charlie &:/root:/bin/sh
EOM

cat > /mnt/etc/master.passwd <<EOM
root::0:0::0:0:Charlie &:/root:/bin/sh
EOM

chmod 600 /mnt/etc/master.passwd
chmod 644 /mnt/etc/passwd
/usr/sbin/pwd_mkdb -d/mnt/etc /mnt/etc/master.passwd

#
# umount the floppy and inform the user
#
/sbin/umount /mnt
echo "The floppy has been unmounted and is now ready."
```

19.12.8.2 After the Disaster

The key question is: did your hardware survive? You have been doing regular backups so there is no need to worry about the software.

If the hardware has been damaged, the parts should be replaced before attempting to use the computer.

If your hardware is okay, check your floppies. If you are using a custom boot floppy, boot single-user (type `-s` at the `boot:` prompt). Skip the following paragraph.

If you are using the `boot.flp` and `fixit.flp` floppies, keep reading. Insert the `boot.flp` floppy in the first floppy drive and boot the computer. The original install menu will be displayed on the screen. Select the `Fixit--Repair mode with CDROM or floppy.` option. Insert the `fixit.flp` when prompted. `restore` and the other programs that you need are located in `/mnt2/rescue` (`/mnt2/stand` for FreeBSD versions older than 5.2).

Recover each file system separately.

Try to `mount` (e.g. `mount /dev/da0a /mnt`) the root partition of your first disk. If the bsdlabel was damaged, use `bsdlabel` to re-partition and label the disk to match the label that you printed and saved. Use `newfs` to re-create the file systems. Re-mount the root partition of the floppy read-write (`mount -u -o rw /mnt`). Use your backup program and backup tapes to recover the data for this file system (e.g. `restore vrf /dev/sa0`). Unmount the file system (e.g. `umount /mnt`). Repeat for each file system that was damaged.

Once your system is running, backup your data onto new tapes. Whatever caused the crash or data loss may strike again. Another hour spent now may save you from further distress later.

19.13 Network, Memory, and File-Backed File Systems

Reorganized and enhanced by Marc Fonvieille.

Aside from the disks you physically insert into your computer: floppies, CDs, hard drives, and so forth; other forms of disks are understood by FreeBSD - the *virtual disks*.

These include network file systems such as the Network File System and Coda, memory-based file systems and file-backed file systems.

According to the FreeBSD version you run, you will have to use different tools for creation and use of file-backed and memory-based file systems.

> **Óçìåßùóç:** Use devfs(5) to allocate device nodes transparently for the user.

19.13.1 File-Backed File System

The utility mdconfig(8) is used to configure and enable memory disks, md(4), under FreeBSD. To use mdconfig(8), you have to load md(4) module or to add the support in your kernel configuration file:

```
device md
```

The mdconfig(8) command supports three kinds of memory backed virtual disks: memory disks allocated with malloc(9), memory disks using a file or swap space as backing. One possible use is the mounting of floppy or CD images kept in files.

To mount an existing file system image:

ÐáñÜäåéãìá 19-4. Using `mdconfig` to Mount an Existing File System Image

```
# mdconfig -a -t vnode -f diskimage -u 0
# mount /dev/md0 /mnt
```

To create a new file system image with mdconfig(8):

ÐáñÜäåéãìá 19-5. Creating a New File-Backed Disk with `mdconfig`

```
# dd if=/dev/zero of=newimage bs=1k count=5k
5120+0 records in
5120+0 records out
# mdconfig -a -t vnode -f newimage -u 0
# bsdlabel -w md0 auto
# newfs md0a
/dev/md0a: 5.0MB (10224 sectors) block size 16384, fragment size 2048
        using 4 cylinder groups of 1.25MB, 80 blks, 192 inodes.
super-block backups (for fsck -b #) at:
 160, 2720, 5280, 7840
# mount /dev/md0a /mnt
# df /mnt
Filesystem 1K-blocks Used Avail Capacity  Mounted on
/dev/md0a       4710    4  4330     0%    /mnt
```

If you do not specify the unit number with the `-u` option, mdconfig(8) will use the md(4) automatic allocation to select an unused device. The name of the allocated unit will be output on stdout like `md4`. For more details about mdconfig(8), please refer to the manual page.

The utility mdconfig(8) is very useful, however it asks many command lines to create a file-backed file system. FreeBSD also comes with a tool called mdmfs(8), this program configures a md(4) disk using mdconfig(8), puts a UFS file system on it using newfs(8), and mounts it using mount(8). For example, if you want to create and mount the same file system image as above, simply type the following:

ÐáñÜäåéãìá 19-6. Configure and Mount a File-Backed Disk with `mdmfs`

```
# dd if=/dev/zero of=newimage bs=1k count=5k
5120+0 records in
5120+0 records out
# mdmfs -F newimage -s 5m md0 /mnt
# df /mnt
Filesystem 1K-blocks Used Avail Capacity  Mounted on
/dev/md0        4718    4  4338     0%    /mnt
```

If you use the option `md` without unit number, mdmfs(8) will use md(4) auto-unit feature to automatically select an unused device. For more details about mdmfs(8), please refer to the manual page.

19.13.2 Memory-Based File System

For a memory-based file system the “swap backing” should normally be used. Using swap backing does not mean that the memory disk will be swapped out to disk by default, but merely that the memory disk will be allocated from a memory pool which can be swapped out to disk if needed. It is also possible to create memory-based disk which are malloc(9) backed, but using malloc backed memory disks, especially large ones, can result in a system panic if the kernel runs out of memory.

ÐáñÜäåéãìá 19-7. Creating a New Memory-Based Disk with `mdconfig`

```
# mdconfig -a -t swap -s 5m -u 1
# newfs -U md1
/dev/md1: 5.0MB (10240 sectors) block size 16384, fragment size 2048
        using 4 cylinder groups of 1.27MB, 81 blks, 192 inodes.
        with soft updates
super-block backups (for fsck -b #) at:
 160, 2752, 5344, 7936
# mount /dev/md1 /mnt
# df /mnt
Filesystem 1K-blocks Used Avail Capacity  Mounted on
/dev/md1        4718    4  4338     0%    /mnt
```

ÐáñÜäåéãìá 19-8. Creating a New Memory-Based Disk with `mdmfs`

```
# mdmfs -s 5m md2 /mnt
# df /mnt
Filesystem 1K-blocks Used Avail Capacity  Mounted on
/dev/md2        4846    2  4458     0%    /mnt
```

19.13.3 Detaching a Memory Disk from the System

When a memory-based or file-based file system is not used, you should release all resources to the system. The first thing to do is to unmount the file system, then use mdconfig(8) to detach the disk from the system and release the resources.

For example to detach and free all resources used by `/dev/md4`:

```
# mdconfig -d -u 4
```

It is possible to list information about configured md(4) devices in using the command `mdconfig -l`.

19.14 File System Snapshots

Contributed by Tom Rhodes.

FreeBSD offers a feature in conjunction with Soft Updates: File system snapshots.

Snapshots allow a user to create images of specified file systems, and treat them as a file. Snapshot files must be created in the file system that the action is performed on, and a user may create no more than 20 snapshots per file system. Active snapshots are recorded in the superblock so they are persistent across unmount and remount operations along with system reboots. When a snapshot is no longer required, it can be removed with the standard rm(1) command. Snapshots may be removed in any order, however all the used space may not be acquired because another snapshot will possibly claim some of the released blocks.

The un-alterable `snapshot` file flag is set by mksnap_ffs(8) after initial creation of a snapshot file. The unlink(1) command makes an exception for snapshot files since it allows them to be removed.

Snapshots are created with the mount(8) command. To place a snapshot of `/var` in the file `/var/snapshot/snap` use the following command:

```
# mount -u -o snapshot /var/snapshot/snap /var
```

Alternatively, you can use mksnap_ffs(8) to create a snapshot:

```
# mksnap_ffs /var /var/snapshot/snap
```

One can find snapshot files on a file system (e.g. `/var`) by using the find(1) command:

```
# find /var -flags snapshot
```

Once a snapshot has been created, it has several uses:

- Some administrators will use a snapshot file for backup purposes, because the snapshot can be transfered to CDs or tape.
- The file system integrity checker, fsck(8), may be run on the snapshot. Assuming that the file system was clean when it was mounted, you should always get a clean (and unchanging) result. This is essentially what the background fsck(8) process does.
- Run the dump(8) utility on the snapshot. A dump will be returned that is consistent with the file system and the timestamp of the snapshot. dump(8) can also take a snapshot, create a dump image and then remove the snapshot in one command using the `-L` flag.
- mount(8) the snapshot as a frozen image of the file system. To mount(8) the snapshot `/var/snapshot/snap` run:

  ```
  # mdconfig -a -t vnode -f /var/snapshot/snap -u 4
  # mount -r /dev/md4 /mnt
  ```

You can now walk the hierarchy of your frozen `/var` file system mounted at `/mnt`. Everything will initially be in the same state it was during the snapshot creation time. The only exception is that any earlier snapshots will appear as zero length files. When the use of a snapshot has delimited, it can be unmounted with:

```
# umount /mnt
# mdconfig -d -u 4
```

For more information about `softupdates` and file system snapshots, including technical papers, you can visit Marshall Kirk McKusick's website at http://www.mckusick.com/.

19.15 File System Quotas

Quotas are an optional feature of the operating system that allow you to limit the amount of disk space and/or the number of files a user or members of a group may allocate on a per-file system basis. This is used most often on timesharing systems where it is desirable to limit the amount of resources any one user or group of users may allocate. This will prevent one user or group of users from consuming all of the available disk space.

19.15.1 Configuring Your System to Enable Disk Quotas

Before attempting to use disk quotas, it is necessary to make sure that quotas are configured in your kernel. This is done by adding the following line to your kernel configuration file:

```
options QUOTA
```

The stock `GENERIC` kernel does not have this enabled by default, so you will have to configure, build and install a custom kernel in order to use disk quotas. Please refer to ÊåöÜëáéï 9 for more information on kernel configuration.

Next you will need to enable disk quotas in `/etc/rc.conf`. This is done by adding the line:

```
enable_quotas="YES"
```

For finer control over your quota startup, there is an additional configuration variable available. Normally on bootup, the quota integrity of each file system is checked by the quotacheck(8) program. The quotacheck(8) facility insures that the data in the quota database properly reflects the data on the file system. This is a very time consuming process that will significantly affect the time your system takes to boot. If you would like to skip this step, a variable in `/etc/rc.conf` is made available for the purpose:

```
check_quotas="NO"
```

Finally you will need to edit `/etc/fstab` to enable disk quotas on a per-file system basis. This is where you can either enable user or group quotas or both for all of your file systems.

To enable per-user quotas on a file system, add the `userquota` option to the options field in the `/etc/fstab` entry for the file system you want to enable quotas on. For example:

```
/dev/da1s2g   /home    ufs rw,userquota 1 2
```

Similarly, to enable group quotas, use the `groupquota` option instead of `userquota`. To enable both user and group quotas, change the entry as follows:

```
/dev/da1s2g    /home    ufs rw,userquota,groupquota 1 2
```

By default, the quota files are stored in the root directory of the file system with the names `quota.user` and `quota.group` for user and group quotas respectively. See fstab(5) for more information. Even though the fstab(5) manual page says that you can specify an alternate location for the quota files, this is not recommended because the various quota utilities do not seem to handle this properly.

At this point you should reboot your system with your new kernel. `/etc/rc` will automatically run the appropriate commands to create the initial quota files for all of the quotas you enabled in `/etc/fstab`, so there is no need to manually create any zero length quota files.

In the normal course of operations you should not be required to run the quotacheck(8), quotaon(8), or quotaoff(8) commands manually. However, you may want to read their manual pages just to be familiar with their operation.

19.15.2 Setting Quota Limits

Once you have configured your system to enable quotas, verify that they really are enabled. An easy way to do this is to run:

```
# quota -v
```

You should see a one line summary of disk usage and current quota limits for each file system that quotas are enabled on.

You are now ready to start assigning quota limits with the edquota(8) command.

You have several options on how to enforce limits on the amount of disk space a user or group may allocate, and how many files they may create. You may limit allocations based on disk space (block quotas) or number of files (inode quotas) or a combination of both. Each of these limits are further broken down into two categories: hard and soft limits.

A hard limit may not be exceeded. Once a user reaches his hard limit he may not make any further allocations on the file system in question. For example, if the user has a hard limit of 500 kbytes on a file system and is currently using 490 kbytes, the user can only allocate an additional 10 kbytes. Attempting to allocate an additional 11 kbytes will fail.

Soft limits, on the other hand, can be exceeded for a limited amount of time. This period of time is known as the grace period, which is one week by default. If a user stays over his or her soft limit longer than the grace period, the soft limit will turn into a hard limit and no further allocations will be allowed. When the user drops back below the soft limit, the grace period will be reset.

The following is an example of what you might see when you run the edquota(8) command. When the edquota(8) command is invoked, you are placed into the editor specified by the `EDITOR` environment variable, or in the **vi** editor if the `EDITOR` variable is not set, to allow you to edit the quota limits.

```
# edquota -u test
```

```
Quotas for user test:
/usr: kbytes in use: 65, limits (soft = 50, hard = 75)
        inodes in use: 7, limits (soft = 50, hard = 60)
/usr/var: kbytes in use: 0, limits (soft = 50, hard = 75)
        inodes in use: 0, limits (soft = 50, hard = 60)
```

You will normally see two lines for each file system that has quotas enabled. One line for the block limits, and one line for inode limits. Simply change the value you want updated to modify the quota limit. For example, to raise this user's block limit from a soft limit of 50 and a hard limit of 75 to a soft limit of 500 and a hard limit of 600, change:

```
/usr: kbytes in use: 65, limits (soft = 50, hard = 75)
```

to:

```
/usr: kbytes in use: 65, limits (soft = 500, hard = 600)
```

The new quota limits will be in place when you exit the editor.

Sometimes it is desirable to set quota limits on a range of UIDs. This can be done by use of the `-p` option on the edquota(8) command. First, assign the desired quota limit to a user, and then run `edquota -p protouser startuid-enduid`. For example, if user `test` has the desired quota limits, the following command can be used to duplicate those quota limits for UIDs 10,000 through 19,999:

```
# edquota -p test 10000-19999
```

For more information see edquota(8) manual page.

19.15.3 Checking Quota Limits and Disk Usage

You can use either the quota(1) or the repquota(8) commands to check quota limits and disk usage. The quota(1) command can be used to check individual user or group quotas and disk usage. A user may only examine his own quota, and the quota of a group he is a member of. Only the super-user may view all user and group quotas. The repquota(8) command can be used to get a summary of all quotas and disk usage for file systems with quotas enabled.

The following is some sample output from the `quota -v` command for a user that has quota limits on two file systems.

```
Disk quotas for user test (uid 1002):
     Filesystem  usage    quota   limit   grace   files   quota   limit   grace
           /usr      65*     50      75   5days       7      50      60
       /usr/var       0      50      75               0      50      60
```

On the `/usr` file system in the above example, this user is currently 15 kbytes over the soft limit of 50 kbytes and has 5 days of the grace period left. Note the asterisk `*` which indicates that the user is currently over his quota limit.

Normally file systems that the user is not using any disk space on will not show up in the output from the quota(1) command, even if he has a quota limit assigned for that file system. The `-v` option will display those file systems, such as the `/usr/var` file system in the above example.

19.15.4 Quotas over NFS

Quotas are enforced by the quota subsystem on the NFS server. The rpc.rquotad(8) daemon makes quota information available to the quota(1) command on NFS clients, allowing users on those machines to see their quota statistics.

Enable `rpc.rquotad` in `/etc/inetd.conf` like so:

```
rquotad/1      dgram rpc/udp wait root /usr/libexec/rpc.rquotad rpc.rquotad
```

Now restart `inetd`:

```
# kill -HUP ‘cat /var/run/inetd.pid‘
```

19.16 Encrypting Disk Partitions

Contributed by Lucky Green.

FreeBSD offers excellent online protections against unauthorized data access. File permissions and Mandatory Access Control (MAC) (see ÊåöÜëáéï 17) help prevent unauthorized third-parties from accessing data while the operating system is active and the computer is powered up. However, the permissions enforced by the operating system are irrelevant if an attacker has physical access to a computer and can simply move the computer’s hard drive to another system to copy and analyze the sensitive data.

Regardless of how an attacker may have come into possession of a hard drive or powered-down computer, both **GEOM Based Disk Encryption (gbde)** and `geli` cryptographic subsystems in FreeBSD are able to protect the data on the computer's file systems against even highly-motivated attackers with significant resources. Unlike cumbersome encryption methods that encrypt only individual files, `gbde` and `geli` transparently encrypt entire file systems. No cleartext ever touches the hard drive's platter.

19.16.1 Disk Encryption with gbde

1. Become `root`

   Configuring **gbde** requires super-user privileges.

   ```
   % su -
   Password:
   ```

2. Add gbde(4) Support to the Kernel Configuration File

   Add the following line to the kernel configuration file:

   ```
   options GEOM_BDE
   ```

   Rebuild the kernel as described in ÊåöÜëáéï 9.

   Reboot into the new kernel.

3. An alternative to recompiling the kernel is to use `kldload` to load gbde(4):

   ```
   # kldload geom_bde
   ```

19.16.1.1 Preparing the Encrypted Hard Drive

The following example assumes that you are adding a new hard drive to your system that will hold a single encrypted partition. This partition will be mounted as `/private`. **gbde** can also be used to encrypt `/home` and `/var/mail`, but this requires more complex instructions which exceed the scope of this introduction.

1. Add the New Hard Drive

   Install the new drive to the system as explained in ÔìÞìá 19.3. For the purposes of this example, a new hard drive partition has been added as `/dev/ad4s1c`. The `/dev/ad0s1*` devices represent existing standard FreeBSD partitions on the example system.

   ```
   # ls /dev/ad*
   /dev/ad0        /dev/ad0s1b     /dev/ad0s1e     /dev/ad4s1
   /dev/ad0s1      /dev/ad0s1c     /dev/ad0s1f     /dev/ad4s1c
   /dev/ad0s1a     /dev/ad0s1d     /dev/ad4
   ```

2. Create a Directory to Hold gbde Lock Files

   ```
   # mkdir /etc/gbde
   ```

   The **gbde** lock file contains information that **gbde** requires to access encrypted partitions. Without access to the lock file, **gbde** will not be able to decrypt the data contained in the encrypted partition without significant manual intervention which is not supported by the software. Each encrypted partition uses a separate lock file.

3. Initialize the gbde Partition

   A **gbde** partition must be initialized before it can be used. This initialization needs to be performed only once:

```
# gbde init /dev/ad4s1c -i -L /etc/gbde/ad4s1c
```

gbde(8) will open your editor, permitting you to set various configuration options in a template. For use with UFS1 or UFS2, set the sector_size to 2048:

```
$FreeBSD: src/sbin/gbde/template.txt,v 1.1 2002/10/20 11:16:13 phk Exp $
#
# Sector size is the smallest unit of data which can be read or written.
# Making it too small decreases performance and decreases available space.
# Making it too large may prevent filesystems from working.  512 is the
# minimum and always safe.  For UFS, use the fragment size
#
sector_size     =       2048
[...]
```

gbde(8) will ask you twice to type the passphrase that should be used to secure the data. The passphrase must be the same both times. **gbde**'s ability to protect your data depends entirely on the quality of the passphrase that you choose. [1]

The `gbde init` command creates a lock file for your **gbde** partition that in this example is stored as `/etc/gbde/ad4s1c`.

> **Ðñïóï÷Þ:** **gbde** lock files *must* be backed up together with the contents of any encrypted partitions. While deleting a lock file alone cannot prevent a determined attacker from decrypting a **gbde** partition, without the lock file, the legitimate owner will be unable to access the data on the encrypted partition without a significant amount of work that is totally unsupported by gbde(8) and its designer.

4. Attach the Encrypted Partition to the Kernel

   ```
   # gbde attach /dev/ad4s1c -l /etc/gbde/ad4s1c
   ```

   You will be asked to provide the passphrase that you selected during the initialization of the encrypted partition. The new encrypted device will show up in `/dev` as `/dev/device_name.bde`:

   ```
   # ls /dev/ad*
   /dev/ad0        /dev/ad0s1b     /dev/ad0s1e     /dev/ad4s1
   /dev/ad0s1      /dev/ad0s1c     /dev/ad0s1f     /dev/ad4s1c
   /dev/ad0s1a     /dev/ad0s1d     /dev/ad4        /dev/ad4s1c.bde
   ```

5. Create a File System on the Encrypted Device

   Once the encrypted device has been attached to the kernel, you can create a file system on the device. To create a file system on the encrypted device, use newfs(8). Since it is much faster to initialize a new UFS2 file system than it is to initialize the old UFS1 file system, using newfs(8) with the `-O2` option is recommended.

   ```
   # newfs -U -O2 /dev/ad4s1c.bde
   ```

   > **Óçìåßùóç:** The newfs(8) command must be performed on an attached **gbde** partition which is identified by a `*.bde` extension to the device name.

6. Mount the Encrypted Partition

   Create a mount point for the encrypted file system.

   ```
   # mkdir /private
   ```

Mount the encrypted file system.

```
# mount /dev/ad4s1c.bde /private
```

7. Verify That the Encrypted File System is Available

   The encrypted file system should now be visible to df(1) and be available for use.

```
% df -H
Filesystem        Size   Used  Avail Capacity  Mounted on
/dev/ad0s1a      1037M    72M   883M     8%    /
/devfs            1.0K   1.0K     0B   100%    /dev
/dev/ad0s1f       8.1G    55K   7.5G     0%    /home
/dev/ad0s1e      1037M   1.1M   953M     0%    /tmp
/dev/ad0s1d       6.1G   1.9G   3.7G    35%    /usr
/dev/ad4s1c.bde   150G   4.1K   138G     0%    /private
```

19.16.1.2 Mounting Existing Encrypted File Systems

After each boot, any encrypted file systems must be re-attached to the kernel, checked for errors, and mounted, before the file systems can be used. The required commands must be executed as user `root`.

1. Attach the gbde Partition to the Kernel

```
# gbde attach /dev/ad4s1c -l /etc/gbde/ad4s1c
```

   You will be asked to provide the passphrase that you selected during initialization of the encrypted **gbde** partition.

2. Check the File System for Errors

   Since encrypted file systems cannot yet be listed in `/etc/fstab` for automatic mounting, the file systems must be checked for errors by running fsck(8) manually before mounting.

```
# fsck -p -t ffs /dev/ad4s1c.bde
```

3. Mount the Encrypted File System

```
# mount /dev/ad4s1c.bde /private
```

   The encrypted file system is now available for use.

19.16.1.2.1 Automatically Mounting Encrypted Partitions

It is possible to create a script to automatically attach, check, and mount an encrypted partition, but for security reasons the script should not contain the gbde(8) password. Instead, it is recommended that such scripts be run manually while providing the password via the console or ssh(1).

As an alternative, an `rc.d` script is provided. Arguments for this script can be passed via rc.conf(5), for example:

```
gbde_autoattach_all="YES"
gbde_devices="ad4s1c"
```

This will require that the **gbde** passphrase be entered at boot time. After typing the correct passphrase, the **gbde** encrypted partition will be mounted automatically. This can be very useful when using **gbde** on notebooks.

19.16.1.3 Cryptographic Protections Employed by gbde

gbde(8) encrypts the sector payload using 128-bit AES in CBC mode. Each sector on the disk is encrypted with a different AES key. For more information on **gbde**’s cryptographic design, including how the sector keys are derived from the user-supplied passphrase, see gbde(4).

19.16.1.4 Compatibility Issues

sysinstall(8) is incompatible with **gbde**-encrypted devices. All `*.bde` devices must be detached from the kernel before starting sysinstall(8) or it will crash during its initial probing for devices. To detach the encrypted device used in our example, use the following command:

```
# gbde detach /dev/ad4s1c
```

Also note that, as vinum(4) does not use the geom(4) subsystem, you cannot use **gbde** with **vinum** volumes.

19.16.2 Disk Encryption with `geli`

Contributed by Daniel Gerzo.

A new cryptographic GEOM class is available as of FreeBSD 6.0 - `geli`. It is currently being developed by Pawel Jakub Dawidek <`pjd@FreeBSD.org`>. `Geli` is different to `gbde`; it offers different features and uses a different scheme for doing cryptographic work.

The most important features of geli(8) are:

- Utilizes the crypto(9) framework — when cryptographic hardware is available, `geli` will use it automatically.
- Supports multiple cryptographic algorithms (currently AES, Blowfish, and 3DES).
- Allows the root partition to be encrypted. The passphrase used to access the encrypted root partition will be requested during the system boot.
- Allows the use of two independent keys (e.g. a “key” and a “company key”).
- `geli` is fast - performs simple sector-to-sector encryption.
- Allows backup and restore of Master Keys. When a user has to destroy his keys, it will be possible to get access to the data again by restoring keys from the backup.
- Allows to attach a disk with a random, one-time key — useful for swap partitions and temporary file systems.

More `geli` features can be found in the geli(8) manual page.

The next steps will describe how to enable support for `geli` in the FreeBSD kernel and will explain how to create a new `geli` encryption provider. At the end it will be demonstrated how to create an encrypted swap partition using features provided by `geli`.

In order to use `geli`, you must be running FreeBSD 6.0-RELEASE or later. Super-user privileges will be required since modifications to the kernel are necessary.

1. Adding `geli` Support to the Kernel Configuration File

   Add the following lines to the kernel configuration file:

```
options GEOM_ELI
device crypto
```

Rebuild the kernel as described in ÊåöÜëáéï 9.

Alternatively, the `geli` module can be loaded at boot time. Add the following line to the `/boot/loader.conf`:

```
geom_eli_load="YES"
```

geli(8) should now be supported by the kernel.

2. Generating the Master Key

   The following example will describe how to generate a key file, which will be used as part of the Master Key for the encrypted provider mounted under `/private`. The key file will provide some random data used to encrypt the Master Key. The Master Key will be protected by a passphrase as well. Provider's sector size will be 4kB big. Furthermore, the discussion will describe how to attach the `geli` provider, create a file system on it, how to mount it, how to work with it, and finally how to detach it.

   It is recommended to use a bigger sector size (like 4kB) for better performance.

   The Master Key will be protected with a passphrase and the data source for key file will be `/dev/random`. The sector size of `/dev/da2.eli`, which we call provider, will be 4kB.

   ```
   # dd if=/dev/random of=/root/da2.key bs=64 count=1
   # geli init -s 4096 -K /root/da2.key /dev/da2
   Enter new passphrase:
   Reenter new passphrase:
   ```

   It is not mandatory that both a passphrase and a key file are used; either method of securing the Master Key can be used in isolation.

   If key file is given as "-", standard input will be used. This example shows how more than one key file can be used.

   ```
   # cat keyfile1 keyfile2 keyfile3 | geli init -K - /dev/da2
   ```

3. Attaching the Provider with the generated Key

   ```
   # geli attach -k /root/da2.key /dev/da2
   Enter passphrase:
   ```

   The new plaintext device will be named `/dev/`*`da2`*`.eli`.

   ```
   # ls /dev/da2*
   /dev/da2  /dev/da2.eli
   ```

4. Creating the new File System

   ```
   # dd if=/dev/random of=/dev/da2.eli bs=1m
   # newfs /dev/da2.eli
   # mount /dev/da2.eli /private
   ```

   The encrypted file system should be visible to df(1) and be available for use now.

   ```
   # df -H
   Filesystem     Size   Used  Avail Capacity  Mounted on
   /dev/ad0s1a    248M    89M   139M    38%    /
   /devfs         1.0K   1.0K     0B   100%    /dev
   /dev/ad0s1f    7.7G   2.3G   4.9G    32%    /usr
   /dev/ad0s1d    989M   1.5M   909M     0%    /tmp
   /dev/ad0s1e    3.9G   1.3G   2.3G    35%    /var
   ```

```
/dev/da2.eli   150G   4.1K   138G     0%    /private
```

5. Unmounting and Detaching the Provider

   Once the work on the encrypted partition is done, and the `/private` partition is no longer needed, it is prudent to consider unmounting and detaching the `geli` encrypted partition from the kernel.

   ```
   # umount /private
   # geli detach da2.eli
   ```

More information about the use of geli(8) can be found in the manual page.

19.16.2.1 Using the `geli` `rc.d` Script

`geli` comes with a `rc.d` script which can be used to simplify the usage of `geli`. An example of configuring `geli` through rc.conf(5) follows:

```
geli_devices="da2"
geli_da2_flags="-p -k /root/da2.key"
```

This will configure `/dev/da2` as a `geli` provider of which the Master Key file is located in `/root/da2.key`, and `geli` will not use a passphrase when attaching the provider (note that this can only be used if -P was given during the `geli` init phase). The system will detach the `geli` provider from the kernel before the system shuts down.

More information about configuring `rc.d` is provided in the rc.d section of the Handbook.

19.17 Encrypting Swap Space

Written by Christian Brüffer.

Swap encryption in FreeBSD is easy to configure and has been available since FreeBSD 5.3-RELEASE. Depending on which version of FreeBSD is being used, different options are available and configuration can vary slightly. From FreeBSD 6.0-RELEASE onwards, the gbde(8) or geli(8) encryption systems can be used for swap encryption. With earlier versions, only gbde(8) is available. Both systems use the `encswap` rc.d script.

The previous section, Encrypting Disk Partitions, includes a short discussion on the different encryption systems.

19.17.1 Why should Swap be Encrypted?

Like the encryption of disk partitions, encryption of swap space is done to protect sensitive information. Imagine an application that e.g. deals with passwords. As long as these passwords stay in physical memory, all is well. However, if the operating system starts swapping out memory pages to free space for other applications, the passwords may be written to the disk platters unencrypted and easy to retrieve for an adversary. Encrypting swap space can be a solution for this scenario.

19.17.2 Preparation

Óçìåßùóç: For the remainder of this section, `ad0s1b` will be the swap partition.

Up to this point the swap has been unencrypted. It is possible that there are already passwords or other sensitive data on the disk platters in cleartext. To rectify this, the data on the swap partition should be overwritten with random garbage:

```
# dd if=/dev/random of=/dev/ad0s1b bs=1m
```

19.17.3 Swap Encryption with gbde(8)

If FreeBSD 6.0-RELEASE or newer is being used, the `.bde` suffix should be added to the device in the respective `/etc/fstab` swap line:

```
# Device                Mountpoint      FStype  Options         Dump    Pass#
/dev/ad0s1b.bde         none            swap    sw              0       0
```

For systems prior to FreeBSD 6.0-RELEASE, the following line in `/etc/rc.conf` is also needed:

```
gbde_swap_enable="YES"
```

19.17.4 Swap Encryption with geli(8)

Alternatively, the procedure for using geli(8) for swap encryption is similar to that of using gbde(8). The `.eli` suffix should be added to the device in the respective `/etc/fstab` swap line:

```
# Device                Mountpoint      FStype  Options         Dump    Pass#
/dev/ad0s1b.eli         none            swap    sw              0       0
```

geli(8) uses the AES algorithm with a key length of 256 bit by default.

Optionally, these defaults can be altered using the `geli_swap_flags` option in `/etc/rc.conf`. The following line tells the `encswap` rc.d script to create geli(8) swap partitions using the Blowfish algorithm with a key length of 128 bit, a sectorsize of 4 kilobytes and the “detach on last close” option set:

```
geli_swap_flags="-a blowfish -l 128 -s 4096 -d"
```

Please refer to the description of the `onetime` command in the geli(8) manual page for a list of possible options.

19.17.5 Verifying that it Works

Once the system has been rebooted, proper operation of the encrypted swap can be verified using the `swapinfo` command.

If gbde(8) is being used:

```
% swapinfo
Device          1K-blocks     Used    Avail Capacity
/dev/ad0s1b.bde    542720        0   542720     0%
```

If geli(8) is being used:

```
% swapinfo
Device          1K-blocks     Used    Avail Capacity
/dev/ad0s1b.eli    542720        0   542720     0%
```

Óçìåéþóåéò

1. For tips on how to select a secure passphrase that is easy to remember, see the Diceware Passphrase (http://world.std.com/~reinhold/diceware.html) website.

ÊåöÜëáéï 20 GEOM: Äéá÷åßñéóç Óõóôïé÷éþí Äßóêùí

ÃñÜöôçêå áðü ôïí Tom Rhodes.

20.1 Óýíïøç

Ôï êåöÜëáéï áõôü êáëýðôåé ôç ÷ñÞóç ôùí äßóêùí êÜôù áðü ôï ðëáßóéï ëåéôïõñãéþí GEOM óôï FreeBSD. ÐåñéëáìâÜíåé ôá êõñéüôåñá ðñïãñÜììáôá åëÝã÷ïõ RAID ôùí ïðïßùí ïé ñõèìßóåéò âáóßæïíôáé óôï ðëáßóéï GEOM. Ôï êåöÜëáéï áõôü äåí áíáëýåé óå âÜèïò ôïí ôñüðï ìå ôïí ïðïßï ôï GEOM ÷åéñßæåôáé Þ åëÝã÷åé ëåéôïõñãßåò Åéóüäïõ / Åîüäïõ (IO), ôï õðïóýóôçìá ðïõ âñßóêåôáé êÜôù áðü áõôü, Þ ôïí êþäéêá ôïõ. Ïé ðëçñïöïñßåò áõôÝò ðáñÝ÷ïíôáé áðü ôç óåëßäá manual ôïõ geom(4) êáèþò êáé áðü ôéò áíáöïñÝò ðïõ ðåñéÝ÷åé óå Üëëåò ó÷åôéêÝò óåëßäåò. Åðßóçò ôï êåöÜëáéï áõôü äåí áðïôåëåß êáèïñéóôéêü ïäçãü ãéá üëåò ôéò ñõèìßóåéò ôïõ RAID. Èá óõæçôçèïýí ìüíï ïé êáôáóôÜóåéò ëåéôïõñãßáò ôïõ RAID ðïõ õðïóôçñßæïíôáé áðü ôï GEOM.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôï åßäïò ôçò õðïóôÞñéîçò RAID ðïõ åßíáé äéáèÝóéìï ìÝóù ôïõ GEOM.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôá âáóéêÜ âïçèçôéêÜ ðñïãñÜììáôá ãéá ôçí ñýèìéóç, óõíôÞñçóç êáé äéá÷åßñéóç ôùí äéáöüñùí åðéðÝäùí RAID.
- Ðùò íá äçìéïõñãÞóåôå mirror Þ stripe, íá êñõðôïãñáöÞóåôå, êáé íá óõíäÝóåôå äßóêïõò ìå ôï GEOM, ìÝóù ìéáò áðïìáêñõóìÝíçò óýíäåóçò.
- Ðùò íá áíôéìåôùðßóåôå ðñïâëÞìáôá äßóêùí ðïõ ÷ñçóéìïðïéïýí ôï ðëáßóéï ëåéôïõñãéþí GEOM.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ðùò ìåôá÷åéñßæåôáé ôï FreeBSD ôéò óõóêåõÝò äßóêùí (ÊåöÜëáéï 19).
- Íá ãíùñßæåôå ðùò èá ñõèìßóåôå êáé èá åãêáôáóôÞóåôå Ýíá íÝï ðõñÞíá óôï FreeBSD (ÊåöÜëáéï 9).

20.2 ÅéóáãùãÞ óôï GEOM

Ôï GEOM åðéôñÝðåé ôçí ðñüóâáóç êáé ôïí Ýëåã÷ï óå êëÜóåéò — üðùò ôçí ÊåíôñéêÞ ÅããñáöÞ Åêêßíçóçò (Master Boot Record), ôá BSD labels, ê.á. — ìÝóù ôçò ÷ñÞóçò ðáñï÷Ýùí, Þ ìÝóù åéäéêþí áñ÷åßùí óôïí êáôÜëïãï `/dev`. Ôï GEOM õðïóôçñßæåé äéÜöïñåò äéáôÜîåéò RAID êáé ðáñÝ÷åé äéÜöáíç ðñüóâáóç óôï ëåéôïõñãéêü óýóôçìá êáé ôá âïçèçôéêÜ ôïõ ðñïãñÜììáôá.

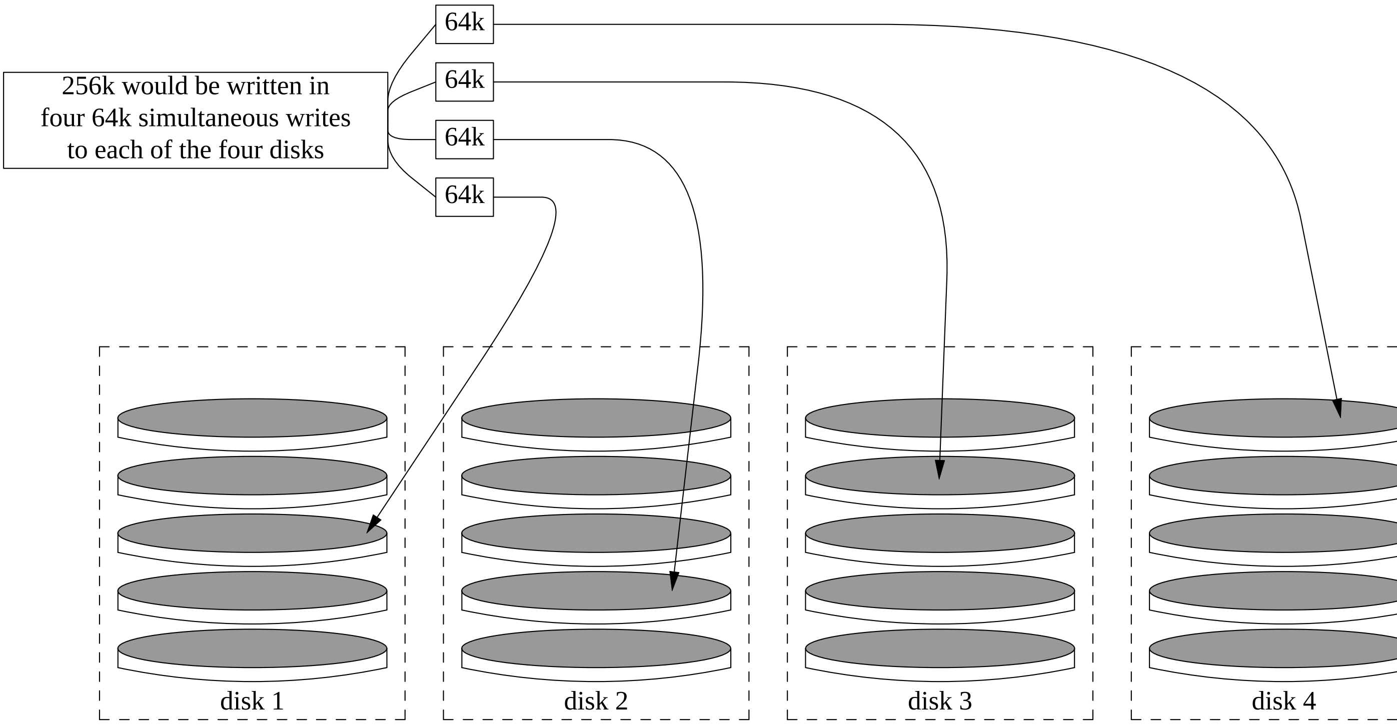
20.3 RAID0 - Striping

ÃñÜöçêå áðü ôïõò Tom Rhodes êáé Murray Stokely.

Ôï striping åßíáé ìéá ìÝèïäïò ðïõ óõíäõÜæåé äéáöïñåôéêïýò öõóéêïýò äßóêïõò óå Ýíá ìïíáäéêü ëïãéêü ôüìï. Óå ðïëëÝò ðåñéðôþóåéò, áõôü ãßíåôáé ìå ôçí âïÞèåéá åîåéäéêåõìÝíïõ õëéêïý (åëåãêôþí). Ôï õðïóýóôçìá äßóêùí GEOM ðáñÝ÷åé õðïóôÞñéîç ìÝóù ëïãéóìéêïý ãéá ôç äéÜôáîç RAID0, ç ïðïßá åßíáé ãíùóôÞ êáé ùò striping.

Óå Ýíá óýóôçìá RAID0, ôá äåäïìÝíá ÷ùñßæïíôáé óå blocks ôá ïðïßá ãñÜöïíôáé ôìçìáôéêÜ óå üëïõò ôïõò äßóêïõò ðïõ áðïôåëïýí ôç óõóôïé÷ßá. Áíôß íá ÷ñåéÜæåôáé íá ðåñéìÝíåôå ôï óýóôçìá íá ãñÜøåé 256k äåäïìÝíùí óå Ýíá äßóêï, Ýíá óýóôçìá RAID0 ìðïñåß íá ãñÜøåé ôáõôü÷ñïíá 64k óå êáèÝíá áðü ôïõò ôÝóóåñéò äßóêïõò ìéáò óõóôïé÷ßáò, ðñïóöÝñïíôáò Ýôóé åîáéñåôéêÞ áðüäïóç åéóüäïõ/åîüäïõ (I/O). Ç áðüäïóç áõôÞ ìðïñåß íá áõîçèåß ðåñéóóüôåñï, ìå ôç ÷ñÞóç ðïëëáðëþí åëåãêôþí äßóêùí.

ÊÜèå äßóêïò óå Ýíá stripe RAID0 ðñÝðåé íá åßíáé ôïõ ßäéïõ ìåãÝèïõò, êáèþò ïé áéôÞóåéò I/O ìïéñÜæïíôáé üóï áöïñÜ ôçí áíÜãíùóç êáé åããñáöÞ, óå ðïëëïýò ðáñÜëëçëïõò äßóêïõò.



Äçìéïõñãßá Stripe áðü ìç-ÄéáìïñöùìÝíïõò ATA Äßóêïõò

1. Öïñôþóôå ôï Üñèñùìá `geom_stripe.ko`:

   ```
   # kldload geom_stripe
   ```

2. Âåâáéùèåßôå üôé õðÜñ÷åé êáôÜëëçëï óçìåßï ðñïóÜñôçóçò. Áí ï ôüìïò ðñüêåéôáé íá ãßíåé êáôÜôìçóç root, ðñïóáñôÞóôå ôïí ðñïóùñéíÜ óå êÜðïéï Üëëï óçìåßï ðñïóÜñôçóçò, üðùò ôï `/mnt`:

   ```
   # mkdir /mnt
   ```

3. Êáèïñßóôå ôá ïíüìáôá ôùí óõóêåõþí ãéá ôïõò äßóêïõò ðïõ ðñüêåéôáé íá ãßíïõí stripe, êáé äçìéïõñãÞóôå ôç íÝá óõóêåõÞ stripe. Ãéá ðáñÜäåéãìá, ãéá íá äçìéïõñãÞóåôå Ýíá stripe áðü äýï á÷ñçóéìïðïßçôïõò êáé ÷ùñßò êáôáôìÞóåéò äßóêïõò ATA, üðùò ð.÷. ôïõò `/dev/ad2` êáé `/dev/ad3`:

   ```
   # gstripe label -v st0 /dev/ad2 /dev/ad3
   Metadata value stored on /dev/ad2.
   Metadata value stored on /dev/ad3.
   Done.
   ```

4. ÃñÜøôå Ýíá ôõðïðïéçìÝíï label (ðßíáêá êáôáôìÞóåùí) óôï íÝï ôüìï, êáé åãêáôáóôÞóôå ôïí ðñïåðéëåãìÝíï êþäéêá åêêßíçóçò (bootstrap):

```
# bsdlabel -wB /dev/stripe/st0
```

5. Ç äéáäéêáóßá áõôÞ èá äçìéïõñãÞóåé ôç óõóêåõÞ `st0`, êáèþò êáé äýï áêüìá óõóêåõÝò óôïí êáôÜëïãï `/dev/stripe`. Ïé óõóêåõÝò áõôÝò èá ïíïìÜæïíôáé `st0a` êáé `st0c`. Óôï óçìåßï áõôü, ìðïñåßôå ðëÝïí íá äçìéïõñãÞóåôå óýóôçìá áñ÷åßùí óôç óõóêåõÞ `st0a` ÷ñçóéìïðïéþíôáò ôï âïçèçôéêü ðñüãñáììá `newfs`:

   ```
   # newfs -U /dev/stripe/st0a
   ```

   Èá äåßôå ìéá ìåãÜëç óåéñÜ áñéèìþí íá ðåñíÜ ãñÞãïñá áðü ôçí ïèüíç óáò, êáé ìåôÜ áðü ëßãá äåõôåñüëåðôá ç äéáäéêáóßá èá Ý÷åé ïëïêëçñùèåß. Ï ôüìïò èá Ý÷åé äçìéïõñãçèåß êáé èá åßíáé Ýôïéìïò ãéá ðñïóÜñôçóç.

Ãéá íá ðñïóáñôÞóåôå ÷åéñïêßíçôá ôï stripe ðïõ äçìéïõñãÞóáôå:

```
# mount /dev/stripe/st0a /mnt
```

Ãéá íá ãßíåôáé áõôüìáôá ç ðñïóÜñôçóç áõôïý ôïõ óõóôÞìáôïò áñ÷åßùí êáôÜ ôçí äéáäéêáóßá åêêßíçóçò, ôïðïèåôÞóôå ôéò ðëçñïöïñßåò ôïõ ôüìïõ óôï áñ÷åßï `/etc/fstab`. Ãéá ôï óêïðü áõôü, äçìéïõñãïýìå Ýíá ìüíéìï óçìåßï ðñïóÜñôçóçò, ôï `stripe`:

```
# mkdir /stripe
# echo "/dev/stripe/st0a /stripe ufs rw 2 2" \
    >> /etc/fstab
```

Ôï Üñèñùìá `geom_stripe.ko` èá ðñÝðåé íá öïñôþíåôáé áõôüìáôá êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. ÅêôåëÝóôå ôçí ðáñáêÜôù åíôïëÞ, ãéá íá ðñïóèÝóåôå ôçí êáôÜëëçëç ñýèìéóç óôï `/boot/loader.conf`:

```
# echo 'geom_stripe_load="YES"' >> /boot/loader.conf
```

20.4 RAID1 - Mirroring

Ôï mirroring (êáèñåöôéóìüò) åßíáé ìéá ôå÷íïëïãßá ðïõ ÷ñçóéìïðïéåßôáé áðü ðïëëÝò åôáéñßåò êáé ïéêéáêïýò ÷ñÞóôåò ãéá íá áóöáëßóïõí ôá äåäïìÝíá ôïõò ÷ùñßò äéáêïðÝò. Óå ìéá äéÜôáîç mirror, ï äßóêïò Â åßíáé áðëþò Ýíá ðëÞñåò áíôßãñáöï ôïõ äßóêïõ Á. [1] ìðïñåß ïé äßóêïé Ã+Ä íá åßíáé áíôßãñáöá ôùí äßóêùí A+B. ¶ó÷åôá ìå ôçí áêñéâÞ äéÜôáîç ôùí äßóêùí, ôï óçìáíôéêü åßíáé üôé ïé ðëçñïöïñßåò åíüò äßóêïõ Þ ìéáò êáôÜôìçóçò áíôéãñÜöïíôáé óå Üëëïõò. Ïé ðëçñïöïñßåò áõôÝò ìðïñåß áñãüôåñá íá áðïêáôáóôáèïýí ìå åýêïëï ôñüðï, Þ íá áíôéãñáöïýí ÷ùñßò íá ðñïêëçèåß äéáêïðÞ óôéò õðçñåóßåò ôïõ ìç÷áíÞìáôïò Þ óôçí ðñüóâáóç ôùí äåäïìÝíùí. Ìðïñïýí áêüìá êáé íá ìåôáöåñèïýí êáé íá öõëá÷èïýí óå Üëëï, áóöáëÝò ìÝñïò.

Ãéá íá îåêéíÞóåôå, âåâáéùèåßôå üôé ôï óýóôçìá óáò Ý÷åé äýï óêëçñïýò äßóêïõò ßäéïõ ìåãÝèïõò. Óôá ðáñáäåßãìáôá ìáò èåùñïýìå üôé ïé äßóêïé åßíáé ôýðïõ SCSI (áðåõèåßáò ðñüóâáóçò, da(4)).

20.4.1 Mirroring óôïõò Âáóéêïýò Äßóêïõò

ÕðïèÝôïíôáò üôé ôï FreeBSD Ý÷åé åãêáôáóôáèåß óôïí ðñþôï äßóêï `da0`, èá ðñÝðåé íá ñõèìßóåôå ôï gmirror(8) íá áðïèçêåýóåé åêåß ôá âáóéêÜ äåäïìÝíá ôïõ.

Ðñéí äçìéïõñãÞóåôå ôï mirror, åíåñãïðïéÞóôå ôçí äõíáôüôçôá åìöÜíéóçò ðåñéóóüôåñùí ëåðôïìåñåéþí (ðïõ ìðïñåß íá óáò âïçèÞóïõí óå ðåñßðôùóç ðñïâëÞìáôïò) êáé åðéôñÝøôå ôçí áðåõèåßáò ðñüóâáóç óôç óõóêåõÞ äßóêïõ. Ãéá ôï óêïðü áõôü èÝóôå ôç ìåôáâëçôÞ `kern.geom.debugflags` ôïõ sysctl(8) óôçí ðáñáêÜôù ôéìÞ:

```
# sysctl kern.geom.debugflags=17
```

Ìðïñåßôå ôþñá íá äçìéïõñãÞóåôå ôï mirror. ÎåêéíÞóôå ôç äéáäéêáóßá áðïèçêåýïíôáò ôá ìåôá-äåäïìÝíá (meta-data) óôïí âáóéêü äßóêï, äçìéïõñãþíôáò ïõóéáóôéêÜ ôç óõóêåõÞ `/dev/mirror/gm`. ×ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ:

Ðñïåéäïðïßçóç: Ç äçìéïõñãßá mirror óôï äßóêï åêêßíçóçò ìðïñåß íá Ý÷åé ùò áðïôÝëåóìá ôçí áðþëåéá äåäïìÝíùí, áí ï ôåëåõôáßïò ôïìÝáò ôïõ äßóêïõ Ý÷åé Þäç ÷ñçóéìïðïéçèåß. Ç ðéèáíüôçôá áõôÞ åßíáé ðïëý ìéêñüôåñç áí ôï mirror äçìéïõñãçèåß áìÝóùò ìåôÜ áðü ìéá íÝá åãêáôÜóôáóç ôïõ FreeBSD. Ç ðáñáêÜôù äéáäéêáóßá åßíáé åðßóçò áóýìâáôç ìå ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò åãêáôÜóôáóçò ôïõ FreeBSD 9.*x* ôôéò ïðïßåò ÷ñçóéìïðïéåßôáé ôï óýóôçìá êáôáôìÞóåùí GPT. To GEOM êáôáóôñÝöåé ôá ìåôáäåäïìÝíá ôïõ GPT, êáé èá ðñïêáëÝóåé áðþëåéá äåäïìÝíùí êáé ðéèáíÞ áäõíáìßá åêêßíçóçò ôïõ óõóôÞìáôïò.

```
# gmirror label -vb round-robin gm0 /dev/da0
```

Ôï óýóôçìá èá áíôáðïêñéèåß ìå ôï ðáñáêÜôù ìÞíõìá:

```
Metadata value stored on /dev/da0.
Done.
```

Áñ÷éêïðïéÞóôå ôï GEOM. Ç ðáñáêÜôù åíôïëÞ èá öïñôþóåé ôï Üñèñùìá `/boot/kernel/geom_mirror.ko` óôïí ðõñÞíá:

```
# gmirror load
```

Óçìåßùóç: Ìå ôçí åðéôõ÷Þ åêôÝëåóç áõôÞò ôçò åíôïëÞò, äçìéïõñãåßôáé ç óõóêåõÞ `gm0` ìÝóá óôïí êáôÜëïãï `/dev/mirror`.

Åíåñãïðïéåßóôå ôï öüñôùìá ôïõ áñèñþìáôïò `geom_mirror.ko` êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò:

```
# echo 'geom_mirror_load="YES"' >> /boot/loader.conf
```

Åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/fstab`, áíôéêáèéóôþíôáò ôéò áíáöïñÝò óôéò ðáëéÝò óõóêåõÝò `da0` ìå ôéò áíôßóôïé÷åò êáéíïýñéåò `gm0` ðïõ áíôéðñïóùðåýïõí ôï mirror.

Óçìåßùóç: Áí ÷ñçóéìïðïéåßôå ôï vi(1), ìðïñåßôå íá áêïëïõèÞóåôå ôá ðáñáêÜôù âÞìáôá ãéá íá ïëïêëçñþóåôå åýêïëá áõôÞ ôç äéáäéêáóßá:

```
# vi /etc/fstab
```

Óôï vi(1), êñáôÞóôå áíôßãñáöï áóöáëåßáò ôïõ ôñÝ÷ïíôïò áñ÷åßïõ `fstab` ðëçêôñïëïãþíôáò **`:w /etc/fstab.bak`**. ¸ðåéôá áíôéêáôáóôÞóôå üëåò ôéò áíáöïñÝò óôéò ðáëéÝò óõóêåõÝò `da0` ìå ôéò íÝåò `gm0` ãñÜöïíôáò **`:%s/da/mirror\/gm/g`**.

Ôï `fstab` ðïõ èá ðñïêýøåé, èá ìïéÜæåé ìå ôï ðáñáêÜôù. Äåí Ý÷åé óçìáóßá áí ïé äßóêïé Þôáí áñ÷éêÜ SCSI Þ ATA, ç óõóêåõÞ RAID èá Ý÷åé ðÜíôá ôï üíïìá `gm`.

```
# Device                Mountpoint  FStype      Options   Dump      Pass#
/dev/mirror/gm0s1b      none        swap        sw        0         0
/dev/mirror/gm0s1a      /           ufs         rw        1         1
/dev/mirror/gm0s1d      /usr        ufs         rw        0         0
```

```
/dev/mirror/gm0s1f        /home       ufs         rw        2        2
#/dev/mirror/gm0s2d       /store      ufs         rw        2        2
/dev/mirror/gm0s1e        /var        ufs         rw        2        2
/dev/acd0                 /cdrom      cd9660      ro,noauto 0        0
```

ÅðáíåêêéíÞóôå ôï óýóôçìá:

```
# shutdown -r now
```

ÊáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò, èá ðñÝðåé ðëÝïí íá ÷ñçóéìïðïéåßôáé ç óõóêåõÞ `gm0` áíôß ãéá ôçí `da0`. ÌåôÜ ôï ôÝëïò ôçò åêêßíçóçò, ìðïñåßôå íá åëÝãîåôå üôé üëá ëåéôïõñãïýí óùóôÜ, åîåôÜæïíôáò ôçí Ýîïäï ôçò åíôïëÞò `mount`:

```
# mount
Filesystem         1K-blocks    Used    Avail Capacity  Mounted on
/dev/mirror/gm0s1a   1012974  224604   707334    24%    /
devfs                      1       1        0   100%    /dev
/dev/mirror/gm0s1f  45970182   28596 42263972     0%    /home
/dev/mirror/gm0s1d   6090094 1348356  4254532    24%    /usr
/dev/mirror/gm0s1e   3045006 2241420   559986    80%    /var
devfs                      1       1        0   100%    /var/named/dev
```

Ç Ýîïäïò öáßíåôáé óùóôÞ, üðùò áíáìåíüôáí. ÔåëéêÜ, ãéá íá îåêéíÞóåé ï óõã÷ñïíéóìüò, åéóÜãåôå êáé ôçí óõóêåõÞ `da1` óôï mirror, ÷ñçóéìïðïéþíôáò ôçí áêüëïõèç åíôïëÞ:

```
# gmirror insert gm0 /dev/da1
```

ÊáôÜ ôç äéÜñêåéá ôïõ óõã÷ñïíéóìïý ôïõ mirror, ìðïñåßôå íá äåßôå ôçí ðñüïäï ôçò äéáäéêáóßáò ìå ôçí ðáñáêÜôù åíôïëÞ:

```
# gmirror status
```

ÌåôÜ ôï ôÝëïò ôçò äüìçóçò ôïõ mirror, êáé áöïý Ý÷ïõí óõã÷ñïíéóôåß üëá ôá äåäïìÝíá, ç Ýîïäïò ôçò ðáñáðÜíù åíôïëÞò èá ìïéÜæåé ìå ôçí áêüëïõèç:

```
      Name    Status  Components
mirror/gm0  COMPLETE  da0
                      da1
```

Áí õðÜñ÷ïõí ðñïâëÞìáôá, Þ áí ôï mirror âñßóêåôáé áêüìá óôç äéáäéêáóßá óõã÷ñïíéóìïý, ôï ðáñÜäåéãìá èá äåß÷íåé `DEGRADED` áíôß ãéá `COMPLETE`.

20.4.2 Áíôéìåôþðéóç ÐñïâëçìÜôùí

20.4.2.1 Ôï óýóôçìá áñíåßôáé íá îåêéíÞóåé

Áí ôï óýóôçìá óáò óôáìáôÜåé óå ìéá ðñïôñïðÞ ðïõ ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
ffs_mountroot: can’t find rootvp
Root mount failed: 6
mountroot>
```

ÅðáíåêêéíÞóôå ôï óýóôçìá óáò ìÝóù ôïõ äéáêüðôç ôñïöïäïóßáò Þ ôïõ ðëÞêôñïõ reset. Óôï ìåíïý åêêßíçóçò, åðéëÝîôå ôï (6). Ìå ôïí ôñüðï áõôü èá âñåèåßôå óôçí ðñïôñïðÞ ôïõ loader(8). Öïñôþóôå ÷åéñïêßíçôá ôï Üñèñùìá óôïí ðõñÞíá:

```
OK? load geom_mirror
OK? boot
```

Áí ôï ðáñáðÜíù ëåéôïõñãÞóåé, ôüôå ãéá êÜðïéï ëüãï ôï Üñèñùìá äåí öïñôþèçêå óùóôÜ. ÅëÝãîôå áí åßíáé óùóôÞ ç ó÷åôéêÞ êáôá÷þñéóç óôï áñ÷åßï `/boot/loader.conf`. Áí ôï ðñüâëçìá ðáñáìÝíåé, ðñïóèÝóôå ôç ãñáììÞ:

```
options GEOM_MIRROR
```

óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò, áíáäçìéïõñãÞóôå êáé åðáíåãêáôáóôÞóôå ôïí ðõñÞíá óáò. Ôï ðñüâëçìá óáò èá ðñÝðåé íá äéïñèùèåß.

20.4.3 ÅðáíáöïñÜ ÌåôÜ áðü Áðïôõ÷ßá Äßóêïõ

Ôï åêðëçêôéêü ìå ôï mirroring åßíáé üôé üôáí Ýíáò óêëçñüò äßóêïò ÷áëÜóåé, ìðïñåßôå íá ôïí áíôéêáôáóôÞóåôå ÷ùñßò íá ÷Üóåôå êáèüëïõ äåäïìÝíá.

ÕðïèÝôïíôáò üôé ÷ñçóéìïðïéÞóáìå ôéò ñõèìßóåéò RAID1 ðïõ äåßîáìå ðñïçãïõìÝíùò, áò èåùñÞóïõìå üôé ÷Üëáóå ï äßóêïò `da1` êáé ðñÝðåé íá áíôéêáôáóôáèåß. Ãéá íá ôïí áíôéêáôáóôÞóåôå, âñåßôå ðïéïò äßóêïò åßíáé êáé áðåíåñãïðïéÞóôå ôï óýóôçìá. Óôï óçìåßï áõôü, ìðïñåßôå ðëÝïí íá áíôáëëÜîåôå ôï äßóêï ìå Ýíá íÝï êáé íá åíåñãïðïéÞóåôå îáíÜ ôï óýóôçìá. ÌåôÜ ôçí åðáíåíåñãïðïßçóç ôïõ óõóôÞìáôïò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôéò ðáñáêÜôù åíôïëÝò ãéá íá èÝóåôå óå ëåéôïõñãßá ôï íÝï äßóêï:

```
# gmirror forget gm0

# gmirror insert gm0 /dev/da1
```

×ñçóéìïðïéÞóôå ôçí åíôïëÞ `gmirror status` ãéá íá ðáñáêïëïõèÞóåôå ôç äéáäéêáóßá ôïõ óõã÷ñïíéóìïý. Åßíáé óôá áëÞèåéá ôüóï áðëü.

20.5 ÄéêôõáêÝò ÓõóêåõÝò ìÝóù GEOM Gate

Ôï GEOM õðïóôçñßæåé áðïìáêñõóìÝíç ÷ñÞóç óõóêåõþí, üðùò ïé óêëçñïß äßóêïé, ôá CD-ROM, ôá áñ÷åßá ê.ë.ð. ÷ñçóéìïðïéþíôáò ôá âïçèçôéêÜ ðñïãñÜììáôá ðýëçò (gate). Ç ëåéôïõñãßá åßíáé ðáñüìïéá ìå ôï NFS.

Ãéá íá îåêéíÞóåôå, ðñÝðåé íá äçìéïõñãÞóåôå Ýíá áñ÷åßï exports. Ôï áñ÷åßï áõôü êáèïñßæåé ðïéïò åðéôñÝðåôáé íá áðïêôÞóåé ðñüóâáóç óôïõò êïéíü÷ñçóôïõò ðüñïõò êáé ôé åðéðÝäïõ èá åßíáé áõôÞ ç ðñüóâáóç. Ãéá ðáñÜäåéãìá, ãéá íá äéáìïéñÜóåôå ôçí ôÝôáñôç êáôÜôìçóç (slice) ôïõ ðñþôïõ äßóêïõ SCSI, åßíáé áñêåôü íá äçìéïõñãÞóåôå ôï ðáñáêÜôù áñ÷åßï `/etc/gg.exports`:

```
192.168.1.0/24 RW /dev/da0s4d
```

Ôï ðáñáðÜíù èá åðéôñÝøåé óå üëïõò ôïõò õðïëïãéóôÝò ôïõ éäéùôéêïý óáò äéêôýïõ, íá Ý÷ïõí ðñüóâáóç ìÝóù äéêôýïõ óôï óýóôçìá áñ÷åßùí ôçò êáôÜôìçóçò `da0s4d`.

Ãéá íá äéáìïéñÜóåôå áõôÞ ôç óõóêåõÞ, âåâáéùèåßôå üôé äåí åßíáé ðñïóáñôçìÝíç ôç äåäïìÝíç óôéãìÞ, êáé îåêéíÞóôå ôï äáßìïíá åîõðçñåôçôÞ ggated(8):

```
# ggated
```

Ãéá íá ðñïóáñôÞóåôå ôçí óõóêåõÞ óôï ìç÷Üíçìá ðåëÜôç, ÷ñçóéìïðïéÞóôå ôéò áêüëïõèåò åíôïëÝò:

```
# ggatec create -o rw 192.168.1.1 /dev/da0s4d
ggate0
# mount /dev/ggate0 /mnt
```

Áðü åäþ êáé óôï åîÞò, ìðïñåßôå íá Ý÷åôå ðñüóâáóç óôç óõóêåõÞ ìÝóù ôïõ óçìåßïõ ðñïóÜñôçóçò `/mnt`.

> **Óçìåßùóç:** ÐñÝðåé íá ôïíéóôåß üôé ç äéáäéêáóßá èá áðïôý÷åé áí ç óõóêåõÞ åßíáé ôç äåäïìÝíç óôéãìÞ ðñïóáñôçìÝíç, åßôå óôïí åîõðçñåôçôÞ, åßôå óå ïðïéïäÞðïôå Üëëï õðïëïãéóôÞ óôï äßêôõï.

¼ôáí äåí ÷ñåéÜæåóôå ðëÝïí ôç óõóêåõÞ, ìðïñåßôå íá ôçí áðïðñïóáñôÞóåôå ìå áóöÜëåéá, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ umount(8), üðùò ãßíåôáé êáé ìå ïðïéáäÞðïôå Üëëç óõóêåõÞ äßóêïõ.

20.6 Äçìéïõñãþíôáò ÅôéêÝôåò (Labels) óôéò ÓõóêåõÝò Äßóêùí

ÊáôÜ ôç äéÜñêåéá ôçò áñ÷éêïðïßçóçò, ôçò åêêßíçóç ôïõ óõóôÞìáôïò, ï ðõñÞíáò ôïõ FreeBSD èá äçìéïõñãÞóåé ôá áðáñáßôçôá áñ÷åßá ãéá êÜèå óõóêåõÞ ðïõ áíé÷íåýóåé. ÁõôÞ ç ìÝèïäïò áíß÷íåõóçò óõóêåõþí, ìðïñåß íá äçìéïõñãÞóåé ðñïâëÞìáôá. Ãéá ðáñÜäåéãìá, ôé èá ãßíåé áí ðñïóèÝóïõìå Ýíá íÝï äßóêï USB; Åßíáé áñêåôÜ ðéèáíü ìéá óõóêåõÞ ìíÞìçò flash íá ðÜñåé ôï üíïìá `da0` êáé ç áñ÷éêÞ `da0` íá ìåôáêéíçèåß óôï `da1`. Áõôü èá ðñïêáëÝóåé ðñïâëÞìáôá óôçí ðñïóÜñôçóç ôùí óõóôçìÜôùí áñ÷åßùí, áí õðÜñ÷ïõí ïé áíôßóôïé÷åò êáôá÷ùñßóåéò ôïõò óôï `/etc/fstab`, êáé ìðïñåß áêüìá êáé íá ðáñåìðïäßóåé ôçí êáíïíéêÞ åêêßíçóç ôïõ óõóôÞìáôïò.

Ìéá ëýóç åßíáé íá ñõèìßóåôå ôéò óõóêåõÝò SCSI ìå ôÝôïéï ôñüðï, þóôå ç áñßèìçóç ôïõò íá åßíáé óõíå÷üìåíç. ¸óé, êÜèå öïñÜ ðïõ ðñïóèÝôåôå ìéá íÝá óõóêåõÞ óôïí åëåãêôÞ SCSI èá åßóôå óßãïõñïò üôé èá ëÜâåé áñéèìü ðïõ äåí Ý÷åé ÷ñçóéìïðïéçèåß. ÁëëÜ ôé ãßíåôáé ìå ôéò óõóêåõÝò USB ðïõ ìðïñåß íá áíôéêáôáóôÞóïõí ôïí êýñéï SCSI äßóêï; Áõôü ìðïñåß ðñÜãìáôé íá óõìâåß, êáèþò ïé óõóêåõÝò USB áíé÷íåýïíôáé óõíÞèùò ðñéí áðü ôïí åëåãêôÞ SCSI. Ìéá ëýóç åßíáé íá âÜæåôå ôéò óõóêåõÝò áõôÝò ìüíï ìåôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ìéá Üëëç ìÝèïäïò åßíáé íá ÷ñçóéìïðïéåßôå ìüíï ìéá óõóêåõÞ ôýðïõ ATA êáé íá ìçí êáôá÷ùñåßôå ðïôÝ ôïõò äßóêïõò SCSI óôï `/etc/fstab`.

ÕðÜñ÷åé ùóôüóï êáëýôåñç ëýóç. ×ñçóéìïðïéþíôáò ôï âïçèçôéêü ðñüãñáììá `glabel`, Ýíáò äéá÷åéñéóôÞò Þ ÷ñÞóôçò, ìðïñåß íá áðïäþóåé åôéêÝôåò óôéò óõóêåõÝò äßóêùí êáé íá ôéò ÷ñçóéìïðïéÞóåé óôï `/etc/fstab`, áíôß ãéá ôá óõìâáôéêÜ ïíüìáôá óõóêåõþí. ÅðåéäÞ ç `glabel` áðïèçêåýåé ôçí åôéêÝôá óôïí ôåëåõôáßï ôïìÝá ôïõ êÜèå ðáñï÷Ýá (óõóêåõÞò äßóêïõ), ç åôéêÝôá äéáôçñåßôáé êáé ìåôÜ áðü ôçí åðáíåêêßíçóç ôïõ óõóôÞìáôïò. ×ñçóéìïðïéþíôáò áõôÞ ôçí åôéêÝôá ùò üíïìá óõóêåõÞò, èá ìðïñåßôå íá ðñïóáñôÞóåôå ðÜíôá ôï óýóôçìá áñ÷åßùí, Üó÷åôá ìå ôï ðñáãìáôéêü üíïìá óõóêåõÞò ðïõ Ý÷åé áðïäïèåß óôï äßóêï.

> **Óçìåßùóç:** Äåí ÷ñåéÜæåôáé öõóéêÜ íá ôïíßóïõìå üôé áõôÞ ç åôéêÝôá èá ðñÝðåé íá åßíáé ìüíéìç. Ôï âïçèçôéêü ðñüãñáììá `glabel` ìðïñåß íá äçìéïõñãÞóåé ôüóï ìüíéìåò üóï êáé ðñïóùñéíÝò åôéêÝôåò. Ìüíï ïé ìüíéìåò åôéêÝôåò äéáôçñïýíôáé áíÝðáöåò ìåôÜ áðü ìéá åðáíåêêßíçóç. Äåßôå ôç óåëßäá manual ôçò glabel(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôá åßäç ôùí åôéêåôþí.

20.6.1 Åßäç Åôéêåôþí êáé Ðáñáäåßãìáôá

ÕðÜñ÷ïõí äýï ôýðïé åôéêåôþí, ç ãåíéêÞ åôéêÝôá êáé ç åôéêÝôá óõóôÞìáôïò áñ÷åßùí. Ïé åôéêÝôåò ìðïñåß íá åßíáé ðñïóùñéíÝò Þ ìüíéìåò. Ïé ìüíéìåò åôéêÝôåò ìðïñïýí íá äçìéïõñãçèïýí ìå ôéò åíôïëÝò tunefs(8) Þ newfs(8). Óôçí ðåñßðôùóç áõôÞ, èá äçìéïõñãçèïýí óå Ýíá õðïêáôÜëïãï ôïõ `/dev`. Ãéá ðáñÜäåéãìá, ïé åôéêÝôåò óõóêåõþí ìå óýóôçìá áñ÷åßùí UFS2, èá äçìéïõñãçèïýí óôïí êáôÜëïãï `/dev/ufs`. Ìüíéìåò åôéêÝôåò ìðïñïýí åðßóçò íá äçìéïõñãçèïýí ìå ÷ñÞóç ôçò åíôïëÞò `glabel label`. Ïé åôéêÝôåò áõôÝò äåí åîáñôþíôáé áðü ôï óýóôçìá áñ÷åßùí, êáé äçìéïõñãïýíôáé óôïí êáôÜëïãï `/dev/label`.

Ïé åôéêÝôåò ðñïóùñéíïý ôýðïõ, ÷Üíïíôáé óå êÜèå åðáíåêêßíçóç ôïõ óõóôÞìáôïò. Ïé åôéêÝôåò áõôÝò äçìéïõñãïýíôáé óôïí êáôÜëïãï `/dev/label` êáé åßíáé ôÝëåéåò ãéá ðåéñáìáôéóìïýò. Ìðïñåßôå íá äçìéïõñãÞóåôå ðñïóùñéíÝò åôéêÝôåò ìå ôçí åíôïëÞ `glabel create`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äéáâÜóôå ôç óåëßäá manual ôçò glabel(8).

Ãéá íá äçìéïõñãÞóåôå ìéá ìüíéìç åôéêÝôá ãéá Ýíá óýóôçìá áñ÷åßùí UFS2, ÷ùñßò íá êáôáóôñÝøåôå ôá äåäïìÝíá ðïõ ðåñéÝ÷åé, ÷ñçóéìïðïéÞóôå ôçí áêüëïõèç åíôïëÞ:

```
# tunefs -L home /dev/da3
```

Ðñïåéäïðïßçóç: Áí ôï óýóôçìá áñ÷åßùí åßíáé ãåìÜôï, ç ðáñáðÜíù åíôïëÞ ìðïñåß íá ðñïêáëÝóåé êáôáóôñïöÞ äåäïìÝíùí. Ùóôüóï, áí ôï óýóôçìá áñ÷åßùí åßíáé ãåìÜôï, óôü÷ïò óáò èá ðñÝðåé íá åßíáé íá äéáãñÜøåôå ôá áñ÷åßá ðïõ äåí ÷ñçóéìïðïéïýíôáé, êáé ü÷é íá ðñïóèÝôåôå åôéêÝôåò.

Èá ðñÝðåé ôþñá íá õðÜñ÷åé ìéá åôéêÝôá óôïí êáôÜëïãï `/dev/ufs` ç ïðïßá ìðïñåß íá ðñïóôåèåß óôï `/etc/fstab`:

```
/dev/ufs/home           /home           ufs     rw              2       2
```

Óçìåßùóç: Ôï óýóôçìá áñ÷åßùí äåí ðñÝðåé íá åßíáé ðñïóáñôçìÝíï êáèþò åêôåëåßôå ôçí åíôïëÞ `tunefs`.

Ìðïñåßôå ôþñá íá ðñïóáñôÞóåôå ôï óýóôçìá áñ÷åßùí ìå ôï óõíÞèç ôñüðï:

```
# mount /home
```

Áðü åäþ êáé ðÝñá, êáé üóï ôï Üñèñùìá `geom_label.ko` öïñôþíåôáé óôïí ðõñÞíá ìÝóù ôïõ `/boot/loader.conf` Þ åöüóïí Ý÷åôå âÜëåé ôçí åðéëïãÞ `GEOM_LABEL` óôïí ðõñÞíá óáò, áêüìá êáé áí ôï üíïìá ôçò óõóêåõÞò áëëÜîåé, äåí èá Ý÷åé êáìéÜ äõóìåíÞ åðßäñáóç óôï óýóôçìá óáò.

Ìðïñåßôå åðßóçò íá äçìéïõñãÞóåôå óõóôÞìáôá áñ÷åßùí ìå ðñïåðéëåãìÝíç åôéêÝôá, ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `-L` óôçí åíôïëÞ `newfs`. Äåßôå ôçí óåëßäá manual ôïõ newfs(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ðáñáêÜôù åíôïëÞ ãéá íá êáôáóôñÝøåôå ìéá åôéêÝôá:

```
# glabel destroy home
```

Ôï åðüìåíï ðáñÜäåéãìá äåß÷íåé ðùò ìðïñïýí íá äïèïýí åôéêÝôåò óôéò êáôáôìÞóåéò ôïõ äßóêïõ åêêßíçóçò.

ÐáñÜäåéãìá 20-1. Äçìéïõñãßá Åôéêåôþí óôéò ÊáôáôìÞóåéò ôïõ Äßóêïõ Åêêßíçóçò

Äçìéïõñãþíôáò ìüíéìåò åôéêÝôåò óôéò êáôáôìÞóåéò ôïõ äßóêïõ åêêßíçóçò, ôï óýóôçìá óáò èá óõíå÷ßóåé íá åêêéíåß êáíïíéêÜ áêüìá êáé áí ìåôáöÝñåôå ôï äßóêï óå Üëëï åëåãêôÞ Þ áêüìá êáé óå äéáöïñåôéêü óýóôçìá. Óôï ðáñÜäåéãìá ìáò, èåùñïýìå üôé ÷ñçóéìïðïéåßôáé Ýíáò äßóêïò ATA, ï ïðïßïò áíáãíùñßæåôáé áðü ôï óýóôçìá ùò `ad0`. Èåùñïýìå åðßóçò üôé ÷ñçóéìïðïéåßôáé ç óõíçèéóìÝíç äéÜôáîç êáôáôìÞóåùí ôïõ FreeBSD, ðïõ ðåñéëáìâÜíåé ôéò êáôáôìÞóåéò `/`, `/var`, `/usr` êáé `/tmp` üðùò åðßóçò êáé ìéá êáôÜôìçóç swap.

ÅðáíåêêéíÞóôå ôï óýóôçìá, êáé üôáí åìöáíéóôåß ç ðñïôñïðÞ ôïõ loader(8), ðéÝóôå ôï **4** ãéá íá ðñáãìáôïðïéçèåß åêêßíçóç óå êáôÜóôáóç åíüò ÷ñÞóôç. ¸ðåéôá, äþóôå ôéò áêüëïõèåò åíôïëÝò:

```
# glabel label rootfs /dev/ad0s1a
GEOM_LABEL: Label for provider /dev/ad0s1a is label/rootfs
# glabel label var /dev/ad0s1d
GEOM_LABEL: Label for provider /dev/ad0s1d is label/var
# glabel label usr /dev/ad0s1f
GEOM_LABEL: Label for provider /dev/ad0s1f is label/usr
# glabel label tmp /dev/ad0s1e
GEOM_LABEL: Label for provider /dev/ad0s1e is label/tmp
# glabel label swap /dev/ad0s1b
GEOM_LABEL: Label for provider /dev/ad0s1b is label/swap
# exit
```

Ç åêêßíçóç èá óõíå÷éóôåß êáíïíéêÜ êáé ôï óýóôçìá èá Ýëèåé óå êáôÜóôáóç ðïëëáðëþí ÷ñçóôþí (multi-user). ÌåôÜ ôï ôÝëïò ôçò åêêßíçóçò, åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/fstab` êáé áëëÜîôå ôá óõìâáôéêÜ ïíüìáôá óõóêåõþí ìå ôéò áíôßóôïé÷åò åôéêÝôåò. Ôï ôåëéêü áñ÷åßï `/etc/fstab` èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
# Device                Mountpoint      FStype  Options         Dump    Pass#
/dev/label/swap         none            swap    sw              0       0
/dev/label/rootfs       /               ufs     rw              1       1
/dev/label/tmp          /tmp            ufs     rw              2       2
/dev/label/usr          /usr            ufs     rw              2       2
/dev/label/var          /var            ufs     rw              2       2
```

Ìðïñåßôå ôþñá íá åðáíåêêéíÞóåôå ôï óýóôçìá. Áí üëá ðÞãáí êáëÜ, ç åêêßíçóç èá åßíáé êáíïíéêÞ, êáé ç åíôïëÞ `mount` èá äåßîåé:

```
# mount
/dev/label/rootfs on / (ufs, local)
devfs on /dev (devfs, local)
/dev/label/tmp on /tmp (ufs, local, soft-updates)
/dev/label/usr on /usr (ufs, local, soft-updates)
/dev/label/var on /var (ufs, local, soft-updates)
```

Îåêéíþíôáò áðü ôï FreeBSD 7.2, ôï glabel(8) õðïóôçñßæåé Ýíá íÝï åßäïò åôéêÝôáò ãéá óõóôÞìáôá áñ÷åßùí UFS, ðïõ âáóßæåôáé óå Ýíá ìïíáäéáßï áíáãíùñéóôéêü ôïõò, ôï `ufsid`. Ïé åôéêÝôåò áõôÝò âñßóêïíôáé óôïí êáôÜëïãï `/dev/ufsid`, äçìéïõñãïýíôáé áõôüìáôá êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò êáé åßíáé äõíáôüí íá ÷ñçóéìïðïéçèïýí ãéá ôçí ðñïóÜñôçóç êáôáôìÞóåùí ìÝóù ôïõ `/etc/fstab`. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `glabel status` ãéá íá ëÜâåôå ìéá ëßóôá ôùí óõóôçìÜôùí áñ÷åßùí ìå ôéò áíôßóôïé÷åò `ufsid` åôéêÝôåò ôïõò:

```
% glabel status
                  Name  Status  Components
ufsid/486b6fc38d330916     N/A  ad4s1d
ufsid/486b6fc16926168e     N/A  ad4s1f
```

Óôï ðáñáðÜíù ðáñÜäåéãìá, ôï `ad4s1d` áíôéðñïóùðåýåé ôï óýóôçìá áñ÷åßùí `/var`, åíþ ôï `ad4s1f` áíôéðñïóùðåýåé ôï óýóôçìá áñ÷åßùí `/usr`. ×ñçóéìïðïéþíôáò ôéò ôéìÝò `ufsid` ðïõ öáßíïíôáé, ç ðñïóÜñôçóç áõôþí ôùí êáôáôìÞóåùí ìðïñåß íá ãßíåé ìå ôéò ðáñáêÜôù êáôá÷ùñßóåéò óôï `/etc/fstab`:

```
/dev/ufsid/486b6fc38d330916        /var        ufs        rw        2      2
/dev/ufsid/486b6fc16926168e        /usr        ufs        rw        2      2
```

ÏðïéáäÞðïôå êáôÜôìçóç äéáèÝôåé áíáãíùñéóôéêü `ufsid` ìðïñåß íá ðñïóáñôçèåß ìå ôïí ßäéï ôñüðï, ÷ùñßò íá õðÜñ÷åé ðëÝïí áíÜãêç íá äçìéïõñãçèåß ìüíéìç åôéêÝôá ÷åéñïêßíçôá. Ç ðñïóÜñôçóç ìÝóù åôéêÝôáò `ufsid`, ðáñÝ÷åé ôï ðëåïíÝêôçìá ôçò áíåîáñôçóßáò áðü ôï üíïìá óõóêåõÞò, ôï ïðïßï ðáñÝ÷ïõí êáé ïé ìüíéìåò åôéêÝôåò.

20.7 UFS Journaling ÌÝóù GEOM

Óôçí Ýêäïóç 7.0 ôïõ FreeBSD õëïðïéåßôáé ãéá ðñþôç öïñÜ ç íÝá (êáé áðü ðïëëïýò áíáìåíüìåíç) äõíáôüôçôá ãéá ÷ñÞóç çìåñïëïãßïõ (journal) óôï óýóôçìá áñ÷åßùí. Ç õëïðïßçóç ðáñÝ÷åôáé ìÝóù ôïõ õðïóõóôÞìáôïò GEOM êáé ìðïñåß íá ñõèìéóôåß åýêïëá ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò gjournal(8).

Ôé åßíáé ôï journaling; Ôï journaling áðïèçêåýåé óå Ýíá áñ÷åßï êáôáãñáöÞò (log, çìåñïëüãéï, Þ áðëþò journal) ôéò óõíáëëáãÝò ôïõ óõóôÞìáôïò áñ÷åßùí. ÐáñÜäåéãìá óõíáëëáãÞò åßíáé ïé áëëáãÝò ðïõ áðáéôïýíôáé ãéá ìéá ðëÞñç äéáäéêáóßá åããñáöÞò óôï äßóêï. ¸óé, óôï log áðïèçêåýïíôáé ïé áëëáãÝò óôá ìåôá-äåäïìÝíá (meta-data) êáé óôá ßäéá ôá áñ÷åßá, ðñéí ãßíåé ç ôåëéêÞ (êáíïíéêÞ) áðïèÞêåõóç ôïõò óôï äßóêï. Ôï áñ÷åßï êáôáãñáöÞò ìðïñåß áñãüôåñá íá îáíá÷ñçóéìïðïéçèåß þóôå ç óõíáëëáãÞ íá ãßíåé áðü ôçí áñ÷Þ, åîáóöáëßæïíôáò ìå áõôü ôïí ôñüðï üôé ôï óýóôçìá áñ÷åßùí èá ðáñáìåßíåé óå óôáèåñÞ êáôÜóôáóç.

Ðñüêåéôáé ïõóéáóôéêÜ ãéá ìéá áêüìá ìÝèïäï ðñïöýëáîçò áðü áðþëåéá äåäïìÝíùí êáé áóõíÝðåéåò óôï óýóôçìá áñ÷åßùí. Óå áíôßèåóç ìå ôá Soft Updates ôá ïðïßá åíôïðßæïõí êáé õðï÷ñåþíïõí ôçí Üìåóç åããñáöÞ ôùí ìåôá-äåäïìÝíùí, êáé ôùí óôéãìéïôýðùí (Snapshots) ôá ïðïßá åßíáé åéêüíåò ôïõ óõóôÞìáôïò áñ÷åßùí óå ìéá äåäïìÝíç óôéãìÞ, ôï log áðïèçêåýåôáé óå ÷þñï ðïõ Ý÷åé åê÷ùñçèåß åéäéêÜ ãéá áõôü ôï óêïðü, êáé óå ìåñéêÝò ðåñéðôþóåéò ìðïñåß íá áðïèçêåýåôáé óå åíôåëþò äéáöïñåôéêü äßóêï.

Óå áíôßèåóç ìå õëïðïéÞóåéò journaling óå Üëëá óõóôÞìáôá áñ÷åßùí, ç ìÝèïäïò `gjournal` âáóßæåôáé óå blocks, êáé äåí õëïðïéåßôáé ùò ìÝñïò ôïõ óõóôÞìáôïò áñ÷åßùí, áëëÜ ìüíï ùò åðÝêôáóç ôïõ GEOM.

Ãéá åíåñãïðïßçóç ôçò õðïóôÞñéîçò `gjournal`, èá ðñÝðåé íá õðÜñ÷åé ç ðáñáêÜôù åðéëïãÞ óôïí ðõñÞíá ôïõ FreeBSD. Ç åðéëïãÞ áõôÞ õðÜñ÷åé áðü ðñïåðéëïãÞ óôçí Ýêäïóç 7.0 êáé üëåò ôéò íåüôåñåò åêäüóåéò ôïõ FreeBSD.

```
options UFS_GJOURNAL
```

Áí ÷ñåéÜæåôáé íá ðñïóáñôþíôáé ôüìïé ìå journaling êáôÜ ôçí åêêßíçóç, èá ðñÝðåé åðßóçò íá öïñôþíåôáé áõôüìáôá êáé ôï Üñèñùìá ðõñÞíá `geom_journal.ko`. Ãéá ôï óêïðü áõôü, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`:

```
geom_journal_load="YES"
```

ÅíáëëáêôéêÜ, ç ëåéôïõñãßá áõôÞ ìðïñåß íá åíóùìáôùèåß óå Ýíá ðñïóáñìïóìÝíï ðõñÞíá, ìå ôçí ðñïóèÞêç ôçò ðáñáêÜôù ãñáììÞò óôï áíôßóôïé÷ï áñ÷åßï ñõèìßóåùí:

```
options GEOM_JOURNAL
```

Ç äçìéïõñãßá journal óå Ýíá åëåýèåñï óýóôçìá áñ÷åßùí, ìðïñåß ôþñá íá ãßíåé ìå ôá áêüëïõèá âÞìáôá, èåùñþíôáò üôé ç óõóêåõÞ `da4` åßíáé Ýíáò íÝïò äßóêïò SCSI:

```
# gjournal load
# gjournal label /dev/da4
```

Óôï óçìåßï áõôü èá õðÜñ÷åé ìéá óõóêåõÞ `/dev/da4` êáèþò êáé ìéá óõóêåõÞ `/dev/da4.journal`. Óôç óõóêåõÞ áõôÞ ìðïñåßôå ôþñá íá äçìéïõñãÞóåôå óýóôçìá áñ÷åßùí:

```
# newfs -O 2 -J /dev/da4.journal
```

Ç ðáñáðÜíù åíôïëÞ èá äçìéïõñãÞóåé Ýíá óýóôçìá áñ÷åßùí UFS2 óôç óõóêåõÞ `/dev/da4.journal`, ç ïðïßá Ý÷åé Þäç õðïóôÞñéîç ãéá journaling.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `mount` ãéá íá ðñïóáñôÞóåôå ôçí óõóêåõÞ óôï åðéèõìçôü óçìåßï ðñïóÜñôçóçò, üðùò öáßíåôáé ðáñáêÜôù:

```
# mount /dev/da4.journal /mnt
```

> **Óçìåßùóç:** Óôçí ðåñßðôùóç áñêåôþí slice, èá äçìéïõñãçèåß Ýíá journal ãéá êÜèå åðéìÝñïõò slice. Ãéá ðáñÜäåéãìá, áí õðÜñ÷ïõí ôá slices `ad4s1` êáé `ad4s2` ôüôå ôï `gjournal` èá äçìéïõñãÞóåé ôéò óõóêåõÝò `ad4s1.journal` êáé `ad4s2.journal`.

Ãéá êáëýôåñç áðüäïóç, ßóùò åßíáé åðéèõìçôÞ ç ôÞñçóç ôïõ journal óå äéáöïñåôéêü äßóêï. Ãéá ôéò ðåñéðôþóåéò áõôÝò, ï ðáñï÷Ýáò çìåñïëïãßïõ (ç óõóêåõÞ äßóêïõ ðïõ èá ðåñéÝ÷åé ôï journal) ðñÝðåé íá äßíåôáé ùò ðáñÜìåôñïò óôçí åíôïëÞ, áìÝóùò ìåôÜ ôç óõóêåõÞ äßóêïõ óôçí ïðïßá èá åíåñãïðïéçèåß ôï journaling. Ìðïñåßôå åðßóçò íá åíåñãïðïéÞóåôå ôï journaling óå õðÜñ÷ïíôá óõóôÞìáôá áñ÷åßùí ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `tunefs`. Ùóôüóï, èá ðñÝðåé íá êñáôÞóåôå áíôßãñáöï áóöáëåßáò ôùí áñ÷åßùí óáò, ðñéí åðé÷åéñÞóåôå íá êÜíåôå áëëáãÝò óå Ýíá õðÜñ÷ïí óýóôçìá áñ÷åßùí. Óôéò ðåñéóóüôåñåò ðåñéðôþóåéò, ç `tunefs` èá áðïôý÷åé áí äåí ìðïñÝóåé íá äçìéïõñãÞóåé ôï journal, áëëÜ áõôü äåí óáò ðñïóôáôåýåé áðü áðþëåéá äåäïìÝíùí ðïõ ìðïñåß íá ðñïÝëèåé áðü êáêÞ ÷ñÞóç ôçò `tunefs`.

Åßíáé åðßóçò äõíáôüí íá ÷ñçóéìïðïéçèåß journaling óôïí äßóêï åêêßíçóçò åíüò óõóôÞìáôïò FreeBSD. ÄéáâÜóôå ôï Üñèñï Õëïðïßçóç ôïõ UFS Journaling óå Ýíá Desktop ÕðïëïãéóôÞ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/gjournal-desktop) ãéá ëåðôïìåñåßò ïäçãßåò.

ÊåöÜëáéï 21 ÕðïóôÞñéîç ÓõóôçìÜôùí Áñ÷åßùí

ÃñÜöçêå áðü ôïí Tom Rhodes.

21.1 Óýíïøç

Ôá óõóôÞìáôá áñ÷åßùí áðïôåëïýí áíáðüóðáóôï ôìÞìá êÜèå ëåéôïõñãéêïý óõóôÞìáôïò. ÅðéôñÝðïõí óôïõò ÷ñÞóôåò íá äçìéïõñãïýí êáé íá áðïèçêåýïõí áñ÷åßá, ðáñÝ÷ïõí ðñüóâáóç óå äåäïìÝíá, êáé öõóéêÜ áîéïðïéïýí ôïõò óêëçñïýò äßóêïõò. ÄéáöïñåôéêÜ ëåéôïõñãéêÜ óõóôÞìáôá ÷ñçóéìïðïéïýí óõíÞèùò äéáöïñåôéêÜ åããåíÞ óõóôÞìáôá áñ÷åßùí. Ôï óýóôçìá áñ÷åßùí ôïõ FreeBSD åßíáé ôï Fast File System Þ FFS, ôï ïðïßï ðñïÞëèå áðü ôï áñ÷éêü óýóôçìá áñ÷åßùí ôïõ Unix™, ãíùóôü åðßóçò êáé ùò UFS. Áõôü åßíáé êáé ôï åããåíÝò óýóôçìá áñ÷åßùí ôïõ FreeBSD, ôï ïðïßï ÷ñçóéìïðïéåßôáé óôïõò óêëçñïýò äßóêïõò êáé ðñïóöÝñåé ðñüóâáóç óôá äåäïìÝíá.

Ôï FreeBSD ðñïóöÝñåé åðßóçò ðëçèþñá äéáöïñåôéêþí óõóôçìÜôùí áñ÷åßùí, þóôå íá ðáñÝ÷åé ôïðéêÞ ðñüóâáóç óå äåäïìÝíá ðïõ Ý÷ïõí äçìéïõñãçèåß áðü Üëëá ëåéôïõñãéêÜ óõóôÞìáôá, ð.÷. äåäïìÝíá ðïõ âñßóêïíôáé óå ôïðéêÜ USB áðïèçêåõôéêÜ ìÝóá, ïäçãïýò flash, êáé óêëçñïýò äßóêïõò. ÕðÜñ÷åé åðßóçò õðïóôÞñéîç ãéá Üëëá, ìç-åããåíÞ óõóôÞìáôá áñ÷åßùí, üðùò ôï Extended File System (EXT) ôïõ Linux êáèþò êáé ôï óýóôçìá Z File System (ZFS) ôçò Sun.

Ôï FreeBSD ðáñÝ÷åé äéáöïñåôéêü åðßðåäï õðïóôÞñéîçò ãéá êÜèå óýóôçìá áñ÷åßùí. Ãéá ïñéóìÝíá èá ÷ñåéáóôåß íá öïñôùèåß êÜðïéï Üñèñùìá óôïí ðõñÞíá, åíþ ãéá Üëëá èá ðñÝðåé íá åãêáôáóôáèïýí êÜðïéá åñãáëåßá. Ôï êåöÜëáéï áõôü Ý÷åé ó÷åäéáóôåß íá âïçèÞóåé ôïõò ÷ñÞóôåò ôïõ FreeBSD íá áðïêôÞóïõí ðñüóâáóç óå Üëëá óõóôÞìáôá áñ÷åßùí óôï óýóôçìá ôïõò, îåêéíþíôáò áðü ôï Æ File System ôçò Sun.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ãíùñßæåôå:

- Ôç äéáöïñÜ ìåôáîý ôùí åããåíþí êáé ôùí õðïóôçñéæüìåíùí óõóôçìÜôùí áñ÷åßùí.
- Ðïéá óõóôÞìáôá áñ÷åßùí õðïóôçñßæïíôáé áðü ôï FreeBSD.
- Ðùò íá åíåñãïðïéÞóåôå, íá ñõèìßóåôå, íá áðïêôÞóåôå ðñüóâáóç êáé íá ÷ñçóéìïðïéÞóåôå ìç-åããåíÞ óõóôÞìáôá áñ÷åßùí.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).
- Íá åßóôå åîïéêåéùìÝíïò ìå ôéò âáóéêÝò äéáäéêáóßåò ñýèìéóçò êáé åãêáôÜóôáóçò ðñïóáñìïóìÝíïõ ðõñÞíá (ÊåöÜëáéï 9).
- Íá áéóèÜíåóôå Üíåôá ìå ôçí åãêáôÜóôáóç åöáñìïãþí ôñßôïõ êáôáóêåõáóôÞ óôï FreeBSD (ÊåöÜëáéï 5).
- Íá åßóôå åîïéêåéùìÝíïò ìå ôïõò äßóêïõò, ôá ìÝóá áðïèÞêåõóçò, êáé ôá áíôßóôïé÷á ïíüìáôá óõóêåõþí óôï FreeBSD (ÊåöÜëáéï 19).

21.2 Ôï Óýóôçìá Áñ÷åßùí Z (ZFS)

Ôï óýóôçìá áñ÷åßùí Z, áíáðôý÷èçêå áðü ôçí Sun, êáé åßíáé ìéá íÝá ôå÷íïëïãßá ðïõ ó÷åäéÜóôçêå ãéá íá ðáñÝ÷åé áðïèÞêåõóç ìÝóù ôçò ìåèüäïõ pool. Áõôü óçìáßíåé üôé üëïò ï åëåýèåñïò ÷þñïò äéáôßèåôáé ùò áðüèåìá, êáé äéáíÝìåôáé äõíáìéêÜ óå êÜèå óýóôçìá áñ÷åßùí áíÜëïãá ìå ôéò áíÜãêåò áðïèÞêåõóçò äåäïìÝíùí. ¸÷åé åðßóçò ó÷åäéáóôåß ãéá ôç ìÝãéóôç áêåñáéüôçôá äåäïìÝíùí êáé õðïóôçñßæåé óôéãìéüôõðá (snapshots) äåäïìÝíùí, ðïëëáðëÜ áíôßãñáöá êáé áèñïßóìáôá åëÝã÷ïõ äåäïìÝíùí (checksums). ¸÷åé áêüìá ðñïóôåèåß Ýíá íÝï ìïíôÝëï ãéá ôç äéáôÞñçóç áíôéãñÜöùí ôùí äåäïìÝíùí, ãíùóôü ùò RAID-Z. Ôï ìïíôÝëï RAID-Z åßíáé ðáñüìïéï ìå ôï RAID5 áëëÜ åßíáé ó÷åäéáóìÝíï íá ðáñÝ÷åé ðñïóôáóßá ôùí äåäïìÝíùí êáôÜ ôçí åããñáöÞ ôïõò.

21.2.1 Âåëôéóôïðïßçóç ôïõ ZFS

Ôï õðïóýóôçìá ZFS ÷ñçóéìïðïéåß áñêåôïýò ðüñïõò ôïõ óõóôÞìáôïò. Âåëôéóôïðïéþíôáò ôéò ñõèìßóåéò ôïõ óõóôÞìáôïò óáò, èá åðéôý÷åôå ôç ìÝãéóôç áðüäïóç óôçí êáèçìåñéíÞ ÷ñÞóç. Êáèþò ôï ZFS åßíáé áêüìá óå ðåéñáìáôéêü óôÜäéï óôï FreeBSD, áõôü ßóùò áëëÜîåé ìåëëïíôéêÜ. Ùóôüóï, ãéá ôçí þñá, óõíßóôáôáé íá áêïëïõèÞóåôå ôá ðáñáêÜôù âÞìáôá:

21.2.1.1 ÌíÞìç

Ôï óõíïëéêü ìÝãåèïò ìíÞìçò ôïõ óõóôÞìáôïò ðñÝðåé íá åßíáé ôïõëÜ÷éóôïí Ýíá gigabyte, åíþ ôï óõíéóôþìåíï ìÝãåèïò åßíáé äýï gigabytes Þ êáé ðåñéóóüôåñï. Óå üëá ôá ðáñáäåßãìáôá ðïõ öáßíïíôáé åäþ, ôï óýóôçìá Ý÷åé Ýíá gigabyte ìíÞìçò êáé Ý÷ïõìå åðßóçò âåëôéóôïðïéÞóåé ôéò ñõèìßóåéò ôïõ.

ÏñéóìÝíïé ÷ñÞóôåò öáßíåôáé íá ôá êáôáöÝñíïõí êáé ìå ëéãüôåñï áðü Ýíá gigabyte ìíÞìçò, áëëÜ ìå ôÝôïéïõò ðåñéïñéóìïýò öõóéêÞò ìíÞìçò, åßíáé áñêåôÜ ðéèáíü íá äçìéïõñãçèåß panic êÜôù áðü âáñý öïñôßï åñãáóßáò, åîáéôßáò åîÜíôëçóçò ôçò.

21.2.1.2 Ñýèìéóç ôïõ ÐõñÞíá

Óõíßóôáôáé íá áöáéñÝóåôå ôá ðñïãñÜììáôá ïäÞãçóçò êáé ôéò åðéëïãÝò ðïõ äåí ÷ñçóéìïðïéåßôå áðü ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá. Êáèþò ïé ðåñéóóüôåñïé ïäçãïß óõóêåõþí äéáôßèåíôáé åðßóçò êáé óå ìïñöÞ áñèñùìÜôùí, ìðïñåßôå áðëÜ íá ôïõò öïñôþóåôå ÷ñçóéìïðïéþíôáò ôï áñ÷åßï `/boot/loader.conf`.

Ïé ÷ñÞóôåò ôçò áñ÷éôåêôïíéêÞò i386 èá ðñÝðåé íá ðñïóèÝóïõí ôçí ðáñáêÜôù åðéëïãÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá ôïõò, íá ôïí åðáíáìåôáãëùôôßóïõí êáé íá åðáíåêêéíÞóïõí ôï óýóôçìá ôïõò:

```
options         KVA_PAGES=512
```

Ç åðéëïãÞ áõôÞ èá äéåõñýíåé ôçí ðåñéï÷Þ äéåõèýíóåùí ôïõ ðõñÞíá, åðéôñÝðïíôáò Ýôóé ôçí áýîçóç ôéìÞò ôçò ñõèìéóôéêÞò ìåôáâëçôÞò `vm.kvm_size` ðÝñá áðü ôï ôñÝ÷ïí üñéï ôïõ 1 GB (2 GB ãéá ðõñÞíåò PAE). Ãéá íá âñåßôå ôçí êáôáëëçëüôåñç ôéìÞ ãéá áõôÞ ôçí åðéëïãÞ, äéáéñÝóôå ôï åðéèõìçôü ìÝãåèïò ôçò ðåñéï÷Þò äéåõèýíóåùí ìå ôï ôÝóóåñá (4). Óôçí ðåñßðôùóç áõôÞ, Ý÷ïõìå `512` ãéá ìÝãåèïò 2 GB.

21.2.1.3 Ñõèìßóåéò óôéò ÌåôáâëçôÝò ôïõ Loader

Èá ðñÝðåé íá áõîçèåß ç ðåñéï÷Þ äéåõèýíóåùí `kmem` óå üëåò ôéò áñ÷éôåêôïíéêÝò ôïõ FreeBSD. Óôï äïêéìáóôéêü ìáò óýóôçìá, ìå Ýíá gigabyte öõóéêÞò ìíÞìçò, åß÷áìå åðéôõ÷çìÝíï áðïôÝëåóìá ÷ñçóéìïðïéþíôáò ôéò áêüëïõèåò åðéëïãÝò óôï áñ÷åßï `/boot/loader.conf` êáé åðáíåêêéíþíôáò ôï óýóôçìá ìáò:

```
vm.kmem_size="330M"
vm.kmem_size_max="330M"
vfs.zfs.arc_max="40M"
vfs.zfs.vdev.cache.size="5M"
```

Ãéá áíáëõôéêüôåñåò ñõèìßóåéò ó÷åôéêÜ ìå ôçí âåëôéóôïðïßçóç ôïõ ZFS, äåßôå ôï http://wiki.freebsd.org/ZFSTuningGuide.

21.2.2 ×ñçóéìïðïéþíôáò ôï ZFS

ÕðÜñ÷åé Ýíáò ìç÷áíéóìüò åêêßíçóçò ðïõ åðéôñÝðåé óôï FreeBSD íá ðñïóáñôÞóåé ZFS pools êáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò ôïõ óõóôÞìáôïò. Ãéá íá ôïí ñõèìßóåôå, åêôåëÝóôå ôéò áêüëïõèåò åíôïëÝò:

```
# echo ’zfs_enable="YES"’ >> /etc/rc.conf
# /etc/rc.d/zfs start
```

Ôï õðüëïéðï áõôïý ôïõ êåöáëáßïõ õðïèÝôåé üôé Ý÷åôå äéáèÝóéìïõò ôñåéò SCSI äßóêïõò, êáé üôé ôá ïíüìáôá óõóêåõþí ôïõò åßíáé *da0*, *da1* êáé *da2*. ¼óïé äéáèÝôïõí äßóêïõò IDE èá ðñÝðåé íá ÷ñçóéìïðïéÞóïõí óõóêåõÝò ôïõ ôýðïõ *ad* áíôß ãéá ôéò áíôßóôïé÷åò SCSI.

21.2.2.1 Pool ìå ¸íá Ìüíï Äßóêï

Ãéá ôçí äçìéïõñãßá åíüò ZFS pool ìå Ýíá ìüíï äßóêï (÷ùñßò äõíáôüôçôá áíï÷Þò óöáëìÜôùí), ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `zpool`:

```
# zpool create example /dev/da0
```

Ãéá íá äåßôå ôï íÝï pool, åîåôÜóôå ôçí Ýîïäï ôçò åíôïëÞò `df`:

```
# df
Filesystem  1K-blocks    Used    Avail Capacity  Mounted on
/dev/ad0s1a   2026030  235230  1628718    13%    /
devfs               1       1        0   100%    /dev
/dev/ad0s1d  54098308 1032846 48737598     2%    /usr
example      17547136       0 17547136     0%    /example
```

Ç Ýîïäïò áõôÞ äåß÷íåé êáèáñÜ üôé ôï `example` pool ü÷é ìüíï Ý÷åé äçìéïõñãçèåß, áëëÜ Ý÷åé åðßóçò *ðñïóáñôçèåß* êéüëáò. Åßíáé åðßóçò äéáèÝóéìï ùò êáíïíéêü óýóôçìá áñ÷åßùí, ìðïñåßôå íá äçìéïõñãÞóåôå áñ÷åßá óå áõôü, êáé Üëëïé ÷ñÞóôåò ìðïñïýí åðßóçò íá ôï äïõí, üðùò öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá:

```
# cd /example
# ls
# touch testfile
# ls -al
total 4
drwxr-xr-x   2 root  wheel    3 Aug 29 23:15 .
drwxr-xr-x  21 root  wheel  512 Aug 29 23:12 ..
-rw-r--r--   1 root  wheel    0 Aug 29 23:15 testfile
```

Äõóôõ÷þò áõôü ôï pool äåí ÷ñçóéìïðïéåß êÜðïéï áðü ôá ðëåïíåêôÞìáôá ôïõ ZFS. ÄçìéïõñãÞóôå Ýíá óýóôçìá áñ÷åßùí óå áõôü ôï pool êáé åíåñãïðïéÞóôå óå áõôü ôç óõìðßåóç:

```
# zfs create example/compressed
# zfs set compression=gzip example/compressed
```

Ôï óýóôçìá áñ÷åßùí `example/compressed` åßíáé ðëÝïí Ýíá óõìðéåóìÝíï ZFS óýóôçìá. ÄïêéìÜóôå íá áíôéãñÜøåôå ìåñéêÜ ìåãÜëá áñ÷åßá óå áõôü, áðåõèåßáò óôïí êáôÜëïãï `/example/compressed`.

Ìðïñåßôå ôþñá íá áðåíåñãïðïéÞóåôå ôç óõìðßåóç ãñÜöïíôáò:

```
# zfs set compression=off example/compressed
```

Ãéá íá áðïðñïóáñôÞóåôå ôï óýóôçìá áñ÷åßùí, åêôåëÝóôå ôçí áêüëïõèç åíôïëÞ êáé åðáëçèåýóôå ôï áðïôÝëåóìá ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò `df`:

```
# zfs umount example/compressed
# df
Filesystem  1K-blocks    Used    Avail Capacity  Mounted on
/dev/ad0s1a   2026030  235232  1628716    13%    /
devfs               1       1        0   100%    /dev
/dev/ad0s1d  54098308 1032864 48737580     2%    /usr
example      17547008       0 17547008     0%    /example
```

ÐñïóáñôÞóôå îáíÜ ôï óýóôçìá áñ÷åßùí, þóôå íá åßíáé êáé ðÜëé ðñïóâÜóéìï, êáé åðáëçèåýóôå ôï ÷ñçóéìïðïéþíôáò üðùò êáé ðñéí, ôçí åíôïëÞ `df`:

```
# zfs mount example/compressed
# df
Filesystem         1K-blocks    Used    Avail Capacity  Mounted on
/dev/ad0s1a          2026030  235234  1628714    13%    /
devfs                      1       1        0   100%    /dev
/dev/ad0s1d         54098308 1032864 48737580     2%    /usr
example             17547008       0 17547008     0%    /example
example/compressed  17547008       0 17547008     0%    /example/compressed
```

Ìðïñåßôå åðßóçò íá äåßôå ôï pool êáé ôï óýóôçìá áñ÷åßùí åîåôÜæïíôáò ôçí Ýîïäï ôçò åíôïëÞò `mount`:

```
# mount
/dev/ad0s1a on / (ufs, local)
devfs on /dev (devfs, local)
/dev/ad0s1d on /usr (ufs, local, soft-updates)
example on /example (zfs, local)
example/data on /example/data (zfs, local)
example/compressed on /example/compressed (zfs, local)
```

¼ðùò ðáñáôçñïýìå, ôï óýóôçìá áñ÷åßùí ZFS ìðïñåß íá ÷ñçóéìïðïéçèåß ùò êïéíü óýóôçìá áñ÷åßùí ìåôÜ ôç äçìéïõñãßá ôïõ. Ùóôüóï, äéáèÝôåé ðïëëÝò áêüìá ëåéôïõñãßåò. Óôï ðáñáêÜôù ðáñÜäåéãìá äçìéïõñãïýìå Ýíá íÝï óýóôçìá áñ÷åßùí, ôï `data`. èá áðïèçêåýïõìå óçìáíôéêÜ äåäïìÝíá óå áõôü, êáé Ýôóé ôï ñõèìßæïõìå þóôå íá êñáôÜåé äýï áíôßãñáöá áðü êÜèå ìðëïê äåäïìÝíùí:

```
# zfs create example/data
# zfs set copies=2 example/data
```

Ìðïñïýìå ôþñá íá äïýìå ôá äåäïìÝíá êáé ôçí êáôáíÜëùóç ÷þñïõ äßíïíôáò îáíÜ ôçí åíôïëÞ `df`:

```
# df
Filesystem         1K-blocks    Used    Avail Capacity  Mounted on
/dev/ad0s1a          2026030  235234  1628714    13%    /
devfs                      1       1        0   100%    /dev
/dev/ad0s1d         54098308 1032864 48737580     2%    /usr
example             17547008       0 17547008     0%    /example
example/compressed  17547008       0 17547008     0%    /example/compressed
example/data        17547008       0 17547008     0%    /example/data
```

ÐáñáôçñÞóôå üôé êÜèå óýóôçìá áñ÷åßùí óôï pool äåß÷íåé ôï ßäéï ìÝãåèïò äéáèÝóéìïõ ÷þñïõ. Áõôüò åßíáé êáé ï ëüãïò ðïõ ÷ñçóéìïðïéïýìå ôçí åíôïëÞ `df` óå üëá ôá ðáñáäåßãìáôá, ãéá íá äåßîïõìå üôé ôá óõóôÞìáôá áñ÷åßùí ÷ñçóéìïðïéïýí ìüíï ôï ÷þñï ðïõ ÷ñåéÜæïíôáé êáé üôé üëá ìïéñÜæïíôáé ôïí ßäéï ÷þñï (ôï êïéíü÷ñçóôï áðüèåìá — pool). Óôï óýóôçìá áñ÷åßùí ZFS Ýííïéåò üðùò ïé ôüìïé (volumes) êáé ïé êáôáôìÞóåéò (partitions) äåí Ý÷ïõí íüçìá. Áíôßèåôá, ðïëëÜ óõóôÞìáôá áñ÷åßùí ìïéñÜæïíôáé ôïí ßäéï ÷þñï, ôï pool. Ìðïñåßôå íá êáôáñãÞóåôå ôï óýóôçìá áñ÷åßùí êáé êáôüðéí ôï ßäéï ôï pool üôáí äåí ôá ÷ñåéÜæåóôå ðëÝïí:

```
# zfs destroy example/compressed
# zfs destroy example/data
# zpool destroy example
```

Ïé óêëçñïß äßóêïé ìå ôïí êáéñü ÷áëÜíå, åßíáé áíáðüöåõêôï. ¼ôáí Ýíáò äßóêïò ÷áëÜóåé, ôá äåäïìÝíá ôïõ ÷Üíïíôáé. Ìéá ìÝèïäïò ãéá íá áðïöýãïõìå ôçí áðþëåéá äåäïìÝíùí åîáéôßáò åíüò ÷áëáóìÝíïõ äßóêïõ åßíáé íá äçìéïõñãÞóïõìå ìéá óõóôïé÷ßá RAID. Ôá pools ôïõ ZFS Ý÷ïõí ó÷åäéáóôåß þóôå íá õðïóôçñßæïõí áõôü ôï ÷áñáêôçñéóôéêü. Ç ëåéôïõñãßá áõôÞ áíáëýåôáé óôçí åðüìåíç åíüôçôá.

21.2.2.2 ZFS RAID-Z

¼ðùò áíáöÝñáìå ðñïçãïõìÝíùò, ç åíüôçôá áõôÞ ðñïûðïèÝôåé üôé ÷ñçóéìïðïéïýìå ôñåéò óõóêåõÝò SCSI ìå ïíüìáôá óõóêåõþí `da0`, `da1` êáé `da2`. Ãéá íá äçìéïõñãÞóïõìå Ýíá pool ôýðïõ RAID-Z, åêôåëïýìå ôçí áêüëïõèç åíôïëÞ:

```
# zpool create storage raidz da0 da1 da2
```

> **Óçìåßùóç:** Ç Sun óõíéóôÜ íá ÷ñçóéìïðïéïýíôáé áðü ôñåéò ùò åííéÜ óõóêåõÝò óå óõóôïé÷ßåò ôýðïõ RAID-Z. Áí ÷ñåéÜæåôáé íá äçìéïõñãÞóåôå Ýíá pool ìå ðåñéóóüôåñïõò áðü äÝêá äßóêïõò, åßíáé ðñïôéìüôåñï íá ôï ÷ùñßóåôå óå ìéêñüôåñá RAID-Z pools. Áí äéáèÝôåôå ìüíï äýï äßóêïõò áëëÜ ÷ñåéÜæåóôå ôçí äõíáôüôçôá áíï÷Þò óöáëìÜôùí, ßóùò åßíáé êáëýôåñï íá ÷ñçóéìïðïéÞóåôå Ýíá ZFS mirror. Äåßôå ôç óåëßäá manual ôïõ zpool(8) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Èá äçìéïõñãçèåß ôï `storage` zpool. Ìðïñåßôå íá åðáëçèåýóåôå ôï áðïôÝëåóìá ÷ñçóéìïðïéþíôáò, üðùò êáé ðñïçãïõìÝíùò, ôéò åíôïëÝò mount(8) êáé df(1). Èá ìðïñïýóáìå íá ÷ñçóéìïðïéÞóïõìå ðåñéóóüôåñïõò äßóêïõò, ðñïóèÝôïíôáò ôá ïíüìáôá óõóêåõþí ôïõò óôï ôÝëïò ôçò ðáñáðÜíù ëßóôáò. Äçìéïõñãåßóôå Ýíá íÝï óýóôçìá áñ÷åßùí óôï pool, ôï ïðïßï èá ïíïìÜæåôáé `home` êáé üðïõ èá áðïèçêåýïíôáé ôåëéêÜ ôá áñ÷åßá ôùí ÷ñçóôþí:

```
# zfs create storage/home
```

Ìðïñïýìå ôþñá íá åíåñãïðïéÞóïõìå ôçí óõìðßåóç êáé íá êñáôÜìå åðéðëÝïí áíôßãñáöá ôùí êáôáëüãùí êáé ôùí äåäïìÝíùí ôùí ÷ñçóôþí. ¼ðùò êáé ðñïçãïõìÝíùò, ìðïñïýìå íá ôï åðéôý÷ïõìå ÷ñçóéìïðïéþíôáò ôéò ðáñáêÜôù åíôïëÝò:

```
# zfs set copies=2 storage/home
# zfs set compression=gzip storage/home
```

Ãéá íá ãßíåé áõôüò ï íÝïò êáôÜëïãïò ôùí ÷ñçóôþí, áíôéãñÜøôå ôá äåäïìÝíá ôïõò óå áõôüí êáé äçìéïõñãÞóôå ôïõò êáôÜëëçëïõò óõìâïëéêïýò äåóìïýò:

```
# cp -rp /home/* /storage/home
# rm -rf /home /usr/home
# ln -s /storage/home /home
# ln -s /storage/home /usr/home
```

Ôá äåäïìÝíá ôùí ÷ñçóôþí èá áðïèçêåýïíôáé ôþñá óôï íÝï óýóôçìá áñ÷åßùí `/storage/home`. Ãéá íá ôï åðáëçèåýóåôå, äçìéïõñãÞóôå Ýíá íÝï ÷ñÞóôç êáé åéóÝëèåôå óôï óýóôçìá ìå ôï íÝï ëïãáñéáóìü.

ÄïêéìÜóôå íá äçìéïõñãÞóåôå Ýíá óôéãìéüôõðï (snapshot) óôï ïðïßï èá ìðïñåßôå íá åðáíÝëèåôå áñãüôåñá:

```
# zfs snapshot storage/home@08-30-08
```

Óçìåéþóôå üôé ç åðéëïãÞ äçìéïõñãßáò óôéãìéüôõðïõ ëåéôïõñãåß ìüíï óå ðñáãìáôéêü óýóôçìá áñ÷åßùí, êáé ü÷é óå êÜðïéï ìåìïíùìÝíï êáôÜëïãï Þ áñ÷åßï. Ï ÷áñáêôÞñáò @ ÷ñçóéìïðïéåßôáé ùò äéá÷ùñéóôéêü ìåôáîý ôïõ óõóôÞìáôïò áñ÷åßùí êáé ôïõ ïíüìáôïò ôüìïõ. Áí êáôáóôñáöåß ï êáôÜëïãïò äåäïìÝíùí êÜðïéïõ ÷ñÞóôç áðïêáôáóôÞóôå ôïí ìå ôçí åíôïëÞ:

```
# zfs rollback storage/home@08-30-08
```

Ãéá íá äåßôå ìéá ëßóôá ôùí äéáèÝóéìùí óôéãìéüôõðùí, åêôåëÝóôå ôçí åíôïëÞ `ls` óôïí êáôÜëïãï `.zfs/snapshot` ôïõ óõóôÞìáôïò áñ÷åßùí. Ãéá ðáñÜäåéãìá, ãéá íá äåßôå ôï óôéãìéüôõðï ðïõ äçìéïõñãÞóáìå ðñïçãïõìÝíùò, åêôåëÝóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# ls /storage/home/.zfs/snapshot
```

Åßíáé äõíáôüí íá ãñÜøåôå êÜðïéï script ðïõ íá äçìéïõñãåß ìçíéáßá óôéãìéüôõðá ôùí äåäïìÝíùí ôùí ÷ñçóôþí. Ùóôüóï, ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ, ôá óôéãìéüôõðá èá êáôáíáëþóïõí ìåãÜëï ðïóïóôü ôïõ ÷þñïõ óôï äßóêï. Ìðïñåßôå íá äéáãñÜøåôå ôï ðñïçãïýìåíï óôéãìéüôõðï ÷ñçóéìïðïéþíôáò ôçí ðáñáêÜôù åíôïëÞ:

```
# zfs destroy storage/home@08-30-08
```

Äåí õðÜñ÷åé ëüãïò, ìåôÜ áðü üëåò áõôÝò ôéò äïêéìÝò, íá êñáôÞóïõìå ôï `/storage/home` óôçí ðáñïýóá êáôÜóôáóç ôïõ. ÌåôáöÝñôå ôï óôï ðñáãìáôéêü óýóôçìá áñ÷åßùí `/home`:

```
# zfs set mountpoint=/home storage/home
```

×ñçóéìïðïéþíôáò ôéò åíôïëÝò `df` êáé `mount` èá äïýìå üôé ôï óýóôçìá ÷åéñßæåôáé ðëÝïí áõôü ôï óýóôçìá áñ÷åßùí ùò ôï ðñáãìáôéêü `/home`:

```
# mount
/dev/ad0s1a on / (ufs, local)
devfs on /dev (devfs, local)
/dev/ad0s1d on /usr (ufs, local, soft-updates)
storage on /storage (zfs, local)
storage/home on /home (zfs, local)
# df
Filesystem   1K-blocks    Used    Avail Capacity  Mounted on
/dev/ad0s1a    2026030  235240  1628708    13%    /
devfs                1       1        0   100%    /dev
/dev/ad0s1d   54098308 1032826 48737618     2%    /usr
storage       26320512       0 26320512     0%    /storage
storage/home  26320512       0 26320512     0%    /home
```

Åäþ ïëïêëçñþíåôáé ç ñýèìéóç ôïõ RAID-Z. Ãéá íá äÝ÷åóôå áíáöïñÝò êáôÜóôáóçò ó÷åôéêÜ ìå ôá óõóôÞìáôá áñ÷åßùí êáôÜ ôç íõêôåñéíÞ åêôÝëåóç ôïõ periodic(8), äþóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# echo 'daily_status_zfs_enable="YES"' >> /etc/periodic.conf
```

21.2.2.3 ÁíÜêôçóç ôïõ RAID-Z

ÊÜèå ëïãéóìéêü RAID Ý÷åé ìéá ìÝèïäï ãéá åðßâëåøç ôçò êáôÜóôáóÞò ôïõ, êáé ôï ZFS äåí áðïôåëåß åîáßñåóç. Ìðïñåßôå íá äåßôå ôçí êáôÜóôáóç ôùí óõóêåõþí ôïõ RAID-Z ÷ñçóéìïðïéþíôáò ôçí áêüëïõèç åíôïëÞ:

```
# zpool status -x
```

Áí üëá ôá pools åßíáé óå õãéÞ êáôÜóôáóç, èá ðÜñåôå ôï áêüëïõèï ìÞíõìá:

```
all pools are healthy
```

Áí õðÜñ÷åé êÜðïéï ðñüâëçìá, ð.÷. êÜðïéïò äßóêïò Ý÷åé âãåé åêôüò ëåéôïõñãßáò, èá äåßôå ôçí ðåñéãñáöÞ ôçò êáôÜóôáóçò óå Ýíá ìÞíõìá üðùò ôï ðáñáêÜôù:

```
  pool: storage
 state: DEGRADED
status: One or more devices has been taken offline by the administrator.
        Sufficient replicas exist for the pool to continue functioning in a
        degraded state.
action: Online the device using ’zpool online’ or replace the device with
        ’zpool replace’.
 scrub: none requested
config:

        NAME        STATE     READ WRITE CKSUM
        storage     DEGRADED     0     0     0
          raidz1    DEGRADED     0     0     0
            da0     ONLINE       0     0     0
            da1     OFFLINE      0     0     0
            da2     ONLINE       0     0     0

errors: No known data errors
```

Ôï ðáñáðÜíù äåß÷íåé üôé ç óõóêåõÞ ôÝèçêå åêôüò ëåéôïõñãßáò áðü ôïí äéá÷åéñéóôÞ. Áõôü åßíáé áëÞèåéá ãéá ôï óõãêåêñéìÝíï ðáñÜäåéãìá. Ãéá íá ôåèåß ï äßóêïò åêôüò, ÷ñçóéìïðïéÞèçêå ç ðáñáêÜôù åíôïëÞ:

```
# zpool offline storage da1
```

Ìðïñïýìå ôþñá íá áíôéêáôáóôÞóïõìå ôï äßóêï `da1` ìåôÜ ôçí áðåíåñãïðïßçóç ôïõ óõóôÞìáôïò. ¼ôáí ôï óýóôçìá åðáíÝëèåé óå ëåéôïõñãßá, ìðïñïýìå íá ÷ñçóéìïðïéÞóïõìå ôçí áêüëïõèç åíôïëÞ ãéá íá åíçìåñþóïõìå ôï óýóôçìá ãéá ôçí áíôéêáôÜóôáóç ôïõ äßóêïõ:

```
# zpool replace storage da1
```

Áðü åäþ, ìðïñïýìå íá åëÝãîïõìå îáíÜ ôçí êáôÜóôáóç, áõôÞ ôç öïñÜ ÷ùñßò ôçí åðéëïãÞ `-x`:

```
# zpool status storage
 pool: storage
 state: ONLINE
 scrub: resilver completed with 0 errors on Sat Aug 30 19:44:11 2008
config:

        NAME        STATE     READ WRITE CKSUM
        storage     ONLINE       0     0     0
```

```
          raidz1    ONLINE       0     0     0
            da0     ONLINE       0     0     0
            da1     ONLINE       0     0     0
            da2     ONLINE       0     0     0

errors: No known data errors
```

¼ðùò öáßíåôáé óôï ðáñÜäåéãìá, ôá ðÜíôá öáßíåôáé íá ëåéôïõñãïýí öõóéïëïãéêÜ.

21.2.2.4 ÅðáëÞèåõóç ÄåäïìÝíùí

¼ðùò áíáöÝñáìå ðñïçãïõìÝíùò, ôï ZFS ÷ñçóéìïðïéåß `checksums` (áèñïßóìáôá åëÝã÷ïõ) ãéá íá åðáëçèåýóåé ôçí áêåñáéüôçôá ôùí áðïèçêåõìÝíùí äåäïìÝíùí. Ôá áèñïßóìáôá åëÝã÷ïõ åíåñãïðïéïýíôáé áõôüìáôá êáôÜ ôçí äçìéïõñãßá ôùí óõóôçìÜôùí áñ÷åßùí, êáé ìðïñïýí íá áðåíåñãïðïéçèïýí ìÝóù ôçò åðüìåíçò åíôïëÞò:

```
# zfs set checksum=off storage/home
```

Áõôü äåí åßíáé ãåíéêÜ êáëÞ éäÝá, êáèþò ôá checksums êáôáëáìâÜíïõí åëÜ÷éóôï áðïèçêåõôéêü ÷þñï, êáé åßíáé ðïëý ðéï ÷ñÞóéìï íá ôá Ý÷ïõìå åíåñãïðïéçìÝíá. Åðßóçò äåí öáßíåôáé íá ðñïêáëïýí êÜðïéá óçìáíôéêÞ êáèõóôÝñçóç Þ åðéâÜñõíóç. Ìå ôá checksums åíåñãïðïéçìÝíá, ìðïñïýìå íá æçôÞóïõìå áðü ôï ZFS íá åëÝãîåé ôçí áêåñáéüôçôá ôùí äåäïìÝíùí ÷ñçóéìïðïéþíôáò ôá ãéá åðáëÞèåõóç. Ç äéáäéêáóßá áõôÞ åßíáé ãíùóôÞ ùò “scrubbing.” Ãéá íá åëÝãîåôå ôçí áêåñáéüôçôá äåäïìÝíùí ôïõ pool `storage`, ÷ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# zpool scrub storage
```

Ç äéáäéêáóßá áõôÞ ìðïñåß íá ðÜñåé áñêåôÞ þñá, áíÜëïãá ìå ôçí ðïóüôçôá ôùí áðïèçêåõìÝíùí äåäïìÝíùí. Åðßóçò ÷ñçóéìïðïéåß ðÜñá ðïëý ôï äßóêï (I/O), ôüóï þóôå óå êÜèå äåäïìÝíç óôéãìÞ ìðïñåß íá åêôåëåßôáé ìüíï ìéá ôÝôïéá äéáäéêáóßá. ÌåôÜ ôçí ïëïêëÞñùóç ôïõ scrub, èá áíáíåùèåß êáé ç áíáöïñÜ êáôÜóôáóçò, ôçí ïðïßá ìðïñåßôå íá äåßôå æçôþíôáò ôçí ìå ôçí ðáñáêÜôù åíôïëÞ:

```
# zpool status storage
 pool: storage
 state: ONLINE
 scrub: scrub completed with 0 errors on Sat Aug 30 19:57:37 2008
config:

        NAME        STATE     READ WRITE CKSUM
        storage     ONLINE       0     0     0
          raidz1    ONLINE       0     0     0
            da0     ONLINE       0     0     0
            da1     ONLINE       0     0     0
            da2     ONLINE       0     0     0

errors: No known data errors
```

Óôï ðáñÜäåéãìá ìáò åìöáíßæåôáé êáé ç ÷ñïíéêÞ óôéãìÞ ðïõ ïëïêëçñþèçêå ç åíôïëÞ scrub. Ç äõíáôüôçôá áõôÞ ìáò åîáóöáëßæåé áêåñáéüôçôá äåäïìÝíùí óå ìåãÜëï âÜèïò ÷ñüíïõ.

ÕðÜñ÷ïõí ðïëëÝò áêüìá åðéëïãÝò ãéá ôï óýóôçìá áñ÷åßùí Æ. Äåßôå ôéò óåëßäåò manual zfs(8) êáé zpool(8).

ÊåöÜëáéï 22 Ï Äéá÷åéñéóôÞò Ôüìùí Vinum

Áñ÷éêÞ óõíåéóöïñÜ ôïõ Greg Lehey.

22.1 Óýíïøç

ÏôéäÞðïôå äßóêïõò êáé áí Ý÷åôå, ðÜíôá õðÜñ÷ïõí ðéèáíÜ ðñïâëÞìáôá:

- Ìðïñåß íá åßíáé ðïëý ìéêñïß.
- Ìðïñåß íá åßíáé ðïëý áñãïß.
- Ìðïñåß íá ìçí åßíáé áñêåôÜ áîéüðéóôïé.

Ãéá ôá ðñïâëÞìáôá áõôÜ, Ý÷ïõí ðñïôáèåß êáé õëïðïéçèåß äéÜöïñåò ëýóåéò. ¸íáò óõ÷íÜ ÷ñçóéìïðïéïýìåíïò ôñüðïò ðñïóôáóßáò, åßíáé ìå ôçí ÷ñÞóç ðïëëáðëþí êáé ïñéóìÝíåò öïñÝò ðåñéôôþí (redundant) äßóêùí. Åêôüò áðü ôçí õðïóôÞñéîç ðïõ ðáñÝ÷åôáé ãéá óõóêåõÝò (êÜñôåò êáé åëåãêôÝò) hardware RAID, ôï âáóéêü óýóôçìá ôïõ FreeBSD ðåñéëáìâÜíåé ôï äéá÷åéñéóôÞ ôüìùí (volume manager) Vinum, Ýíá ðñüãñáììá ïäÞãçóçò ôýðïõ ìðëïê ôï ïðïßï õëïðïéåß åéêïíéêïýò äßóêïõò. Ôï *Vinum* áðïêáëåßôáé êáé *Äéá÷åéñéóôÞò Ôüìùí*, êáé åßíáé Ýíáò ïäçãüò åéêïíéêþí äßóêùí ðïõ áíôéìåôùðßæåé ôá ðáñáðÜíù ôñßá ðñïâëÞìáôá. Ôï Vinum ðáñÝ÷åé êáëýôåñç åõåëéîßá, áðüäïóç êáé áîéïðéóôßá óå ó÷Ýóç ìå ôá ðáñáäïóéáêÜ õðïóôÞìáôá áðïèÞêåõóçò, êáé õëïðïéåß ôá ìïíôÝëá RAID-0, RAID-1 êáé RAID-5, ôüóï ìåìïíùìÝíá, üóï êáé óå óõíäõáóìü ìåôáîý ôïõò.

Ôï êåöÜëáéï áõôü ðáñÝ÷åé ìéá åðéóêüðçóç ôùí ðéèáíþí ðñïâëçìÜôùí ôùí ðáñáäïóéáêþí óõóôçìÜôùí áðïèÞêåõóçò, êáé ìéá åéóáãùãÞ óôï Äéá÷åéñéóôÞ Ôüìùí Vinum.

> **Óçìåßùóç:** Îåêéíþíôáò áðü ôï FreeBSD 5 êáé ìåôÜ, ôï Vinum îáíáãñÜöôçêå þóôå íá åíóùìáôùèåß óôçí áñ÷éôåêôïíéêÞ GEOM (ÊåöÜëáéï 20), äéáôçñþíôáò ùóôüóï ôéò áñ÷éêÝò éäÝåò, ïñïëïãßá, êáé ôç ìïñöÞ ôùí ìåôá-äåäïìÝíùí (metadata) ðïõ áðïèçêåýïíôáé óôïí äßóêï. Ç íÝá áõôÞ åêäï÷Þ ïíïìÜæåôáé *gvinum* (áðü ôï *GEOM vinum*). Ôï áêüëïõèï êåßìåíï áíáöÝñåôáé óõíÞèùò óôï *Vinum* ùò áöçñçìÝíç Ýííïéá, Üó÷åôá ìå ôéò ëåðôïìÝñåéåò ôçò õëïðïßçóçò. ¼ëåò ïé åíôïëÝò èá ðñÝðåé ôþñá íá êáëïýíôáé ìå ôç ÷ñÞóç ôçò `gvinum`, ôï Üñèñùìá ðõñÞíá (kernel module) Ý÷åé ìåôïíïìáóôåß óå `geom_vinum.ko` áðü `vinum.ko`, êáé üëá ôá áñ÷åßá óõóêåõþí âñßóêïíôáé óôïí êáôÜëïãï `/dev/gvinum` áíôß ãéá `/dev/vinum`. Áðü ôï FreeBSD 6 êáé ìåôÜ, ç ðáëéÜ õëïðïßçóç ôïõ Vinum äåí ðåñéëáìâÜíåôáé ðëÝïí óôï âáóéêü óýóôçìá.

22.2 Ïé Äßóêïé Åßíáé Ðïëý Ìéêñïß

Ïé äßóêïé ãßíïíôáé ïëïÝíá êáé ìåãáëýôåñïé, áëëÜ ìå ôïí ßäéï ñõèìü áõîÜíïíôáé åðßóçò êáé ïé áðáéôÞóåéò ìáò óå áðïèçêåõôéêü ÷þñï. ÐïëëÝò öïñÝò èá âñåèåßôå óå èÝóç íá ÷ñåéÜæåóôå Ýíá óýóôçìá áñ÷åßùí ìåãáëýôåñï áðü ôïõò äßóêïõò ðïõ Ý÷åôå äéáèÝóéìïõò. Óßãïõñá ôï ðñüâëçìá áõôü äåí åßíáé ôüóï Ýíôïíï üóï ðñéí äÝêá ÷ñüíéá, áëëÜ åîáêïëïõèåß íá õðÜñ÷åé. ÌåñéêÜ óõóôÞìáôá åðéëýïõí áõôü ôï ðñüâëçìá, äçìéïõñãþíôáò ìéá åéêïíéêÞ óõóêåõÞ ðïõ áðïèçêåýåé ôá äåäïìÝíá óå Ýíá áñéèìü äéáêñéôþí äßóêùí.

22.3 ÊáèõóôåñÞóåéò Ðñüóâáóçò

Óôá ìïíôÝñíá óõóôÞìáôá, õðÜñ÷åé óõ÷íÜ áíÜãêç ðñüóâáóçò äåäïìÝíùí áðü ðïëëÝò äéåñãáóßåò ôáõôü÷ñïíá. Ãéá ðáñÜäåéãìá, ìåãÜëïé åîõðçñåôçôÝò FTP Þ HTTP ìðïñåß íá Ý÷ïõí áíÜ ðÜóá óôéãìÞ ÷éëéÜäåò ôáõôü÷ñïíåò åîùôåñéêÝò óõíäÝóåéò êáé íá äéáèÝôïõí ðïëëáðëÝò äéåðáöÝò 100 Mbit/s ïé ïðïßåò îåðåñíÜíå êáôÜ ðïëý ôéò äõíáôüôçôåò ìåôáöïñÜò äåäïìÝíùí ôùí ðåñéóóüôåñùí óêëçñþí äßóêùí.

Ôá ôñÝ÷ïíôá ìïíôÝëá óêëçñþí äßóêùí ìðïñïýí íá ìåôáöÝñïõí äåäïìÝíá óåéñéáêÜ ìå ôá÷ýôçôá ìÝ÷ñé êáé 70 MB/s, áëëÜ ç ôéìÞ áõôÞ Ý÷åé ìéêñÞ óçìáóßá óå Ýíá ðåñéâÜëëïí üðïõ ðïëëÝò áíåîÜñôçôåò äéåñãáóßåò ÷ñåéÜæïíôáé ðñüóâáóç óôïí ßäéï äßóêï. Óå ôÝôïéåò ðåñéðôþóåéò, êÜèå äéåñãáóßá ìðïñåß íá ðåñéìÝíåé ìÝ÷ñé ìéá ìåóáßá êáèõóôÝñçóç ìÝ÷ñé íá ôç ðñïóðåëÜóåé, êáé åðßóçò íá ÷ñÞóéìïðïéÞóåé ôïí ÷ñüíï áõôü êáé íá ðåñéìÝíåé ôïí äßóêï íá ìåôáöÝñåé ôá äåäïìÝíá. Áõôü ôï ðñüâëçìá äåí ìðïñåß íá ëõèåß ìå ôçí áýîçóç ôçò ôá÷ýôçôáò ôïõ äßóêïõ, ãéáôß ïé ðåñéóóüôåñåò êáèõóôåñÞóåéò ïöåßëïíôáé óôçí ìç÷áíéêÞ êßíçóç: ï ÷ñüíïò áíáæÞôçóçò êáé ç ðåñéóôñïöéêÞ êáèõóôÝñçóç ôïõ äßóêïõ ðïõ ìåôñéÝôáé óå ms. Ìå Üëëá ëüãéá, ï ÷ñüíïò ðïõ ðáñáìÝíïõí áðáó÷ïëçìÝíïé ïé äßóêïé åîáéôßáò ôçò ìåôáöïñÜò.

Óå êÜèå ìåôáöïñÜ äåäïìÝíùí, ï äßóêïò èá ðñÝðåé ðñþôá íá ôïðïèåôÞóåé ôéò êåöáëÝò óôï óùóôü óçìåßï, íá ðåñéìÝíåé íá ðåñÜóåé ï ðñþôïò ôïìÝáò êÜôù áðü ôçí êåöáëÞ áíÜãíùóçò, êáé Ýðåéôá íá åêôåëÝóåé ôç ìåôáöïñÜ. Ïé åíÝñãåéåò áõôÝò ìðïñïýí íá èåùñçèïýí áôïìéêÝò: äåí Ý÷åé íüçìá íá äéáêïðïýí ìÝ÷ñé íá ïëïêëçñùèïýí.

Áò èåùñÞóïõìå ìéá ôõðéêÞ ìåôáöïñÜ ðåñßðïõ 10 kB. Ç ôñÝ÷ïõóá ãåíéÜ äßóêùí õøçëÞò áðüäïóçò ìðïñåß íá ôïðïèåôÞóåé ôéò êåöáëÝò óôç óùóôÞ èÝóç óå ðåñßðïõ 3.5 ms. Ïé ðéï ãñÞãïñïé äßóêïé Ý÷ïõí ôá÷ýôçôá ðåñéóôñïöÞò 15.000 óôñïöÝò ôï ëåðôü, Ýôóé ï ìÝóïò ÷ñüíïò êáèõóôÝñçóçò ðåñéóôñïöÞò (ìéóÞ ðåñéóôñïöÞ) åßíáé 2 ms. Ìå 70 MB/s, ç ìåôáöïñÜ áõôÞ êáè’ áõôÞ èá ÷ñåéáóôåß ðåñßðïõ 150 μs, ó÷åäüí ôßðïôá óå ó÷Ýóç ìå ôï ÷ñüíï ðïõ ÷ñåéÜæåôáé ãéá ôçí ôïðïèÝôçóç ôçò êåöáëÞò óôï óùóôü óçìåßï. Óôçí ðåñßðôùóç áõôÞ, ï ðñáãìáôéêüò ñõèìüò ìåôáöïñÜò ðÝöôåé óå ëßãï ðåñéóóüôåñï áðü Ýíá 1 ÌÂ/s êáé åßíáé åìöáíÝò üôé åîáñôÜôáé óå ìåãÜëï âáèìü áðü ôï ìÝãåèïò ôùí äåäïìÝíùí ðïõ ìåôáöÝñïíôáé.

Ç ðáñáäïóéáêÞ êáé ðñïöáíÞò ëýóç óå áõôü ôï ðñüâëçìá, åßíáé íá ðñïóèÝóïõìå “ðåñéóóüôåñïõò äßóêïõò”: áíôß íá ÷ñçóéìïðïéÞóïõìå Ýíá ìåãÜëï äßóêï, íá âÜëïõìå ðïëëïýò ìéêñüôåñïõò ìå ôïí ßäéï ôåëéêü áðïèçêåõôéêü ÷þñï. ÊÜèå äßóêïò Ý÷åé äõíáôüôçôá íá ìåôáêéíåß ôéò êåöáëÝò êáé íá ìåôáöÝñåé äåäïìÝíá áíåîÜñôçôá áðü ôïõò Üëëïõò, Ýôóé ç ðñáãìáôéêÞ äéáìåôáãùãÞ áõîÜíåé áíáëïãéêÜ ìå ôï ðëÞèïò ôùí äßóêùí ðïõ ÷ñçóéìïðïéïýíôáé.

Ç ðñáãìáôéêÞ áýîçóç ôçò äéáìåôáãùãÞò åßíáé öõóéêÜ ìéêñüôåñç áðü ôï ðëÞèïò ôùí äßóêùí ðïõ ÷ñçóéìïðïéïýíôáé: áí êáé êÜèå äßóêïò åßíáé éêáíüò íá ìåôáöÝñåé äåäïìÝíá ðáñÜëëçëá ìå ôïõò Üëëïõò, äåí õðÜñ÷åé ôñüðïò íá åîáóöáëßóïõìå üôé ïé áéôÞóåéò ìåôáöïñÜò êáôáíÝìïíôáé ïìïéüìïñöá óå üëïõò ôïõò äßóêïõò. Åßíáé áíáðüöåõêôï üôé ôï öïñôßï óå Ýíá äßóêï èá åßíáé ìåãáëýôåñï áðü ôï öïñôßï óå êÜðïéï Üëëï.

Ç ïìïéüìïñößá êáôáíïìÞò ôïõ öïñôßïõ óôïõò äßóêïõò, åîáñôÜôáé óå ìåãÜëï âáèìü áðü ôïí ôñüðï ðïõ Ý÷ïõí ìïéñáóôåß ôá äåäïìÝíá óå áõôïýò. Óôçí ðáñáêÜôù óõæÞôçóç, åßíáé âïëéêü íá óêåöôüìáóôå ôïí áðïèçêåõôéêü ÷þñï åíüò äßóêïõ ùò Ýíá ìåãÜëï áñéèìü áðü ôïìåßò ôïõ ïðïßïõò Ý÷ïõìå ðñüóâáóç ìå âÜóç Ýíá áñéèìü, áêñéâþò üðùò ïé óåëßäåò óå Ýíá âéâëßï. Ç ðéï ðñïöáíÞò ìÝèïäïò åßíáé íá ÷ùñßóïõìå ôïí åéêïíéêü äßóêï óå ïìÜäåò áðü óõíå÷üìåíïõò ôïìåßò, üðïõ êáèåìßá Ý÷åé ôï ìÝãåèïò ôïõ ðñáãìáôéêïý öõóéêïý äßóêïõ, êáé íá ôéò áðïèçêåýóïõìå ìå áõôü ôïí ôñüðï, ðåñßðïõ óáí íá ðáßñíáìå Ýíá ìåãÜëï âéâëßï êáé íá ôï ÷ùñßæáìå óå ìéêñüôåñïõò ôüìïõò. Ç ìÝèïäïò áõôÞ ïíïìÜæåôáé *óõíÝíùóç (concatenation)* êáé Ý÷åé ôï ðëåïíÝêôçìá üôé äåí áðáéôåß ôá ìåãÝèç ôùí äßóêùí íá Ý÷ïõí êÜðïéá ó÷Ýóç ìåôáîý ôïõò. Ëåéôïõñãåß ðïëý êáëÜ üôáí ç ðñüóâáóç óôïí åéêïíéêü äßóêï åßíáé ïìïéüìïñöá êáôáíåìçìÝíç óå üëç ôçí ðåñéï÷Þ äéåõèýíóåùí ôïõ. ¼ôáí ç ðñüóâáóç óõãêåíôñþíåôáé óå ìéá ìéêñüôåñç ðåñéï÷Þ, ç âåëôßùóç åßíáé ìéêñüôåñç. Ôï Ó÷Þìá 22-1 äåß÷íåé ôçí áêïëïõèßá ìå ôçí ïðïßá ãßíåôáé ç êáôáíïìÞ ôùí èÝóåùí áðïèÞêåõóçò üôáí ÷ñçóéìïðïéåßôáé ç óõíÝíùóç.

Ó÷Þìá 22-1. ÏñãÜíùóç ÓõíÝíùóçò

Disk 1	Disk 2	Disk 3	Disk 4
0	6	10	12
1	7	11	13
2	8		14
3	9		15
4			16
5			17

¸íáò åíáëëáêôéêüò ôñüðïò áðïèÞêåõóçò, åßíáé íá ÷ùñéóôåß ç ðåñéï÷Þ äéåõèýíóåùí óå ìéêñüôåñá ôìÞìáôá ßóïõ ìåãÝèïõò ôá ïðïßá íá áðïèçêåýïíôáé óåéñéáêÜ óå äéáöïñåôéêÝò óõóêåõÝò. Ãéá ðáñÜäåéãìá, ïé ðñþôïé 256 ôïìåßò ìðïñåß íá åßíáé áðïèçêåõìÝíïé óôïí ðñþôï äßóêï, ïé åðüìåíïé 256 óôïí åðüìåíï äßóêï, ê.ï.ê. ÌåôÜ ôçí ÷ñÞóç êáé ôïõ ôåëåõôáßïõ äßóêïõ, ç äéáäéêáóßá åðáíáëáìâÜíåôáé ìÝ÷ñé íá ãåìßóïõí üëïé ïé äßóêïé. ÁõôÞ ç ìÝèïäïò ïíïìÜæåôáé *striping* Þ RAID-0. [1] Ôï striping áðáéôåß êÜðùò ðåñéóóüôåñç ðñïóðÜèåéá ãéá ôïí åíôïðéóìü ôùí äåäïìÝíùí êáé ìðïñåß íá ðñïêáëÝóåé ìåãáëýôåñï öïñôßï I/O üôáí ìéá ìåôáöïñÜ êáôáíÝìåôáé óå ðïëëáðëïýò äßóêïõò, áëëÜ áðü ôçí Üëëç åðéôõã÷Üíåé ìåãáëýôåñï óôáèåñü öïñôßï óå êÜèå äßóêï. Ôï Ó÷Þìá 22-2 äåß÷íåé ôç óåéñÜ ìå ôçí ïðïßá ÷ñçóéìïðïéïýíôáé ïé ìïíÜäåò áðïèÞêåõóçò óå ìéá ïñãÜíùóç ôýðïõ stripe.

Ó÷Þìá 22-2. Striped Organization

Disk 1	Disk 2	Disk 3	Disk 4
0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
20	21	22	23

22.4 Áêåñáéüôçôá ÄåäïìÝíùí

Ôï ôåëåõôáßï ðñüâëçìá ìå ôçí ôñÝ÷ïõóá ôå÷íïëïãßá äßóêùí, åßíáé ç áíáîéïðéóôßá ôïõò. Áí êáé ôá ôåëåõôáßá ÷ñüíéá ç áîéïðéóôßá ôùí äßóêùí Ý÷åé áõîçèåß óçìáíôéêÜ, åîáêïëïõèïýí íá åßíáé ôï åîÜñôçìá ìå ôï ìåãáëýôåñï ñõèìü áðïôõ÷ßáò óôïõò åîõðçñåôçôÝò. ¼ôáí áðïôý÷åé Ýíáò äßóêïò, ôá áðïôåëÝóìáôá ìðïñåß íá åßíáé êáôáóôñïöéêÜ: ç áíôéêáôÜóôáóç åíüò ÷áëáóìÝíïõ äßóêïõ êáé ç áíôéãñáöÞ ôùí äåäïìÝíùí óôïí íÝï ìðïñåß íá äéáñêÝóåé ìÝñåò.

Ï ðáñáäïóéáêüò ôñüðïò áíôéìåôþðéóçò áõôïý ôïõ ðñïâëÞìáôïò åßíáé ôï *mirroring* (êáèñåðôéóìüò), ç äéáôÞñçóç äçëáäÞ äýï áíôéãñÜöùí ôùí äåäïìÝíùí óå äéáöïñåôéêïýò äßóêïõò. Ìå ôçí åöåýñåóç ôùí äéÜöïñùí åðéðÝäùí RAID, ç ôå÷íéêÞ áõôÞ Ýãéíå åðßóçò ãíùóôÞ ìå ôçí ïíïìáóßá RAID åðéðÝäïõ 1 Þ áðëþò RAID-1. ÊÜèå åããñáöÞ óôïí ôüìï ãßíåôáé êáé óôïõò äýï äßóêïõò. Ç áíÜãíùóç ìðïñåß íá ãßíåé áðü ïðïéïäÞðïôå äßóêï, Ýôóé áí Ýíáò áðü ôïõò äýï áðïôý÷åé, ôá äåäïìÝíá åîáêïëïõèïýí íá åßíáé äéáèÝóéìá óôïí Üëëï.

Ôï mirroring Ý÷åé äýï ðñïâëÞìáôá:

- Ôï êüóôïò. Áðáéôåß äéðëÜóéï êüóôïò áðü ïðïéïäÞðïôå ëýóç äåí ðñïóöÝñåé áõôÞ ôç ëåéôïõñãßá.
- Ôç ìåßùóç ôçò áðüäïóçò. Ïé åããñáöÝò ðñÝðåé íá ãßíïíôáé êáé óôïõò äýï äßóêïõò, êáôáíáëþíïíôáò Ýôóé ôï äéðëÜóéï åýñïò æþíçò óå ó÷Ýóç ìå Ýíá ôüìï ðïõ äåí ÷ñçóéìïðïéåß mirror. Ç áíÜãíùóç äåí õðïöÝñåé áðü ôï ßäéï ðñüâëçìá. ÌÜëéóôá öáßíåôáé íá åßíáé êáé ãñçãïñüôåñç.

Ìéá åíáëëáêôéêÞ ëýóç åßíáé ôï *parity* (éóïôéìßá), ôï ïðïßï õëïðïéåßôáé óôá åðßðåäá 2, 3, 4 êáé 5 ôïõ RAID. Áðü ôá åðßðåäá áõôÜ, ôï RAID-5 åßíáé ôï ðéï åíäéáöÝñïí. Ï ôñüðïò ðïõ õëïðïéåßôáé óôï Vinum, åßíáé ìéá ðáñáëëáãÞ ôçò ïñãÜíùóçò äåäïìÝíùí ðïõ ÷ñçóéìïðïéåßôáé óôï stripe, ìå ôç äéáöïñÜ üôé Ýíá ìðëïê áðü êÜèå stripe ÷ñçóéìïðïéåßôáé ãéá íá áðïèçêåýåé ôçí éóïôéìßá åíüò Üëëïõ ìðëïê. Óôï Vinum, ìéá õöÞíáíóç RAID-5, åßíáé ðáñüìïéá ìå ìéá õöÞíáíóç stripe, åêôüò áðü ôï ãåãïíüò üôé õëïðïéåß RAID-5 êáèþò êÜèå stripe ðåñéÝ÷åé êáé ìðëïê éóïôéìßáò. Ç ôïðïèåóßá ôïõ ìðëïê éóïôéìßáò, áëëÜæåé áðü ôï Ýíá stripe óôï åðüìåíï, êÜôé ðïõ áðáéôåßôáé áðü ôï RAID-5. Ïé áñéèìïß óôá ìðëïê äåäïìÝíùí áíáöÝñïíôáé óôç ó÷åôéêÞ áñßèìçóç ôïõò.

Ó÷Þìá 22-3. RAID-5 Organization

Disk 1	Disk 2	Disk 3	Disk 4
0	1	2	Parity
3	4	Parity	5
6	Parity	7	8
Parity	9	10	11
12	13	14	Parity
15	16	Parity	17

Óå óýãêñéóç ìå ôï mirror, ôï RAID-5 Ý÷åé ôï ðëåïíÝêôçìá íá áðáéôåß óçìáíôéêÜ ëéãüôåñï ÷þñï áðïèÞêåõóçò. Ç ôá÷ýôçôá áíÜãíùóçò åßíáé ßäéá ìå ôï stripe, áëëÜ ç åããñáöÞ åßíáé óçìáíôéêÜ ðéï áñãÞ, ðåñßðïõ ôï 25% ôçò áðüäïóçò êáôÜ ôçí áíÜãíùóç. Áí Ýíáò äßóêïò ÷áëÜóåé, ç óõóôïé÷ßá åîáêïëïõèåß íá ëåéôïõñãåß óå åëáôôùìÝíç (degraded) êáôÜóôáóç: ç áíÜãíùóç áðü ôïõò äßóêïõò ðïõ ëåéôïõñãïýí êáíïíéêÜ óõíå÷ßæåôáé áðñïâëçìÜôéóôá, áëëÜ ç áíÜãíùóç äåäïìÝíùí ðïõ âñßóêïíôáí óôïí ðñïâëçìáôéêü äßóêï ðñÝðåé íá åðáíáûðïëïãéóôåß ìå âÜóç ôá áíôßóôïé÷á ìðëïê éóïôéìßáò ðïõ âñßóêïíôáé óå üëïõò ôïõò Üëëïõò äßóêïõò.

22.5 Áíôéêåßìåíá ôïõ Vinum

Ãéá ôçí áíôéìåôþðéóç ôùí ðáñáðÜíù ðñïâëçìÜôùí, ôï Vinum õëïðïéåß ìéá éåñáñ÷ßá áíôéêåéìÝíùí ôåóóÜñùí åðéðÝäùí:

- Ôï ðëÝïí ïñáôü áíôéêåßìåíï åßíáé ï åéêïíéêüò äßóêïò, ï ïðïßïò êáëåßôáé êáé *ôüìïò (volume)*. Ïé ôüìïé Ý÷ïõí ïõóéáóôéêÜ ôéò ßäéåò éäéüôçôåò ìå Ýíá äßóêï ôïõ UNIX, áí êáé õðÜñ÷ïõí êÜðïéåò ìéêñÝò äéáöïñÝò. Äåí õðÜñ÷ïõí ðåñéïñéóìïß üóï áöïñÜ ôï ìÝãåèïò ôïõò.
- Ïé ôüìïé áðïôåëïýíôáé áðü *plex*, êáé êÜèå Ýíá áðü áõôÜ áíôéðñïóùðåýåé ôï óõíïëéêü ÷þñï äéåõèýíóåùí åíüò ôüìïõ. Áõôü ôï åðßðåäï óôçí éåñáñ÷ßá ðáñÝ÷åé ôç äõíáôüôçôá redundancy. Ìðïñåßôå íá óêåöôåßôå ôá plex ùò ìåìïíùìÝíïõò äßóêïõò óå ìéá óõóôïé÷ßá mirror, üðïõ êÜèå Ýíá ðåñéÝ÷åé ôá ßäéá äåäïìÝíá.
- Êáèþò ôï Vinum õðÜñ÷åé ìÝóá óôï ðëáßóéï ëåéôïõñãéþí ôïõ UNIX ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí áðïèÞêåõóç óå äßóêïõò, èá ìðïñïýóå íá ÷ñçóéìïðïéÞóåé ôéò êáôáôìÞóåéò ôïõ UNIX ùò ôï äïìéêü óôïé÷åßï ãéá ôç äçìéïõñãßá ôùí plex. Óôçí ðñáãìáôéêüôçôá, ç ëýóç áõôÞ áðïäåéêíýåôáé éäéáßôåñá ðåñéïñéóôéêÞ: ïé äßóêïé óôï UNIX ìðïñïýí íá Ý÷ïõí ðåñéïñéóìÝíï áñéèìü êáôáôìÞóåùí. Áíôßèåôá, ôï Vinum õðïäéáéñåß ìéá ìüíï êáôÜôìçóç ôïõ UNIX (ôïí *ïäçãü*) óå óõíå÷üìåíåò ðåñéï÷Ýò ðïõ êáëïýíôáé *õðïäßóêïé (subdisks)*. Ïé õðïäßóêïé ÷ñçóéìïðïéïýíôáé ùò ôá äïìéêÜ óôïé÷åßá ãéá ôá plex.
- Ïé õðïäßóêïé âñßóêïíôáé óå *ïäçãïýò* Vinum, ðïõ ôç äåäïìÝíç óôéãìÞ åßíáé êáôáôìÞóåéò ôïõ UNIX. Ïé ïäçãïß ôïõ Vinum ìðïñïýí íá ðåñéÝ÷ïõí ïðïéïäÞðïôå áñéèìü áðü õðïäßóêïõò. Ìå åîáßñåóç ìéá ìéêñÞ ðåñéï÷Þ óôçí áñ÷Þ ôïõ äßóêïõ (ç ïðïßá ÷ñçóéìïðïéåßôáé ãéá ôçí áðïèÞêåõóç äåäïìÝíùí ñýèìéóçò êáé êáôÜóôáóçò) üëïò ï õðüëïéðïò ïäçãüò åßíáé äéáèÝóéìïò ãéá áðïèÞêåõóç äåäïìÝíùí.

Ïé ðáñáêÜôù åíüôçôåò ðåñéãñÜöïõí ôïí ôñüðï ìå ôïí ïðïßï áõôÜ ôá áíôéêåßìåíá ðáñÝ÷ïõí ôçí ëåéôïõñãéêüôçôá ðïõ áðáéôåßôáé áðü ôï Vinum.

22.5.1 ÌÝãåèïò Ôüìïõ

Ôá plex ìðïñïýí íá ðåñéëáìâÜíïõí ðïëëáðëïýò õðïäßóêïõò, ðïõ êáôáíÝìïíôáé óå üëïõò ôïõò ïäçãïýò ôïõ Vinum. Óáí áðïôÝëåóìá, ôï ìÝãåèïò åíüò óõãêåêñéìÝíïõ äßóêïõ äåí ðåñéïñßæåé ôï ìÝãåèïò ïýôå ôïõ plex, ïýôå ôïõ ôüìïõ.

22.5.2 ÐëåïíÜæïõóá (Redundant) ÁðïèÞêåõóç ÄåäïìÝíùí

Ôï Vinum õëïðïéåß ôï mirroring ðñïóáñôþíôáò ðïëëáðëÜ plex óå Ýíá ôüìï. ÊÜèå plex åßíáé ìéá áíáðáñÜóôáóç ôùí äåäïìÝíùí åíüò ôüìïõ. ¸íáò ôüìïò ìðïñåß íá ðåñéÝ÷åé ìåôáîý åíüò êáé ïêôþ plex.

Áí êáé Ýíá plex áíôéðñïóùðåýåé ôá ðëÞñç äåäïìÝíá åíüò ôüìïõ, åßíáé äõíáôüí êÜðïéá ìÝñç ôçò áíáðáñÜóôáóçò íá ëåßðïõí áðü ôï öõóéêü ìÝóï, åßôå åðåéäÞ Ý÷åé ó÷åäéáóôåß ìå áõôü ôï ôñüðï (áí äåí Ý÷åé ïñéóôåß õðïäßóêïò ãéá êÜðïéá ôìÞìáôá ôïõ plex) Þ áðü ðñüâëçìá (ùò áðïôÝëåóìá ôçò áðþëåéáò êÜðïéïõ äßóêïõ). ¼óï õðÜñ÷åé ôïõëÜ÷éóôïí Ýíá plex ðïõ ìðïñåß íá ðáñÝ÷åé ôá äåäïìÝíá ãéá ôçí ðëÞñç ðåñéï÷Þ äéåõèýíóåùí ôïõ ôüìïõ, ï ôüìïò åßíáé ðëÞñùò ëåéôïõñãéêüò.

22.5.3 ÈÝìáôá Áðüäïóçò

Ôï Vinum õëïðïéåß ôüóï óõíÝíùóç üóï êáé striping óå åðßðåäï plex:

- ¸á *plex óõíÝíùóçò (concatenated)* ÷ñçóéìïðïéåß ôçí ðåñéï÷Þ äéåõèýíóåùí êÜèå õðïäßóêïõ ìå ôç óåéñÜ.
- ¸á *striped plex* ãñÜöåé ôá äåäïìÝíá óå ëùñßäåò (stripes) ðïõ êáôáíÝìïíôáé óå êÜèå õðïäßóêï. ¼ëïé ïé õðïäßóêïé ðñÝðåé íá Ý÷ïõí ôï ßäéï ìÝãåèïò êáé ðñÝðåé íá õðÜñ÷ïõí ôïõëÜ÷éóôïí äýï õðïäßóêïé, ãéá íá îå÷ùñßæïõí óå ó÷Ýóç ìå ôï plex óõíÝíùóçò.

22.5.4 Åßäç ÏñãÜíùóçò Plex

Ç Ýêäïóç ôïõ Vinum ðïõ ðáñÝ÷åôáé ìå ôï FreeBSD 9.1 õëïðïéåß äýï åßäç plex:

- Ôá plex óõíÝíùóçò ðñïóöÝñïõí ôç ìåãáëýôåñç åõåëéîßá: ìðïñïýí íá ðåñéÝ÷ïõí ïðïéïäÞðïôå áñéèìü õðïäßóêùí, êáé ïé õðïäßóêïé áõôïß ìðïñåß íá åßíáé äéáöïñåôéêïý ìåãÝèïõò. Ôï plex ìðïñåß íá åðåêôáèåß ðñïóèÝôïíôáò ðåñéóóüôåñïõò õðïäßóêïõò. ×ñåéÜæïíôáé ëéãüôåñï ÷ñüíï CPU óå ó÷Ýóç ìå ôá stripes, áí êáé ç äéáöïñÜ óôç ÷ñÞóç ôçò CPU äåí åßíáé ìåôñÞóéìç. Áðü ôçí Üëëç ìåñéÜ, åßíáé ðéï åðéññåðÞ óå ìç-éóïññïðçìÝíç ëåéôïõñãßá, üðïõ Ýíáò äßóêïò åßíáé ðïëý åíåñãüò êáé ïé õðüëïéðïé áäñáíåßò.
- Ôï ìåãáëýôåñï ðëåïíÝêôçìá ôùí stripes (RAID-0), åßíáé üôé Ý÷ïõí ðéï éóïññïðçìÝíç ëåéôïõñãßá: åðéëÝãïíôáò ôï ùóôü ìÝãåèïò ëùñßäáò (ðåñßðïõ 256 kB), ìðïñåßôå íá åîéóïññïðÞóåôå ôï öïñôßï óå êÜèå äßóêï ôïõ plex. Ôá ìåéïíåêôÞìáôá áõôÞò ôçò ìåèüäïõ åßíáé (åëáöñÜ) ðéï ðïëýðëïêï êþäéêáò êáé ðåñéïñéóìïß óôïõò õðïäßóêïõò: ðñÝðåé üëïé íá åßíáé ôï ßäéï ìÝãåèïò êáé ç åðÝêôáóç åíüò plex ìå ðñïóèÞêç ðåñéóóüôåñùí äßóêùí åßíáé ôüóï ðïëýðëïêç ðïõ ôç äåäïìÝíç óôéãìÞ ôï Vinum äåí ôçí õëïðïéåß. Ôï Vinum åðßóçò åðéâÜëëåé Ýíá áêüìá áðëïúêü ðåñéïñéóìü: Ýíá plex ôýðïõ stripe ðñÝðåé íá äéáèÝôåé ôïõëÜ÷éóôïí äýï õðïäßóêïõò, äéáöïñåôéêÜ åßíáé áäýíáôï íá ôï îå÷ùñßóïõìå áðü Ýíá plex óõíÝíùóçò.

Ï Ðßíáêáò 22-1 äåß÷íåé ðåñéëçðôéêÜ ôá ðëåïíåêôÞìáôá êáé ìåéïíåêôÞìáôá êÜèå åßäïõò ïñãÜíùóçò plex.

Ðßíáêáò 22-1. Åßäç ÏñãÜíùóçò Vinum Plex

Ôýðïò plex	ÅëÜ÷éóôï ðëÞèïò õðïäßóêùí	Äõíáôüôçôá ðñïóèÞêçò õðïäßóêùí	Ïé õðïäßóêïé ðñÝðåé íá åßíáé ßäéïõ ìåãÝèïõò	ÅöáñìïãÞ
óõíÝíùóçò (concatenated)	1	íáé	ü÷é	ÁðïèÞêåõóç ìåãÜëïõ üãêïõ äåäïìÝíùí ìå ìÝãéóôç åõåëéîßá óôïí ôñüðï êáôáíïìÞò êáé ìÝôñéá áðüäïóç.
striped	2	ü÷é	íáé	ÕøçëÞ áðüäïóç óå óõíäõáóìü ìå ðïëý êáëÝò ôá÷ýôçôåò óå êáôáóôÜóåéò ðïëëáðëÞò ðñüóâáóçò.

22.6 ÌåñéêÜ Ðáñáäåßãìáôá

Ôï Vinum äéáôçñåß ìéá *âÜóç äåäïìÝíùí ìå ôéò ñõèìßóåéò ôïõ* ç ïðïßá ðåñéãñÜöåé ôá áíôéêåßìåíá ôá ïðïßá ãíùñßæåé Ýíá óõãêåêñéìÝíï óýóôçìá. Áñ÷éêÜ, ï ÷ñÞóôçò äçìéïõñãåß áõôÞ ôç âÜóç äåäïìÝíùí áðü Ýíá Þ ðåñéóóüôåñá áñ÷åßá ñõèìßóåùí, ìå ôçí âïÞèåéá ôïõ ðñïãñÜììáôïò gvinum(8). Ôï vinum áðïèçêåýåé Ýíá áíôßãñáöï ôçò âÜóçò äåäïìÝíùí óå êÜèå slice ôïõ äßóêïõ (ðïõ ôï Vinum áðïêáëåß *óõóêåõÞ*) ðïõ âñßóêåôáé õðü ôïí Ýëåã÷ï ôïõ. Ç âÜóç äåäïìÝíùí áíáíåþíåôáé óå êÜèå áëëáãÞ êáôÜóôáóçò, þóôå üëá ôá áíôéêåßìåíá ôïõ Vinum íá åðáíÝñ÷ïíôáé óôç óùóôÞ êáôÜóôáóç ìåôÜ áðü ìéá åðáíåêêßíçóç.

22.6.1 Ôï Áñ÷åßï Ñõèìßóåùí

Ôï áñ÷åßï ñõèìßóåùí ðåñéãñÜöåé ôá ìåìïíùìÝíá áíôéêåßìåíá ôïõ Vinum. Ï ïñéóìüò ãéá Ýíá áðëü ôüìï ìðïñåß íá ìïéÜæåé ìå ôïí ðáñáêÜôù:

```
drive a device /dev/da3h
volume myvol
  plex org concat
    sd length 512m drive a
```

Áõôü ôï áñ÷åßï ðåñéãñÜöåé ôÝóóåñá áíôéêåßìåíá ôïõ Vinum:

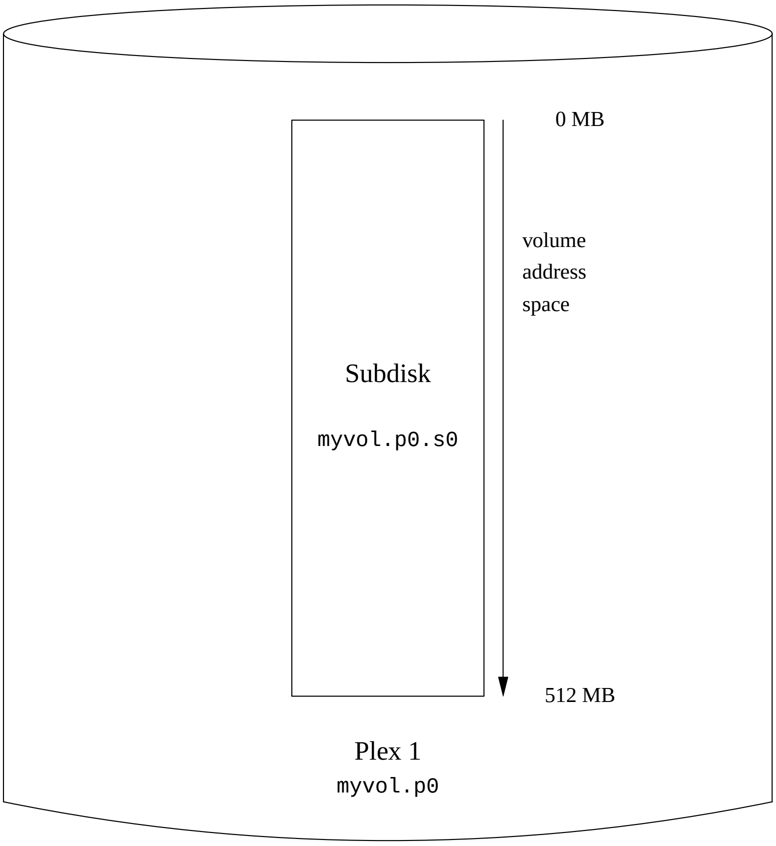
- Ç ãñáììÞ *drive* ðåñéãñÜöåé ìéá êáôÜôìçóç äßóêïõ (*ïäçãïý*) êáé ôç èÝóç ôçò óå ó÷Ýóç ìå ôï öõóéêü äßóêï. Äßíåôáé óå áõôÞ ôï óõìâïëéêü üíïìá *a*. Áõôüò ï äéá÷ùñéóìüò ôùí óõìâïëéêþí áðü ôá ðñáãìáôéêÜ ïíüìáôá óõóêåõþí, ìáò åðéôñÝðåé íá ìåôáöÝñïõìå äßóêïõò áðü ìéá èÝóç óå ìéá Üëëç ÷ùñßò íá ðñïêëçèåß óýã÷õóç.
- Ç ãñáììÞ *volume* ðåñéãñÜöåé Ýíá ôüìï. Ôï ìüíï áðáéôïýìåíï ÷áñáêôçñéóôéêü åßíáé ôï üíïìá, óôçí ðåñßðôùóç ìáò *myvol*.
- Ç ãñáììÞ *plex* ïñßæåé Ýíá plex. Ç ìüíç áðáñáßôçôç ðáñÜìåôñïò åßíáé ôï åßäïò ôçò ïñãÜíùóçò, óôç óõãêåêñéìÝíç ðåñßðôùóç ôï *concat*. Äåí åßíáé áðáñáßôçôï íá äïèåß üíïìá: ôï óýóôçìá ðáñÜãåé áõôüìáôá Ýíá üíïìá ÷ñçóéìïðïéþíôáò ôï üíïìá ôïõ ôüìïõ êáé ôçí êáôÜëçîç *.px*, üðïõ ôï *x* åßíáé ï áñéèìüò ôïõ plex óôïí ôüìï. ¸ôóé, áõôü ôï plex èá êáëåßôáé *myvol.p0*.
- Ç ãñáììÞ *sd* ðåñéãñÜöåé Ýíá õðïäßóêï. Ïé åëÜ÷éóôåò áðáéôïýìåíåò ðñïäéáãñáöÝò åßíáé ôï üíïìá åíüò äßóêïõ óôïí ïðïßï èá áðïèçêåõôåß, êáé ôï ìÞêïò ôïõ õðïäßóêïõ. ¼ðùò óõìâáßíåé êáé ìå ôá plex, äåí áðáéôåßôáé üíïìá: ôï óýóôçìá áðïäßäåé ïíüìáôá áõôüìáôá, ÷ñçóéìïðïéþíôáò ùò óçìåßï åêêßíçóçò ôï üíïìá ôïõ plex êáé ðñïóèÝôïíôáò ôçí êáôÜëçîç *.sx*, üðïõ ôï *x* åßíáé ï áñéèìüò ôïõ õðïäßóêïõ óôï plex. ¸ôóé, ôï Vinum äßíåé óå áõôüí ôïí õðïäßóêï ôï üíïìá *myvol.p0.s0*.

ÌåôÜ ôçí åðåîåñãáóßá áõôïý ôïõ áñ÷åßïõ, ôï gvinum(8) ðáñÜãåé ôçí áêüëïõèç Ýîïäï:

```
# gvinum -> create config1
Configuration summary
Drives:         1 (4 configured)
Volumes:        1 (4 configured)
Plexes:         1 (8 configured)
Subdisks:       1 (16 configured)

  D a                     State: up       Device /dev/da3h        Avail: 2061/2573 MB (80%)

  V myvol                 State: up       Plexes:       1 Size:        512 MB

  P myvol.p0            C State: up       Subdisks:     1 Size:        512 MB

  S myvol.p0.s0           State: up       PO:        0  B Size:        512 MB
```

Ç ðáñáðÜíù Ýîïäïò ÷ñçóéìïðïéåß ôç ìïñöÞ óõíôïìåõìÝíçò ëßóôáò ôïõ gvinum(8). Ç ãñáöéêÞ áðåéêüíéóç öáßíåôáé óôï Ó÷Þìá 22-4.

Ó÷Þìá 22-4. ¸íáò Áðëüò Ôüìïò Vinum



Óôï ó÷Þìá áõôü (êáèþò êáé óå áõôÜ ðïõ áêïëïõèïýí) õðÜñ÷åé ç áíáðáñÜóôáóç åíüò ôüìïõ ðïõ ðåñéÝ÷åé ôá plex, ôá ïðïßá ìå ôç óåéñÜ ôïõò ðåñéÝ÷ïõí ôïõò õðïäßóêïõò. Óå áõôü ôï áðëïõóôåõìÝíï ðáñÜäåéãìá, ï ôüìïò ðåñéÝ÷åé Ýíá plex êáé ôï plex ðåñéÝ÷åé Ýíá õðïäßóêï.

Ï ôüìïò áõôüò äåí Ý÷åé êÜðïéï óõãêåêñéìÝíï ðëåïíÝêôçìá óå ó÷Ýóç ìå ìéá óõìâáôéêÞ êáôÜôìçóç äßóêïõ. ÐåñéÝ÷åé Ýíá ìüíï plex, Üñá äåí Ý÷åé êÜðïéá éêáíüôçôá áíï÷Þò óöáëìÜôùí. Ôï plex ðåñéÝ÷åé åðßóçò Ýíá õðïäßóêï, êáé Ýôóé äåí õðÜñ÷åé äéáöïñÜ óôçí êáôáíïìÞ ÷þñïõ óå ó÷Ýóç ìå ìéá óõìâáôéêÞ êáôÜôìçóç. Óôéò åðüìåíåò åíüôçôåò èá äåßîïõìå äéáöïñåôéêÝò êáé ðéï åíäéáöÝñïõóåò ìåèüäïõò ñýèìéóçò.

22.6.2 ÁõîçìÝíç Áîéïðéóôßá: Mirroring

Ç áîéïðéóôßá åíüò ôüìïõ ìðïñåß íá áõîçèåß ìÝóù ôïõ mirroring (êáèñåðôéóìïý). ¼ôáí ó÷åäéÜæåôå Ýíá ôüìï óôïí ïðïßï èá ãßíåé mirroring, åßíáé óçìáíôéêü íá åîáóöáëßóåôå üôé ïé õðïäßóêïé óå êÜèå plex åßíáé óå äéáöïñåôéêïýò ïäçãïýò, þóôå ç áðïôõ÷ßá åíüò äßóêïõ íá ìçí ðñïêáëÝóåé ðáýóç ëåéôïõñãßáò êáé óôá äýï plex. Ôï ðáñáêÜôù ðáñÜäåéãìá äåß÷íåé ðùò ìðïñåß íá ãßíåé mirroring åíüò ôüìïõ:

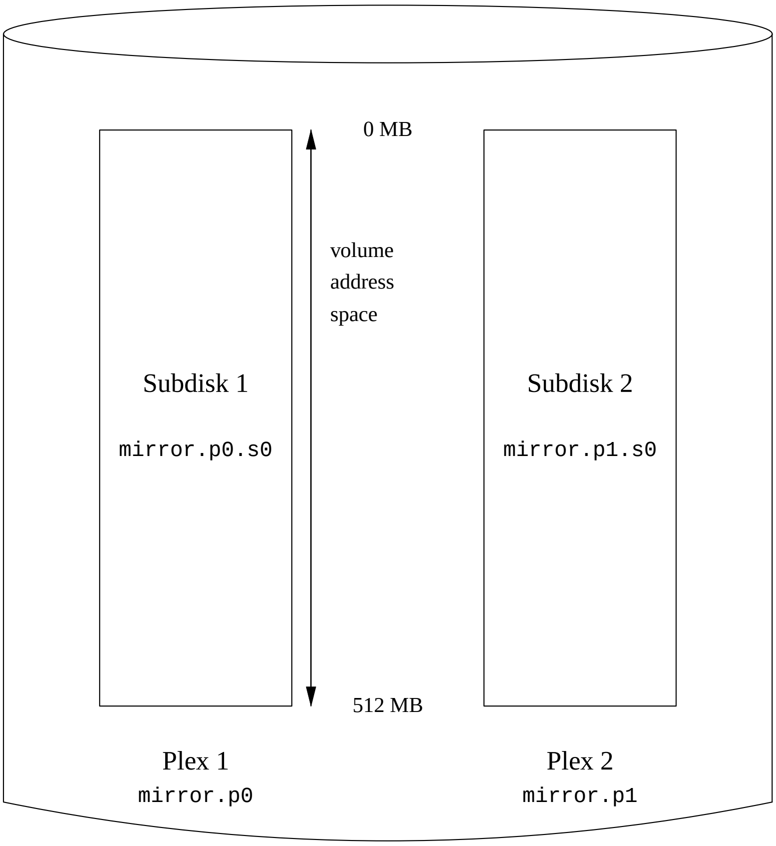
```
  drive b device /dev/da4h
  volume mirror
plex org concat
  sd length 512m drive a
    plex org concat
      sd length 512m drive b
```

Óôï ðáñÜäåéãìá áõôü, äåí Þôáí áðáñáßôçôï íá êáèïñéóôåß îáíÜ ï ïäçãüò *a*, êáèþò ôï Vinum äéáèÝôåé Þäç ôéò áíôßóôïé÷åò êáôá÷ùñßóåéò óôç âÜóç äåäïìÝíùí ìå ôéò ñõèìßóåéò ôïõ. ÌåôÜ ôçí åðåîåñãáóßá ôùí ðáñáðÜíù ïñéóìþí, ç ñýèìéóç ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
    Drives:         2 (4 configured)
    Volumes:        2 (4 configured)
    Plexes:         3 (8 configured)
    Subdisks:       3 (16 configured)

    D a                     State: up       Device /dev/da3h        Avail: 1549/2573 MB (60%)
    D b                     State: up       Device /dev/da4h        Avail: 2061/2573 MB (80%)

V myvol                 State: up       Plexes:       1 Size:        512 MB
V mirror                State: up       Plexes:       2 Size:        512 MB

P myvol.p0            C State: up       Subdisks:     1 Size:        512 MB
P mirror.p0           C State: up       Subdisks:     1 Size:        512 MB
P mirror.p1           C State: initializing     Subdisks:     1 Size:        512 MB

S myvol.p0.s0           State: up       PO:        0  B Size:        512 MB
    S mirror.p0.s0          State: up       PO:        0  B Size:        512 MB
    S mirror.p1.s0          State: empty    PO:        0  B Size:        512 MB
```

Ôï Ó÷Þìá 22-5 áíáðáñéóôÜ áõôÞ ôç äïìÞ ãñáöéêÜ.

Ó÷Þìá 22-5. ¸íáò Mirrored Ôüìïò Vinum



Óôï ðáñÜäåéãìá áõôü, êÜèå plex ðåñéÝ÷åé ôçí ðëÞñç ðåñéï÷Þ äéåõèýíóåùí, ìåãÝèïõò 512 MB. ¼ðùò êáé óôï ðñïçãïýìåíï ðáñÜäåéãìá, êÜèå plex ðåñéÝ÷åé Ýíá ìïíáäéêü õðïäßóêï.

22.6.3 Âåëôéóôïðïéþíôáò ôçí Áðüäïóç

Ï mirrored ôüìïò ôïõ ðñïçãïýìåíïõ ðáñáäåßãìáôïò ðáñïõóéÜæåé ìåãáëýôåñç áíï÷Þ óöáëìÜôùí óå ó÷Ýóç ìå Ýíá ôüìï ðïõ äåí ÷ñçóéìïðïéåß mirror, áëëÜ ç áðüäïóç ôïõ åßíáé ìéêñüôåñç: êÜèå åããñáöÞ óôïí ôüìï ðñÝðåé íá ãßíåôáé êáé óôïõò äýï äßóêïõò, ÷ñçóéìïðïéþíôáò Ýôóé ìåãáëýôåñï ðïóïóôü ôïõ äéáèÝóéìïõ åýñïõò æþíçò. Ïé áðáéôÞóåéò ðïõ åíäå÷ïìÝíùò Ý÷ïõìå ãéá áðüäïóç, áðáéôïýí äéáöïñåôéêÞ ðñïóÝããéóç: áíôß íá ÷ñçóéìïðïéÞóïõìå mirror, ìðïñïýìå íá äçìéïõñãÞóïõìå ëùñßäåò áðïèÞêåõóçò (stripes) óå üóï ôï äõíáôüí ðåñéóóüôåñïõò äßóêïõò. Ç ðáñáêÜôù ñýèìéóç äåß÷íåé Ýíá ôüìï óôïí ïðïßï ôï plex Ý÷åé ãßíåé stripe óå ôÝóóåñéò äßóêïõò:

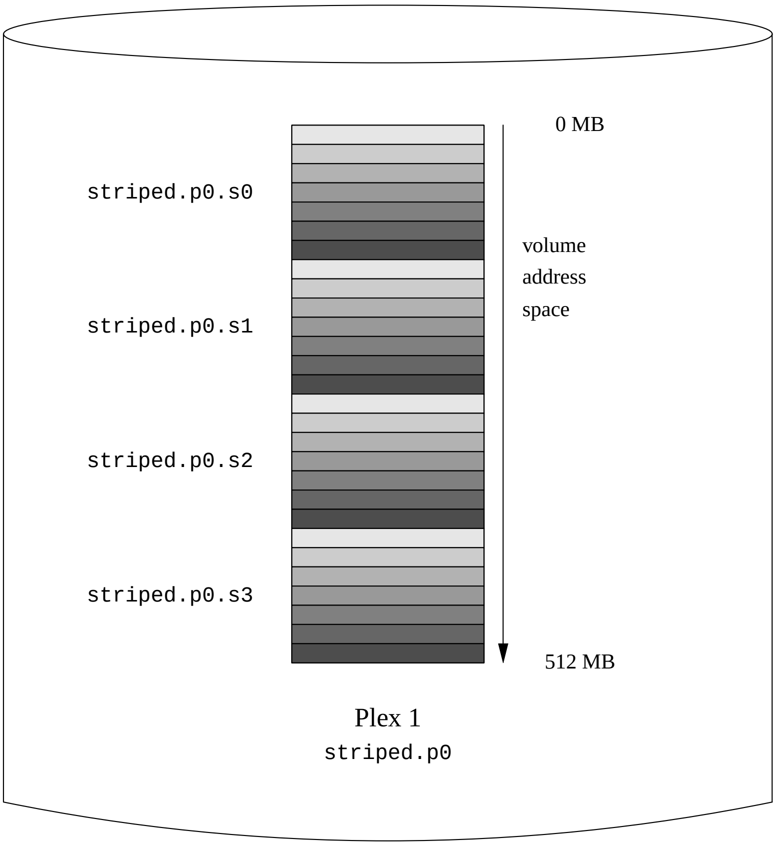
```
drive c device /dev/da5h
drive d device /dev/da6h
volume stripe
plex org striped 512k
```

```
sd length 128m drive a
sd length 128m drive b
sd length 128m drive c
sd length 128m drive d
```

¼ðùò êáé ðñïçãïõìÝíùò, äåí ÷ñåéÜæåôáé íá ïñßóïõìå îáíÜ ôïõò äßóêïõò ðïõ åßíáé Þäç ãíùóôïß óôï Vinum. ÌåôÜ ôçí åðåîåñãáóßá ôïõ ðáñáðÜíù ïñéóìïý, ç ñýèìéóç èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
        Drives:         4 (4 configured)
        Volumes:        3 (4 configured)
        Plexes:         4 (8 configured)
        Subdisks:       7 (16 configured)

    D a                     State: up       Device /dev/da3h        Avail: 1421/2573 MB (55%)
    D b                     State: up       Device /dev/da4h        Avail: 1933/2573 MB (75%)
    D c                     State: up       Device /dev/da5h        Avail: 2445/2573 MB (95%)
    D d                     State: up       Device /dev/da6h        Avail: 2445/2573 MB (95%)

    V myvol                 State: up       Plexes:       1 Size:        512 MB
    V mirror                State: up       Plexes:       2 Size:        512 MB
    V striped               State: up       Plexes:       1 Size:        512 MB

    P myvol.p0            C State: up       Subdisks:     1 Size:        512 MB
    P mirror.p0           C State: up       Subdisks:     1 Size:        512 MB
    P mirror.p1           C State: initializing     Subdisks:     1 Size:        512 MB
    P striped.p1            State: up       Subdisks:     1 Size:        512 MB

    S myvol.p0.s0           State: up       PO:        0  B Size:        512 MB
    S mirror.p0.s0          State: up       PO:        0  B Size:        512 MB
    S mirror.p1.s0          State: empty    PO:        0  B Size:        512 MB
    S striped.p0.s0         State: up       PO:        0  B Size:        128 MB
    S striped.p0.s1         State: up       PO:      512 kB Size:        128 MB
    S striped.p0.s2         State: up       PO:     1024 kB Size:        128 MB
    S striped.p0.s3         State: up       PO:     1536 kB Size:        128 MB
```

Ó÷Þìá 22-6. ¸íáò Striped Ôüìïò Vinum


0 MB
striped.p0.s0
volume
address
space
striped.p0.s1
striped.p0.s2
striped.p0.s3
512 MB
Plex 1
striped.p0

Áõôüò ï ôüìïò áíáðáñßóôáôáé ãñáöéêÜ óôï Ó÷Þìá 22-6. Ç áðü÷ñùóç ôçò ëùñßäáò áíôéðñïóùðåýåé ôç èÝóç ôçò ìÝóá óôï ÷þñï äéåõèýíóåùí ôïõ plex: ïé áíïé÷ôü÷ñùìåò ëùñßäåò åßíáé ïé ðñþôåò, ïé óêïõñü÷ñùìåò åßíáé ïé ôåëåõôáßåò.

22.6.4 Áîéïðéóôßá êáé Áðüäïóç

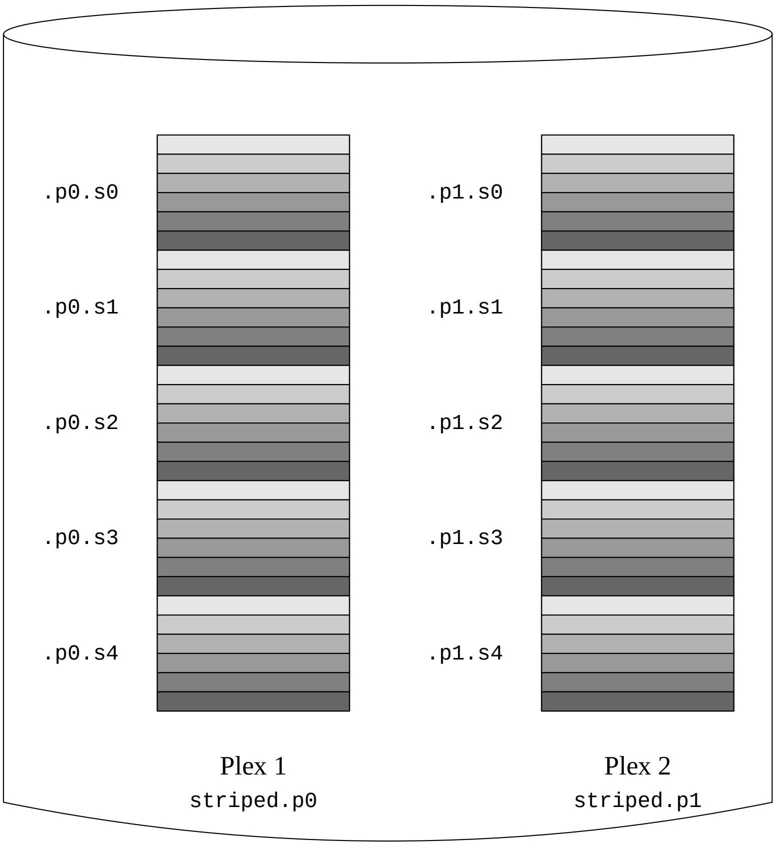
Ìå ôï êáôÜëëçëï õëéêü, åßíáé äõíáôüí íá äçìéïõñãçèïýí ôüìïé ïé ïðïßïé íá ðáñïõóéÜæïõí ôüóï ìåãÜëç áíï÷Þ óå óöÜëìáôá, üóï êáé áõîçìÝíç áðüäïóç óå ó÷Ýóç ìå ôéò ôõðïðïéçìÝíåò êáôáôìÞóåéò ôïõ UNIX. ¸íá ôõðéêü áñ÷åßï ñõèìßóåùí èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
  volume raid10
plex org striped 512k
  sd length 102480k drive a
  sd length 102480k drive b
  sd length 102480k drive c
  sd length 102480k drive d
  sd length 102480k drive e
plex org striped 512k
  sd length 102480k drive c
  sd length 102480k drive d
  sd length 102480k drive e
  sd length 102480k drive a
  sd length 102480k drive b
```

Ïé õðïäßóêïé ôïõ äåýôåñïõ plex Ý÷ïõí ìåôáôåèåß êáôÜ äýï ïäçãïýò óå ó÷Ýóç ìå áõôïýò ôïõ ðñþôïõ plex: áõôü åîáóöáëßæåé üôé ïé åããñáöÝò äåí ãßíïíôáé óôïõò ßäéïõò õðïäßóêïõò, áêüìá êáé áí ìéá ìåôáöïñÜ ÷ñçóéìïðïéåß êáé ôïõò äýï äßóêïõò.

Ôï Ó÷Þìá 22-7 áíáðáñéóôÜ ãñáöéêÜ ôç äïìÞ áõôïý ôïõ ôüìïõ.

Ó÷Þìá 22-7. ¸íáò Mirrored êáé Striped Ôüìïò ôïõ Vinum


.p0.s0
.p0.s1
.p0.s2
.p0.s3
.p0.s4
.p1.s0
.p1.s1
.p1.s2
.p1.s3
.p1.s4
Plex 1
striped.p0
Plex 2
striped.p1

22.7 Ïíïìáóßá ÁíôéêåéìÝíùí

¼ðùò ðåñéãñÜøáìå ðáñáðÜíù, ôï Vinum áðïäßäåé ðñïåðéëåãìÝíá ïíüìáôá óå plex êáé õðïäßóêïõò, áí êáé õðÜñ÷åé ç äõíáôüôçôá íá ôá ðáñáêÜìøåôå. Áõôü ùóôüóï äåí óõíßóôáôáé: ç åìðåéñßá ðïõ Ý÷ïõìå áðü ôï äéá÷åéñéóôÞ ôüìùí VERITAS (ï ïðïßïò åðéôñÝðåé åëåýèåñç áðüäïóç ïíïìÜôùí óôá áíôéêåßìåíá) Ý÷åé äåßîåé üôé áõôïý ôïõ åßäïõò ç åõåëéîßá äåí ðñïóöÝñåé óçìáíôéêÜ ðëåïíåêôÞìáôá, êáé ìðïñåß íá ðñïêáëÝóåé óýã÷õóç.

Ôá ïíüìáôá ìðïñåß íá ðåñéÝ÷ïõí ïðïéïäÞðïôå ìç-êåíü ÷áñáêôÞñá, áëëÜ óõíßóôáôáé íá ðåñéïñßæïíôáé óôç ÷ñÞóç ãñáììÜôùí, áñéèìþí êáé ôçò êÜôù ðáýëáò. Ôá ïíüìáôá ôùí ôüìùí, ôùí plex êáé ôùí õðïäßóêùí ìðïñåß íá åßíáé ìÝ÷ñé 64 ÷áñáêôÞñåò, åíþ ôá ïíüìáôá ôùí äßóêùí ìðïñåß íá åßíáé ìÝ÷ñé 32 ÷áñáêôÞñåò.

Ôá áñ÷åßá óõóêåõþí ôïõ Vinum äçìéïõñãïýíôáé óôïí êáôÜëïãï `/dev/gvinum`. Ìå ôéò ñõèìßóåéò ðïõ öáßíïíôáé ðáñáðÜíù, ôï Vinum èá äçìéïõñãÞóåé ôá ðáñáêÜôù áñ÷åßá óõóêåõþí:

- Êáôá÷ùñßóåéò óõóêåõþí ãéá êÜèå ôüìï. ÁõôÝò åßíáé êáé ïé êýñéåò óõóêåõÝò ðïõ ÷ñçóéìïðïéåß ôï Vinum. Ìå ôéò ñõèìßóåéò ðïõ äåßîáìå ðáñáðÜíù, èá Ý÷ïõìå ôéò óõóêåõÝò: `/dev/gvinum/myvol`, `/dev/gvinum/mirror`, `/dev/gvinum/striped`, `/dev/gvinum/raid5` êáé `/dev/gvinum/raid10`.
- ¼ëïé ïé ôüìïé äéáèÝôïõí áðåõèåßáò êáôá÷ùñßóåéò óôïí êáôÜëïãï `/dev/gvinum/`.
- Ïé êáôÜëïãïé `/dev/gvinum/plex` êáé `/dev/gvinum/sd`, ðïõ ðåñéÝ÷ïõí ôá áñ÷åßá óõóêåõþí ãéá êÜèå plex êáé õðïäßóêï áíôßóôïé÷á.

Ãéá ðáñÜäåéãìá, èåùñÞóôå ôï ðáñáêÜôù áñ÷åßï ñõèìßóåùí:

```
    drive drive1 device /dev/sd1h
    drive drive2 device /dev/sd2h
    drive drive3 device /dev/sd3h
    drive drive4 device /dev/sd4h
volume s64 setupstate
  plex org striped 64k
    sd length 100m drive drive1
    sd length 100m drive drive2
    sd length 100m drive drive3
    sd length 100m drive drive4
```

ÌåôÜ ôçí åðåîåñãáóßá áõôïý ôïõ áñ÷åßïõ, ôï gvinum(8) èá äçìéïõñãÞóåé ôçí áêüëïõèç äïìÞ óôïí êáôÜëïãï `/dev/gvinum`:

```
    drwxr-xr-x  2 root  wheel       512 Apr 13 16:46 plex
    crwxr-xr--  1 root  wheel   91,   2 Apr 13 16:46 s64
    drwxr-xr-x  2 root  wheel       512 Apr 13 16:46 sd

/dev/vinum/plex:
total 0
crwxr-xr--  1 root  wheel   25, 0x10000002 Apr 13 16:46 s64.p0

/dev/vinum/sd:
total 0
crwxr-xr--  1 root  wheel   91, 0x20000002 Apr 13 16:46 s64.p0.s0
crwxr-xr--  1 root  wheel   91, 0x20100002 Apr 13 16:46 s64.p0.s1
crwxr-xr--  1 root  wheel   91, 0x20200002 Apr 13 16:46 s64.p0.s2
crwxr-xr--  1 root  wheel   91, 0x20300002 Apr 13 16:46 s64.p0.s3
```

Áí êáé óõíßóôáôáé íá ìçí äßíïíôáé óõãêåêñéìÝíá ïíüìáôá óôá plex êáé ôïõò õðïäßóêïõò, èá ðñÝðåé íá äïèïýí ïíüìáôá óôïõò äßóêïõò ôïõ Vinum. Ìå ôïí ôñüðï áõôü, ï äßóêïò áíáãíùñßæåôáé áõôüìáôá áêüìá êáé áí áëëÜîåé èÝóç. Ôá ïíüìáôá ôùí äßóêùí ìðïñåß íá Ý÷ïõí ìÝãåèïò ìÝ÷ñé 32 ÷áñáêôÞñåò.

22.7.1 Äçìéïõñãßá ÓõóôçìÜôùí Áñ÷åßùí

Ïé ôüìïé äåß÷íïõí üìïéïé ìå ôïõò äßóêïõò üóï áöïñÜ ôï óýóôçìá, ìå ìéá åîáßñåóç. Áíôßèåôá ìå ôïõò äßóêïõò ôïõ UNIX, ôï Vinum äåí äçìéïõñãåß êáôáôìÞóåéò óôïõò ôüìïõò, êáé Ýôóé áðïõóéÜæåé áðü áõôïýò ï áíôßóôïé÷ïò ðßíáêáò êáôáôìÞóåùí. Áõôü áðáéôåß ôçí ôñïðïðïßçóç êÜðïéùí âïçèçôéêþí ðñïãñáììÜôùí êáé åéäéêüôåñá ôïõ newfs(8), ôï ïðïßï óôéò ðñïçãïýìåíåò õëïðïéÞóåéò ôïõ ðñïóðáèïýóå íá åñìçíåýóåé ôï ôåëåõôáßï ãñÜììá åíüò ôüìïõ Vinum ùò áíáãíùñéóôéêü ôçò êáôÜôìçóçò. Ãéá ðáñÜäåéãìá, Ýíáò êáíïíéêüò äßóêïò ìðïñåß íá Ý÷åé ôï üíïìá `/dev/ad0a` Þ `/dev/da2h`. Ôá ïíüìáôá áõôÜ áíôéðñïóùðåýïõí ôçí ðñþôç êáôÜôìçóç (`a`) óôïí ðñþôï äßóêï IDE (`ad`) êáé ôçí üãäïç êáôÜôìçóç (`h`) óôïí ôñßôï (2) SCSI äßóêï (`da`) áíôßóôïé÷á. Óå áíôßèåóç, Ýíáò ôüìïò ôïõ Vinum ìðïñåß íá ïíïìÜæåôáé `/dev/gvinum/concat`, ôï ïðïßï äåí Ý÷åé êáìéÜ ó÷Ýóç ìå üíïìá êáôÜôìçóçò.

Ãéá íá äçìéïõñãÞóåôå Ýíá óýóôçìá áñ÷åßùí óå áõôü ôïí ôüìï, ÷ñçóéìïðïéÞóôå ôçí newfs(8):

```
# newfs /dev/gvinum/concat
```

22.8 Ñýèìéóç ôïõ Vinum

Ôï Vinum äåí õðÜñ÷åé óôïí ðõñÞíá `GENERIC`. Åßíáé äõíáôüí íá äçìéïõñãÞóåôå ðñïóáñìïóìÝíï ðõñÞíá ðïõ íá ôï ðåñéÝ÷åé, áëëÜ äåí óõíßóôáôáé. Ï óõíçèéóìÝíïò ôñüðïò íá îåêéíÞóåôå ôï Vinum, åßíáé íá ôï öïñôþóåôå ùò Üñèñùìá óôïí ðõñÞíá (kld). Äåí ÷ñåéÜæåôáé êáí íá ÷ñçóéìïðïéÞóåôå ôçí kldload(8) ãéá ôï Vinum: üôáí îåêéíÞóåôå ôï gvinum(8), èá ãßíåé Ýëåã÷ïò ãéá íá äéáðéóôùèåß áí ôï Üñèñùìá åßíáé öïñôùìÝíï, êáé áí äåí åßíáé èá öïñôùèåß áõôüìáôá.

22.8.1 Åêêßíçóç

Ôï Vinum áðïèçêåýåé ôéò ðëçñïöïñßåò ãéá ôéò ñõèìßóåéò ôïõ óôá slices ôùí äßóêùí, ïõóéáóôéêÜ ìå ôïí ßäéï ôñüðï ðïõ ôéò áðïèçêåýåé êáé óôá áñ÷åßá ñõèìßóåùí. ¼ôáí ôï Vinum äéáâÜæåé ôç âÜóç äåäïìÝíùí ôùí ñõèìßóåùí, ìðïñåß íá áíáãíùñßóåé Ýíá áñéèìü ëÝîåùí ðïõ äåí åðéôñÝðïíôáé íá åìöáíéóôïýí óôá áñ÷åßá ñõèìßóåùí. Ãéá ðáñÜäåéãìá, ïé ñõèìßóåéò ãéá êÜðïéï äßóêï ìðïñåß íá ðåñéÝ÷ïõí ôï ðáñáêÜôù êåßìåíï:

```
volume myvol state up
volume bigraid state down
plex name myvol.p0 state up org concat vol myvol
plex name myvol.p1 state up org concat vol myvol
plex name myvol.p2 state init org striped 512b vol myvol
plex name bigraid.p0 state initializing org raid5 512b vol bigraid
sd name myvol.p0.s0 drive a plex myvol.p0 state up len 1048576b driveoffset 265b plexoffset 0b
sd name myvol.p0.s1 drive b plex myvol.p0 state up len 1048576b driveoffset 265b plexoffset 1048576b
sd name myvol.p1.s0 drive c plex myvol.p1 state up len 1048576b driveoffset 265b plexoffset 0b
sd name myvol.p1.s1 drive d plex myvol.p1 state up len 1048576b driveoffset 265b plexoffset 1048576b
sd name myvol.p2.s0 drive a plex myvol.p2 state init len 524288b driveoffset 1048841b plexoffset 0b
sd name myvol.p2.s1 drive b plex myvol.p2 state init len 524288b driveoffset 1048841b plexoffset 524288b
sd name myvol.p2.s2 drive c plex myvol.p2 state init len 524288b driveoffset 1048841b plexoffset 1048576b
sd name myvol.p2.s3 drive d plex myvol.p2 state init len 524288b driveoffset 1048841b plexoffset 1572864b
sd name bigraid.p0.s0 drive a plex bigraid.p0 state initializing len 4194304b driveoff set 1573129b plexoffset 0b
sd name bigraid.p0.s1 drive b plex bigraid.p0 state initializing len 4194304b driveoff set 1573129b plexoffset 4194304b
sd name bigraid.p0.s2 drive c plex bigraid.p0 state initializing len 4194304b driveoff set 1573129b plexoffset 8388608b
sd name bigraid.p0.s3 drive d plex bigraid.p0 state initializing len 4194304b driveoff set 1573129b plexoffset 12582912b
sd name bigraid.p0.s4 drive e plex bigraid.p0 state initializing len 4194304b driveoff set 1573129b plexoffset 16777216b
```

Ïé ðñïöáíåßò äéáöïñÝò åäþ, åßíáé ç ðáñïõóßá óõãêåêñéìÝíùí èÝóåùí êáé ïíïìÜôùí (êáé ôá äýï åßíáé åðéôñåðôÜ, áëëÜ ãåíéêÜ äåí óõíßóôáôáé ç ÷ñÞóç ôïõò) êáé ïé ðëçñïöïñßåò êáôÜóôáóçò (ðïõ äåí åßíáé äéáèÝóéìåò óôï ÷ñÞóôç). Ôï Vinum äåí áðïèçêåýåé ðëçñïöïñßåò ó÷åôéêÝò ìå ôïõò äßóêïõò óôéò ñõèìßóåéò ôïõ: áðëþò áíé÷íåýåé üëïõò ôïõò äßóêïõò ãéá êáôáôìÞóåéò ðïõ ðåñéÝ÷ïõí åôéêÝôá Vinum. Áõôü åðéôñÝðåé óôï Vinum íá áíáãíùñßóåé ôïõò äßóêïõò óùóôÜ, áêüìá êáé áí ôïõò Ý÷åé äïèåß äéáöïñåôéêü UNIX áíáãíùñéóôéêü (ID).

22.8.1.1 Áõôüìáôç Åêêßíçóç

Ôï *Gvinum* îåêéíÜåé ðÜíôïôå áõôüìáôá ìåôÜ ôçí öüñôùóç ôïõ áñèñþìáôïò ìÝóù ôïõ loader.conf(5). Ãéá íá öïñôþóåôå ôï Üñèñùìá ôïõ *Gvinum* êáôÜ ôçí åêêßíçóç, ðñïóèÝóôå ôç ãñáììÞ `geom_vinum_load="YES"` óôï áñ÷åßï `/boot/loader.conf`.

¼ôáí îåêéíÜôå ôï Vinum ìå ôçí åíôïëÞ `gvinum start`, ôï Vinum äéáâÜæåé ôç âÜóç äåäïìÝíùí ñõèìßóåùí áðü Ýíáí äßóêï ðïõ âñßóêåôáé õðü ôïí Ýëåã÷ï ôïõ. ÊÜôù áðü öõóéïëïãéêÝò óõíèÞêåò, êÜèå äßóêïò ðåñéÝ÷åé Ýíá üìïéï áíôßãñáöï ôçò âÜóçò, Ýôóé äåí Ý÷åé óçìáóßá áðü ðïéï äßóêï èá ãßíåé ç áíÜãíùóç. Ùóôüóï, ìåôÜ áðü êÜðïéï áðüôïìï ôåñìáôéóìü ëåéôïõñãßáò, ôï Vinum èá ðñÝðåé íá êáèïñßóåé ðïéïò äßóêïò Ý÷åé ôï ðéï ðñüóöáôï áíôßãñáöï êáé íá äéáâÜóåé áðü åêåß ôéò ñõèìßóåéò. ÌåôÜ èá äéïñèþóåé (áí ÷ñåéÜæåôáé) ôéò ñõèìßóåéò êáé óôïõò õðüëïéðïõò äßóêïõò.

22.9 ×ñÞóç ôïõ Vinum óôï Ñéæéêü Óýóôçìá Áñ÷åßùí

Óå Ýíá ìç÷Üíçìá óôï ïðïßï Ý÷åé ãßíåé ðëÞñçò mirror óôá óõóôÞìáôá áñ÷åßùí ìå ôç ÷ñÞóç ôïõ Vinum, åßíáé óõíÞèùò åðéèõìçôü íá ãßíåé mirror êáé óôï ñéæéêü (root) óýóôçìá áñ÷åßùí. Ç ñýèìéóç áõôÞ äåí åßíáé ôüóï áðëÞ üóï óå Ýíá ïðïéïäÞðïôå óýóôçìá áñ÷åßùí, åðåéäÞ:

- Ôï ñéæéêü óýóôçìá áñ÷åßùí ðñÝðåé íá åßíáé äéáèÝóéìï áðü ðïëý íùñßò êáôÜ ôç äéáäéêáóßá åêêßíçóçò, Ýôóé åßíáé áðáñáßôçôï ïé õðïäïìÝò ôïõ Vinum íá åßíáé åðßóçò äéáèÝóéìåò ôçí ßäéá óôéãìÞ.
- Ï ôüìïò ðïõ ðåñéÝ÷åé ôï ñéæéêü óýóôçìá áñ÷åßùí ðåñéÝ÷åé åðßóçò êáé ôïí êþäéêá åêêßíçóçò (bootstrap) êáé ôïí ðõñÞíá, ï ïðïßïò èá ðñÝðåé íá åßíáé ðñïóâÜóéìïò áðü âáóéêÜ ðñïãñÜììáôá ôïõ óõóôÞìáôïò (ð.÷. ôï BIOS óå ìç÷áíÞìáôá ôýðïõ PC), ôá ïðïßá äåí ãíùñßæïõí êáé äåí ìðïñïýí íá ìÜèïõí ôéò ëåðôïìÝñåéåò õëïðïßçóçò ôïõ Vinum.

Óôéò åðüìåíåò åíüôçôåò, ï üñïò “ñéæéêüò ôüìïò” ÷ñçóéìïðïéåßôáé ãåíéêÜ ãéá íá ðåñéãñÜøåé ôïí ôüìï ôïõ Vinum ðïõ ðåñéÝ÷åé ôï ñéæéêü óýóôçìá áñ÷åßùí. Åßíáé ãåíéêÜ êáëÞ éäÝá íá ÷ñçóéìïðïéåßôáé ôï üíïìá `"root"` ãéá áõôü ôïí ôüìï, áëëÜ áõôü äåí áðïôåëåß ôå÷íéêÞ áðáßôçóç. ¼ëá ôá ðáñáäåßãìáôá åíôïëþí óôéò ðáñáêÜôù åíüôçôåò ÷ñçóéìïðïéïýí ôçí ðáñáðÜíù ðáñáäï÷Þ.

22.9.1 Åêêßíçóç ôïõ Vinum ÁñêåôÜ Íùñßò ãéá ôï Ñéæéêü Óýóôçìá Áñ÷åßùí

Áõôü ìðïñåß íá åðéôåõ÷èåß ìå äéÜöïñïõò ôñüðïõò:

- Ôï Vinum ðñÝðåé íá åßíáé äéáèÝóéìï óôïí ðõñÞíá êáôÜ ôçí åêêßíçóç. Ãéá ôï ëüãï áõôü, ç ìÝèïäïò áõôüìáôçò åêêßíçóçò ðïõ ðåñéãñÜøáìå óôï ÔìÞìá 22.8.1.1 äåí ìðïñåß íá ÷ñçóéìïðïéçèåß óå áõôÞ ôçí ðåñßðôùóç êáé ç ðáñÜìåôñïò `start_vinum` *äåí* èá ðñÝðåé íá ôåèåß üôáí ÷ñçóéìïðïéåßôáé ç ðáñáêÜôù äéÜôáîç. Ìéá ðéèáíÞ åðéëïãÞ åßíáé íá ìåôáãëùôôßóåôå óôáôéêÜ ôï Vinum óôïí ðõñÞíá þóôå íá åßíáé äéáèÝóéìï ðÜíôá, áëëÜ áõôü óõíÞèùò äåí åßíáé åðéèõìçôü. ÕðÜñ÷åé ìéá áêüìá äéáèÝóéìç åðéëïãÞ, íá ïñßóåôå íá öïñôþíåôáé ôï Üñèñùìá ôïõ ðõñÞíá ìÝóù ôïõ `/boot/loader` (ÔìÞìá 13.3.3) ðñéí ôçí åêêßíçóç ôïõ ßäéïõ ôïõ ðõñÞíá. Áõôü ìðïñåß íá åðéôåõ÷èåß ìå ôç ãñáììÞ:

```
geom_vinum_load="YES"
```

óôï áñ÷åßï `/boot/loader.conf`.

- Óôï *Gvinum*, üëç ç äéáäéêáóßá åêêßíçóçò ãßíåôáé áõôüìáôá ìåôÜ ôçí öüñôùóç ôïõ áñèñþìáôïò ðõñÞíá, Ýôóé ç äéáäéêáóßá ðïõ ðåñéãñÜøáìå ðáñáðÜíù åßíáé êáé ç ìüíç ðïõ áðáéôåßôáé.

22.9.2 Äçìéïõñãßá Ñéæéêïý Ôüìïõ Vinum ìå Äõíáôüôçôá Ðñüóâáóçò áðü ôïí Êþäéêá Åêêßíçóçò (Bootstrap).

Êáèþò ï ôñÝ÷ïíôáò êþäéêáò åêêßíçóçò ôïõ FreeBSD Ý÷åé ìÝãåèïò ìüíï 7.5 KB, êáé åßíáé Þäç åðéöïñôéóìÝíïò ìå ôçí áíÜãíùóç áñ÷åßùí (üðùò ôï `/boot/loader`) áðü ôï óýóôçìá áñ÷åßùí UFS, åßíáé ðñáêôéêÜ áäýíáôï íá ãíùñßæåé êáé ôéò áðáéôïýìåíåò åóùôåñéêÝò äïìÝò ôïõ Vinum þóôå íá ìðïñåß íá åñìçíåýóåé ôéò áíôßóôïé÷åò ðëçñïöïñßåò ñýèìéóçò êáé íá ìÜèåé ôéò ëåðôïìÝñåéåò ôïõ ôüìïõ åêêßíçóçò. Ãéá ôï ëüãï áõôü, ÷ñåéÜæåôáé íá ÷ñçóéìïðïéÞóïõìå êÜðïéá ôå÷íÜóìáôá þóôå íá äþóïõìå óôïí êþäéêá åêêßíçóçò ôçí øåõäáßóèçóç ýðáñîçò ìéáò êáíïíéêÞò êáôÜôìçóçò `"a"` ðïõ íá ðåñéÝ÷åé ôï ñéæéêü óýóôçìá áñ÷åßùí.

Ãéá íá êáôáóôåß áõôü äõíáôü, èá ðñÝðåé íá ðëçñïýíôáé ôáõôü÷ñïíá üëåò ïé ðáñáêÜôù ðñïûðïèÝóåéò üóï áöïñÜ ôïí ôüìï åêêßíçóçò:

- Ï ôüìïò åêêßíçóçò äåí èá ðñÝðåé íá åßíáé stripe Þ RAID-5.
- Ï ôüìïò åêêßíçóçò äåí èá ðñÝðåé íá ðåñéÝ÷åé ðåñéóóüôåñïõò áðü Ýíá óõíåíùìÝíïõò õðïäßóêïõò áíÜ plex.

Óçìåéþóôå üôé åßíáé óõíÞèùò åðéèõìçôü êáé äõíáôü íá õðÜñ÷ïõí ðïëëáðëÜ plex, êáèÝíá áðü ôá ïðïßá íá åßíáé áíôßãñáöï ôïõ ñéæéêïý óõóôÞìáôïò áñ÷åßùí. Ç äéáäéêáóßá åêêßíçóçò èá ÷ñçóéìïðïéÞóåé ùóôüóï ìüíï Ýíá áðü áõôÜ ôá áíôßãñáöá ãéá íá âñåé ôïí êþäéêá åêêßíçóçò êáé üëá ôá áñ÷åßá, ìÝ÷ñé íá ãßíåé ôåëéêÜ ç ðñïóÜñôçóç ôïõ ñéæéêïý óõóôÞìáôïò áñ÷åßùí áðü ôïí ßäéï ôïí ðõñÞíá. ÊÜèå ìïíáäéêüò õðïäßóêïò ìÝóá óå áõôÜ ôá plex, èá ÷ñåéáóôåß íá äéáèÝôåé ôç äéêÞ ôïõ øåõôï-êáôÜôìçóç `"a"` þóôå ç óõóêåõÞ íá åßíáé åêêéíÞóéìç. Äåí åßíáé áðáñáßôçôï êÜèå ìéá áðü áõôÝò ôéò øåõôï-êáôáôìÞóåéò íá âñßóêåôáé óôçí ßäéá èÝóç ìÝóá óôçí óõóêåõÞ, óå ó÷Ýóç ìå Üëëåò óõóêåõÝò ðïõ ðåñéÝ÷ïõí plex ìå ñéæéêü óýóôçìá áñ÷åßùí. Åßíáé üìùò ãåíéêÜ êáëÞ éäÝá íá äçìéïõñãÞóåôå ôïõò ôüìïõò ôïõ Vinum ìå ôÝôïéï ôñüðï, þóôå ïé óõóêåõÝò mirror ðïõ ðñïêýðôïõí íá åßíáé óõììåôñéêÝò ãéá íá áðïöýãåôå ôç óýã÷õóç.

Ãéá íá äçìéïõñãçèïýí áõôÝò ïé ôýðïõ `"a"` êáôáôìÞóåéò ãéá êÜèå óõóêåõÞ ðïõ èá ðåñéÝ÷åé ôìÞìáôá ôïõ ñéæéêïý ôüìïõ, èá ðñÝðåé íá ãßíïõí ôá áêüëïõèá:

1. Èá ðñÝðåé íá åîåôÜóåôå ôç èÝóç (ôçí áðüóôáóç áðü ôçí áñ÷Þ ôçò óõóêåõÞò) êáé ôï ìÝãåèïò ôçò óõóêåõÞò õðïäßóêïõ ç ïðïßá èá åßíáé ìÝñïò ôïõ ñéæéêïý ôüìïõ, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ:

   ```
   # gvinum l -rv root
   ```

   Óçìåéþóôå üôé óôï Vinum ïé èÝóåéò êáé ôá ìåãÝèç ìåôñïýíôáé óå bytes. Èá ðñÝðåé íá äéáéñÝóåôå áõôïýò ôïõò áñéèìïýò ìå ôï 512 ãéá íá âñåßôå ôïõò áñéèìïýò ìðëïê ðïõ èá ÷ñçóéìïðïéÞóåôå óôçí åíôïëÞ `bsdlabel`.

2. ÅêôåëÝóôå ôçí åíôïëÞ:

   ```
   # bsdlabel -e devname
   ```

   ãéá êÜèå óõóêåõÞ ðïõ óõììåôÝ÷åé óôï ñéæéêü ôüìï. Ôï *`devname`* èá ðñÝðåé íá åßíáé åßôå ôï üíïìá ôïõ äßóêïõ (ãéá ðáñÜäåéãìá `da0`) ãéá äßóêïõò ÷ùñßò slices (÷ùñßò äçë. êáôáôìÞóåéò fdisk), Þ ôï üíïìá ôïõ slice (ãéá ðáñÜäåéãìá, `ad0s1`).

   Áí õðÜñ÷åé Þäç ìéá êáôÜôìçóç `"a"` óôç óõóêåõÞ (ðïõ ðéèáíþò ðåñéÝ÷åé ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ Þôáí óå ÷ñÞóç ðñéí ÷ñçóéìïðïéçèåß ôï Vinum), èá ðñÝðåé íá ìåôïíïìáóôåß óå êÜôé Üëëï þóôå íá åîáêïëïõèåß íá åßíáé ðñïóâÜóéìï (óå ðåñßðôùóç áíÜãêçò), áëëÜ äåí èá ÷ñçóéìïðïéåßôáé ðëÝïí áðü ðñïåðéëïãÞ ãéá ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Óçìåéþóôå üôé ïé åíåñãÝò êáôáôìÞóåéò (üðùò ãéá ðáñÜäåéãìá Ýíá ñéæéêü óýóôçìá áñ÷åßùí ôï ïðïßï åßíáé Þäç ðñïóáñôçìÝíï) äåí ìðïñïýí íá ìåôïíïìáóôïýí. Èá ðñÝðåé íá åêôåëÝóåôå ôçí åíôïëÞ ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ “Fixit” ôïõ CD åãêáôÜóôáóçò, Þ íá áêïëïõèÞóåôå ìéá äéáäéêáóßá äýï âçìÜôùí (óå ðåñßðôùóç ðïõ Ý÷åôå mirror) îåêéíþíôáò áðü ôïí Ýíá äßóêï êáé ìåôïíïìÜæïíôáò ôïí Üëëï.

¸ðåéôá èá ðñÝðåé íá ðñïóèÝóåôå ôçí áðüóôáóç (offset, áí õðÜñ÷åé) ôçò êáôÜôìçóçò Vinum áõôÞò ôçò óõóêåõÞò, ìå ôçí áðüóôáóç ôïõ õðïäßóêïõ ôïõ áíôßóôïé÷ïõ ñéæéêïý ôüìïõ ôçò óõóêåõÞò. Ç ôéìÞ ðïõ èá ðñïêýøåé èá åßíáé ç áðüóôáóç (`"offset"`) ãéá ôç íÝá êáôÜôìçóç `"a"`. Ìðïñåßôå íá ðÜñåôå áõôïýóéá ôçí ôéìÞ `"size"` ãéá áõôÞ ôçí êáôÜôìçóç áðü ôïí õðïëïãéóìü ðïõ êÜíáôå ðáñáðÜíù. Ôï `"fstype"` èá ðñÝðåé íá åßíáé `4.2BSD`. Ïé ôéìÝò ôùí `"fsize"`, `"bsize"`, êáé `"cpg"` èá ðñÝðåé íá åðéëå÷èïýí ìå ôÝôïéï ôñüðï þóôå íá ôáéñéÜæïõí ìå ôï ðñáãìáôéêü óýóôçìá áñ÷åßùí, áí êáé äåí Ý÷ïõí óçìáóßá óôç óõãêåêñéìÝíç ðåñßðôùóç.

Ìå áõôü ôïí ôñüðï, èá äçìéïõñãçèåß ìéá íÝá êáôÜôìçóç `"a"` ç ïðïßá åðéêáëýðôåé ôçí êáôÜôìçóç ôïõ Vinum óå áõôÞ ôç óõóêåõÞ. Óçìåéþóôå üôé ç åíôïëÞ `bsdlabel` èá åðéôñÝøåé áõôÞ ôçí åðéêÜëõøç ìüíï áí ç êáôÜôìçóç ôïõ Vinum Ý÷åé åðéóçìáíèåß êáôÜëëçëá ìå fstype `"vinum"`.

3. Áõôü åßíáé üëï! ÕðÜñ÷åé ðëÝïí ìéá øåõôï-êáôÜôìçóç `"a"` óå êÜèå óõóêåõÞ ç ïðïßá Ý÷åé áíôßãñáöï ôïõ ñéæéêïý ôüìïõ. Óõíßóôáôáé íá åðáëçèåýóåôå îáíÜ ôï áðïôÝëåóìá, ÷ñçóéìïðïéþíôáò ìéá åíôïëÞ üðùò ôçí ðáñáêÜôù:

   ```
   # fsck -n /dev/devnamea
   ```

Èá ðñÝðåé íá èõìÜóôå üôé ïé èÝóåéò ôùí áñ÷åßùí ðïõ ðåñéÝ÷ïõí ðëçñïöïñßåò åëÝã÷ïõ ðñÝðåé íá åßíáé ó÷åôéêÝò ùò ðñïò ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ âñßóêåôáé óôï ôüìï ôïõ Vinum, êáé ï ïðïßïò (êáôÜ ôçí äçìéïõñãßá êáéíïýñéïõ ñéæéêïý ôüìïõ Vinum) ìðïñåß íá ìçí ôáéñéÜæåé ìå ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ åßíáé åíåñãü ôç äåäïìÝíç óôéãìÞ. Èá ðñÝðåé éäéáßôåñá íá öñïíôßóåôå ôá áñ÷åßá `/etc/fstab` êáé `/boot/loader.conf`.

Óôçí åðüìåíç åðáíåêêßíçóç, ï êþäéêáò åêêßíçóçò èá ðñÝðåé íá åíôïðßóåé ôéò êáôÜëëçëåò ðëçñïöïñßåò åëÝã÷ïõ áðü ôï íÝï (Vinum) ñéæéêü óýóôçìá áñ÷åßùí êáé íá äñÜóåé êáôÜëëçëá. Óôï ôÝëïò ôçò äéáäéêáóßáò áñ÷éêïðïßçóçò ôïõ ðõñÞíá, êáé ìåôÜ ôçí áíáãíþñéóç üëùí ôùí óõóêåõþí, ôï ìÞíõìá ôï ïðïßï äåß÷íåé ôçí åðéôõ÷Þ ëåéôïõñãßá ôïõ åã÷åéñÞìáôïò ìïéÜæåé ìå ôï ðáñáêÜôù:

```
Mounting root from ufs:/dev/gvinum/root
```

22.9.3 ÐáñÜäåéãìá Ñýèìéóçò Ñéæéêïý Ôüìïõ ìå Vinum

ÌåôÜ ôçí ñýèìéóç ôïõ ñéæéêïý ôüìïõ ìå ôï Vinum, ç Ýîïäïò ôçò åíôïëÞò `gvinum l -rv root` èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
...
Subdisk root.p0.s0:
                Size:        125829120 bytes (120 MB)
                State: up
                Plex root.p0 at offset 0 (0  B)
                Drive disk0 (/dev/da0h) at offset 135680 (132 kB)

Subdisk root.p1.s0:
                Size:        125829120 bytes (120 MB)
                State: up
                Plex root.p1 at offset 0 (0  B)
                Drive disk1 (/dev/da1h) at offset 135680 (132 kB)
```

Ïé ôéìÝò ðïõ èá ðñÝðåé íá óçìåéþóåôå åßíáé ôï `135680` ãéá ôçí áðüóôáóç (offset óå ó÷Ýóç ìå ôçí êáôÜôìçóç `/dev/da0h`). Áõôü ìåôáöñÜæåôáé óå 265 block ôùí 512 byte ãéá ôçí åíôïëÞ `bsdlabel`. Ðáñüìïéá, ôï ìÝãåèïò ôïõ ñéæéêïý ôüìïõ åßíáé 245760 ìðëïê ôùí 512 byte. Ôï `/dev/da1h`, ôï ïðïßï ðåñéÝ÷åé ôï äåýôåñï áíôßãñáöï ôïõ ñéæéêïý ôüìïõ, Ý÷åé óõììåôñéêÞ ñýèìéóç.

Ôï bsdlabel ãéá áõôÝò ôéò óõóêåõÝò èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
...
8 partitions:
#        size   offset    fstype   [fsize bsize bps/cpg]
  a:   245760      281    4.2BSD     2048 16384     0   # (Cyl.    0*- 15*)
  c: 71771688        0    unused        0     0         # (Cyl.    0 - 4467*)
  h: 71771672       16     vinum                        # (Cyl.    0*- 4467*)
```

Ìðïñåßôå íá ðáñáôçñÞóåôå üôé ç ðáñÜìåôñïò `"size"` ãéá ôçí øåõôï-êáôÜôìçóç `"a"` ôáéñéÜæåé ìå ôçí ôéìÞ ðïõ äåßîáìå ðáñáðÜíù, åíþ ç ôéìÞ ôçò ðáñáìÝôñïõ `"offset"` åßíáé ôï Üèñïéóìá ôçò áðüóôáóçò áíÜìåóá óôçí êáôÜôìçóç Vinum `"h"` êáé ôçò áðüóôáóçò áõôÞò ôçò êáôÜôìçóçò ìÝóá óôç óõóêåõÞ (Þ ôï slice). Ðñüêåéôáé ãéá ìéá ôõðéêÞ ñýèìéóç ðïõ åßíáé áðáñáßôçôç ãéá íá áðïöåõ÷èïýí ôá ðñïâëÞìáôá ðïõ ðåñéãñÜöçêáí óôï ÔìÞìá 22.9.4.3. Ìðïñåßôå åðßóçò íá äåßôå üôé ïëüêëçñç ç êáôÜôìçóç `"a"` ðåñéÝ÷åôáé áõôïýóéá ìÝóá óôçí `"h"` ç ïðïßá êáé ðåñéÝ÷åé üëåò ôéò ðëçñïöïñßåò Vinum ôçò óõóêåõÞò.

Óçìåéþóôå üôé óôï ðáñáðÜíù ðáñÜäåéãìá ç óõóêåõÞ ÷ñçóéìïðïéåßôáé åî’ ïëïêëÞñïõ áðü ôï Vinum, êáé äåí õðÜñ÷åé êÜðïéá êáôÜëïéðç ñéæéêÞò êáôÜôìçóçò áðü ðáëéüôåñç ÷ñÞóç. Áõôü óõìâáßíåé åðåéäÞ ðñüêåéôáé ãéá äßóêï ðïõ ÷ñçóéìïðïéÞèçêå áðü ôçí áñ÷Þ ùò ìÝñïò åíüò óõóôÞìáôïò Vinum.

22.9.4 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Óå ðåñßðôùóç ðñïâëÞìáôïò, èá ÷ñåéáóôåßôå êÜðïéá ìÝèïäï áíôéìåôþðéóçò. Ç ðáñáêÜôù ëßóôá ðåñéÝ÷åé ìåñéêÜ áðü ôá ðéï óõíçèéóìÝíá ðñïâëÞìáôá êáé ôéò ëýóåéò ôïõò.

22.9.4.1 Ï Êþäéêáò Åêêßíçóçò Öïñôþíåôáé, ÁëëÜ ôï Óýóôçìá äåí Åêêéíåß

Áí ãéá ïðïéïäÞðïôå ëüãï ôï óýóôçìá äåí óõíå÷ßæåé ôçí åêêßíçóç, èá ðñÝðåé íá äéáêüøåôå ôçí åêêßíçóç ìÝóá óôï ÷ñïíéêü äéÜóôçìá ôùí 10 äåõôåñïëÝðôùí ðïõ åìöáíßæåôáé ï öïñôùôÞò åêêßíçóçò, ðéÝæïíôáò ôï ðëÞêôñï **space**. Ìðïñåßôå íá åîåôÜóåôå ôéò ôéìÝò ôùí ìåôáâëçôþí ôïõ öïñôùôÞ (üðùò ç `vinum.autostart`), ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `show`, êáé íá ôéò áëëÜîåôå ìå ôéò åíôïëÝò `set` Þ `unset`.

Áí ôï ìïíáäéêü ðñüâëçìá Þôáí ç áðïõóßá ôïõ áñèñþìáôïò Vinum óôç ëßóôá ôçò áõôüìáôçò öüñôùóçò, áñêåß íá äþóåôå ôçí åíôïëÞ `load geom_vinum`.

¼ôáí åßóôå Ýôïéìïò, ç åêêßíçóç ìðïñåß íá óõíå÷éóôåß ìå ôçí åíôïëÞ `boot -as`. Ïé åðéëïãÝò `-as` èá ïäçãÞóïõí ôïí ðõñÞíá íá ñùôÞóåé ãéá ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ ðñüêåéôáé íá ðñïóáñôçèåß (`-a`), êáé ç äéáäéêáóßá åêêßíçóçò èá óôáìáôÞóåé óå êáôÜóôáóç åíüò ÷ñÞóôç (single user, ëüãù ôçò åðéëïãÞò `-s`), üðïõ ç ðñïóÜñôçóç ôïõ ñéæéêïý óõóôÞìáôïò åßíáé ìüíï ãéá áíÜãíùóç. Ìå ôïí ôñüðï áõôü, áêüìá êáé áí Ý÷åé ðñïóáñôçèåß ìüíï Ýíá plex åíüò ôüìïõ ðïõ áðïôåëåßôáé áðü ðïëëÜ, äåí õðÜñ÷åé êßíäõíïò íá äçìéïõñãçèåß áóõíÝðåéá äåäïìÝíùí ìåôáîý ôùí plex.

Óôçí ðñïôñïðÞ ðïõ åìöáíßæåôáé ãéá ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ ðñüêåéôáé íá ðñïóáñôçèåß, ìðïñåßôå íá åéóÜãåôå ïðïéáäÞðïôå óõóêåõÞ ðåñéÝ÷åé Ýíá Ýãêõñï ñéæéêü óýóôçìá áñ÷åßùí. Áí ôï `/etc/fstab` Ý÷åé ñõèìéóôåß óùóôÜ, ç ðñïåðéëïãÞ èá åßíáé êÜôé óáí `ufs:/dev/gvinum/root`. Ìéá ôõðéêÞ åíáëëáêôéêÞ ôïðïèåóßá èá ìðïñïýóå íá åßíáé ôï `ufs:da0d`, ìéá õðïèåôéêÞ êáôÜôìçóç ðïõ ðåñéÝ÷åé ôï ðáëéü (ðñéí ôï Vinum) ñéæéêü óýóôçìá áñ÷åßùí. Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ìéá áðü ôéò ôýðïõ `"a"` øåõôï-êáôáôìÞóåéò ðïõ åßíáé óôçí ðñáãìáôéêüôçôá õðïäßóêïé ôçò ñéæéêÞò óõóêåõÞò ôïõ Vinum, èá ðñÝðåé íá åßóôå ðñïóåêôéêüò, ãéáôß áí ÷ñçóéìïðïéåßôå mirror èá ãßíáé ðñïóÜñôçóç ìüíï ôïõ åíüò ôìÞìáôïò ôçò óõóêåõÞò. Áí ðñüêåéôáé íá ðñïóáñôÞóåôå áõôÞ ôç óõóêåõÞ áñãüôåñá ìå äõíáôüôçôá åããñáöÞò-áíÜãíùóçò, åßíáé áðáñáßôçôï íá áöáéñÝóåôå ôá õðüëïéðá plex ôïõ ñéæéêïý ôüìïõ ôïõ Vinum, êáèþò áõôÜ èá ðåñéÝ÷ïõí äåäïìÝíá ðïõ äåí åßíáé óå óõã÷ñïíéóìü ìå ôçí êáôÜôìçóç ðïõ Ý÷åôå Þäç ðñïóáñôÞóåé.

22.9.4.2 Öïñôþíåé Ìüíï ï Âáóéêüò Êþäéêáò Åêêßíçóçò

Áí ç öüñôùóç ôïõ `/boot/loader` äåí åßíáé åðéôõ÷Þò, áëëÜ ï âáóéêüò êþäéêáò åêêßíçóçò (primary bootstrap) öïñôþíåôáé (êÜôé ðïõ ìðïñåßôå íá äéáðéóôþóåôå åëÝã÷ïíôáò áí åìöáíßæåôáé ìéá ðáýëá óôçí ðÜíù áñéóôåñÞ ãùíßá ôçò ïèüíçò êáôÜ ôï áñ÷éêü óôÜäéï åêêßíçóçò), ìðïñåßôå íá ðñïóðáèÞóåôå íá äéáêüøåôå ôç âáóéêÞ åêêßíçóç óå áõôü ôï óçìåßï ÷ñçóéìïðïéþíôáò ôï ðëÞêôñï **space**. Ìå áõôü ôïí ôñüðï, ç åêêßíçóç èá óôáìáôÞóåé óôï óôÜäéï äýï (äåßôå ôï ÔìÞìá 13.3.2). Ìðïñåßôå åäþ íá ðñïóðáèÞóåôå íá åêêéíÞóåôå áðü ìéá åíáëëáêôéêÞ êáôÜôìçóç, ð.÷. ôçí êáôÜôìçóç ðïõ ðåñéÝ÷åé ôï ñéæéêü óýóôçìá áñ÷åßùí ðïõ ìåôáêéíÞóáôå áðü ôï `"a"` üôáí îåêéíÞóáôå íá ÷ñçóéìïðïéåßôå ôï Vinum.

22.9.4.3 Äåí Ãßíåôáé ÊáìéÜ Åêêßíçóç, ï Êþäéêáò Åêêßíçóçò Ðñïêáëåß Panic

Áõôü ìðïñåß íá óõìâåß áí ï êþäéêáò åêêßíçóçò êáôáóôñáöåß áðü ôçí åãêáôÜóôáóç ôïõ Vinum. Äõóôõ÷þò, ôï Vinum ôçí ôñÝ÷ïõóá óôéãìÞ áöÞíåé ìüíï 4 KB åëåýèåñá óôçí áñ÷Þ ôçò êáôÜôìçóçò ôïõ ðñéí áñ÷ßóåé íá ãñÜöåé ôéò ðëçñïöïñßåò ôçò åðéêåöáëßäáò ôïõ. Ùóôüóï ôá óôÜäéá Ýíá êáé äýï êáèþò êáé ôï bsdlabel ðïõ åíóùìáôþíåôáé áíÜìåóá ôïõò, ÷ñåéÜæïíôáé 8 KB. ¸ôóé, áí ìéá êáôÜôìçóç Vinum îåêßíáãå óôçí èÝóç 0 ìÝóá óå Ýíá slice Þ äßóêï ðïõ ðñïïñßæïíôáí ãéá åêêßíçóç, ç åãêáôÜóôáóç ôïõ Vinum èá êáôÝóôñåöå ôïí êþäéêá åêêßíçóçò.

Ìå ôïí ßäéï ôñüðï, áí ç ðáñáðÜíù êáôÜóôáóç åðéäéïñèùèåß ãéá ðáñÜäåéãìá îåêéíþíôáò áðü Ýíá CD “Fixit” êáé åðáíåãêáèéóôþíôáò ôïí êþäéêá åêêßíçóçò ìå ôç âïÞèåéá ôçò åíôïëÞò `bsdlabel -B` (üðùò ðåñéãñÜöåôáé óôï ÔìÞìá 13.3.2), ï êþäéêáò åêêßíçóçò èá êáôáóôñÝøåé ôçí åðéêåöáëßäá ôïõ Vinum, ôï ïðïßï äåí èá ìðïñåß ðëÝïí íá åíôïðßóåé ôïõò äßóêïõò ôïõ. Áí êáé ôï ðáñáðÜíù äåí êáôáóôñÝöåé ôá äåäïìÝíá ñõèìßóåùí Þ ôá ðñáãìáôéêÜ äåäïìÝíá ðïõ õðÜñ÷ïõí óôïõò ôüìïõò (êáé ç áíÜêôçóç ôïõò åßíáé äõíáôÞ áí äþóåôå îáíÜ áêñéâþò ôéò ßäéåò ñõèìßóåéò óôï Vinum ìå ôéò áñ÷éêÝò óáò), ç êáôÜóôáóç äéïñèþíåôáé áñêåôÜ äýóêïëá. Èá ðñÝðåé íá ìåôáêéíÞóåôå ïëüêëçñç ôçí êáôÜôìçóç ôïõ Vinum ôïõëÜ÷éóôïí êáôÜ 4 KB þóôå íá ìçí õðÜñ÷åé óýãêñïõóç ìåôáîý ôçò åðéêåöáëßäáò ôïõ Vinum êáé ôïõ êþäéêá åêêßíçóçò.

Óçìåéþóåéò

1. Ôï RAID óçìáßíåé *Redundant Array of Inexpensive Disks* êáé ðáñÝ÷åé äéÜöïñåò ìïñöÝò áíï÷Þò óå óöÜëìáôá, áí êáé óôçí ðáñáðÜíù ÷ñÞóç ï üñïò åßíáé êÜðùò ðáñáðëáíçôéêüò: ôï RAID-0 äåí ðáñÝ÷åé êáìéÜ ôÝôïéá ðñïóôáóßá äåäïìÝíùí.

ÊåöÜëáéï 23 Åéêïíéêïðïßçóç

ÓõíåéóöïñÜ áðü ôïí Murray Stokely.

23.1 Óýíïøç

Ôï ëïãéóìéêü åéêïíéêïðïßçóçò åðéôñÝðåé óå ðïëëáðëÜ ëåéôïõñãéêÜ óõóôÞìáôá íá åêôåëïýíôáé ôáõôü÷ñïíá óôïí ßäéï õðïëïãéóôÞ. Óå õðïëïãéóôÝò PC ôï ëïãéóìéêü áõôü ôõðéêÜ ÷ñçóéìïðïéåß Ýíá ëåéôïõñãéêü ùò îåíéóôÞ (host) óôï ïðïßï êáé åêôåëåßôáé, êáé ôï ïðïßï õðïóôçñßæåé Ýíá ïðïéïäÞðïôå áñéèìü áðü öéëïîåíïýìåíá (guest) ëåéôïõñãéêÜ.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôç äéáöïñÜ ìåôáîý åíüò îåíéóôÞ (host) êáé åíüò öéëïîåíïýìåíïõ (guest) ëåéôïõñãéêïý.
- Ðùò íá åãêáôáóôÞóåôå ôï FreeBSD óå Ýíá Apple Macintosh õðïëïãéóôÞ ðïõ âáóßæåôáé óå Intel áñ÷éôåêôïíéêÞ.
- Ðþò íá åãêáôáóôÞóåôå ôï FreeBSD êÜôù áðü Microsoft Windows ìå ôï **Virtual PC**.
- Ðùò íá âåëôéóôïðïéÞóåôå Ýíá FreeBSD óýóôçìá ãéá ôçí êáëýôåñç áðüäïóç óå ðåñéâÜëëïí åéêïíéêïý ìç÷áíÞìáôïò.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá Ý÷åôå êáôáíïÞóåé ôéò âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).
- Íá ãíùñßæåôå ðùò èá åãêáôáóôÞóåôå ôï FreeBSD (ÊåöÜëáéï 2).
- Íá ãíùñßæåôå ðùò èá ñõèìßóåôå ôç óýíäåóç óáò óôï äßêôõï (ÊåöÜëáéï 32).
- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

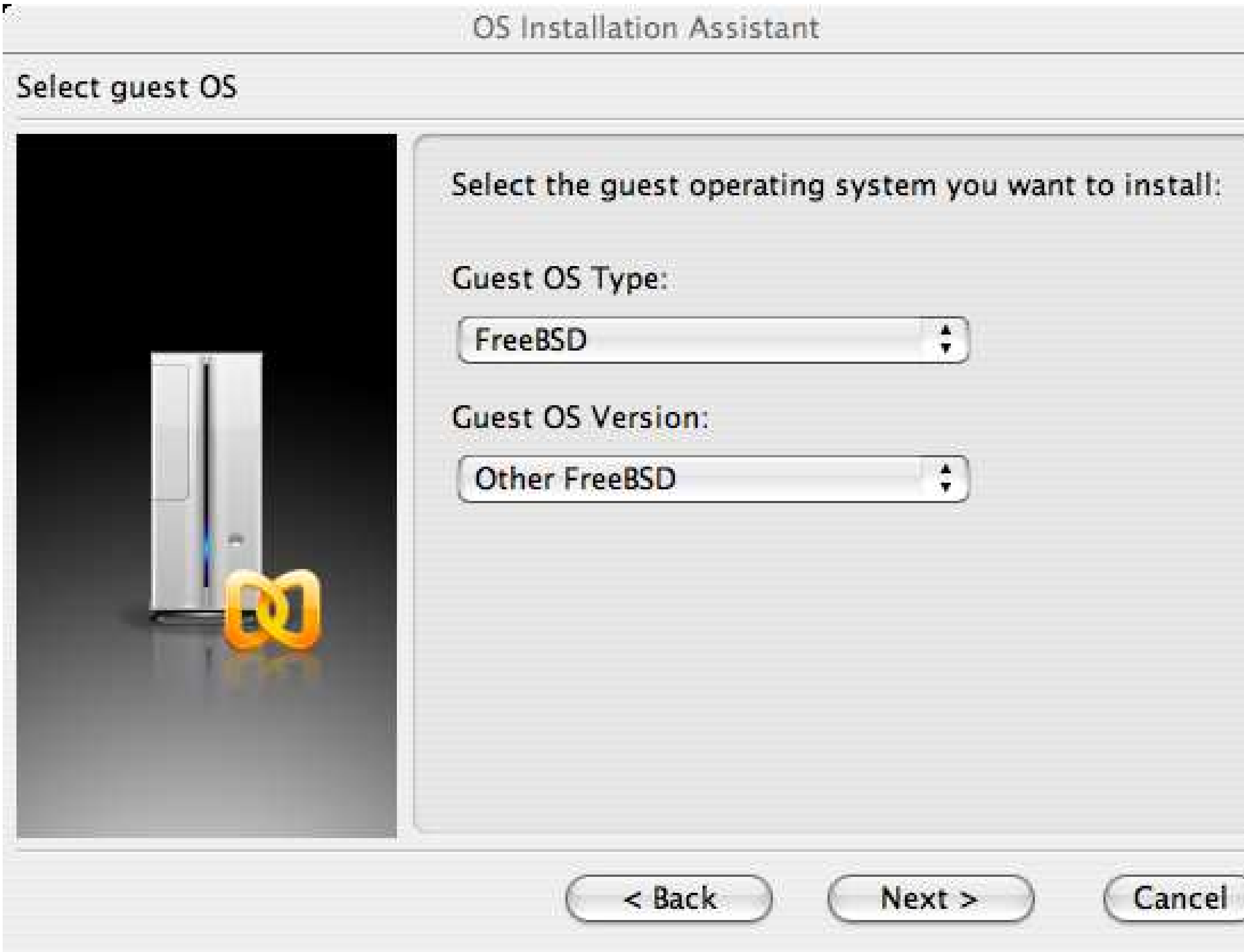
23.2 Ôï FreeBSD ùò öéëïîåíïýìåíï ëåéôïõñãéêü

23.2.1 Ôï Parallels óå MacOS

Ôï **Parallels Desktop** ãéá Mac åßíáé Ýíá åìðïñéêü ëïãéóìéêü ôï ïðïßï åßíáé äéáèÝóéìï ãéá õðïëïãéóôÝò Apple Mac ìå åðåîåñãáóôÞ Intel êáé ëåéôïõñãéêü Mac OS 10.4.6 Þ íåüôåñï. Ôï FreeBSD ðáñÝ÷åé ðëÞñç õðïóôÞñéîç ùò öéëïîåíïýìåíï ëåéôïõñãéêü. ¼ôáí ôï **Parallels** Ý÷åé åãêáôáóôáèåß óôï Mac OS X, ï ÷ñÞóôçò ðñÝðåé íá ñõèìßóåé Ýíá åéêïíéêü óýóôçìá êáé óôç óõíÝ÷åéá íá åãêáôáóôÞóåé ôï öéëïîåíïýìåíï ëåéôïõñãéêü óýóôçìá ðïõ åðéèõìåß.

23.2.1.1 Åãêáèéóôþíôáò ôï FreeBSD óôï Parallels/Mac OS® X

Ôï ðñþôï âÞìá ãéá ôçí åãêáôÜóôáóç ôïõ FreeBSD óôï Mac OS X/**Parallels** åßíáé íá äçìéïõñãÞóåôå Ýíá íÝï åéêïíéêü óýóôçìá ãéá ôï FreeBSD. ¼ôáí åñùôçèåßôå, åðéëÝîôå ôï FreeBSD óáí ôï öéëïîåíïýìåíï ëåéôïõñãéêü (Guest OS) .


OS Installation Assistant
Select guest OS

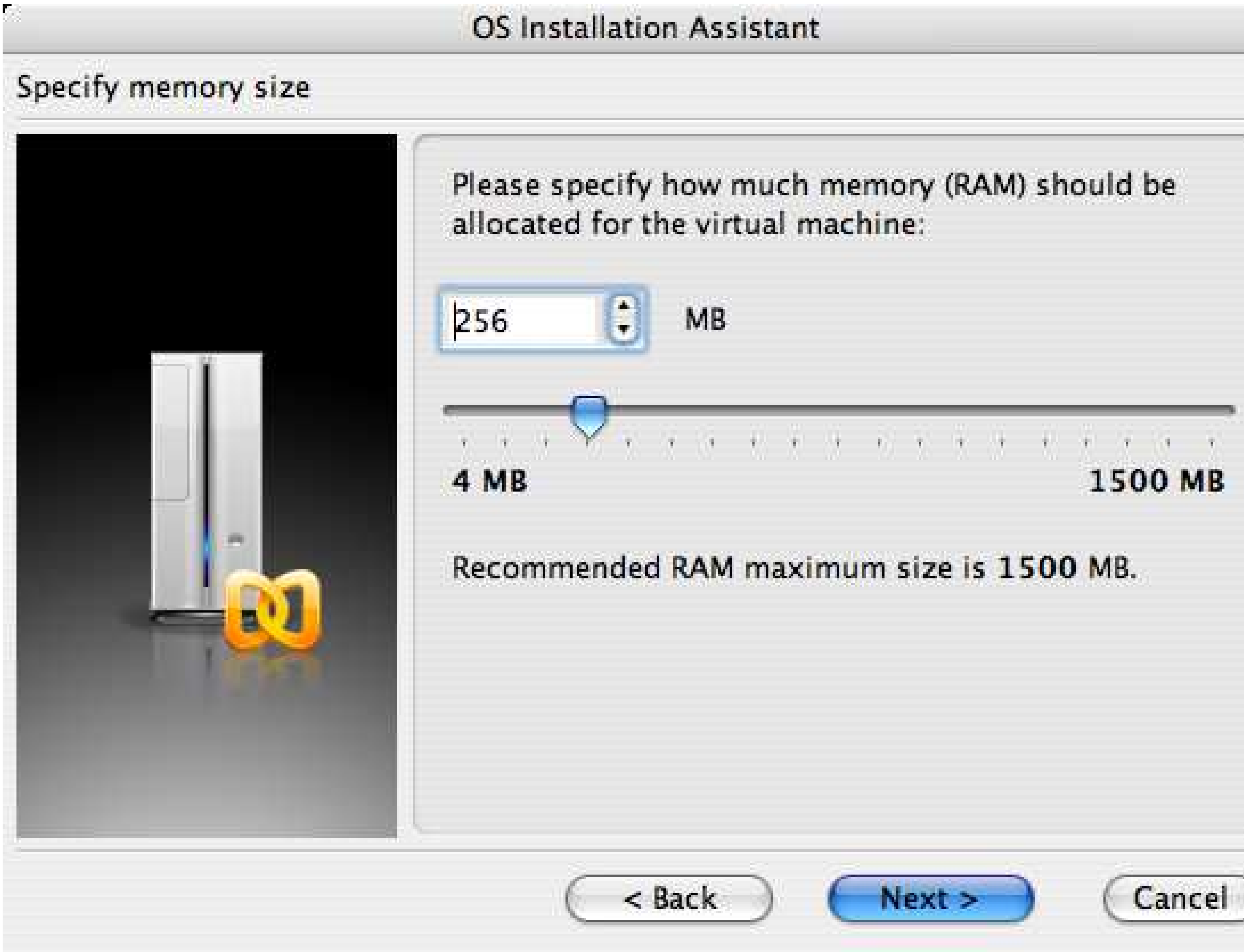
Select the guest operating system you want to install:

Guest OS Type: FreeBSD

Guest OS Version: Other FreeBSD

< Back
Next >
Cancel

Ïñßóôå Ýíá ëïãéêü ìÝãåèïò äßóêïõ êáé ìíÞìçò ðïõ íá áíôáðïêñßíåôáé óôá ó÷Ýäéá ðïõ Ý÷åôå ãéá ôçí åéêïíéêïðïßçóç ôïõ FreeBSD. 4GB äßóêïò êáé 512MB ìíÞìçò äïõëåýïõí ìéá ÷áñÜ ãéá ôïõò ðåñéóóüôåñïõò ÷ñÞóôåò ôïõ FreeBSDìÝóá áðü ôï **Parallels**:


OS Installation Assistant
< Back
Next >
Cancel

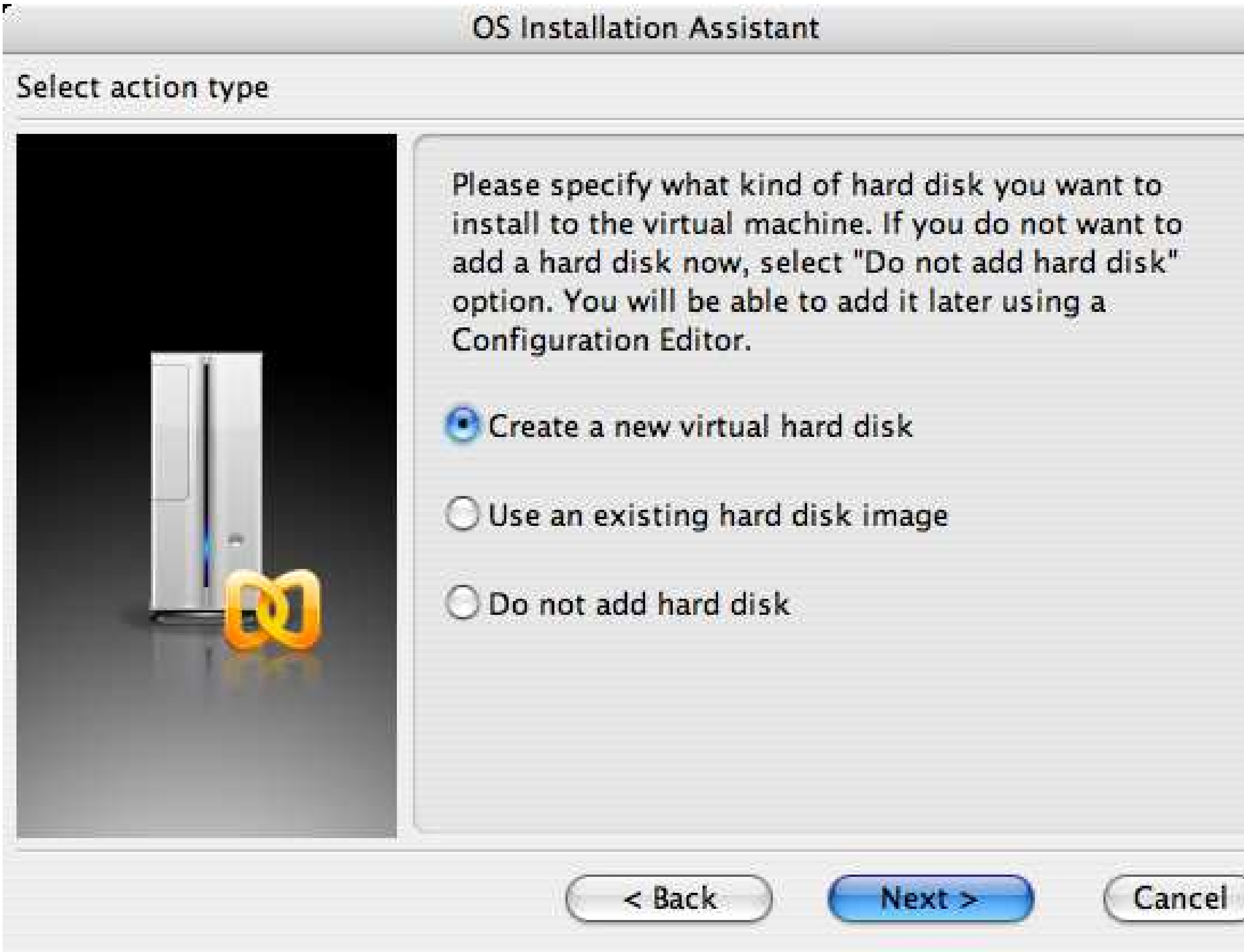
Specify memory size

Please specify how much memory (RAM) should be allocated for the virtual machine:

256 MB

4 MB 1500 MB

Recommended RAM maximum size is 1500 MB.



OS Installation Assistant

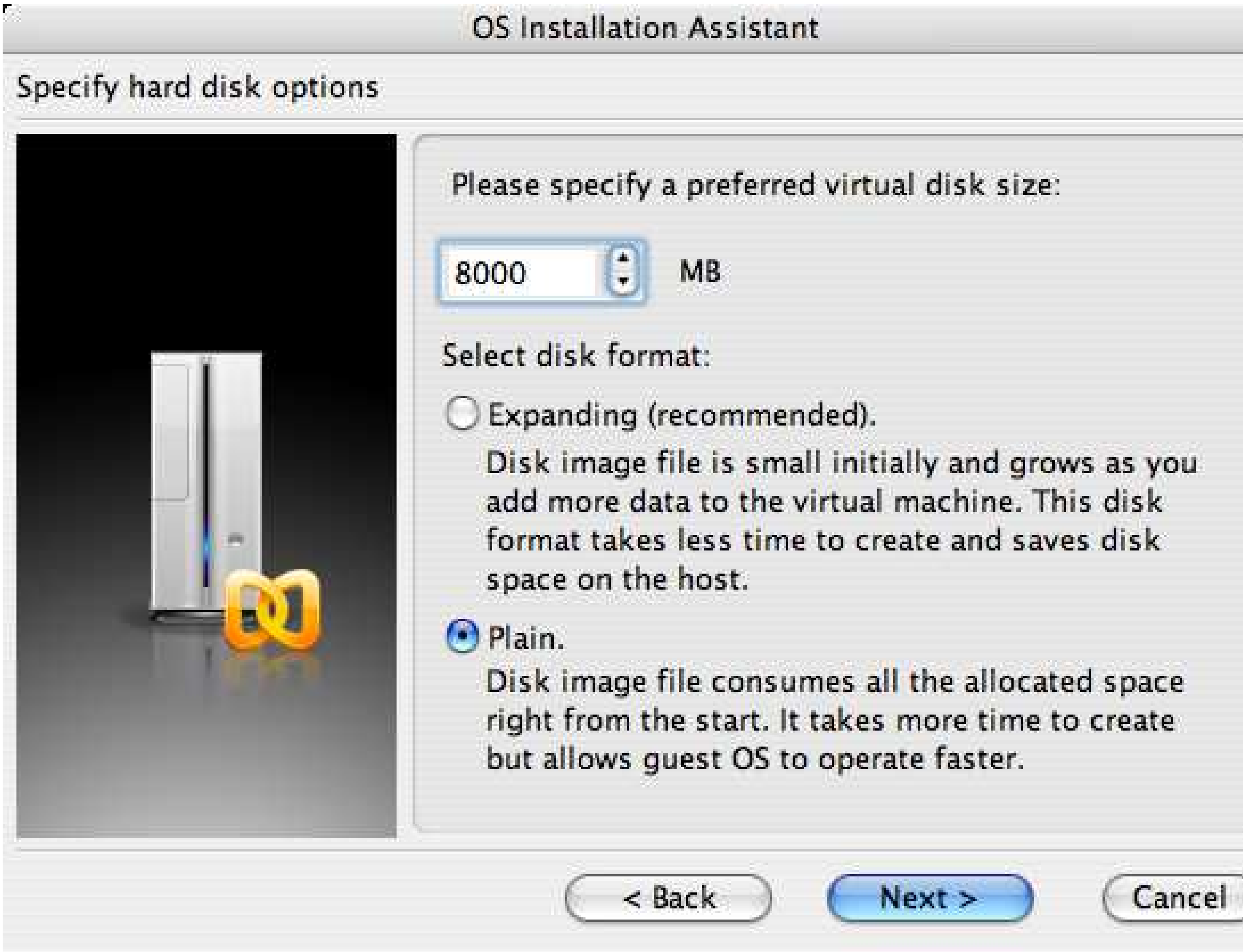
Select action type

Please specify what kind of hard disk you want to install to the virtual machine. If you do not want to add a hard disk now, select "Do not add hard disk" option. You will be able to add it later using a Configuration Editor.

● Create a new virtual hard disk

○ Use an existing hard disk image

○ Do not add hard disk



Specify hard disk options

Please specify a preferred virtual disk size:

8000 MB

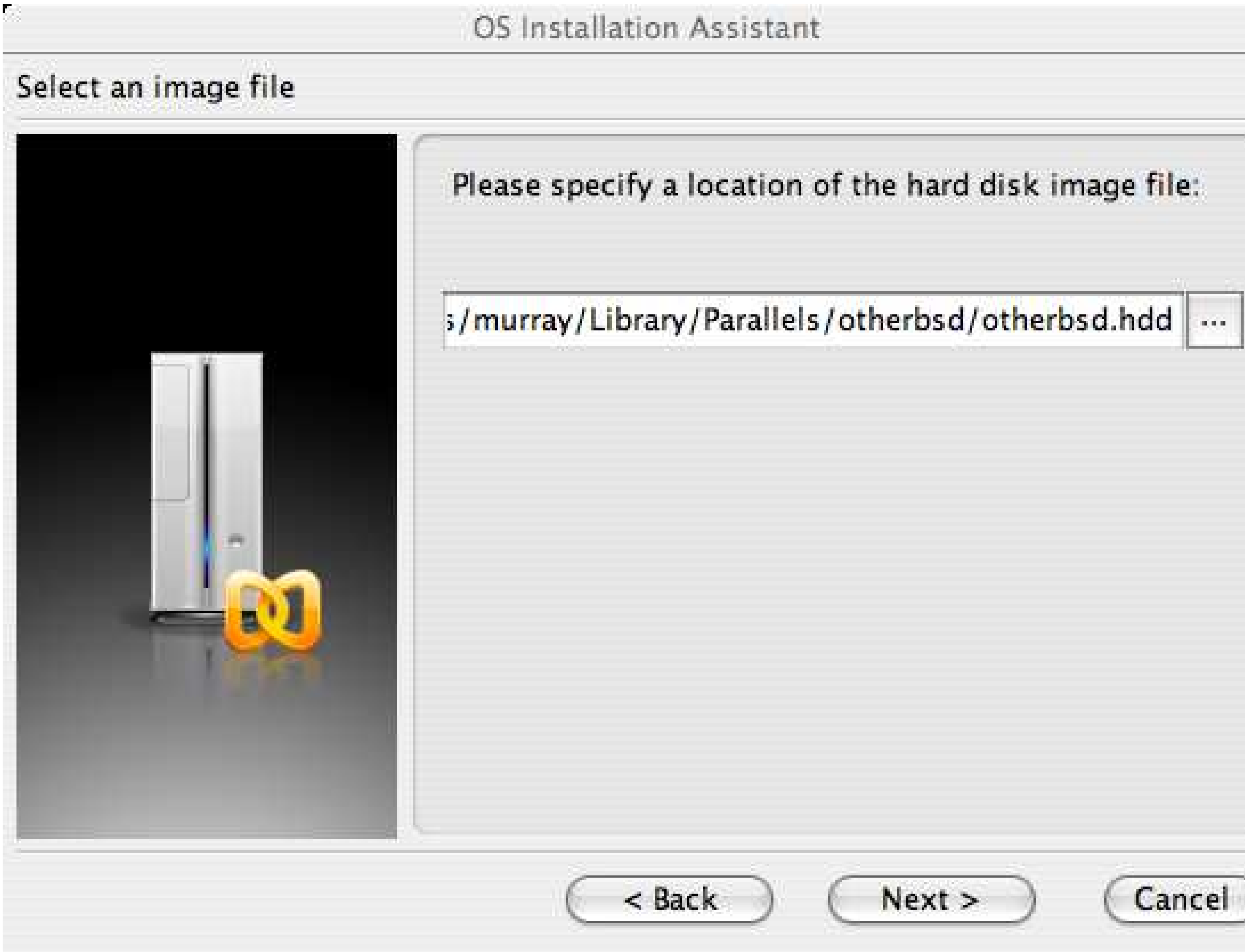
Select disk format:

○ Expanding (recommended).

Disk image file is small initially and grows as you add more data to the virtual machine. This disk format takes less time to create and saves disk space on the host.

● Plain.

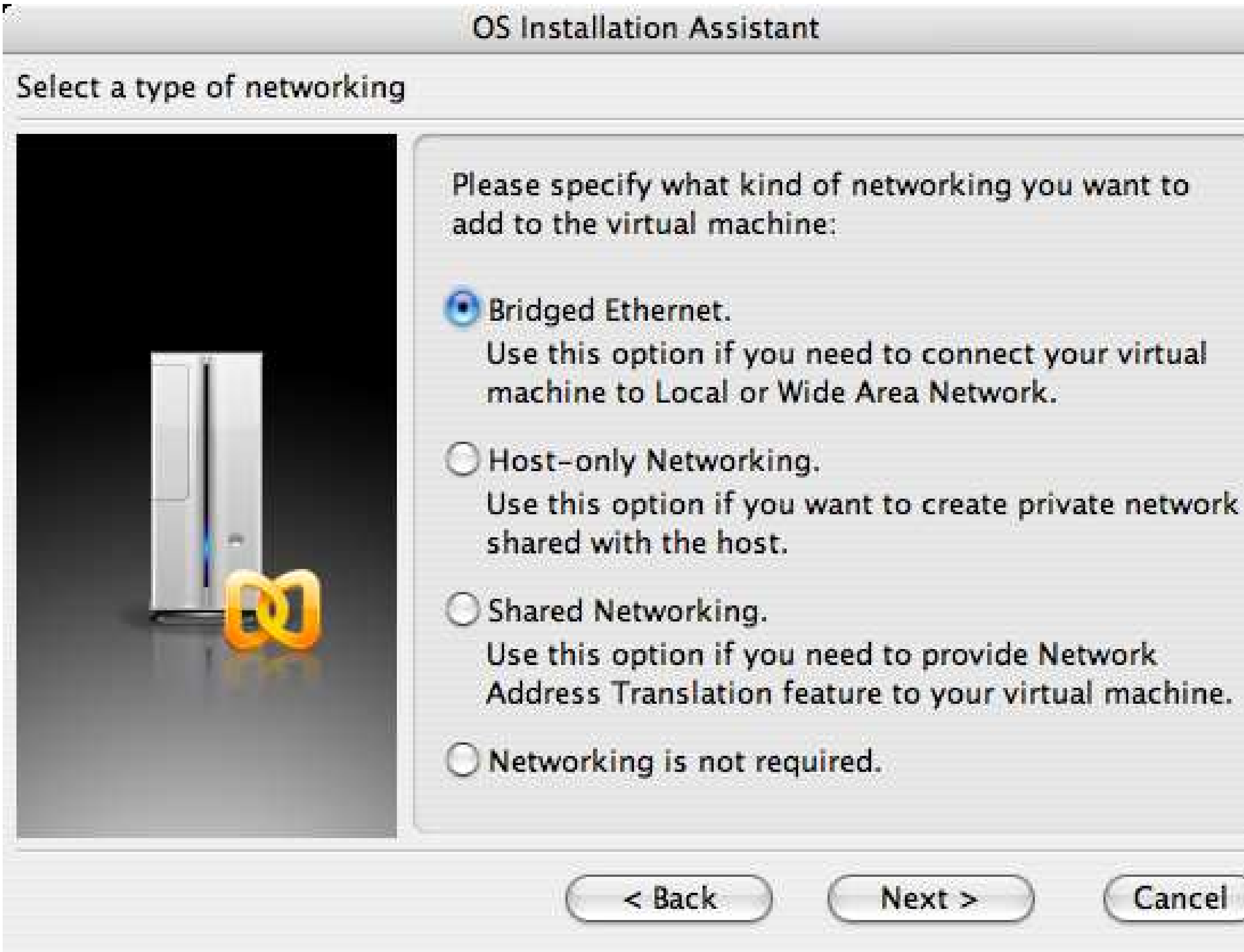
Disk image file consumes all the allocated space right from the start. It takes more time to create but allows guest OS to operate faster.


OS Installation Assistant
Select an image file
...
< Back
Next >
Cancel

Please specify a location of the hard disk image file:

/murray/Library/Parallels/otherbsd/otherbsd.hdd

ÅðéëÝîôå ôïí ôýðï äéêôýùóçò êáé ôïí ðñïóáñìïãÝá äéêôýïõ:



OS Installation Assistant

Select a type of networking

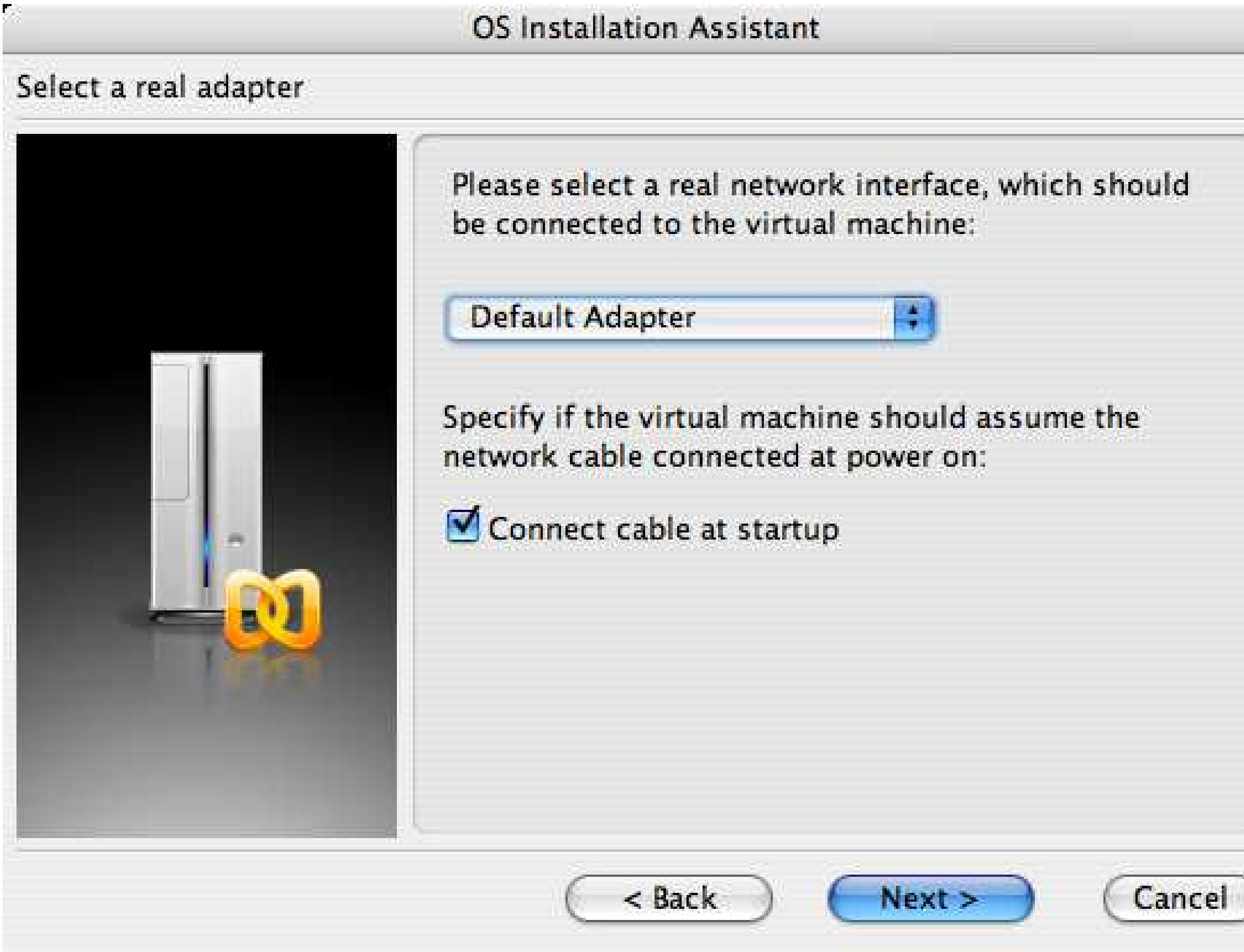
Please specify what kind of networking you want to add to the virtual machine:

● Bridged Ethernet.
Use this option if you need to connect your virtual machine to Local or Wide Area Network.

○ Host-only Networking.
Use this option if you want to create private network shared with the host.

○ Shared Networking.
Use this option if you need to provide Network Address Translation feature to your virtual machine.

○ Networking is not required.


OS Installation Assistant
< Back
Next >
Cancel

Select a real adapter

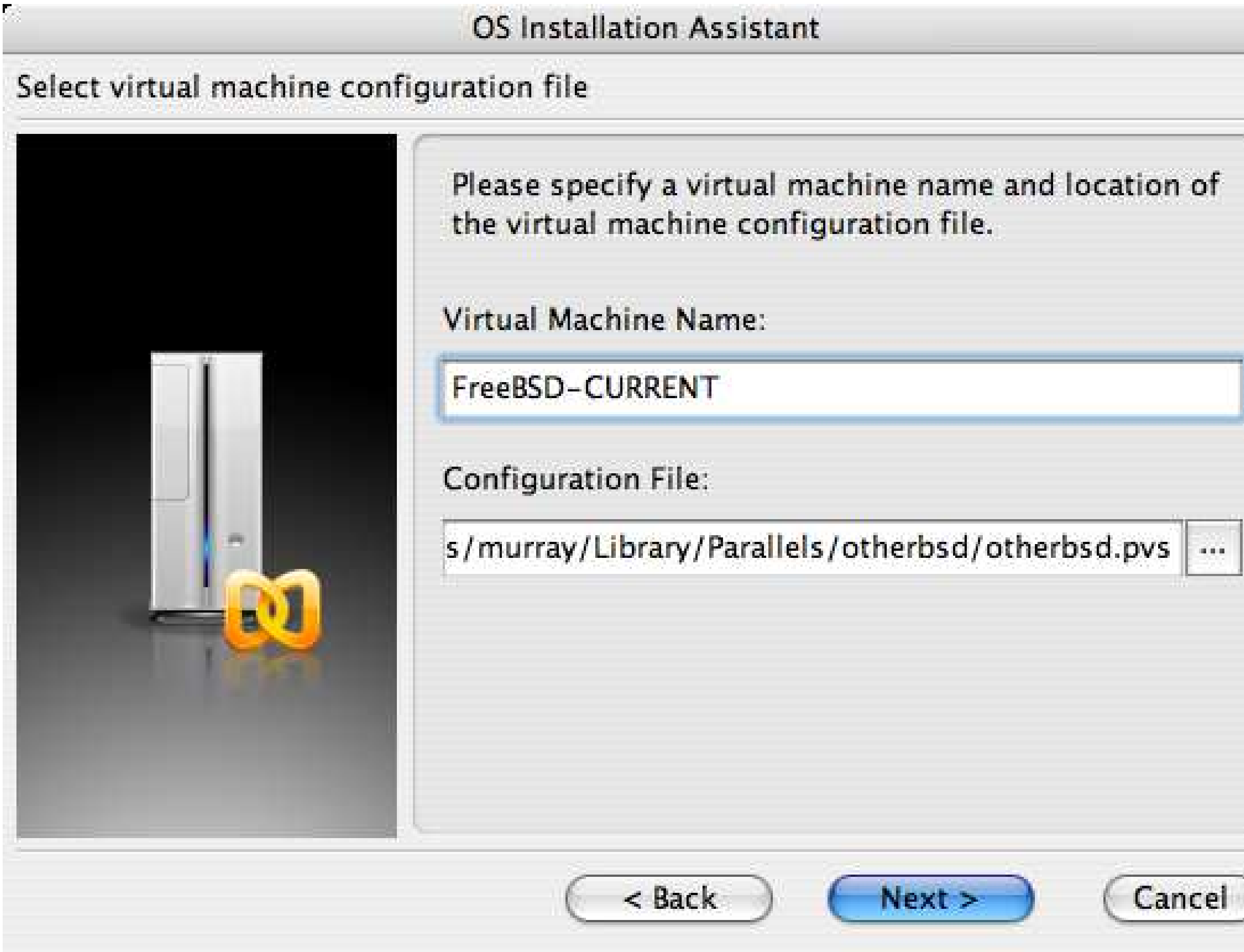
Please select a real network interface, which should be connected to the virtual machine:

Default Adapter

Specify if the virtual machine should assume the network cable connected at power on:

☑ Connect cable at startup

ÁðïèÞêåõóç êáé ôÝëïò ôùí ñõèìßóåùí:



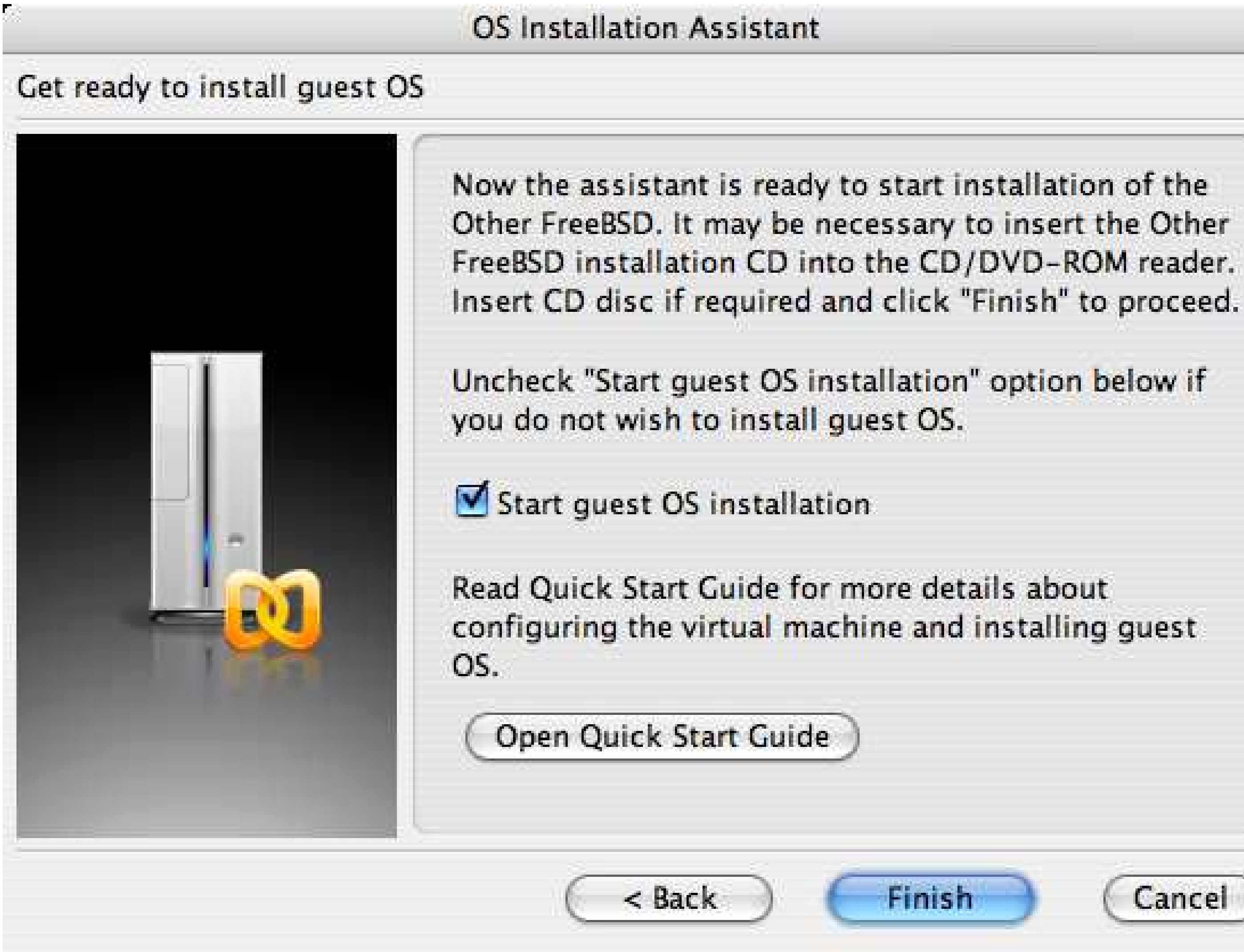
OS Installation Assistant

Select virtual machine configuration file

Please specify a virtual machine name and location of the virtual machine configuration file.

Virtual Machine Name: FreeBSD-CURRENT

Configuration File: s/murray/Library/Parallels/otherbsd/otherbsd.pvs


OS Installation Assistant

Get ready to install guest OS

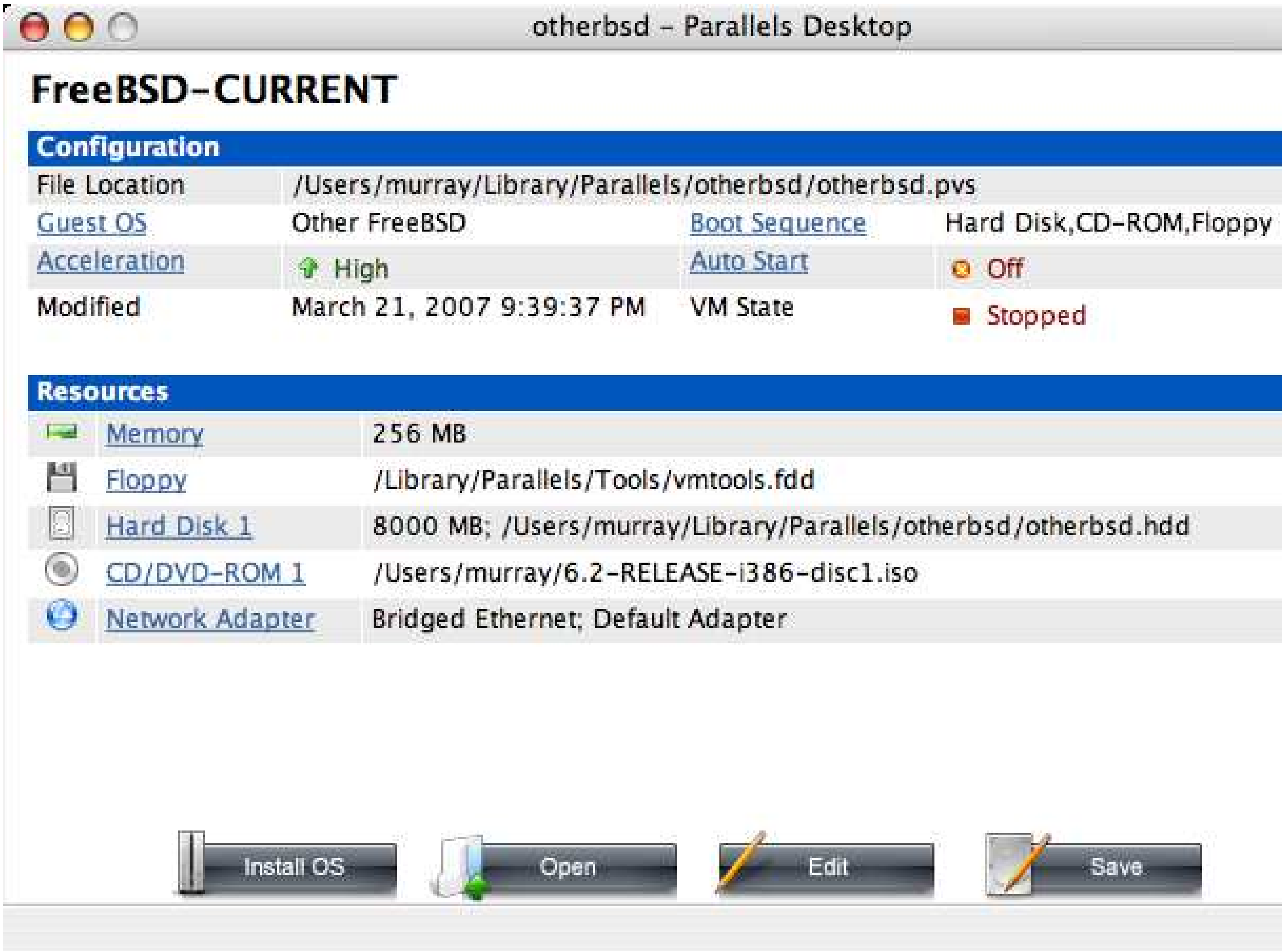
Now the assistant is ready to start installation of the Other FreeBSD. It may be necessary to insert the Other FreeBSD installation CD into the CD/DVD-ROM reader. Insert CD disc if required and click "Finish" to proceed.

Uncheck "Start guest OS installation" option below if you do not wish to install guest OS.

☑ Start guest OS installation

Read Quick Start Guide for more details about configuring the virtual machine and installing guest OS.

¼ôáí ôï åéêïíéêü óýóôçìá Ý÷åé äçìéïõñãçèåß, èá ÷ñåéáóôåß íá åãêáôáóôÞóåôå ôï ßäéï ôï FreeBSD. Ï êáëýôåñïò ôñüðïò ãéá íá ãßíåé ç åãêáôÜóôáóç åßíáé ìå ôï åðßóçìï FreeBSD CD-ROM Þ ìå êÜðïéï áñ÷åßï ISO, êáôåâáóìÝíï áðü ôïí åðßóçìï FTP ôüðï. ¼ôáí Ý÷åôå ôï êáôÜëëçëï ISO óôï óêëçñü óáò, Þ ôï CD-ROM óôïí ïäçãü CD, åíåñãïðïéÞóôå ìå ôï ðïíôßêé ôï åéêïíßäéï ôïõ CD óôï êÜôù äåîß ìÝñïò ôçò ïèüíçò ôïõ **Parallels**. Ìå áõôüí ôïí ôñüðï èá ìðïñÝóåôå íá ïñßóåôå ôçí ðçãÞ ôçò åãêáôÜóôáóçò. Ìðïñåßôå íá ïñßóåôå ôï CDROM Þ êÜðïéï äéáèÝóéìï ISO áñ÷åßï.

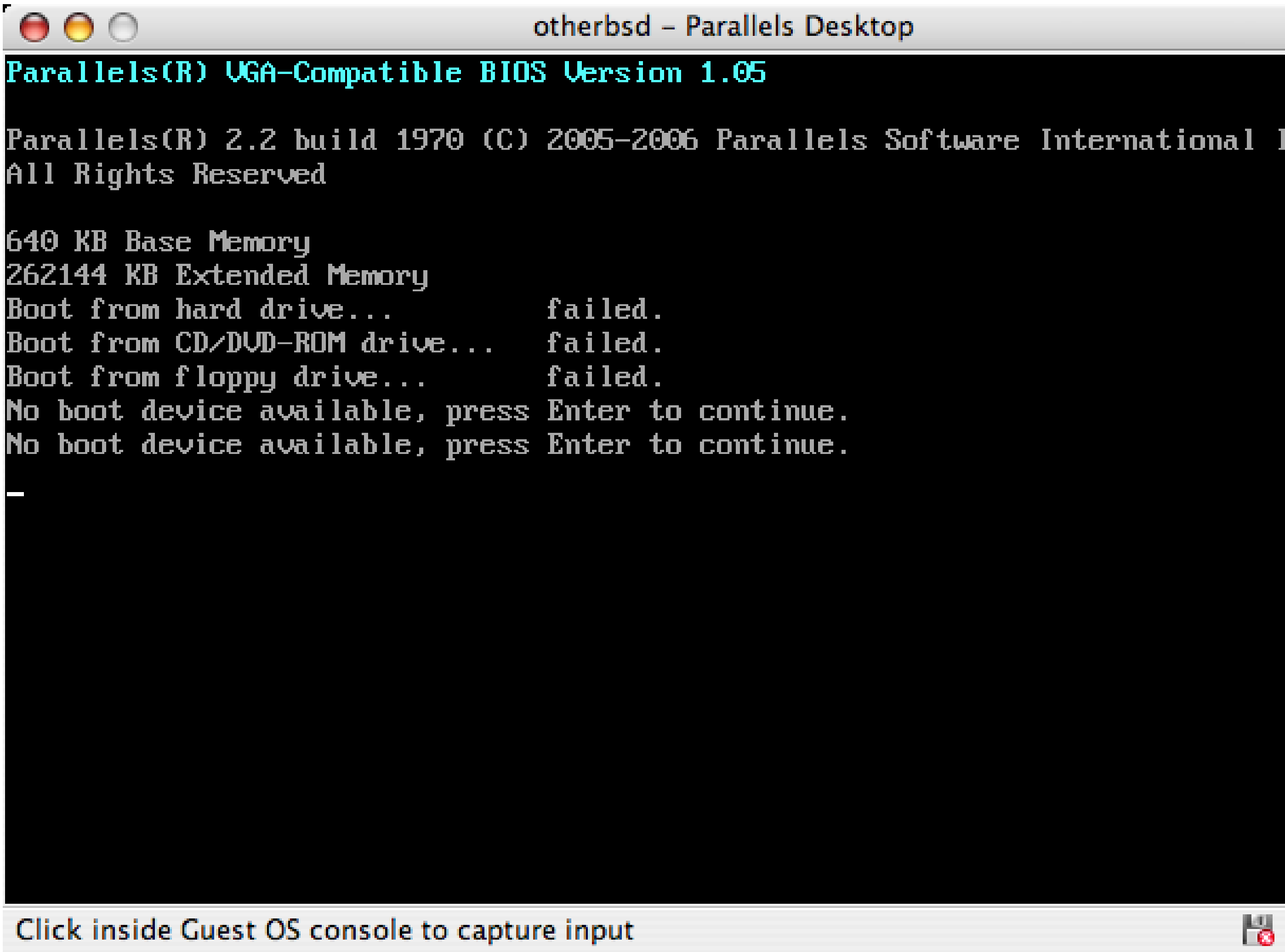


FreeBSD-CURRENT

Configuration			
File Location	/Users/murray/Library/Parallels/otherbsd/otherbsd.pvs		
Guest OS	Other FreeBSD	Boot Sequence	Hard Disk,CD-ROM,Floppy
Acceleration	High	Auto Start	Off
Modified	March 21, 2007 9:39:37 PM	VM State	Stopped

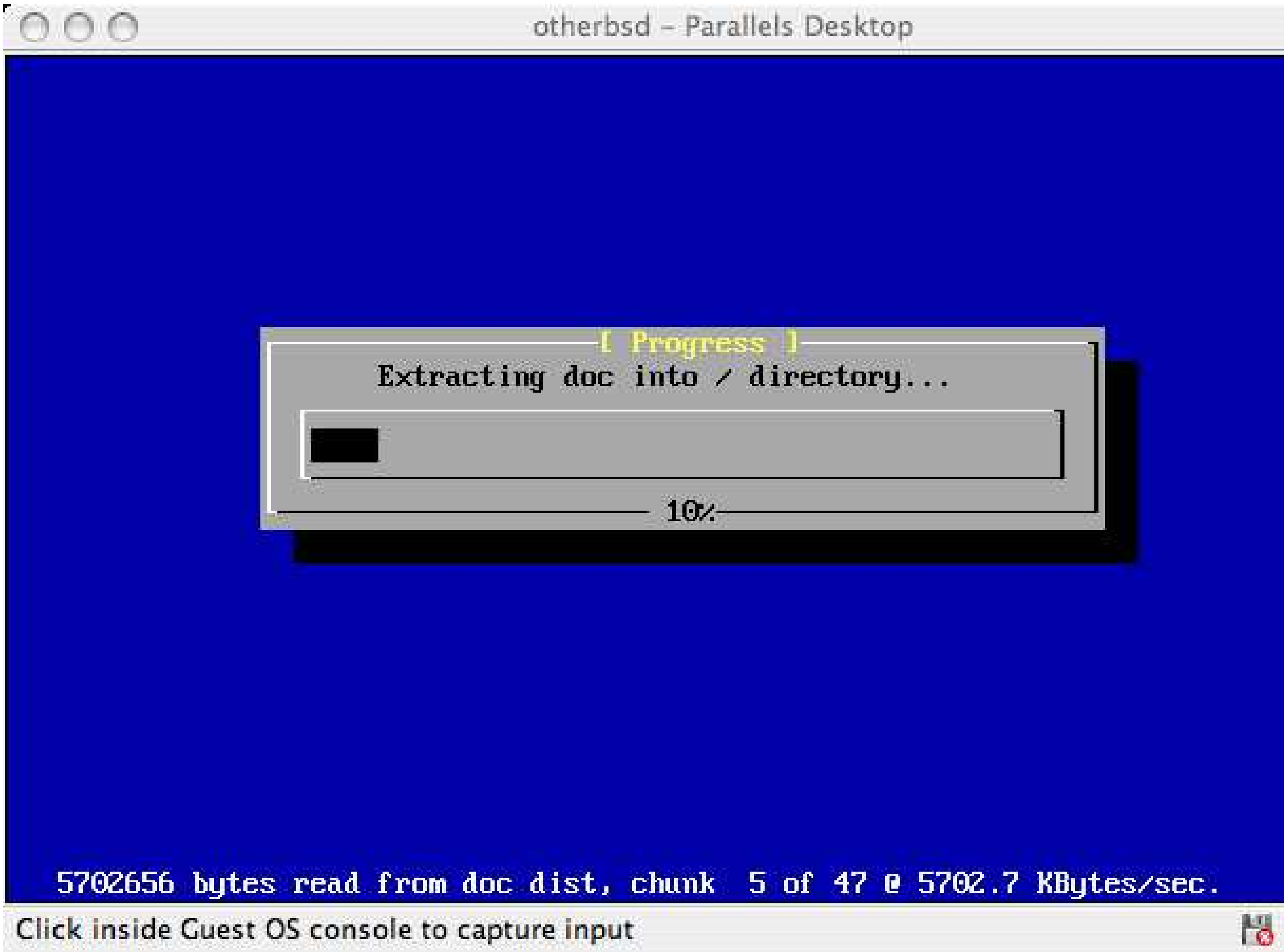
Resources	
Memory	256 MB
Floppy	/Library/Parallels/Tools/vmtools.fdd
Hard Disk 1	8000 MB; /Users/murray/Library/Parallels/otherbsd/otherbsd.hdd
CD/DVD-ROM 1	/Users/murray/6.2-RELEASE-i386-disc1.iso
Network Adapter	Bridged Ethernet; Default Adapter

¼ôáí Ý÷åôå áíôéóôïé÷Þóåé ôç ðçãÞ åãêáôÜóôáóçò, åðáíåêêéíÞóôå ôï åéêïíéêü óýóôçìá ðáôþíôáò áðëÜ ôï êïõìðß ôçò åðáíåêêßíçóçò (reboot) ôïõ **Parallels**. Ôï **Parallels** èá îåêéíÞóåé ìå Ýíá åéêïíéêü BIOS ôï ïðïßï ðñþôá åëÝã÷åé åÜí õðÜñ÷åé äéáèÝóéìï êÜðïéï CD-ROM, üðùò êÜíåé êáé Ýíá öõóéïëïãéêü BIOS.


otherbsd – Parallels Desktop
Click inside Guest OS console to capture input

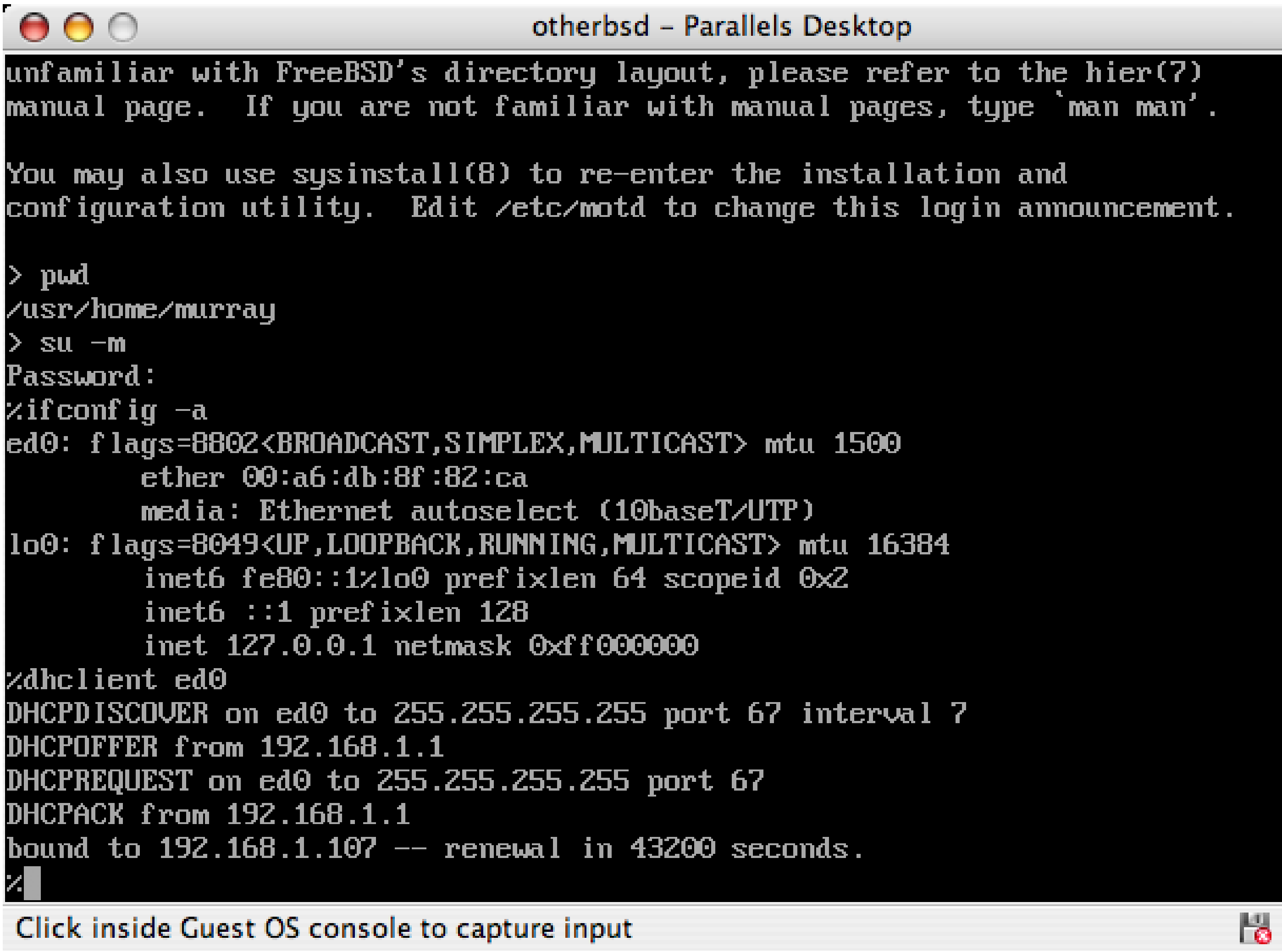
```
Parallels(R) VGA-Compatible BIOS Version 1.05

Parallels(R) 2.2 build 1970 (C) 2005-2006 Parallels Software International
All Rights Reserved

640 KB Base Memory
262144 KB Extended Memory
Boot from hard drive...        failed.
Boot from CD/DVD-ROM drive...  failed.
Boot from floppy drive...      failed.
No boot device available, press Enter to continue.
No boot device available, press Enter to continue.

_
```

Óå áõôÞ ôç ðåñßðôùóç èá âñåé ôï ìÝóï åãêáôÜóôáóçò ôïõ FreeBSD êáé èá îåêéíÞóåé ôï **sysinstall** üðùò ðåñéãñÜöåôáé óôï ÊåöÜëáéï 2. Ìðïñåßôå íá åãêáôáóôÞóåôå ôï X11, áëëÜ ìç äïêéìÜóåôå íá ñõèìßóåôå áõôÞ ôç óôéãìÞ.


otherbsd – Parallels Desktop
Click inside Guest OS console to capture input

```
[ Progress ]
Extracting doc into / directory...

10%

5702656 bytes read from doc dist, chunk  5 of 47 @ 5702.7 KBytes/sec.
```

¼ôáí ôåëåéþóåôå ìå ôçí åãêáôÜóôáóç, êÜíôå ìéá åðáíåêêßíçóç óôï öñÝóêï áéêïíéêü FreeBSD.


otherbsd – Parallels Desktop
Click inside Guest OS console to capture input

```
unfamiliar with FreeBSD's directory layout, please refer to the hier(7)
manual page.  If you are not familiar with manual pages, type `man man'.

You may also use sysinstall(8) to re-enter the installation and
configuration utility.  Edit /etc/motd to change this login announcement.

> pwd
/usr/home/murray
> su -m
Password:
%ifconfig -a
ed0: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        ether 00:a6:db:8f:82:ca
        media: Ethernet autoselect (10baseT/UTP)
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x2
        inet6 ::1 prefixlen 128
        inet 127.0.0.1 netmask 0xff000000
%dhclient ed0
DHCPDISCOVER on ed0 to 255.255.255.255 port 67 interval 7
DHCPOFFER from 192.168.1.1
DHCPREQUEST on ed0 to 255.255.255.255 port 67
DHCPACK from 192.168.1.1
bound to 192.168.1.107 -- renewal in 43200 seconds.
%
```

23.2.1.2 Ñõèìßæïíôáò ôï FreeBSD óôï Mac OS X/Parallels

Áöïý Ý÷åé åãêáôáóôáèåß åðéôõ÷þò ôï FreeBSD óôï Mac OS X ìå ôï **Parallels**, õðÜñ÷ïõí ìåñéêÜ âÞìáôá áêüìç ðïõ ìðïñïýí íá óáò âïçèÞóïõí íá ñõèìßóåôå ôï åéêïíéêü óáò óýóôçìá.

1. ÌåôáâëçôÝò ôïõ boot loader

   Ôï ðéï óçìáíôéêü âÞìá åßíáé íá ìåéþóåôå ôï ìÝãåèïò ôïõ `kern.hz` ðñïêåéìÝíïõ íá áîéïðïéÞóåôå ôç CPU ìÝóá áðü ôï **Parallels**. Áõôü ìðïñåß íá ãßíåé ìå ôï íá ðñïóèÝóåôå ôçí áêüëïõèç ãñáììÞ óôï `/boot/loader.conf`:

   ```
   kern.hz=100
   ```

   ×ùñßò áõôÞ ôç ñýèìéóç, Ýíá áäñáíÝò FreeBSD óôï **Parallels** èá êáôáíáëþíåé ôï 15% ôçò CPU åíüò ìïíïðýñçíïõ iMac®. ÌåôÜ áðü ôçí áëëáãÞ, ç êáôáíÜëùóç èá ðÝóåé êïíôÜ óôï 5%.

2. Äçìéïõñãßá íÝïõ áñ÷åßïõ ñõèìßóåùí ôïõ ðõñÞíá

   Ìðïñåßôå íá áöáéñÝóåôå üëïõò ôïõò ïäçãïýò ãéá SCSI, FireWire, êáé USB óõóêåõÝò. Ôï **Parallels** ðáñÝ÷åé Ýíá åéêïíéêü ðñïóáñìïãÝá äéêôýïõ ï ïðïßïò ÷ñçóéìïðïéåßôáé áðü ôïí ïäçãü ed(4), ïðüôå üëïé ïé ïäçãïß ãéá äéêôõáêÝò óõóêåõÝò åêôüò ôùí ed(4) êáé miibus(4) ìðïñïýí íá áöáéñåèïýí áðü ôïí ðõñÞíá.

3. Ñýèìéóç äéêôýïõ

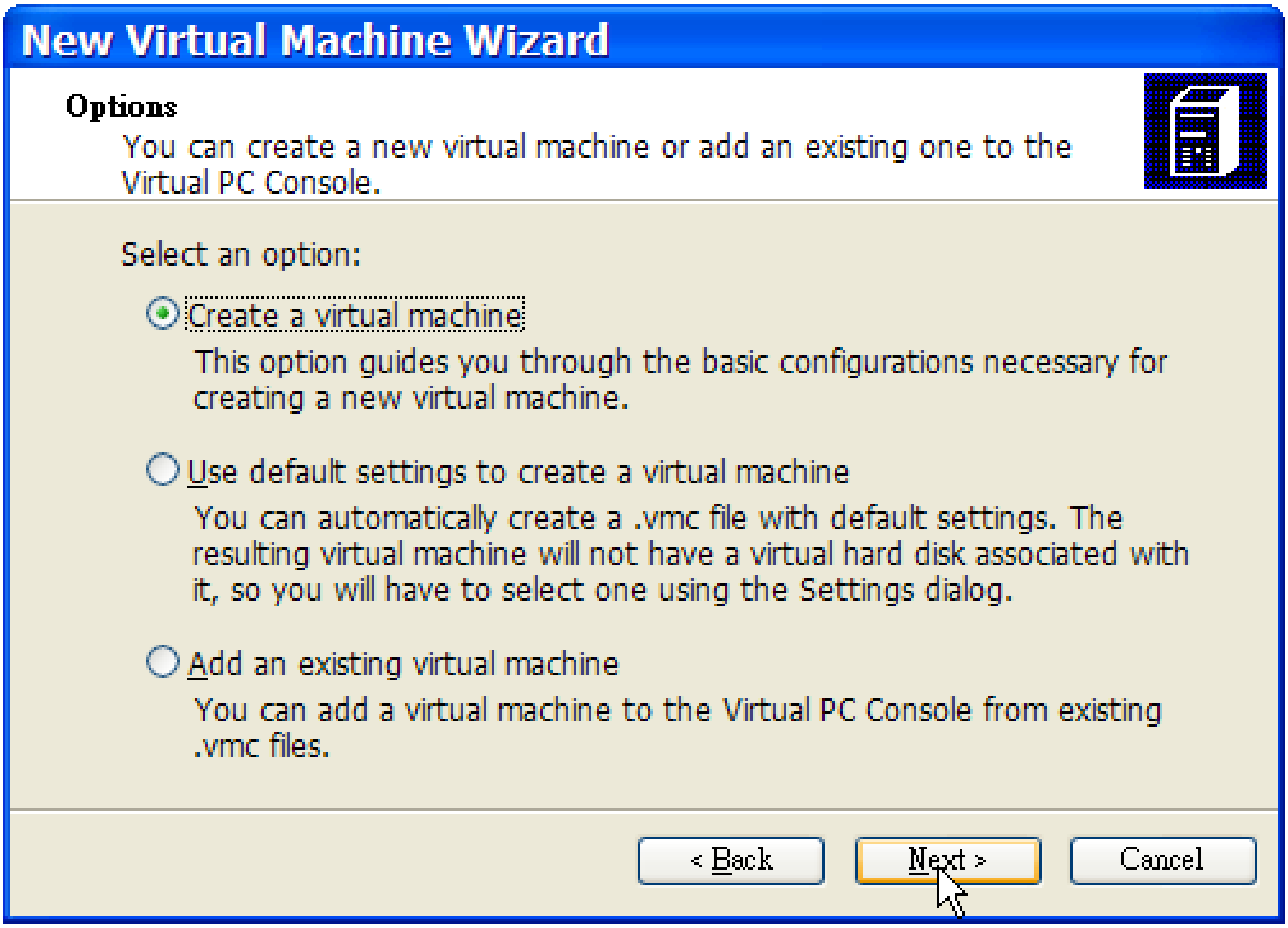
   Ç ðéï áðëÞ ñýèìéóç äéêôýïõ êÜíåé ÷ñÞóç ôïõ DHCP ãéá íá óõíäåèåß ôï åéêïíéêü óáò óýóôçìá óôï ßäéï ôïðéêü äßêôõï ìå ôïí Mac. Áõôü ìðïñåß åýêïëá íá ãßíåé ìå ôï íá ðñïóèÝóåôå ôç ãñáììÞ `ifconfig_ed0="DHCP"` óôï `/etc/rc.conf`. Ðéïõðëïêüôåñåò ñõèìßóåéò äéêôýïõ ðåñéãñÜöïíôáé óôï êåöÜëáéï ÊåöÜëáéï 32.

23.2.2 Ôï Virtual PC óôá Windows

Ôï **Virtual PC** ãéá Windows åßíáé Ýíá ðñïúüí ôçò Microsoft ðïõ äéáôßèåôáé ãéá äùñåÜí êáôÝâáóìá. Äåßôå ôéò áðáéôÞóåéò óõóôÞìáôïò (http://www.microsoft.com/windows/downloads/virtualpc/sysreq.mspx). ÌåôÜ ôçí åãêáôÜóôáóç ôïõ **Virtual PC** óôá Microsoft Windows, ï ÷ñÞóôçò ðñÝðåé íá ñõèìßóåé Ýíá åéêïíéêü ìç÷Üíçìá êáé íá åãêáôáóôÞóåé ôï ëåéôïõñãéêü ðïõ åðéèõìåß.

23.2.2.1 ÅãêáôÜóôáóç ôïõ FreeBSD óôï Virtual PC/Microsoft® Windows

Ôï ðñþôï âÞìá óôçí åãêáôÜóôáóç ôïõ FreeBSD óôá Microsoft Windows ìå ÷ñÞóç ôïõ **Virtual PC**, åßíáé ç äçìéïõñãßá åíüò íÝïõ åéêïíéêïý ìç÷áíÞìáôïò ãéá ôçí åãêáôÜóôáóç ôïõ. ÅðéëÝîôå Create a virtual machine üôáí åñùôçèåßôå:



New Virtual Machine Wizard

Options

You can create a new virtual machine or add an existing one to the Virtual PC Console.

Select an option:

● Create a virtual machine

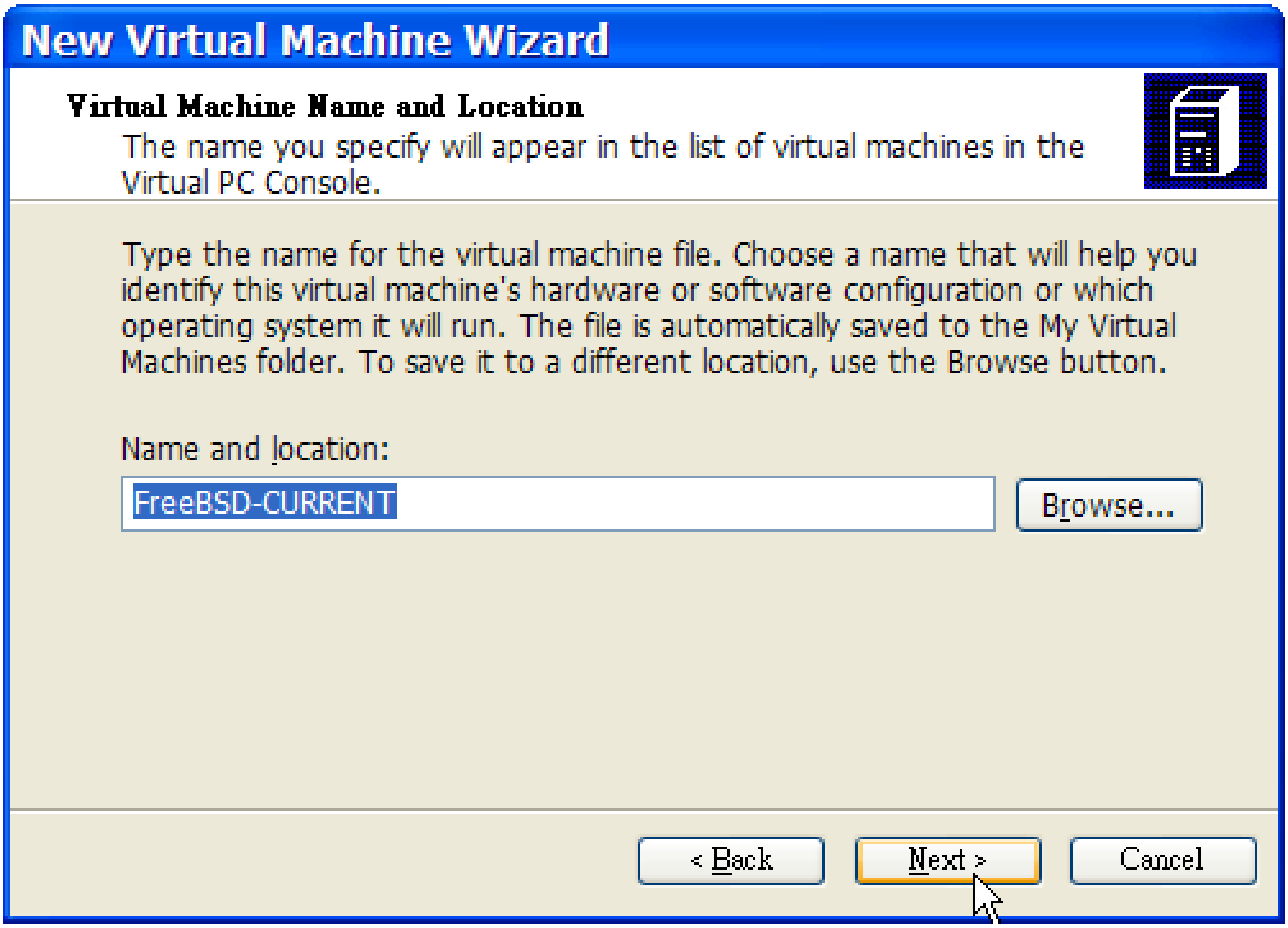
This option guides you through the basic configurations necessary for creating a new virtual machine.

○ Use default settings to create a virtual machine

You can automatically create a .vmc file with default settings. The resulting virtual machine will not have a virtual hard disk associated with it, so you will have to select one using the Settings dialog.

○ Add an existing virtual machine

You can add a virtual machine to the Virtual PC Console from existing .vmc files.



New Virtual Machine Wizard

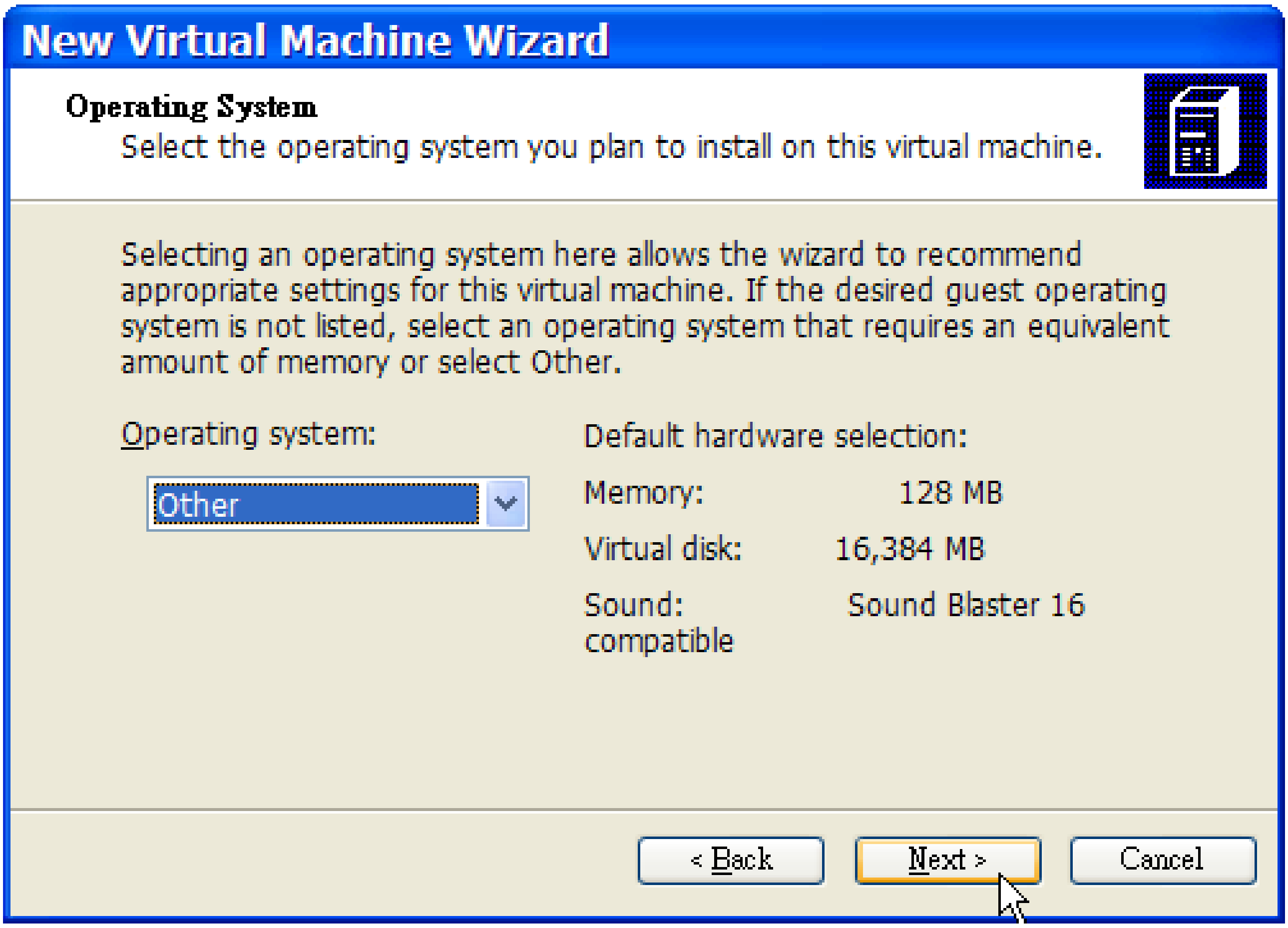
Virtual Machine Name and Location

The name you specify will appear in the list of virtual machines in the Virtual PC Console.

Type the name for the virtual machine file. Choose a name that will help you identify this virtual machine's hardware or software configuration or which operating system it will run. The file is automatically saved to the My Virtual Machines folder. To save it to a different location, use the Browse button.

Name and location: FreeBSD-CURRENT

Óôçí åñþôçóç Operating System åðéëÝîôå Other:


New Virtual Machine Wizard

Operating System

Select the operating system you plan to install on this virtual machine.

Selecting an operating system here allows the wizard to recommend appropriate settings for this virtual machine. If the desired guest operating system is not listed, select an operating system that requires an equivalent amount of memory or select Other.

Operating system: Other

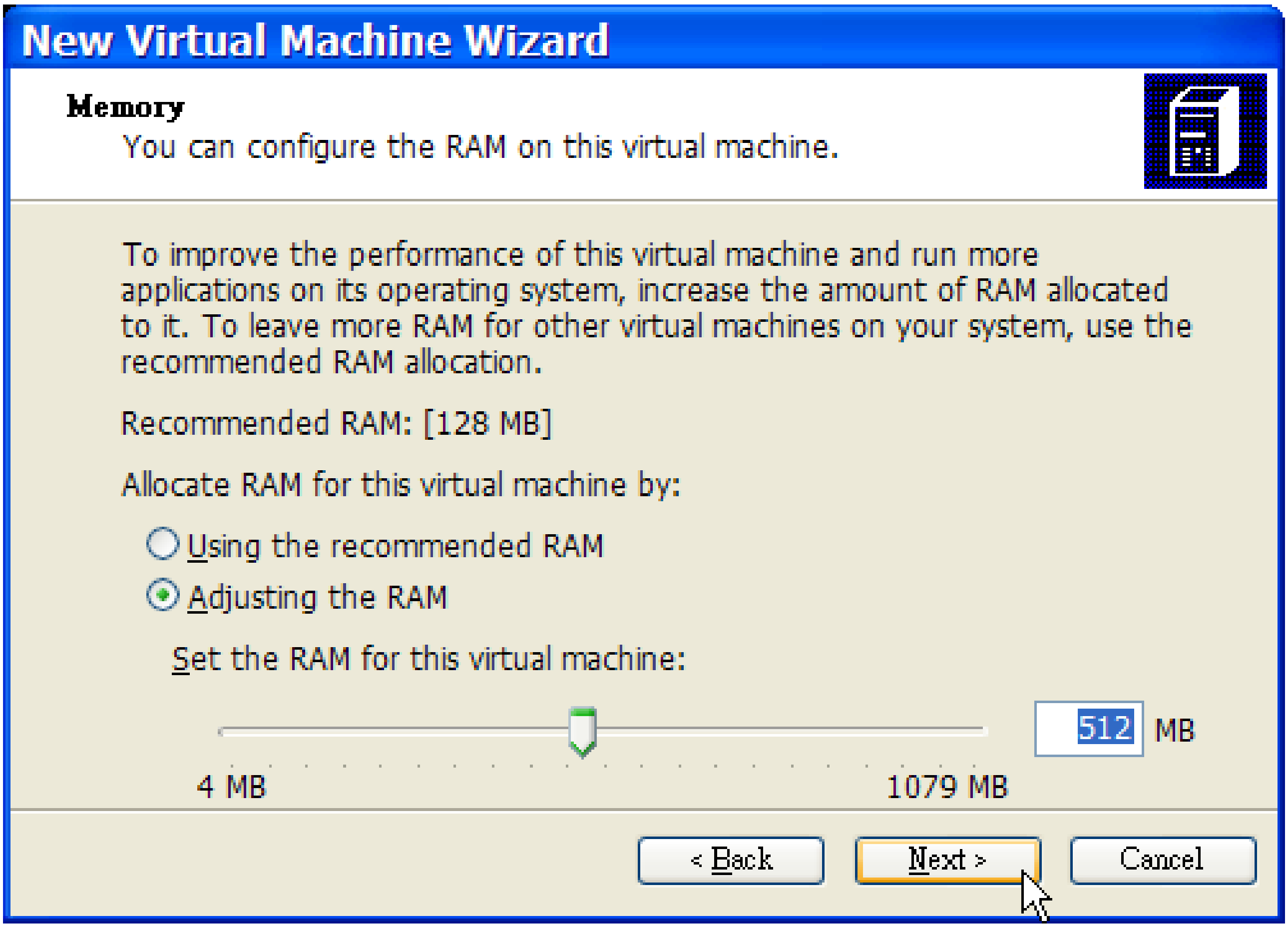
Default hardware selection:

Memory: 128 MB

Virtual disk: 16,384 MB

Sound: Sound Blaster 16 compatible

ÅðéëÝîôå Ýðåéôá êáôÜëëçëï ìÝãåèïò ãéá ôï óêëçñü äßóêï êáé ôç ìíÞìç RAM ôïõ åéêïíéêïý ìç÷áíÞìáôïò, áíÜëïãá ìå ôç ÷ñÞóç ðïõ óêïðåýåôå íá êÜíåôå. Óôéò ðåñéóóüôåñåò ðåñéðôþóåéò, ôá 4GB äßóêïõ êáé 512MB RAM åßíáé áñêåôÜ ãéá ÷ñÞóç ôïõ FreeBSD óôï **Virtual PC**:



New Virtual Machine Wizard

Memory

You can configure the RAM on this virtual machine.

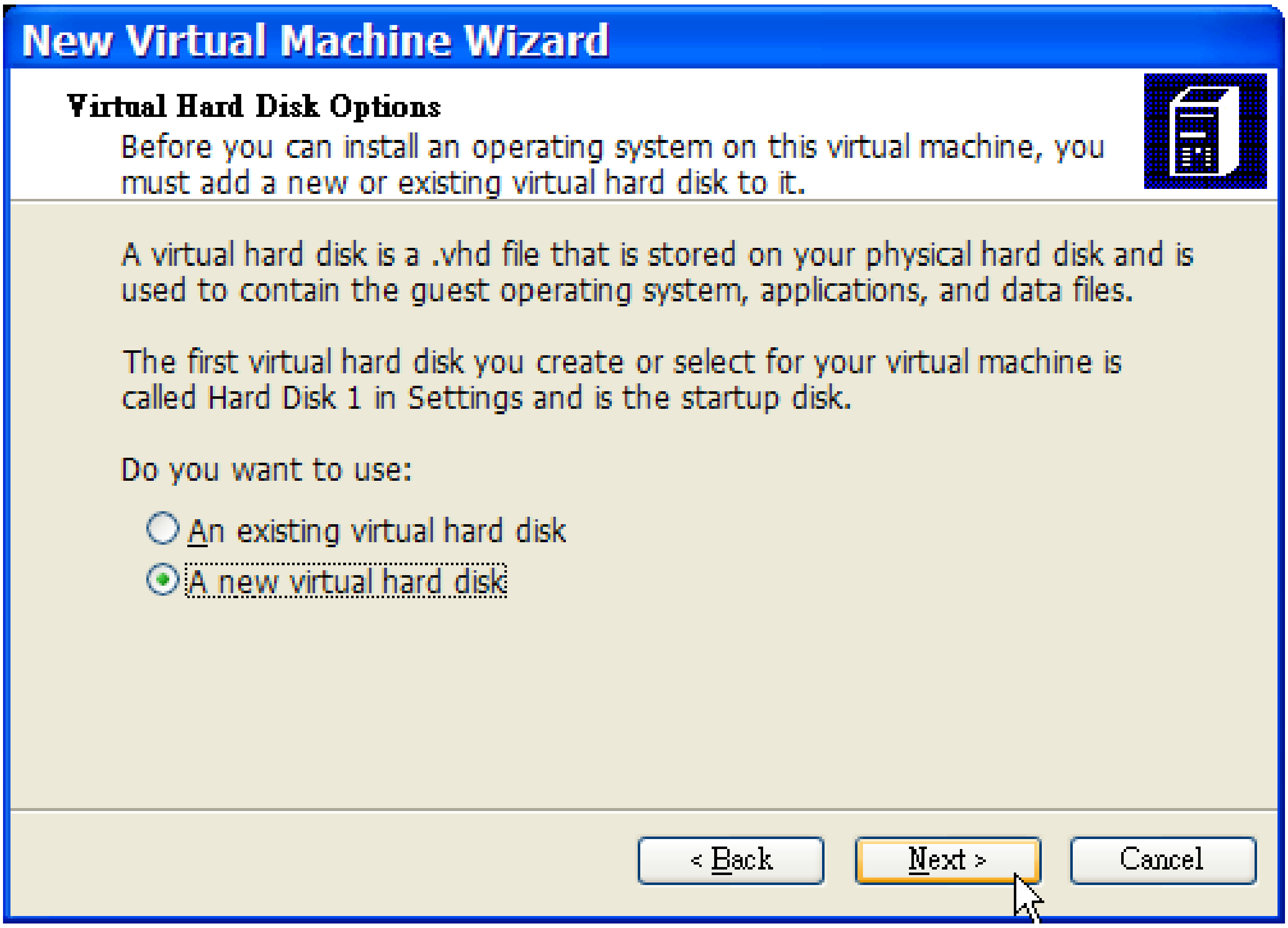
To improve the performance of this virtual machine and run more applications on its operating system, increase the amount of RAM allocated to it. To leave more RAM for other virtual machines on your system, use the recommended RAM allocation.

Recommended RAM: [128 MB]

Allocate RAM for this virtual machine by:

○ Using the recommended RAM
● Adjusting the RAM

Set the RAM for this virtual machine: 512 MB


New Virtual Machine Wizard

Virtual Hard Disk Options

Before you can install an operating system on this virtual machine, you must add a new or existing virtual hard disk to it.

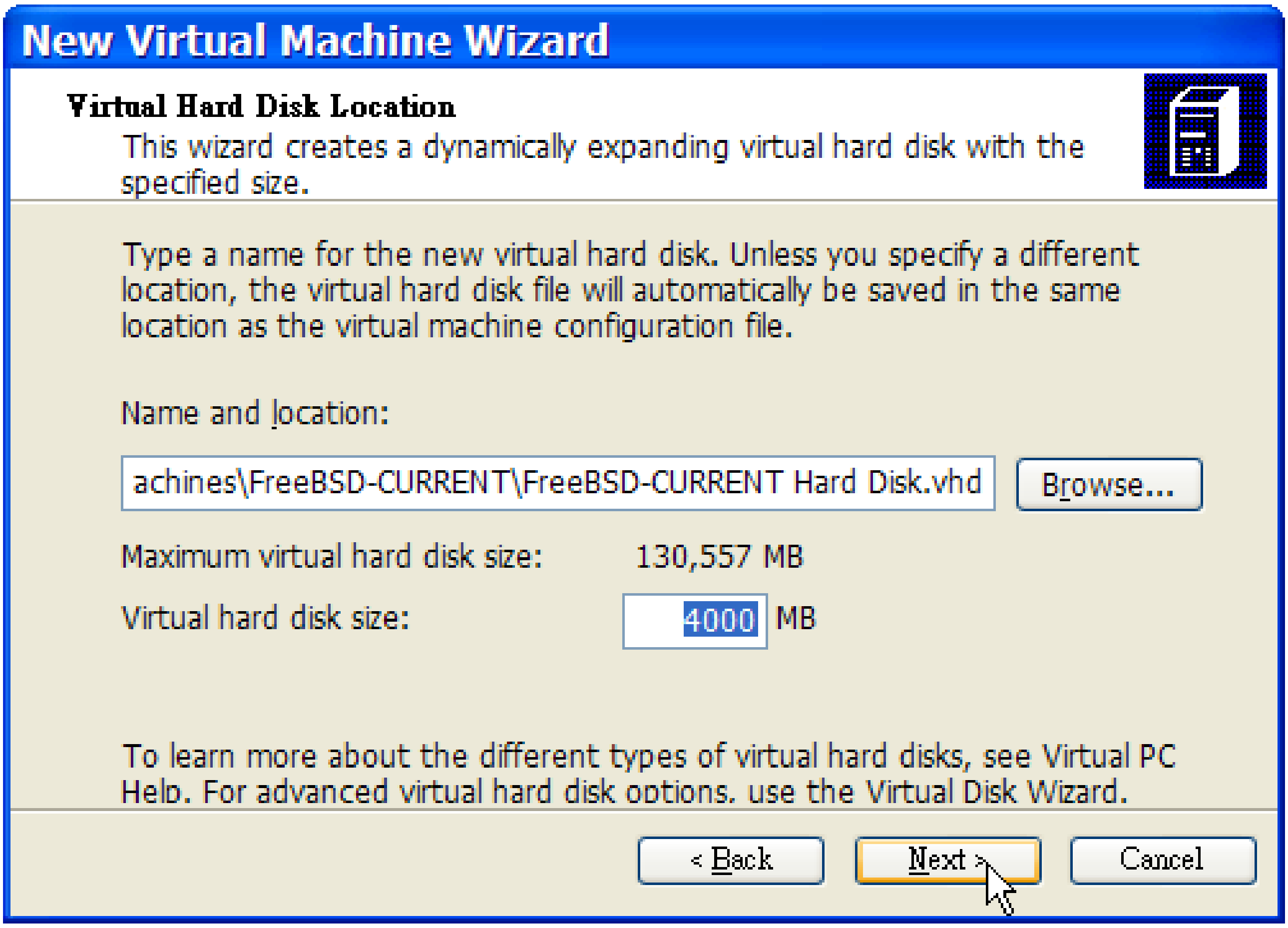
A virtual hard disk is a .vhd file that is stored on your physical hard disk and is used to contain the guest operating system, applications, and data files.

The first virtual hard disk you create or select for your virtual machine is called Hard Disk 1 in Settings and is the startup disk.

Do you want to use:

○ An existing virtual hard disk
● A new virtual hard disk

Ïëïêëçñþóôå áðïèçêåýïíôáò ôéò ñõèìßóåéò:



Virtual Hard Disk Location

This wizard creates a dynamically expanding virtual hard disk with the specified size.

Type a name for the new virtual hard disk. Unless you specify a different location, the virtual hard disk file will automatically be saved in the same location as the virtual machine configuration file.

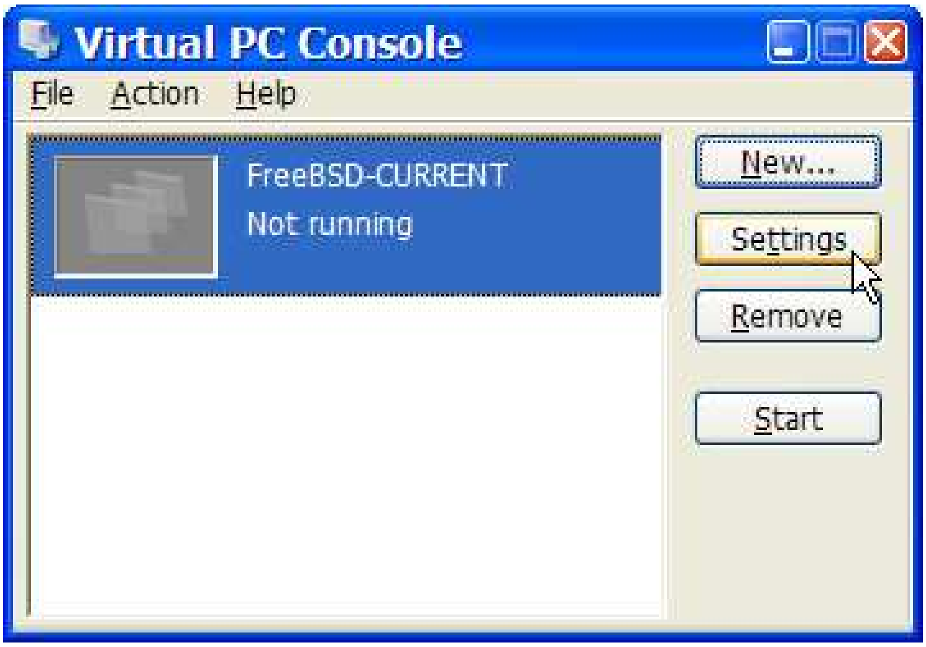
Name and location: achines\FreeBSD-CURRENT\FreeBSD-CURRENT Hard Disk.vhd

Maximum virtual hard disk size: 130,557 MB

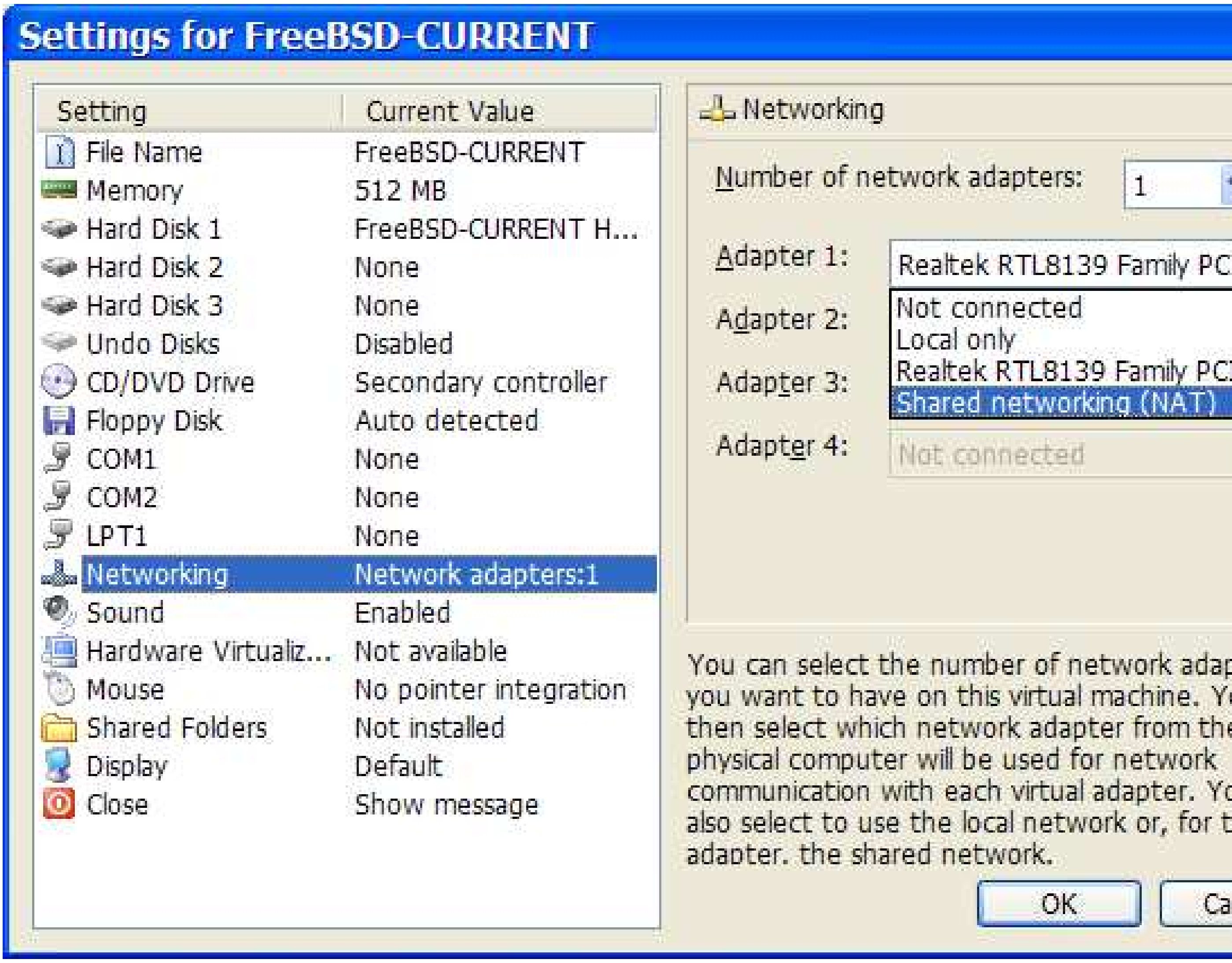
Virtual hard disk size: 4000 MB

To learn more about the different types of virtual hard disks, see Virtual PC Help. For advanced virtual hard disk options, use the Virtual Disk Wizard.

ÅðéëÝîôå ôçí åéêïíéêÞ ìç÷áíÞ FreeBSD ðïõ äçìéïõñãÞóáôå êáé êÜíôå êëéê óôï Settings. Ñõèìßóôå Ýðåéôá ôï åßäïò êáé ôçí äéåðáöÞ (interface) ôïõ äéêôýïõ:


Virtual PC Console
File
Action
Help
New...
Settings
Remove
Start

FreeBSD-CURRENT
Not running



Settings for FreeBSD-CURRENT

Setting	Current Value
File Name	FreeBSD-CURRENT
Memory	512 MB
Hard Disk 1	FreeBSD-CURRENT H...
Hard Disk 2	None
Hard Disk 3	None
Undo Disks	Disabled
CD/DVD Drive	Secondary controller
Floppy Disk	Auto detected
COM1	None
COM2	None
LPT1	None
Networking	Network adapters:1
Sound	Enabled
Hardware Virtualiz...	Not available
Mouse	No pointer integration
Shared Folders	Not installed
Display	Default
Close	Show message

Networking

Number of network adapters: 1

Adapter 1: Realtek RTL8139 Family PC

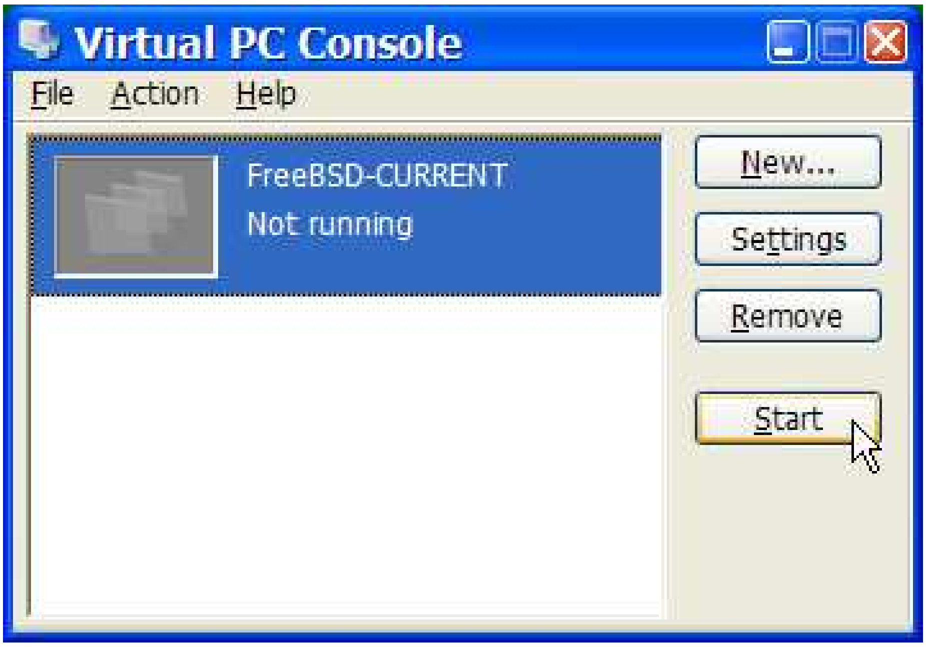
Adapter 2:

Adapter 3:

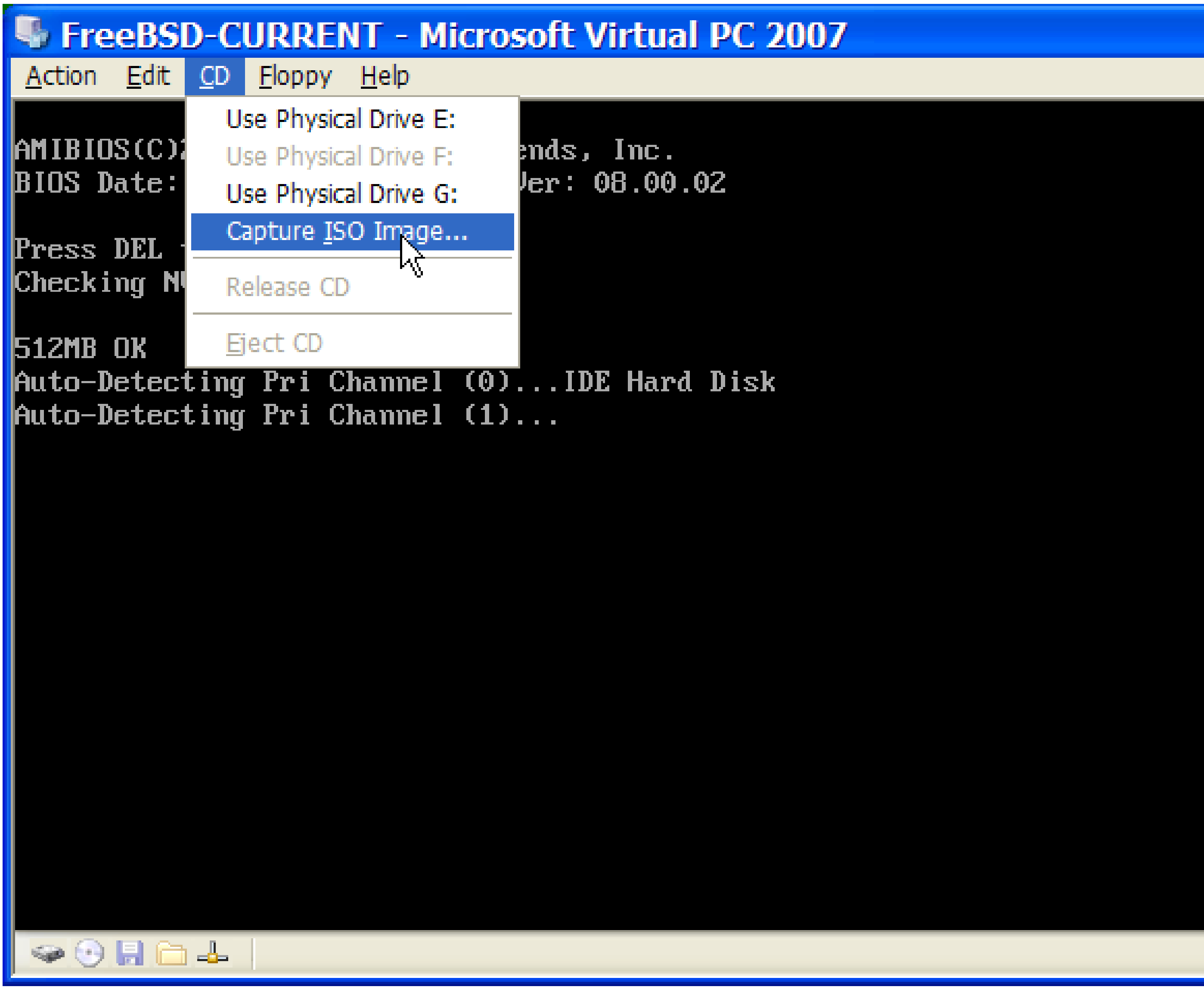
Adapter 4: Not connected

You can select the number of network adap
you want to have on this virtual machine. Yo
then select which network adapter from the
physical computer will be used for network
communication with each virtual adapter. Yo
also select to use the local network or, for t
adapter, the shared network.

Áöïý äçìéïõñãÞóåôå ôçí åéêïíéêÞ ìç÷áíÞ óáò ãéá ôï FreeBSD, èá ðñÝðåé íá åãêáôáóôÞóåôå ôï ëåéôïõñãéêü óå áõôÞí. Ï êáëýôåñïò ôñüðïò åßíáé íá ÷ñçóéìïðïéÞóåôå Ýíá áðü ôá åðßóçìá CDROM ôïõ FreeBSD Þ íá êáôåâÜóåôå êÜðïéï áñ÷åßï ISO áðü ôçí åðßóçìç ôïðïèåóßá FTP. ¸÷ïíôáò ôï êáôÜëëçëï áñ÷åßï ISO óôï ôïðéêü óáò óýóôçìá áñ÷åßùí ôùí Windows (Þ ôï áíôßóôïé÷ï CDROM óôïí ïäçãü), êÜíôå äéðëü êëéê óôï åéêïíßäéï ôçò åéêïíéêÞò ìç÷áíÞò FreeBSD ãéá íá ôçí åêêéíÞóåôå. ¸ðåéôá êÜíôå êëéê óôï CD êáé åðéëÝîôå Capture ISO Image... óôï ðáñÜèõñï ôïõ **Virtual PC**. Èá åìöáíéóôåß Ýíá ðáñÜèõñï ðïõ èá óáò åðéôñÝøåé íá óõó÷åôßóåôå ôïí åéêïíéêü ïäçãü CDROM ìå Ýíá áñ÷åßï ISO Þ êáé ìå ôïí ðñáãìáôéêü óáò ïäçãü.

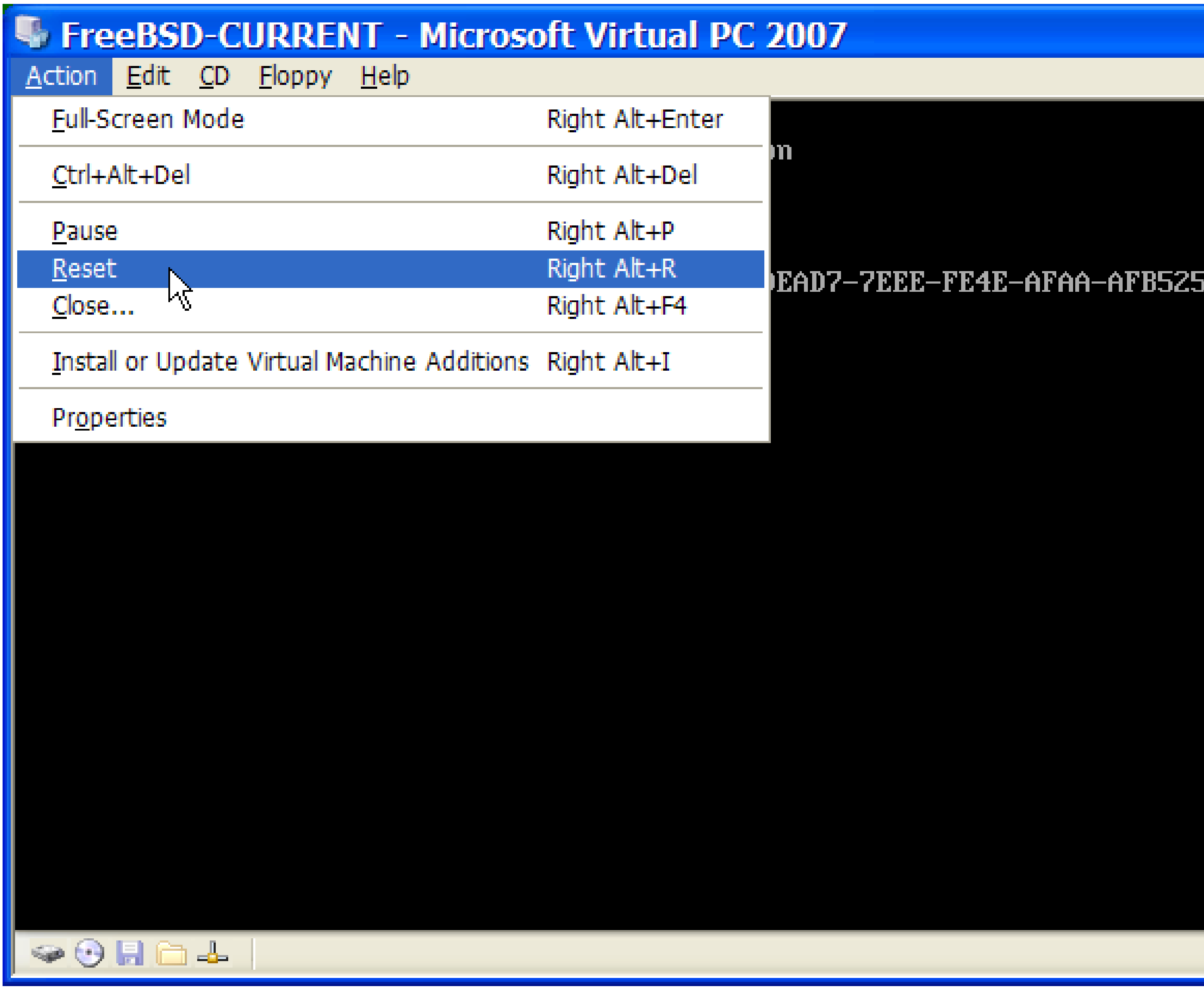

Virtual PC Console
File
Action
Help
New...
Settings
Remove
Start

FreeBSD-CURRENT
Not running


FreeBSD-CURRENT - Microsoft Virtual PC 2007
Action
Edit
CD
Floppy
Help
Use Physical Drive E:
Use Physical Drive F:
Use Physical Drive G:
Capture ISO Image...
Release CD
Eject CD

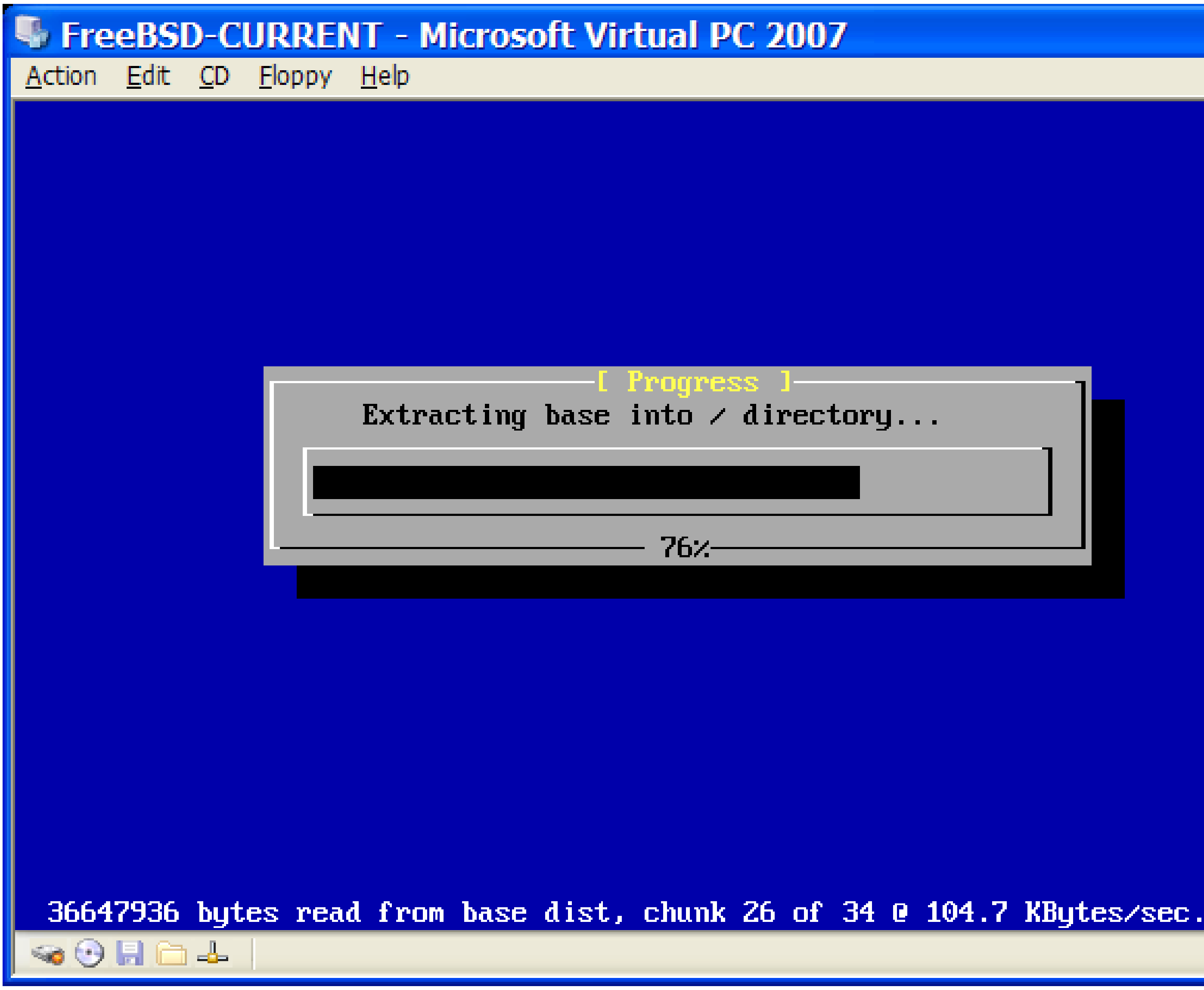
```
AMIBIOS(C)                    ends, Inc.
BIOS Date:                    Ver: 08.00.02

Press DEL
Checking N

512MB OK
Auto-Detecting Pri Channel (0)...IDE Hard Disk
Auto-Detecting Pri Channel (1)...
```

Ìüëéò äçìéïõñãÞóåôå ôç óõó÷Ýôéóç ìå ôçí ðçãÞ ðïõ èá ÷ñçóéìïðïéÞóåôå ùò CDROM, åðáíåêêéíÞóôå ôï åéêïíéêü óáò FreeBSD ìç÷Üíçìá, åðéëÝãïíôáò Reset áðü ôï ìåíïý Action. Ôï **Virtual PC** åêêéíåß ìå Ýíá åéäéêü BIOS ôï ïðïßï åëÝã÷åé ðñþôá áí õðÜñ÷åé CDROM óôï ìç÷Üíçìá, üðùò áêñéâþò óõìâáßíåé êáé ìå Ýíá öõóéïëïãéêü BIOS.


FreeBSD-CURRENT - Microsoft Virtual PC 2007
Action
Edit
CD
Floppy
Help
Full-Screen Mode Right Alt+Enter
Ctrl+Alt+Del Right Alt+Del
Pause Right Alt+P
Reset Right Alt+R
Close... Right Alt+F4
Install or Update Virtual Machine Additions Right Alt+I
Properties

```
n
EAD7-7EEE-FE4E-AFAA-AFB525
```

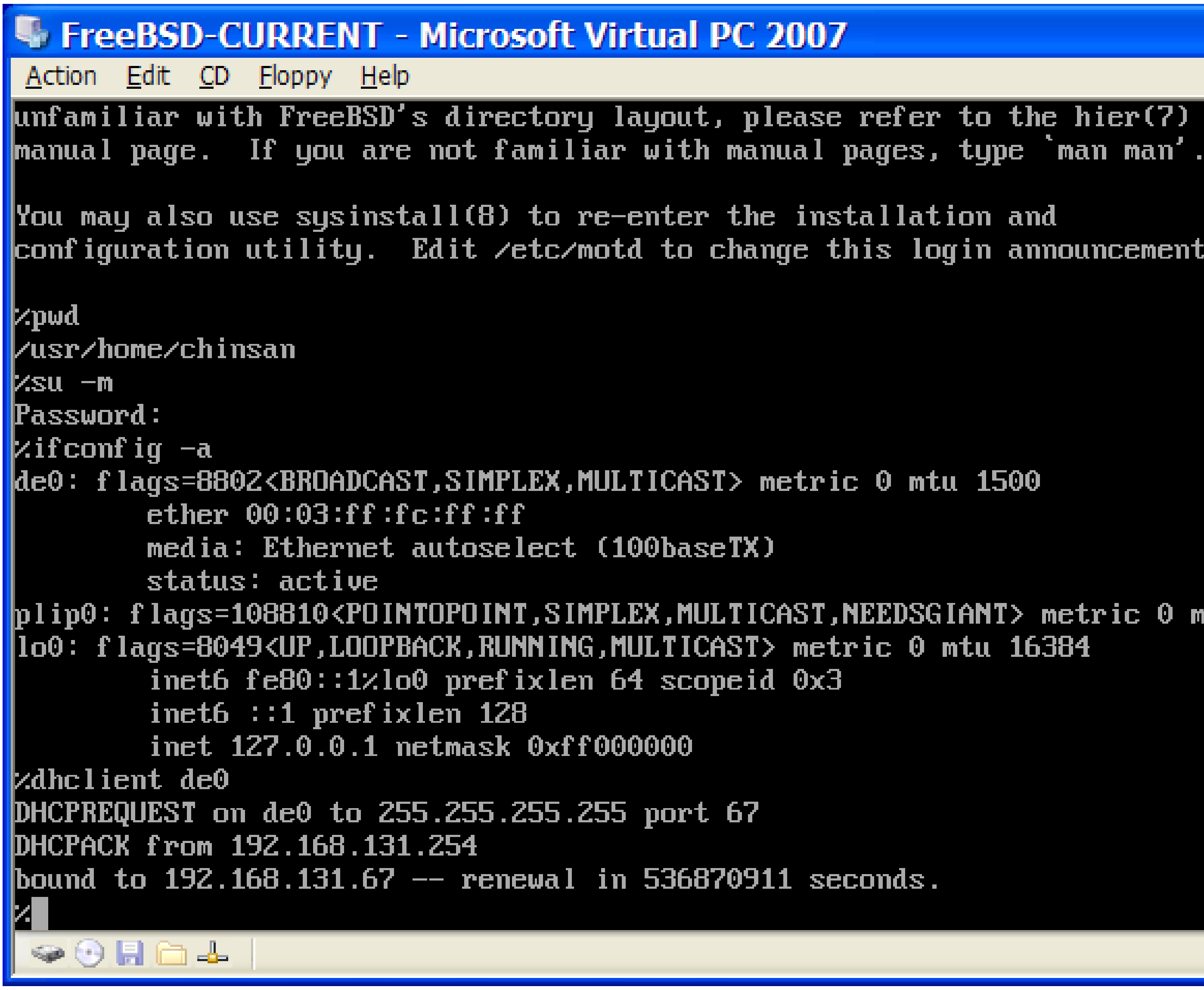
Óôç äéêÞ ìáò ðåñßðôùóç, èá áíé÷íåýóåé ôï ìÝóï åãêáôÜóôáóçò ôïõ FreeBSD êáé èá îåêéíÞóåé ç óõíçèéóìÝíç äéáäéêáóßá åãêáôÜóôáóçò ìÝóù ôïõ **sysinstall**, üðùò ðåñéãñÜöåôáé óôï ÊåöÜëáéï 2. Ìðïñåßôå íá ðñï÷ùñÞóåôå ìå ôçí åãêáôÜóôáóç, áëëÜ ìç ðñïóðáèÞóåôå íá ñõèìßóåôå ôï ãñáöéêü óýóôçìá X11 ôç äåäïìÝíç óôéãìÞ.


FreeBSD-CURRENT - Microsoft Virtual PC 2007
Action
Edit
CD
Floppy
Help
[Progress]
76%

```
Extracting base into / directory...
```

```
36647936 bytes read from base dist, chunk 26 of 34 @ 104.7 KBytes/sec.
```

¼ôáí ôåëåéþóåôå ôçí åãêáôÜóôáóç, ìç îå÷Üóåôå íá âãÜëåôå ôï CDROM áðü ôïí ïäçãü (Þ íá êáôáñãÞóåôå ôçí áíôßóôïé÷ç óõó÷Ýôéóç ìå ôï áñ÷åßï ISO). Ìðïñåßôå Ýðåéôá íá åðáíåêêéíÞóåôå óôç íÝá óáò åãêáôÜóôáóç ôïõ FreeBSD.



```
unfamiliar with FreeBSD's directory layout, please refer to the hier(7)
manual page.  If you are not familiar with manual pages, type `man man'.

You may also use sysinstall(8) to re-enter the installation and
configuration utility.  Edit /etc/motd to change this login announcement

%pwd
/usr/home/chinsan
%su -m
Password:
%ifconfig -a
de0: flags=8802<BROADCAST,SIMPLEX,MULTICAST> metric 0 mtu 1500
        ether 00:03:ff:fc:ff:ff
        media: Ethernet autoselect (100baseTX)
        status: active
plip0: flags=108810<POINTOPOINT,SIMPLEX,MULTICAST,NEEDSGIANT> metric 0 m
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> metric 0 mtu 16384
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x3
        inet6 ::1 prefixlen 128
        inet 127.0.0.1 netmask 0xff000000
%dhclient de0
DHCPREQUEST on de0 to 255.255.255.255 port 67
DHCPACK from 192.168.131.254
bound to 192.168.131.67 -- renewal in 536870911 seconds.
%
```

23.2.2.2 Ñýèìéóç ôïõ FreeBSD óôï Virtual PC óå Microsoft Windows

ÌåôÜ ôçí åðéôõ÷Þ åãêáôÜóôáóç ôïõ FreeBSD óôá Microsoft Windows ìÝóù ôïõ **Virtual PC**, èá ðñÝðåé íá åêôåëÝóåôå ìéá óåéñÜ áðü ñõèìßóåéò ãéá íá âåëôéóôïðïéÞóåôå ôçí ëåéôïõñãßá ôïõ óõóôÞìáôïò óå ðåñéâÜëëïí åéêïíéêÞò ìç÷áíÞò.

1. ÈÝóôå ôéìÝò óôéò ìåôáâëçôÝò ôïõ öïñôùôÞ åêêßíçóçò

   Ç ðéï óçìáíôéêÞ ñýèìéóç åßíáé íá ìåéþóåôå ôçí ôéìÞ ôçò ìåôáâëçôÞò `kern.hz` ãéá íá ìåéþóåôå ôç ÷ñÞóç ôçò CPU óôï FreeBSD üôáí ôï ÷ñçóéìïðïéåßôå óôï åéêïíéêü ðåñéâÜëëïí ôïõ **Virtual PC**. Áõôü ìðïñåß íá åðéôåõ÷èåß ðñïóèÝôïíôáò ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`:

   ```
   kern.hz=100
   ```

×ùñßò áõôÞ ôç ñýèìéóç, ìéá åéêïíéêÞ ìç÷áíÞ FreeBSD óôï **Virtual PC**, üôáí åêôåëåßôáé ÷ùñßò öïñôßï, èá ÷ñçóéìïðïéåß ðåñßðïõ ôï 40% ôïõ åðåîåñãáóôÞ óå Ýíá ìç÷Üíçìá ìå ìßá CPU. ÌåôÜ áðü ôçí áëëáãÞ áõôÞ, ç ÷ñÞóç èá åßíáé êïíôÜ óôï 3%.

2. ÄçìéïõñãÞóôå Ýíá íÝï áñ÷åßï ñõèìßóåùí ðõñÞíá

   Ìðïñåßôå íá áöáéñÝóåôå üëá ôá ðñïãñÜììáôá ïäÞãçóçò ãéá óõóêåõÝò SCSI, Firewire êáé USB. Ôï **Virtual PC** ðáñÝ÷åé ìéá åéêïíéêÞ êÜñôá äéêôýïõ ç ïðïßá õðïóôçñßæåôáé áðü ôï ðñüãñáììá ïäÞãçóçò de(4), Üñá ìðïñåßôå íá áöáéñÝóåôå üëåò ôéò Üëëåò êÜñôåò äéêôýïõ áðü ôïí ðõñÞíá, åêôüò áðü ôï de(4) êáé ôï miibus(4).

3. Ñýèìéóç äéêôýïõ

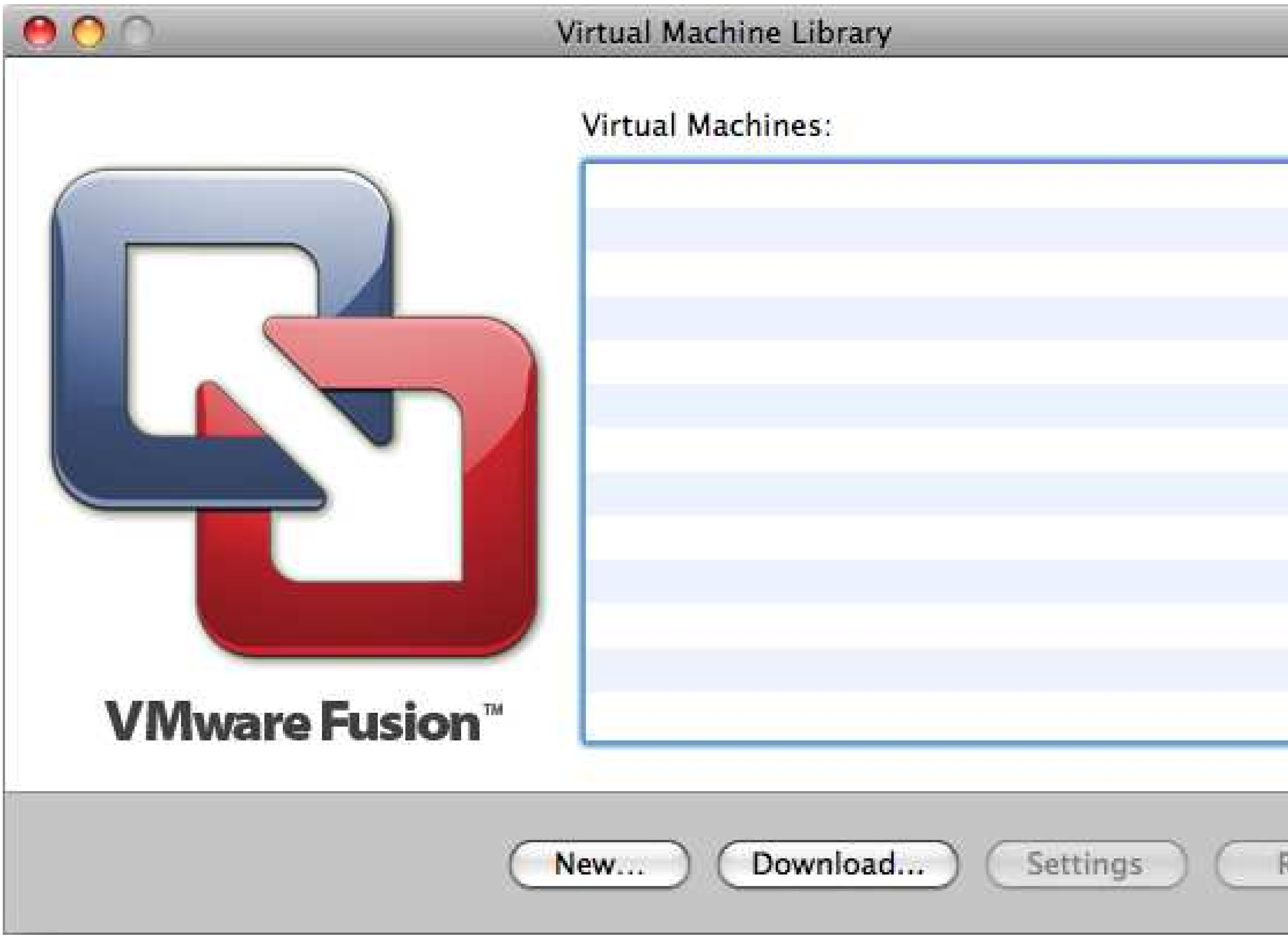
   Ç ðéï áðëÞ ñýèìéóç äéêôýïõ ðåñéëáìâÜíåé ôç ÷ñÞóç ôïõ ðñùôïêüëëïõ DHCP ãéá íá óõíäÝóåôå ôï åéêïíéêü ìç÷Üíçìá óáò óôï ßäéï ôïðéêü äßêôõï ìå ôï ìç÷Üíçìá îåíéóôÞ. Áõôü åðéôõã÷Üíåôáé ðñïóèÝôïíôáò ôç ãñáììÞ `ifconfig_de0="DHCP"` óôï `/etc/rc.conf`. Ìðïñåßôå íá âñåßôå ðéï ðñï÷ùñçìÝíåò ñõèìßóåéò äéêôýïõ óôï ÊåöÜëáéï 32.

23.2.3 Ôï VMware óå MacOS

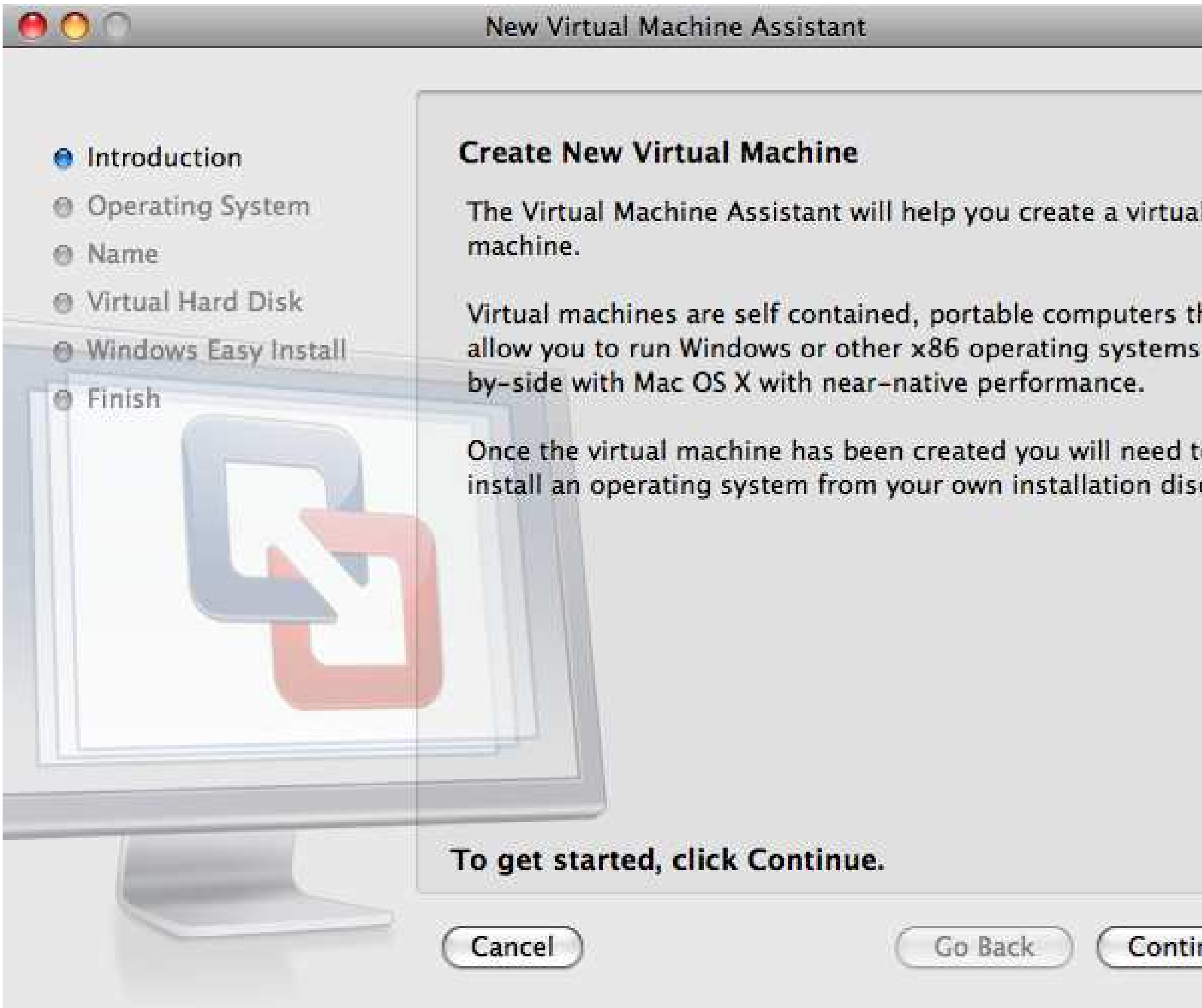
Ôï **VMware Fusion** ãéá Mac åßíáé Ýíá åìðïñéêü ðñüãñáììá. ÕðÜñ÷åé äéáèÝóéìï ãéá õðïëïãéóôÝò Apple Mac áñ÷éôåêôïíéêÞò Intel ðïõ ôñÝ÷ïõí Mac OS 10.4.9 Þ êÜðïéá ðéï ðñüóöáôç Ýêäïóç. Ôï FreeBSD õðïóôçñßæåôáé ðëÞñùò ùò öéëïîåíïýìåíï (guest) ëåéôïõñãéêü. Ìüëéò ïëïêëçñùèåß ç åãêáôÜóôáóç ôïõ **VMware Fusion** óôï Mac OS X, ðñÝðåé íá ñõèìßóåôå ìéá åéêïíéêÞ ìç÷áíÞ êáé íá åãêáôáóôÞóåôå ôï öéëïîåíïýìåíï ëåéôïõñãéêü óýóôçìá.

23.2.3.1 ÅãêáôÜóôáóç ôïõ FreeBSD óôï VMware/Mac OS X

Áñ÷éêÜ îåêéíÞóôå ôï VMware Fusion, êáé èá öïñôùèåß ç ÓõëëïãÞ Åéêïíéêþí Ìç÷áíþí. ÅðéëÝîôå "New" ãéá íá äçìéïõñãÞóåôå ìéá íÝá åéêïíéêÞ ìç÷áíÞ:


Virtual Machine Library
VMware Fusion™
Virtual Machines:
New...
Download...
Settings

Èá äåßôå íá öïñôþíåé ôï New Virtual Machine Assistant, ôï âïçèçôéêü ðñüãñáììá äçìéïõñãßáò ìéáò íÝáò åéêïíéêÞò ìç÷áíÞò. ÅðéëÝîôå Continue ãéá íá óõíå÷ßóåôå:


New Virtual Machine Assistant
Introduction
Operating System
Name
Virtual Hard Disk
Windows Easy Install
Finish
Cancel
Go Back
Contir

Create New Virtual Machine

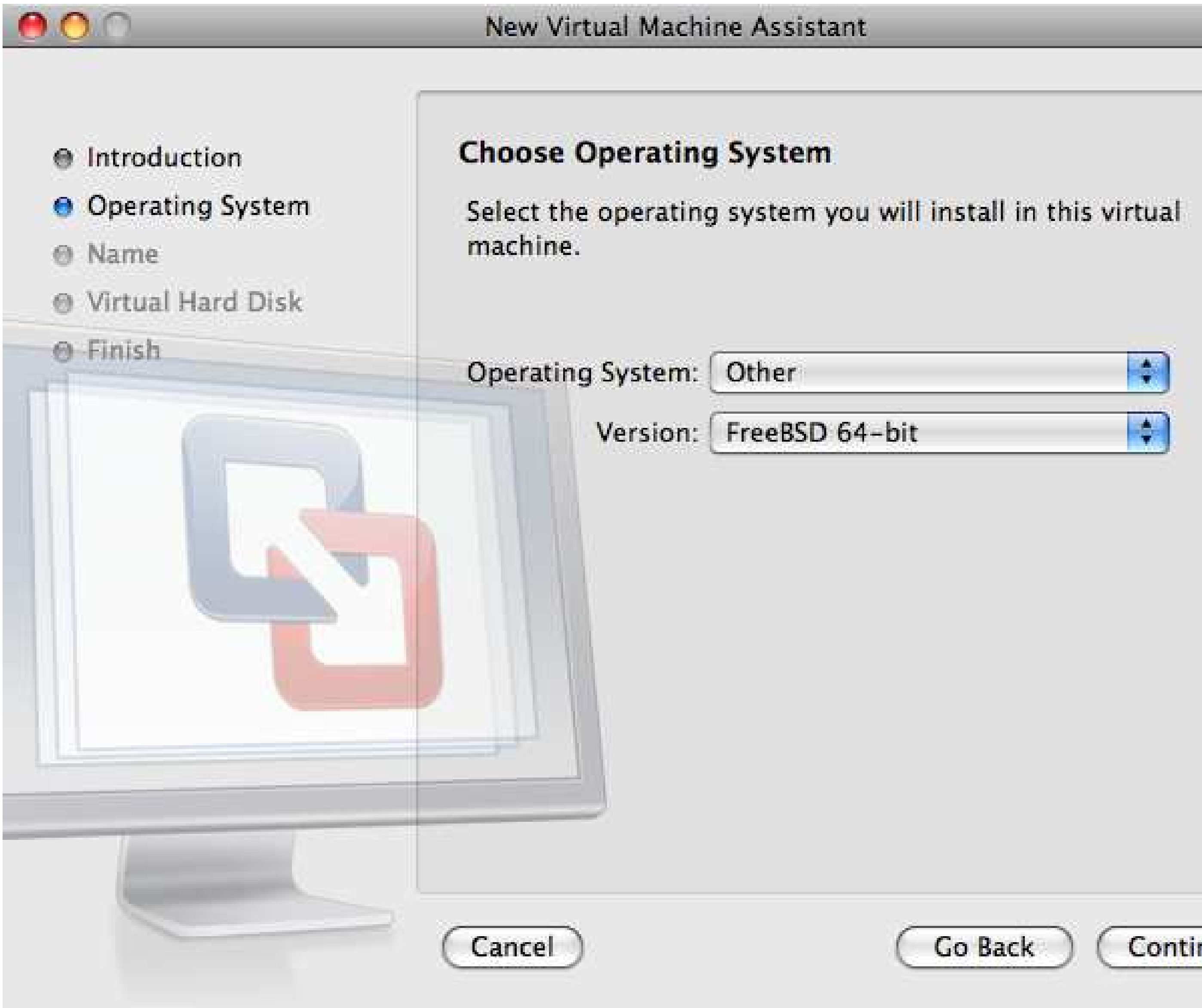
The Virtual Machine Assistant will help you create a virtua
machine.

Virtual machines are self contained, portable computers th
allow you to run Windows or other x86 operating systems
by-side with Mac OS X with near-native performance.

Once the virtual machine has been created you will need t
install an operating system from your own installation dis

To get started, click Continue.

Óôçí åðéëïãÞ ëåéôïõñãéêïý óõóôÞìáôïò äéáëÝîôå Other êáé ùò Ýêäïóç ëåéôïõñãéêïý óõóôÞìáôïò äéáëÝîôå FreeBSD Þ FreeBSD 64-bit (áíÜëïãá ìå ôï áí èÝëåôå õðïóôÞñéîç ãéá 64-bit åöáñìïãÝò Þ ü÷é):


New Virtual Machine Assistant
Introduction
Operating System
Name
Virtual Hard Disk
Finish
Cancel
Go Back
Contir

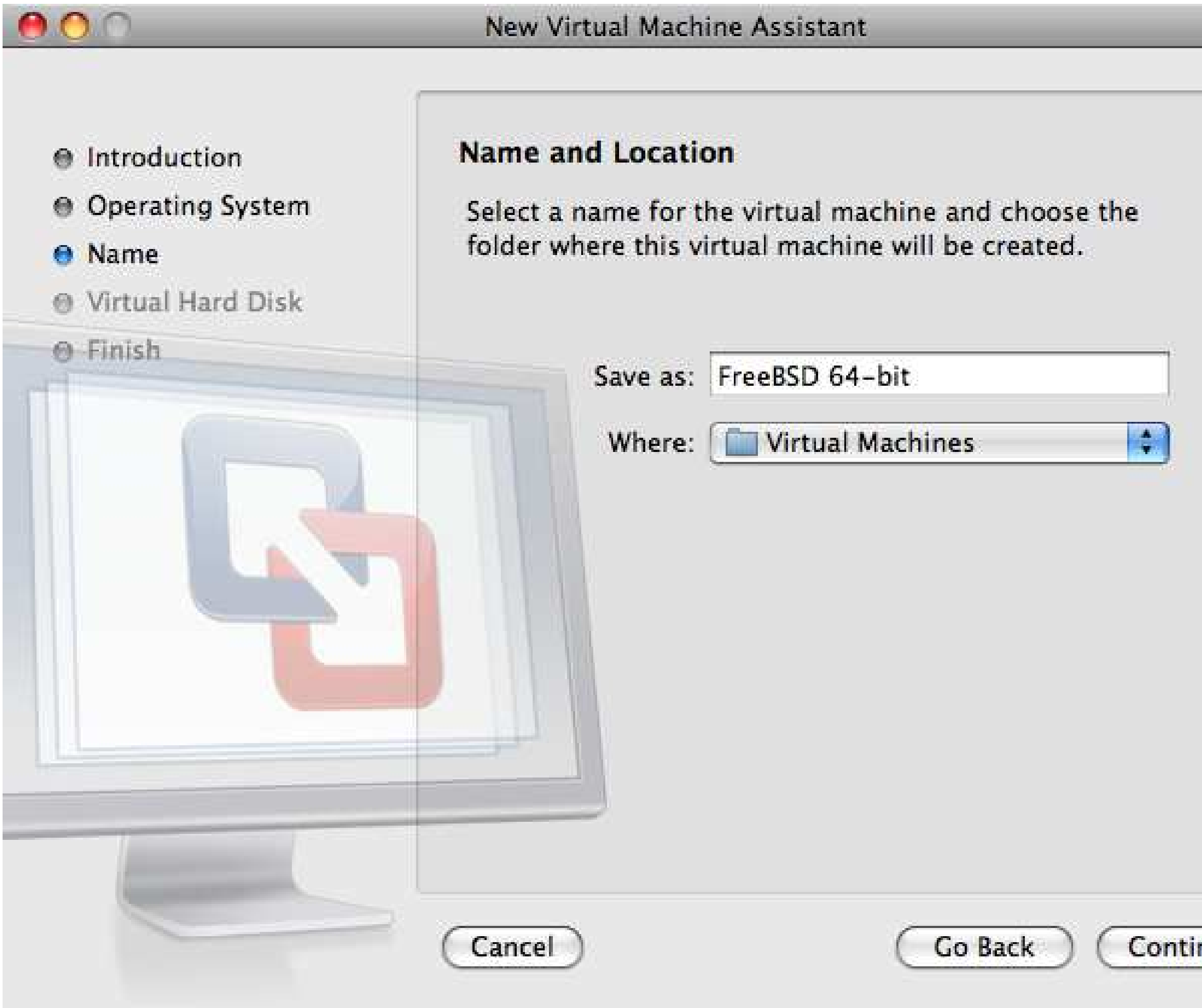
Choose Operating System

Select the operating system you will install in this virtual machine.

Operating System: Other

Version: FreeBSD 64-bit

Äþóôå Ýíá üíïìá ãéá ôï VM Image êáé ñõèìßóôå ôïí êáôÜëïãï óôïí ïðïßï èÝëåôå íá áðïèçêåõèåß:


New Virtual Machine Assistant
Introduction
Operating System
Name
Virtual Hard Disk
Finish
Cancel
Go Back
Contir

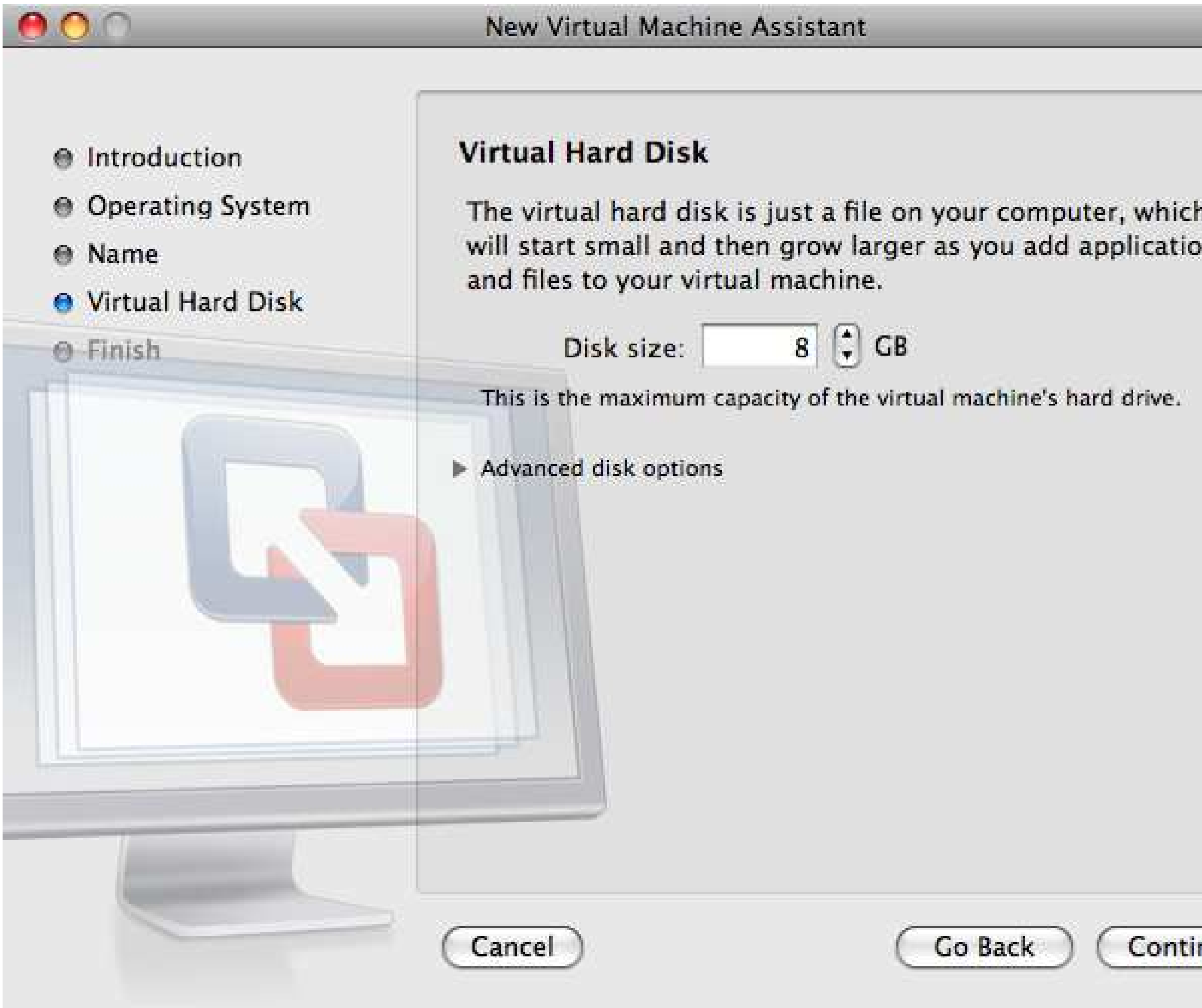
Name and Location

Select a name for the virtual machine and choose the folder where this virtual machine will be created.

Save as: FreeBSD 64-bit

Where: Virtual Machines

Ñõèìßóôå ôï ìÝãåèïò ôïõ Åéêïíéêïý Äßóêïõ ãéá ôçí åéêïíéêÞ ìç÷áíÞ:


New Virtual Machine Assistant
Introduction
Operating System
Name
Virtual Hard Disk
Finish
Advanced disk options
Cancel
Go Back
Contir

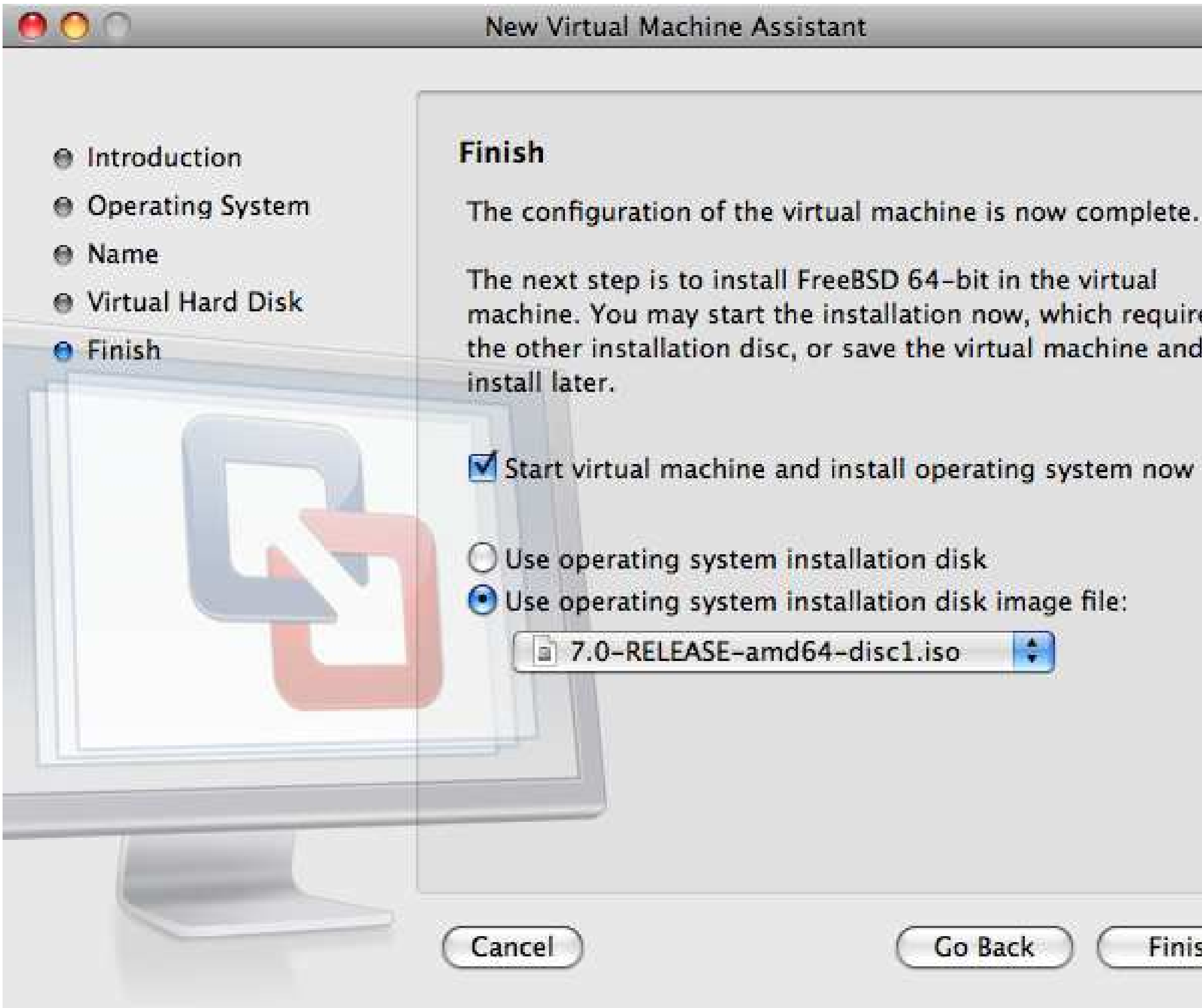
Virtual Hard Disk

The virtual hard disk is just a file on your computer, which will start small and then grow larger as you add applicatio and files to your virtual machine.

Disk size: 8 GB

This is the maximum capacity of the virtual machine's hard drive.

ÅðéëÝîôå ìéá ìÝèïäï åãêáôÜóôáóçò ãéá ôçí åéêïíéêÞ ìç÷áíÞ: åßôå áðü Ýíá ISO image åßôå áðü ôï CD-ROM:


New Virtual Machine Assistant
Introduction
Operating System
Name
Virtual Hard Disk
Finish
Cancel
Go Back
Finis

Finish

The configuration of the virtual machine is now complete.

The next step is to install FreeBSD 64-bit in the virtual machine. You may start the installation now, which requir the other installation disc, or save the virtual machine and install later.

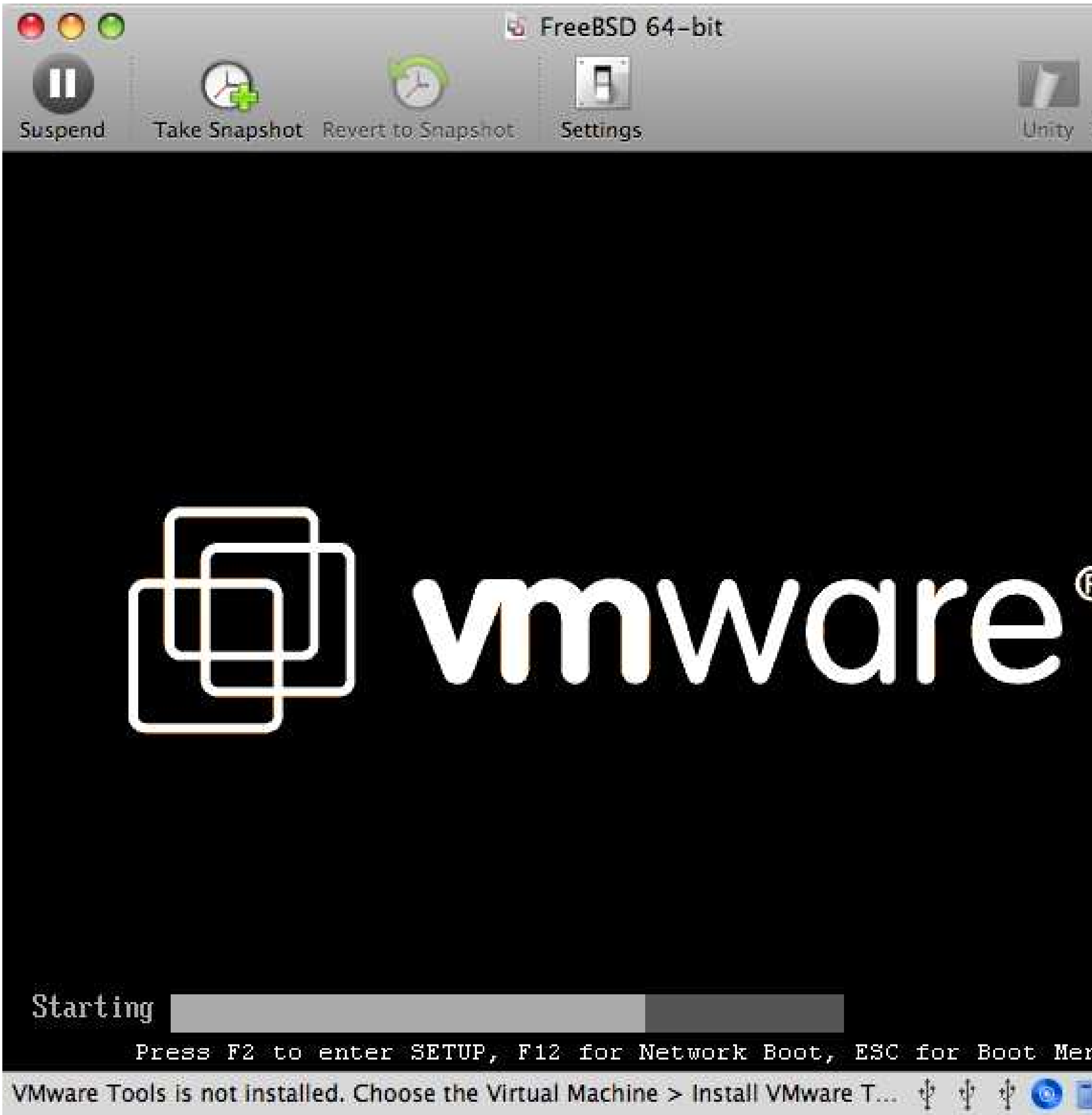
☑ Start virtual machine and install operating system now

○ Use operating system installation disk

● Use operating system installation disk image file:

7.0-RELEASE-amd64-disc1.iso

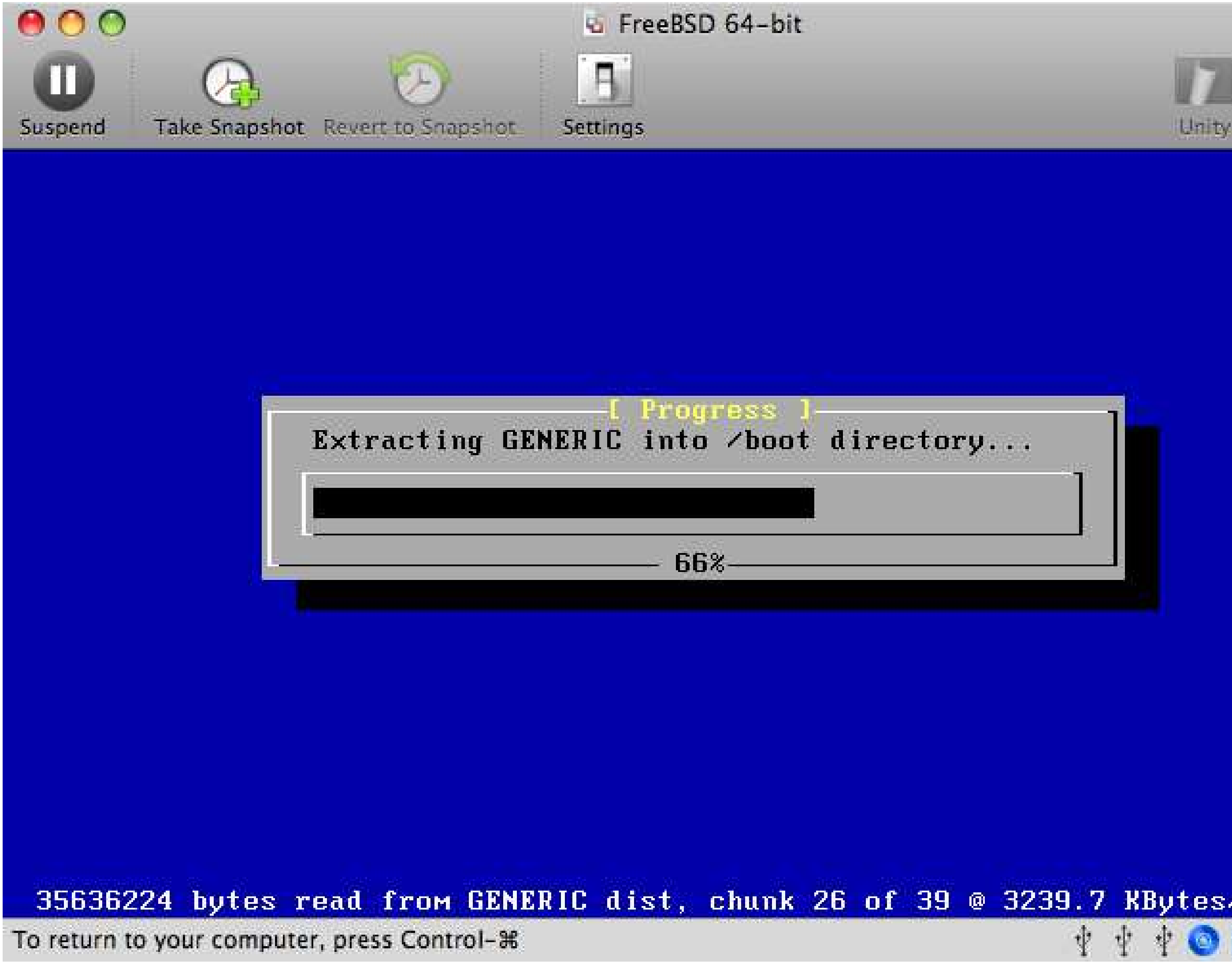
Ìüëéò åðéëÝîåôå Finish, ç åéêïíéêÞ ìç÷áíÞ èá îåêéíÞóåé ôç äéáäéêáóßá åêêßíçóçò (boot):


FreeBSD 64-bit
Suspend
Take Snapshot
Revert to Snapshot
Settings
Unity
vmware

```
Starting
        Press F2 to enter SETUP, F12 for Network Boot, ESC for Boot Mer
```

VMware Tools is not installed. Choose the Virtual Machine > Install VMware T...

ÅãêáôáóôÞóôå ôï FreeBSD üðùò èá êÜíáôå êáé óå ïðïéïäÞðïôå Üëëï õðïëïãéóôÞ, Þ áêïëïõèþíôáò ôéò ïäçãßåò áðü ôï ÊåöÜëáéï 2:

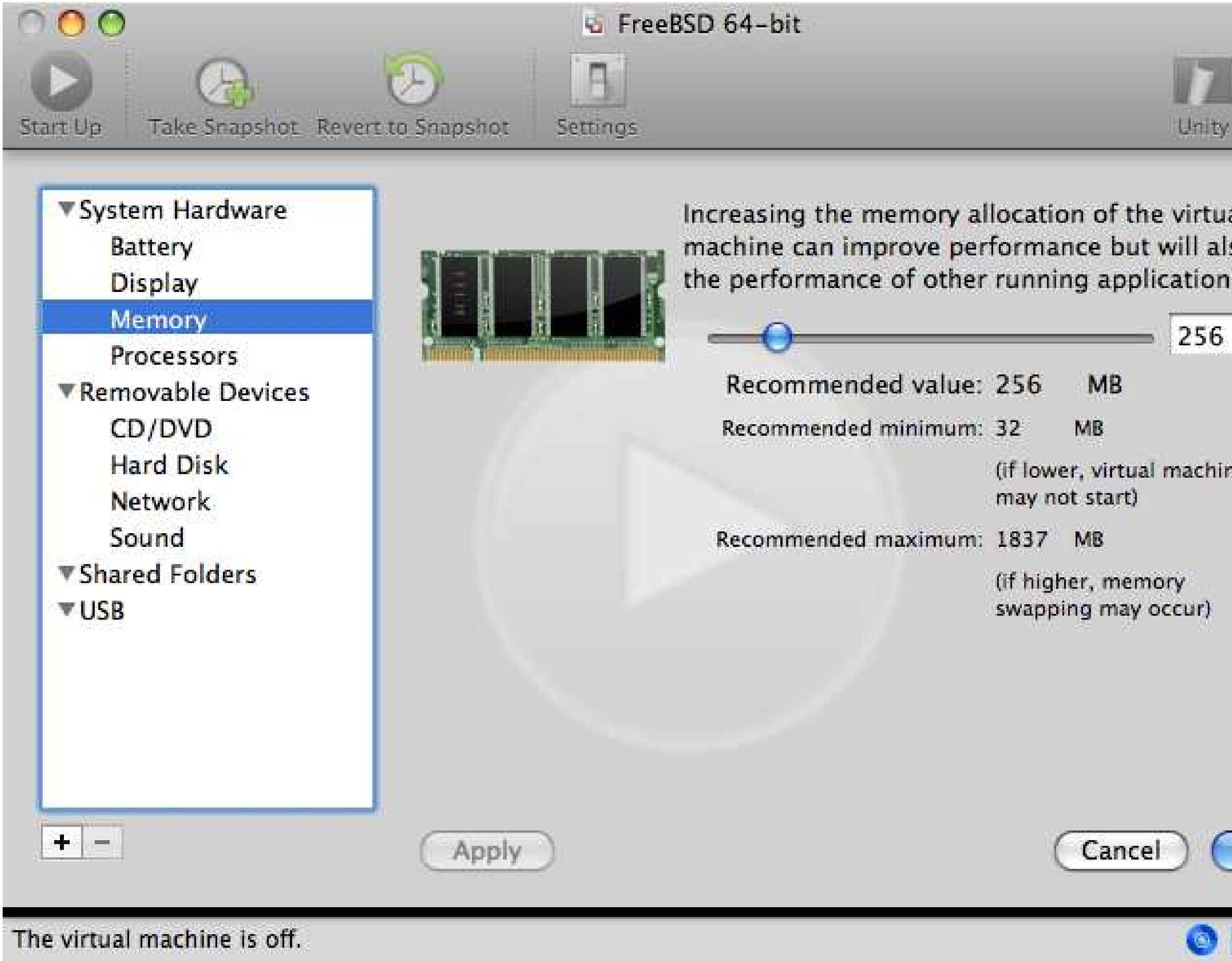

FreeBSD 64-bit
Suspend
Take Snapshot
Revert to Snapshot
Settings
Unity

```
[ Progress ]
Extracting GENERIC into /boot directory...
66%
35636224 bytes read from GENERIC dist, chunk 26 of 39 @ 3239.7 KBytes
```

To return to your computer, press Control-⌘

Ìüëéò ïëïêëçñùèåß ç åãêáôÜóôáóç, ìðïñåßôå íá áëëÜîåôå ôéò ñõèìßóåéò ôçò åéêïíéêÞò ìç÷áíÞò, üðùò ð.÷. ôï ìÝãåèïò ìíÞìçò ðïõ èá ÷ñçóéìïðïéåß:

> **Óçìåßùóç:** Ïé ñõèìßóåéò õëéêïý ìéáò åéêïíéêÞò ìç÷áíÞò äå ìðïñïýí íá áëëÜîïõí üóï ôñÝ÷åé áõôÞ ç åéêïíéêÞ ìç÷áíÞ.


FreeBSD 64-bit
Start Up
Take Snapshot
Revert to Snapshot
Settings
Unity
System Hardware
Battery
Display
Memory
Processors
Removable Devices
CD/DVD
Hard Disk
Network
Sound
Shared Folders
USB
+
−
Apply
Cancel

Increasing the memory allocation of the virtua
machine can improve performance but will als
the performance of other running application

256

Recommended value: 256 MB

Recommended minimum: 32 MB

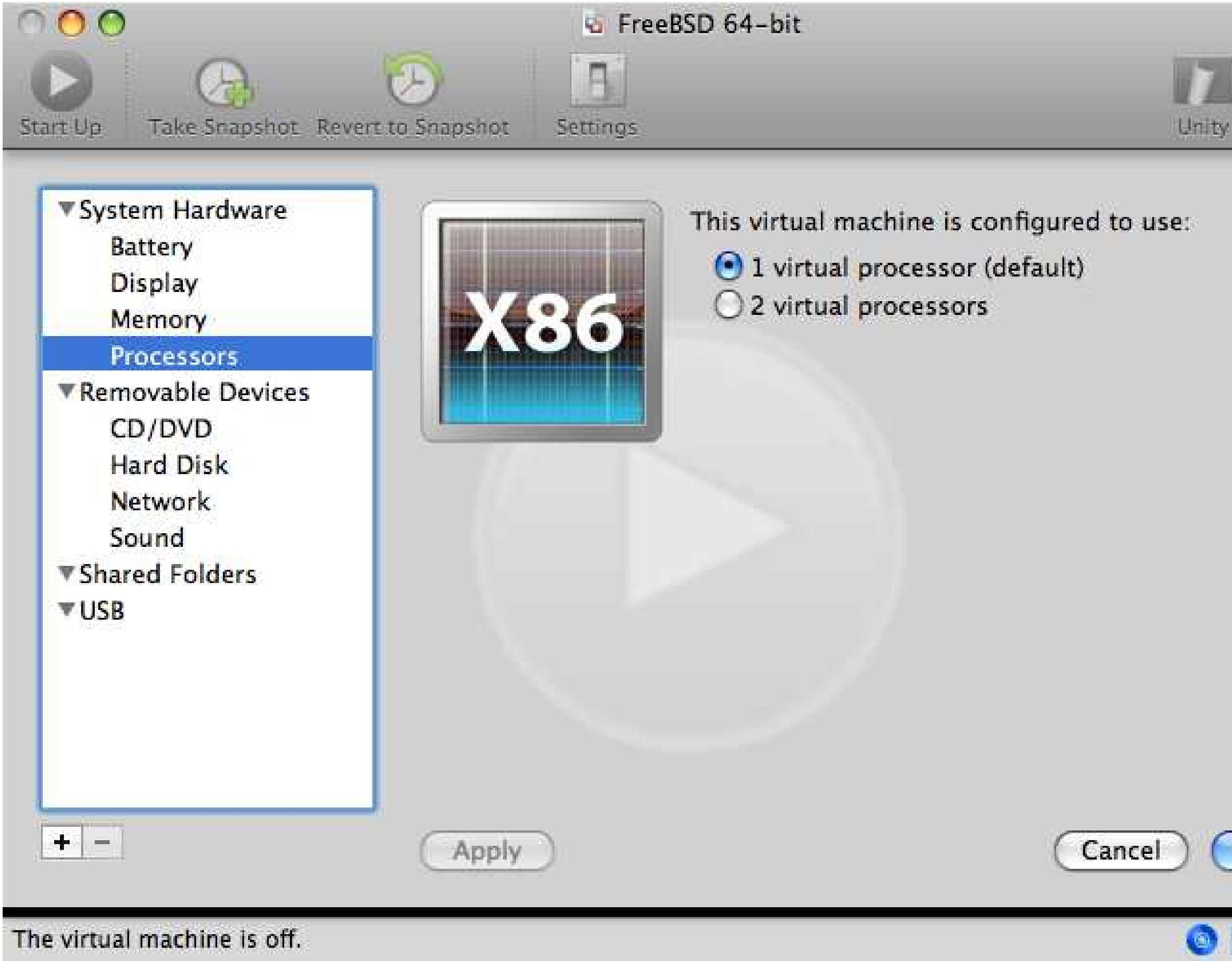
(if lower, virtual machir
may not start)

Recommended maximum: 1837 MB

(if higher, memory
swapping may occur)

The virtual machine is off.

Ìðïñåßôå, áêüìç, íá ñõèìßóåôå ôïí áñéèìü ôùí åðåîåñãáóôþí ôïõ ïðïßïõ åðéôñÝðåôå íá ÷ñçóéìïðïéÞóåé áõôÞ ç åéêïíéêÞ ìç÷áíÞ:

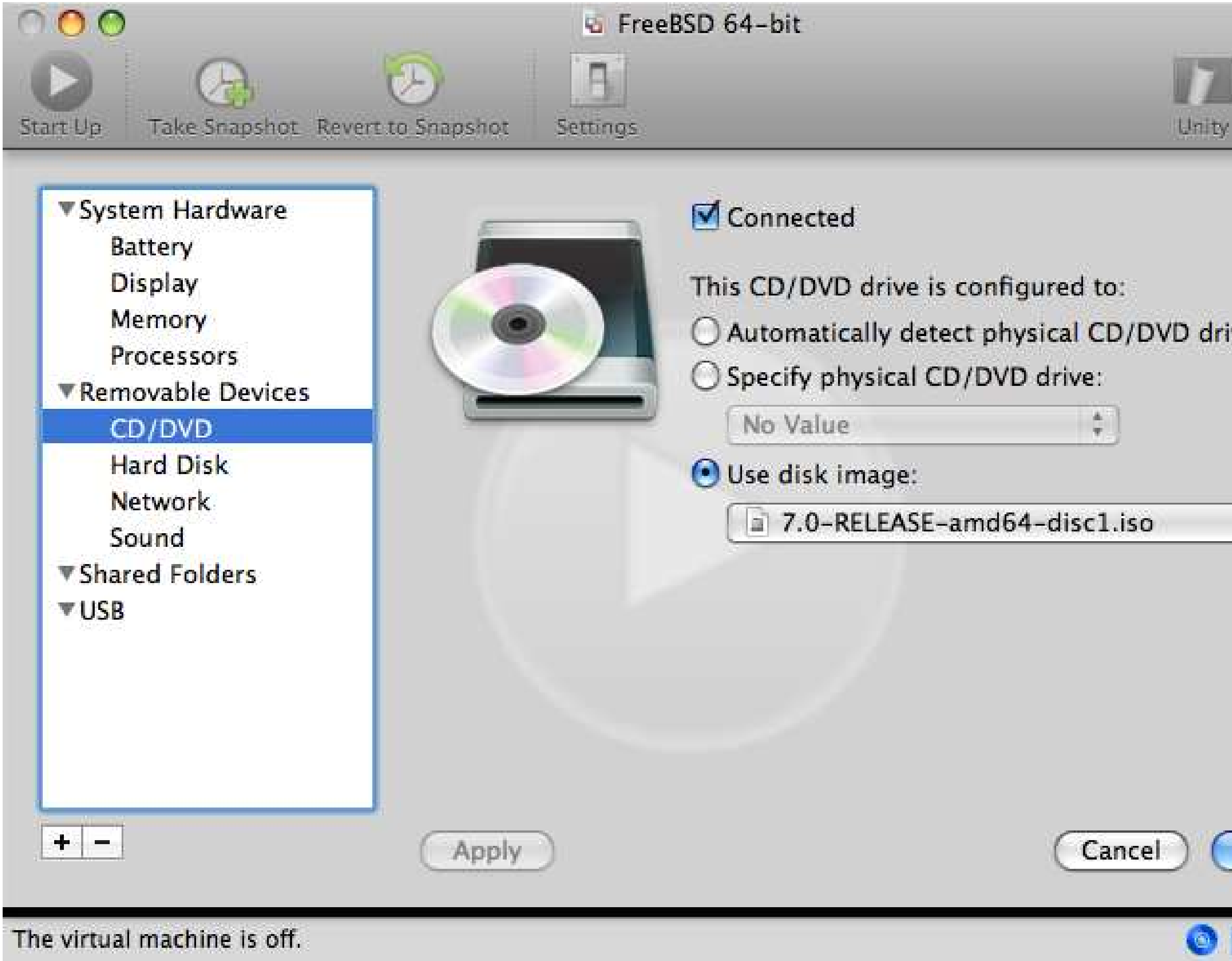

FreeBSD 64-bit
Start Up
Take Snapshot
Revert to Snapshot
Settings
Unity
System Hardware
Battery
Display
Memory
Processors
Removable Devices
CD/DVD
Hard Disk
Network
Sound
Shared Folders
USB
+
−
X86
Apply
Cancel

This virtual machine is configured to use:

● 1 virtual processor (default)
○ 2 virtual processors

The virtual machine is off.

ºóùò Ý÷åé íüçìá, åðßóçò, íá áëëÜîåôå ôï áñ÷åßï Þ ôç óõóêåõÞ ðïõ öáßíåôáé ùò CD-ROM ìÝóá óôçí åéêïíéêÞ ìç÷áíÞ. ÓõíÞèùò ìðïñåßôå íá áðïóõíäÝóåôå ôï CD-ROM Þ ôï ISO image áðü ôçí åéêïíéêÞ ìç÷áíÞ, áöïý äå ÷ñåéÜæåôáé ðëÝïí üôáí Ý÷åé ïëïêëçñùèåß ç åãêáôÜóôáóç ôïõ FreeBSD:


FreeBSD 64-bit
Start Up
Take Snapshot
Revert to Snapshot
Settings
Unity
▼System Hardware
Battery
Display
Memory
Processors
▼Removable Devices
CD/DVD
Hard Disk
Network
Sound
▼Shared Folders
▼USB
+
−
Apply
Cancel

☑ Connected

This CD/DVD drive is configured to:

○ Automatically detect physical CD/DVD dri

○ Specify physical CD/DVD drive:

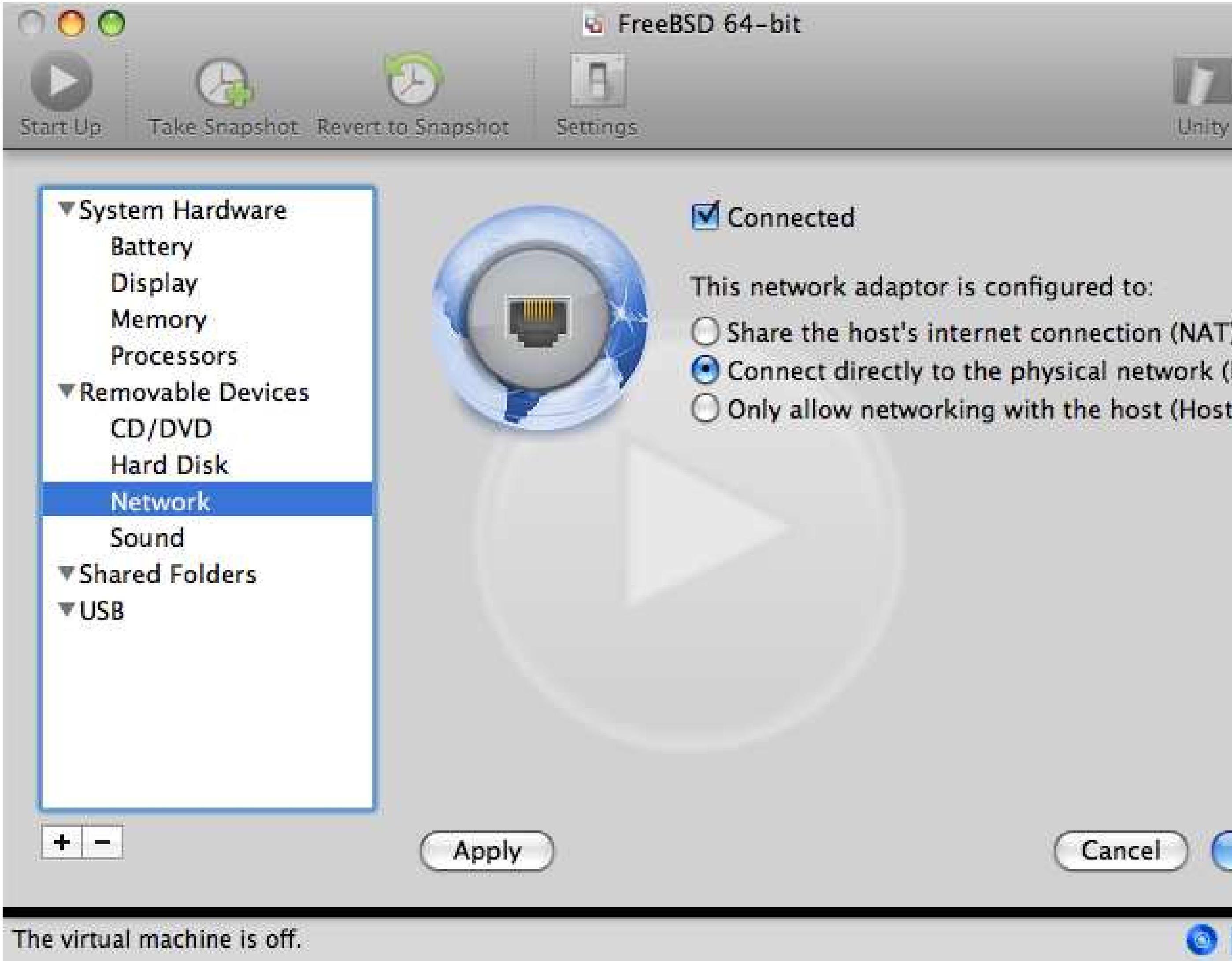
No Value

● Use disk image:

7.0-RELEASE-amd64-disc1.iso

The virtual machine is off.

Ìéá áðü ôéò ôåëåõôáßåò ñõèìßóåéò åßíáé ç óýíäåóç ôçò åéêïíéêÞò ìç÷áíÞò ìå ôï äßêôõï. Ãéá íá ìðïñåßôå íá óõíäåèåßôå óôçí ÅÌ áðü Üëëá ìç÷áíÞìáôá (åêôüò ôïõ îåíéóôÞ), åíåñãïðïéÞóôå ôçí åðéëïãÞ Connect directly to the physical network (Bridged). Áëëéþò, ãéá íá ìðïñåß ç ÅÌ íá óõíäåèåß óôï äßêôõï ìÝóù ôïõ îåíéóôÞ, áëëÜ íá ìç ìðïñïýí Üëëá ìç÷áíÞìáôá íá óõíäåèïýí óå áõôÞ, åíåñãïðïéÞóôå ôçí åðéëïãÞ Share the host’s internet connection (NAT).


FreeBSD 64-bit
Start Up
Take Snapshot
Revert to Snapshot
Settings
Unity
System Hardware
Battery
Display
Memory
Processors
Removable Devices
CD/DVD
Hard Disk
Network
Sound
Shared Folders
USB
+
−
Apply
Cancel

☑ Connected

This network adaptor is configured to:

○ Share the host's internet connection (NAT

● Connect directly to the physical network (

○ Only allow networking with the host (Host

The virtual machine is off.

Ìüëéò ôåëåéþóåôå ìå áõôÝò ôéò ñõèìßóåéò, ìðïñåßôå íá åêêéíÞóåôå ôç íÝá åéêïíéêÞ ìç÷áíÞ ìå ôï öñåóêï-åãêáôåóôçìÝíï FreeBSD óáò.

23.2.3.2 Ñõèìßóåéò ôïõ FreeBSD ìÝóá óôï Mac OS X/VMware

Áöïý ôåëåéþóåôå ìå ôçí åãêáôÜóôáóç ôïõ FreeBSD óå ìéá åéêïíéêÞ ìç÷áíÞ **VMware** ìÝóá óå Mac OS X, ðñÝðåé íá êÜíåôå êÜðïéåò ñõèìßóåéò ãéá íá âåëôéùèåß ç áðüäïóç ôïõ FreeBSD ùò öéëïîåíïýìåíïõ óõóôÞìáôïò.

1. Ñõèìßóåéò ìåôáâëçôþí ôïõ boot loader

   Ç ðéï óçìáíôéêÞ ñýèìéóç åßíáé íá ìåéþóåôå ôçí ôéìÞ ôçò ìåôáâëçôÞò `kern.hz`, ãéá íá ìåéùèåß êÜðùò ç ÷ñÞóç ôïõ åðåîåñãáóôÞ áðü ôï FreeBSD êáèþò ôñÝ÷åé ìÝóá óôï **VMware**. ÐñïóèÝóôå, ëïéðüí, ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`:

   ```
   kern.hz=100
   ```

×ùñßò áõôÞ ôç ñýèìéóç Ýíá öéëïîåíïýìåíï FreeBSD ðïõ ôñÝ÷åé ìÝóá óå VMware ìðïñåß íá ÷ñçóéìïðïéåß ìÝ÷ñé êáé 15% ôïõ åðåîåñãáóôÞ åíüò iMac. ÌåôÜ áðü áõôÞ ôç ñýèìéóç ç ÷ñÞóç ôïõ åðåîåñãáóôÞ ìðïñåß íá åßíáé ìéêñüôåñç áðü 5%.

2. ÄçìéïõñãÞóôå Ýíá íÝï áñ÷åßï ñõèìßóåùí ðõñÞíá

   Ìðïñåßôå íá áöáéñÝóåôå üëåò ôéò óõóêåõÝò FireWire êáé USB. Ôï **VMware** ðáñÝ÷åé ìéá åéêïíéêÞ êÜñôá äéêôýïõ, ç ïðïßá åßíáé óõìâáôÞ ìå ôïí ïäçãü em(4), ïðüôå ìðïñåßôå íá áöáéñÝóåôå üëåò ôéò õðüëïéðåò êÜñôåò äéêôýïõ áðü ôïí ðõñÞíá óáò.

3. Ñõèìßóôå ôï äßêôõï

   Ï ðéï åýêïëïò ôñüðïò íá ñõèìßóåôå ôï äßêôõï ôçò åéêïíéêÞò ìç÷áíÞò åßíáé íá óõíäõÜóåôå ìÝóù DHCP ìå ôï ôïðéêü äßêôõï, ÷ñçóéìïðïéþíôáò ôç äéåýèõíóç MAC ôïõ îåíéóôÞ. Áõôü ìðïñåß íá ãßíåé ðñïóèÝôïíôáò ôç ãñáììÞ `ifconfig_em0="DHCP"` óôï áñ÷åßï `/etc/rc.conf`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò êáé ðéï ðñï÷ùñçìÝíåò ñõèìßóåéò äéêôýïõ, äåßôå ôï ÊåöÜëáéï 32.

23.2.4 VirtualBox™ Guest Additions óå FreeBSD Guest

Ôá ðñüóèåôá ðñïãñÜììáôá ãéá ôï öéëïîåíïýìåíï ëåéôïõñãéêü (guest additions) ôïõ **VirtualBox™** ðáñÝ÷ïõí õðïóôÞñéîç ãéá ôá ðáñáêÜôù:

- ÊïéíÞ ÷ñÞóç ðñï÷åßñïõ (clipboard)
- ¸îõðíç ÷ñÞóç äåßêôç ðïíôéêéïý
- Óõã÷ñïíéóìüò þñáò ìå ôïí îåíéóôÞ (host)
- ÁíáðñïóáñìïãÞ ìåãÝèïõò ðáñáèýñïõ
- ÊáôÜóôáóç áðñüóêïðôçò ëåéôïõñãßáò (seamless mode)

Óçìåßùóç: Ïé ðáñáêÜôù åíôïëÝò åêôåëïýíôáé óôï öéëïîåíïýìåíï FreeBSD ëåéôïõñãéêü.

Áñ÷éêÜ, åãêáôáóôÞóôå ôï ðáêÝôï `emulators/virtualbox-ose-additions` óôï öéëïîåíïýìåíï FreeBSD ëåéôïõñãéêü.

```
# cd /usr/ports/emulators/virtualbox-ose-additions && make install clean
```

ÐñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/rc.conf`:

```
vboxguest_enable="YES"
vboxservice_enable="YES"
```

Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ôï ntpd(8) Þ ôï ntpdate(8), èá ðñÝðåé íá áðåíåñãïðïéÞóåôå ôï óõã÷ñïíéóìü þñáò ìå ôïí îåíéóôÞ:

```
vboxservice_flags="--disable-timesync"
```

Ôï ðñüãñáììá ïäÞãçóçò `vboxvideo_drv` öõóéïëïãéêÜ èá áíáãíùñéóôåß áõôüìáôá üôáí åêôåëÝóåôå ôï `Xorg -configure`. Áí áõôü äåí óõìâåß, ôñïðïðïéÞóôå ôï `xorg.conf` ãéá ôçí êÜñôá ãñáöéêþí ôïõ **VirtualBox**:

```
Section "Device"
        ### Available Driver options are:-
        ### Values: <i>: integer, <f>: float, <bool>: "True"/"False",
        ### <string>: "String", <freq>: "<f> Hz/kHz/MHz"
        ### [arg]: arg optional
        Identifier "Card0"
        Driver "vboxvideo"
        VendorName "InnoTek Systemberatung GmbH"
        BoardName "VirtualBox Graphics Adapter"
        BusID "PCI:0:2:0"
EndSection
```

Ãéá íá ÷ñçóéìïðïéÞóåôå ôï `vboxmouse_drv`, ÷ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíüôçôá ãéá ôï ðïíôßêé óôï `xorg.conf`:

```
Section "InputDevice"
        Identifier "Mouse0"
        Driver "vboxmouse"
EndSection
```

Ïé ÷ñÞóôåò ôïõ HAL èá ðñÝðåé íá äçìéïõñãÞóïõí ôï áñ÷åßï `/usr/local/etc/hal/fdi/policy/90-vboxguest.fdi` Þ íá ôï áíôéãñÜøïõí áðü ôï `/usr/local/share/hal/fdi/policy/10osvendor/90-vboxguest.fdi`:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
# Sun VirtualBox
# Hal driver description for the vboxmouse driver
# $Id: chapter.sgml,v 1.16 2011-12-09 19:53:53 manolis Exp $

        Copyright (C) 2008-2009 Sun Microsystems, Inc.

        This file is part of VirtualBox Open Source Edition (OSE, as
        available from http://www.virtualbox.org. This file is free software;
        you can redistribute it and/or modify it under the terms of the GNU
        General Public License (GPL) as published by the Free Software
        Foundation, in version 2 as it comes in the "COPYING" file of the
        VirtualBox OSE distribution. VirtualBox OSE is distributed in the
        hope that it will be useful, but WITHOUT ANY WARRANTY of any kind.

        Please contact Sun Microsystems, Inc., 4150 Network Circle, Santa
        Clara, CA 95054 USA or visit http://www.sun.com if you need
        additional information or have any questions.
-->
<deviceinfo version="0.2">
  <device>
    <match key="info.subsystem" string="pci">
      <match key="info.product" string="VirtualBox guest Service">
        <append key="info.capabilities" type="strlist">input</append>
        <append key="info.capabilities" type="strlist">input.mouse</append>
        <merge key="input.x11_driver" type="string">vboxmouse</merge>
        <merge key="input.device" type="string">/dev/vboxguest</merge>
      </match>
    </match>
  </device>
</deviceinfo>
```

23.3 Ôï FreeBSD ùò ÎåíéóôÞò (Host)

Ãéá áñêåôÜ ÷ñüíéá, êáíÝíá áðü ôá ðáêÝôá åéêïíéêïðïßçóçò äåí õðïóôÞñéæå åðßóçìá ôï FreeBSD ùò îåíéóôÞ. ÊÜðïéïé ÷ñÞóôåò ÷ñçóéìïðïéïýóáí ðáëéÝò êáé êáôÜ âÜóç åãêáôáëåëåéììÝíåò åêäüóåéò ôïõ **VMware** (üðùò ôï `emulators/vmware3`), ïé ïðïßåò ÷ñçóéìïðïéïýóáí ôçí óõìâáôüôçôá åêôÝëåóçò ðñïãñáììÜôùí Linux. Ëßãï ìåôÜ ôçí åðßóçìç êõêëïöïñßá ôïõ FreeBSD 7.2, Ýãéíå äéáèÝóéìç óôç ÓõëëïãÞ ôùí Ports ç Ýêäïóç Áíïéêôïý Êþäéêá (OSE, Open Source Edition) ôïõ **VirtualBox** ôçò Sun. Ç åöáñìïãÞ áõôÞ åêôåëåßôáé ùò åããåíÝò ðñüãñáììá ôïõ FreeBSD.

Ôï **VirtualBox** åßíáé Ýíá ðëÞñåò ðáêÝôï åéêïíéêïðïßçóçò ôï ïðïßï âñßóêåôáé óå äéáñêÞ áíÜðôõîç. Åßíáé äéáèÝóéìï ãéá ôá ðåñéóóüôåñá ëåéôïõñãéêÜ óõóôÞìáôá, óõìðåñéëáìâáíïìÝíùí ôùí Windows, Mac OS, Linux êáé FreeBSD. ¸÷åé ôç äõíáôüôçôá íá åêôåëåß ôï ßäéï êáëÜ ôüóï ëåéôïõñãéêÜ ôýðïõ Windows üóï êáé UNIX. ¸ñ÷åôáé óå äýï åêäüóåéò: áíïéêôïý êáé êëåéóôïý êþäéêá. Áðü ôçí ìåñéÜ ôïõ ÷ñÞóôç, ßóùò ï ìåãáëýôåñïò ðåñéïñéóìüò ôçò Ýêäïóçò áíïéêôïý êþäéêá åßíáé ç Ýëëåéøç õðïóôÞñéîçò óõóêåõþí USB. Ìðïñåßôå íá äåßôå üëåò ôéò äéáöïñÝò óôç óåëßäá “Editions” ôïõ **VirtualBox** wiki, óôçí ôïðïèåóßá http://www.virtualbox.org/wiki/Editions. Ôç äåäïìÝíç óôéãìÞ, ìüíï ç Ýêäïóç OSE äéáôßèåôáé ãéá ôï FreeBSD.

23.3.1 ÅãêáôÜóôáóç ôïõ VirtualBox

Ôï **VirtualBox** åßíáé äéáèÝóéìï ùò FreeBSD port óôï `emulators/virtualbox-ose`. Êáèþò ôï **VirtualBox** âñßóêåôáé õðü óõíå÷Þ êáé ðïëý åíåñãÞ áíÜðôõîç, âåâáéùèåßôå üôé Ý÷åôå áíáíåþóåé ôï äÝíôñï ôùí ports ðñéí îåêéíÞóåôå ôçí åãêáôÜóôáóç ôïõ. ×ñçóéìïðïéÞóôå ôéò ðáñáêÜôù åíôïëÝò ãéá íá ôï åãêáôáóôÞóåôå:

```
# cd /usr/ports/emulators/virtualbox-ose
# make install clean
```

Ìéá ÷ñÞóéìç åðéëïãÞ ðïõ åìöáíßæåôáé óôï äéÜëïãï ñõèìßóåùí, áöïñÜ ôçí åãêáôÜóôáóç ôùí ðñïãñáììÜôùí `GuestAdditions`. Ôá ðñïãñÜììáôá áõôÜ ðáñÝ÷ïõí ìéá óåéñÜ áðü ÷ñÞóéìåò ëåéôïõñãßåò óôá öéëïîåíïýìåíá ëåéôïõñãéêÜ, üðùò ç äéÜöáíç ëåéôïõñãßá ôïõ äåßêôç ðïíôéêéïý (åðéôñÝðåé óôï ðïíôßêé íá êéíåßôáé åëåýèåñá ìåôáîý ôïõ îåíéóôÞ êáé ôïõ öéëïîåíïýìåíïõ ëåéôïõñãéêïý, ÷ùñßò íá áðáéôåßôáé ç ÷ñÞóç êÜðïéïõ åéäéêïý ðëÞêôñïõ ãéá åíáëëáãÞ) êáèþò êáé ôá÷ýôåñç ãñáöéêÞ áðåéêüíéóç, åéäéêÜ óå ëåéôïõñãéêÜ Windows. Ìðïñåßôå íá âñåßôå ôá guest additions óôï ìåíïý Devices, üôáí ïëïêëçñþóåôå ôçí åãêáôÜóôáóç ôïõ öéëïîåíïýìåíïõ ëåéôïõñãéêïý.

Ðñéí ÷ñçóéìïðïéÞóåôå ôï **VirtualBox** ãéá ðñþôç öïñÜ, èá ðñÝðåé íá áëëÜîåôå êÜðïéåò ñõèìßóåéò. Ôï port åãêáèéóôÜ Ýíá Üñèñùìá ðõñÞíá óôïí êáôÜëïãï `/boot/modules` ôï ïðïßï èá ðñÝðåé íá öïñôþóåôå óôïí ðõñÞíá ðïõ åêôåëåßôáé:

```
# kldload vboxdrv
```

Ãéá íá öïñôþíåôáé ôï Üñèñùìá áõôüìáôá óå êÜèå åðáíåêêßíçóç ôïõ óõóôÞìáôïò, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `/boot/loader.conf`:

```
vboxdrv_load="YES"
```

Ãéá íá ÷ñçóéìïðïéÞóåôå ôá áñèñþìáôá ðõñÞíá ðïõ åðéôñÝðïõí ôç ëåéôïõñãßá ôïõ äéêôýïõ óå êáôÜóôáóç ãÝöõñáò (bridged) Þ host-only, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/rc.conf` êáé åðáíåêêéíÞóôå ôïí õðïëïãéóôÞ óáò:

```
vboxnet_enable="YES"
```

ÊáôÜ ôç äéÜñêåéá ôçò åãêáôÜóôáóçò ôïõ **VirtualBox**, äçìéïõñãåßôáé áõôüìáôá ç ïìÜäá ÷ñçóôþí `vboxusers`. ¼ëïé ïé ÷ñÞóôåò ðïõ ÷ñåéÜæïíôáé ðñüóâáóç óôï **VirtualBox**, èá ðñÝðåé íá áíÞêïõí óå áõôÞ ôçí ïìÜäá. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `pw` ãéá íá ðñïóèÝóåôå íÝá ìÝëç óôçí ïìÜäá:

```
# pw groupmod vboxusers -m yourusername
```

Ôá ðñïåðéëåãìÝíá äéêáéþìáôá ãéá ôç óõóêåõÞ `/dev/vboxnetctl` åßíáé áñêåôÜ ðåñéïñéóôéêÜ êáé ðñÝðåé íá áëëÜîïõí ãéá íá ëåéôïõñãÞóåé ôï äßêôõï óå êáôÜóôáóç ãÝöõñáò.

Ãéá íá äïêéìÜóåôå ôéò íÝåò ñõèìßóåéò ðñïóùñéíÜ:

```
# chown root:vboxusers /dev/vboxnetctl
# chmod 0660 /dev/vboxnetctl
```

Ãéá íá áëëÜîåôå ôá äéêáéþìáôá ìüíéìá, ðñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/devfs.conf`:

```
own     vboxnetctl root:vboxusers
perm    vboxnetctl 0660
```

Ãéá íá åêôåëÝóåôå ôï **VirtualBox**, ìðïñåßôå áðëþò íá åðéëÝîåôå ôçí êáôá÷þñéóç Sun VirtualBox áðü ôï ìåíïý ôïõ ãñáöéêïý óáò ðåñéâÜëëïíôïò, Þ íá ðëçêôñïëïãÞóåôå ôï ðáñáêÜôù óå Ýíá ôåñìáôéêü:

```
% VirtualBox
```

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ñýèìéóç êáé ÷ñÞóç ôïõ **VirtualBox**, ðáñáêáëïýìå åðéóêåöèåßôå ôçí åðßóçìç äéêôõáêÞ ôïðïèåóßá óôï http://www.virtualbox.org. Êáèþò ôï FreeBSD port åßíáé ðïëý ðñüóöáôï, ç åîÝëéîç ôïõ åßíáé óõíå÷Þò. Ãéá ôéò ôåëåõôáßåò ðëçñïöïñßåò êáèþò êáé ãéá ïäçãßåò áíôéìåôþðéóçò ôõ÷üí ðñïâëçìÜôùí, ðáñáêáëïýìå äåßôå ôç ó÷åôéêÞ óåëßäá óôï wiki ôïõ FreeBSD, óôçí ôïðïèåóßá http://wiki.FreeBSD.org/VirtualBox.

23.3.2 ÕðïóôÞñéîç USB óôï VirtualBox

> **Óçìåßùóç:** Ãéá ôá âÞìáôá áõôÜ áðáéôåßôáé ôï **VirtualBox** 4.0.0 Þ ìåôáãåíÝóôåñï.

Ãéá íá ìðïñåßôå íá äéáâÜóåôå êáé íá ãñÜøåôå óå óõóêåõÝò USB, èá ðñÝðåé ï ëïãáñéáóìüò óáò íá áíÞêåé óôçí ïìÜäá operators:

```
# pw groupmod operator -m jerry
```

ÐñïóèÝóôå Ýðåéôá ôéò ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/etc/devfs.rules` (äçìéïõñãÞóôå ôï áí äåí õðÜñ÷åé Þäç):

```
[system=10]
add path 'usb/*' mode 0660 group operator
```

Ãéá íá öïñôþóåôå ôïõò íÝïõò êáíüíåò, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/rc.conf`:

```
devfs_system_ruleset="system"
```

¸ðåéôá åðáíåêêéíÞóôå ôï devfs:

```
# /etc/rc.d/devfs restart
```

Ìðïñåßôå ôþñá íá åíåñãïðïéÞóåôå ôï USB óôï öéëïîåíïýìåíï ëåéôïõñãéêü. Èá ðñÝðåé íá ìðïñåßôå íá äåßôå ôéò óõóêåõÝò USB óôéò ðñïôéìÞóåéò ôïõ VirtualBox.

23.3.3 Ðñüóâáóç óôï DVD/CD ôïõ ÎåíéóôÞ

èá ðñÝðåé íá öïñôþóåôå ôï Üñèñùìá ðõñÞíá `atapicam` ðñïóèÝôïíôáò ôçí ðáñáêÜôù ãñáììÞ óôï `/boot/loader.conf`:

```
atapicam_load="YES"
```

Èá ðñÝðåé íá åêôåëåßôáé ôï HAL ãéá íá ëåéôïõñãÞóåé óùóôÜ ôï DVD/CD óôï **VirtualBox**. ÅíåñãïðïéÞóôå ôï óôï `/etc/rc.conf` êáé îåêéíÞóôå ôï (áí äåí åêôåëåßôáé Þäç):

```
hald_enable="YES"
```

```
# /usr/local/etc/rc.d/hald start
```

Ãéá íá ìðïñïýí ïé ÷ñÞóôåò íá Ý÷ïõí ðñüóâáóç óôéò ëåéôïõñãßåò CD/DVD ôïõ **VirtualBox**, ÷ñåéÜæïíôáé ðñüóâáóç óôéò óõóêåõÝò `/dev/xpt0`, `/dev/cdN` êáé `/dev/passN`. ÐñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/devfs.conf`:

```
perm cd0 0600
perm xpt0 0660
perm pass0 0660
```

ÊåöÜëáéï 24 ÔïðéêÝò Ñõèìßóåéò - ×ñÞóç êáé ñýèìéóç I18N/L10N

ÓõíåéóöïñÜ ôïõ Andrey Chernov. ÃñÜöçêå îáíÜ áðü ôïí Michael C. Wu.

24.1 Óýíïøç

Ôï FreeBSD åßíáé Ýíá éäéáßôåñá áðïêåíôñùìÝíï Ýñãï ìå ÷ñÞóôåò êáé åèåëïíôÝò óå ïëüêëçñï ôïí êüóìï. Óôï êåöÜëáéï áõôü óõæçôïýíôáé ïé äõíáôüôçôåò ôïðéêþí êáé äéåèíþí ñõèìßóåùí ôïõ FreeBSD, ïé ïðïßåò åðéôñÝðïõí óå ÷ñÞóôåò ãëùóóþí åêôüò ôçò ÁããëéêÞò íá åêôåëÝóïõí ðñáãìáôéêÞ åñãáóßá. ÕðÜñ÷ïõí ðïëëïß ðáñÜãïíôåò óôçí õëïðïßçóç ôïõ ðëáéóßïõ i18n, ôüóï óå åðßðåäï óõóôÞìáôïò, üóï êáé åöáñìïãþí, êáé ãéá ôï ëüãï áõôü, üðïõ ÷ñåéÜæåôáé, ðáñáðÝìðïõìå ôïí áíáãíþóôç óå ðéï óõãêåêñéìÝíåò ðçãÝò ôåêìçñßùóçò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò êùäéêïðïéïýíôáé ïé ãëþóóåò êáé ïé ôïðéêÝò ñõèìßóåéò óôá óýã÷ñïíá ëåéôïõñãéêÜ óõóôÞìáôá.
- Ðùò íá âÜëåôå ôïðéêÝò ñõèìßóåéò óôï êÝëõöïò óáò (login shell).
- Ðùò íá ñõèìßóåôå ôçí êïíóüëá ãéá ãëþóóåò åêôüò ôçò ÁããëéêÞò.
- Ðùò íá ÷ñçóéìïðïéÞóåôå áðïôåëåóìáôéêÜ ôï óýóôçìá X Windows ìå äéáöïñåôéêÝò ãëþóóåò.
- Ðïõ íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôç óõããñáöÞ åöáñìïãþí óõìâáôþí ìå ôï ðñüôõðï i18n.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

24.2 ÂáóéêÝò Ãíþóåéò

24.2.1 Ôé Åßíáé ôï I18N/L10N;

Ïé ïìÜäåò áíÜðôõîçò ëïãéóìéêïý äçìéïýñãçóáí ôïí üñï I18N, ùò óõíôüìåõóç ôçò ëÝîçò “internationalization” (äéåèíïðïßçóç), ìåôñþíôáò áðëþò ôá ãñÜììáôá ôçò ëÝîçò áíÜìåóá óôï ðñþôï êáé ôï ôåëåõôáßï. Ï üñïò L10N Ý÷åé ðñïêýøåé ìå ôïí ßäéï ôñüðï, áõôÞ ôç öïñÜ áðü ôç ëÝîç “localization” (ôïðéêïðïßçóç, Þ áðëþò ôïðéêÝò ñõèìßóåéò). ÓõíäõÜæïíôáò ìåôáîý ôïõò ôéò ìåèüäïõò, ôá ðñùôüêïëëá, êáé ôéò åöáñìïãÝò ðïõ óõìâáäßæïõí ìå ôá I18N/L10N, ïé ÷ñÞóôåò ìðïñïýí íá ÷ñçóéìïðïéÞóïõí ôéò ãëþóóåò ôçò åðéëïãÞò ôïõò.

Ïé åöáñìïãÝò I18N ðñïãñáììáôßæïíôáé ìå ôç âïÞèåéá åñãáëåßùí (kits) êáé âéâëéïèçêþí. ÅðéôñÝðåôáé Ýôóé óôïõò ðñïãñáììáôéóôÝò íá ãñÜøïõí Ýíá áðëü áñ÷åßï êáé íá ìåôáöñÜóïõí ôá ìåíïý êáé ôá êåßìåíá ðïõ áðåéêïíßæåé ç åöáñìïãÞ, óå êÜèå ãëþóóá ðïõ áðáéôåßôáé. Óõíéóôïýìå Ýíèåñìá óôïõò ðñïãñáììáôéóôÝò íá áêïëïõèïýí ôçí ðáñáðÜíù óýìâáóç.

24.2.2 Ãéáôß ÐñÝðåé íá ×ñçóéìïðïéþ ôá I18N/L10N;

Ôá I18N/L10N ÷ñçóéìïðïéïýíôáé êÜèå öïñÜ ðïõ åðéèõìåßôå íá äåßôå, íá åéóÜãåôå, Þ íá åðåîåñãáóôåßôå äåäïìÝíá óå ãëþóóåò åêôüò ôçò ÁããëéêÞò.

24.2.3 Ðïéåò Ãëþóóåò Õðïóôçñßæïíôáé óôï I18N;

Ôï I18N êáé ôï L10N äåí åßíáé åéäéêÜ öôéáãìÝíá ãéá ôï FreeBSD. Ôçí äåäïìÝíç óôéãìÞ, õðïóôçñßæïíôáé ïé ðåñéóóüôåñåò ãíùóôÝò ãëþóóåò, óõìðåñéëáìâáíïìÝíùí ôùí: Êéíåæéêþí, Ãåñìáíéêþí, ÃéáðùíÝæéêùí, Êïñåáôéêþí, Ãáëëéêþí, Ñùóéêþí, ÂéåôíáìÝæéêùí, ê.á.

24.3 ×ñÞóç ôùí Ôïðéêþí Ñõèìßóåùí

Ôï I18N åßíáé óôçí ðñáãìáôéêüôçôá ìéá óýìâáóç, êáé äåí Ý÷åé äçìéïõñãçèåß áðïêëåéóôéêÜ ãéá ôï FreeBSD. Åðéèõìïýìå ôç âïÞèåéá óáò þóôå ôï FreeBSD íá áêïëïõèåß áõôÞ ôç óýìâáóç.

Ïé ôïðéêÝò ñõèìßóåéò âáóßæïíôáé óå ôñåéò âáóéêïýò üñïõò: Êùäéêü Ãëþóóáò, Êùäéêü ×þñáò êáé Êùäéêïðïßçóç. Ôá ïíüìáôá ôùí ôïðéêþí ñõèìßóåùí ðñïêýðôïõí áðü ôïõò ðáñáðÜíù üñïõò, ìå ôïí ôñüðï ðïõ ðåñéãñÜöåôáé ðáñáêÜôù:

`ÊùäéêüòÃëþóóáò_Êùäéêüò×þñáò.Êùäéêïðïßçóç`

24.3.1 Êùäéêïß Ãëùóóþí êáé ×ùñþí

Ãéá íá ÷ñçóéìïðïéçèïýí ïé ôïðéêÝò ñõèìßóåéò ãéá ìéá óõãêåêñéìÝíç ãëþóóá óå Ýíá óýóôçìá FreeBSD (Þ óå Üëëï óýóôçìá ôýðïõ UNIX ðïõ õðïóôçñßæåé ôï ðñüôõðï I18N), ï ÷ñÞóôçò èá ðñÝðåé íá âñåé ôïõò êùäéêïýò ôçò óõãêåêñéìÝíçò ÷þñáò êáé ãëþóóáò (ïé êùäéêïß ÷ùñþí êáèïäçãïýí ôéò åöáñìïãÝò ó÷åôéêÜ ìå ôç äéÜëåêôï ôçò ãëþóóáò ðïõ ðñÝðåé íá ÷ñçóéìïðïéçèåß). ÐñïãñÜììáôá üðùò öõëëïìåôñçôÝò, åîõðçñåôçôÝò éóôïóåëßäùí, åîõðçñåôçôÝò SMTP/POP êëð. ðáßñíïõí åðßóçò êÜðïéåò áðïöÜóåéò ðïõ åîáñôþíôáé áðü ôïõò êùäéêïýò áõôïýò. ÐáñáêÜôù öáßíïíôáé ìåñéêÜ ðáñáäåßãìáôá ãëùóóþí/÷ùñþí:

Êùäéêüò Ãëþóóáò/×þñáò	ÐåñéãñáöÞ
en_US	ÁããëéêÜ - ÇíùìÝíåò Ðïëéôåßåò
ru_RU	Ñþóéêá - Ñùóßá
zh_TW	ÐáñáäïóéáêÜ ÊéíÝæéêá - ÔáúâÜí

24.3.2 ÊùäéêïðïéÞóåéò

ÊÜðïéåò ãëþóóåò ÷ñçóéìïðïéïýí êùäéêïðïéÞóåéò ðïõ äåí åßíáé ASCII, áëëÜ ðåñéÝ÷ïõí ÷áñáêôÞñåò 8-bit, wide, Þ multibyte (äåßôå ôç óåëßäá manual multibyte(3) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò). Ïé ðéï êáéíïýñéåò åöáñìïãÝò óõíÞèùò áíáãíùñßæïõí ôïõò ÷áñáêôÞñåò 8-bit. ÁíÜëïãá ìå ôçí õëïðïßçóç, ïé ÷ñÞóôåò ìðïñåß íá ÷ñåéÜæåôáé íá ìåôáãëùôôßóïõí ìéá åöáñìïãÞ ìå õðïóôÞñéîç ÷áñáêôÞñùí wide Þ multibyte, Þ íá ðñïóáñìüóïõí ôéò ñõèìßóåéò ôïõ ðñïãñÜììáôïò. Ãéá íá Ý÷åôå ôçí éêáíüôçôá íá åéóÜãåôå êáé íá åðåîåñãÜæåóôå ÷áñáêôÞñåò multibyte, ç ÓõëëïãÞ ôùí Ports ôïõ FreeBSD (http://www.FreeBSD.org/ports/index.html) äéáèÝôåé ðñïãñÜììáôá ãéá êÜèå ãëþóóá. Äåßôå ôçí ôåêìçñßùóç ãéá ôï I18N óôï áíôßóôïé÷ï Port ôïõ FreeBSD.

Åéäéêüôåñá, ï ÷ñÞóôçò ÷ñåéÜæåôáé íá äéáâÜóåé ôçí ôåêìçñßùóç ôçò åöáñìïãÞò, ãéá íá áðïöáóßóåé ðùò ðñÝðåé íá ôç ñõèìßóåé óùóôÜ Þ ðùò íá ðåñÜóåé ôéò óùóôÝò ôéìÝò óôï configure, ôï Makefile Þ ôïí ìåôáãëùôôéóôÞ.

Èá ðñÝðåé íá Ý÷åôå êáôÜ íïõ êÜðïéá ðñÜãìáôá:

- Óåô ÷áñáêôÞñùí ðïõ åîáñôþíôáé áðü ôç ãëþóóá (single C chars character set, äåßôå ôçí multibyte(3)), ð.÷. ISO8859-1, ISO8859-15, KOI8-R, CP437.

- ÊùäéêïðïéÞóåéò Wide Þ multibyte, ð.÷. EUC, Big5.

Ìðïñåßôå íá äåßôå ôçí åíåñãÞ ëßóôá ôùí óåô ÷áñáêôÞñùí óôï Ìçôñþï IANA (http://www.iana.org/assignments/character-sets).

> **Óçìåßùóç:** Ôï FreeBSD ÷ñçóéìïðïéåß ãéá ôéò ôïðéêÝò ñõèìßóåéò êùäéêïðïéÞóåéò óõìâáôÝò ìå ôï X11.

24.3.3 ÅöáñìïãÝò I18N

Óôï óýóôçìá ðáêÝôùí êáé ports ôïõ FreeBSD, ïé åöáñìïãÝò ðïõ ó÷åôßæïíôáé ìå ôï I18N Ý÷ïõí óôï üíïìá ôïõò ôç ëÝîç `I18N` þóôå íá áíáãíùñßæïíôáé åýêïëá. Ùóôüóï, ìðïñåß íá ìçí õðïóôçñßæïõí ðÜíôïôå ôç ãëþóóá ðïõ ÷ñåéÜæåóôå.

24.3.4 ÔïðéêÝò Ñõèìßóåéò

Åßíáé óõíÞèùò áñêåôü íá ãßíåé export ç ôéìÞ ìå ôçí ïíïìáóßá ôçò åðéèõìçôÞò ôïðéêÞò ñýèìéóçò, ìÝóù ôçò ìåôáâëçôÞò ðåñéâÜëëïíôïò `LANG` óôï êÝëõöïò åéóüäïõ. Áõôü ìðïñåß íá ãßíåé óôï áñ÷åßï `~/.login_conf` ôïõ ÷ñÞóôç, Þ óôï áñ÷åßï åêêßíçóçò ôïõ êåëýöïõò ôïõ ÷ñÞóôç (`~/.profile`, `~/.bashrc`, `~/.cshrc`). Äåí åßíáé áíÜãêç íá èÝóåôå êáé ôéò õðüëïéðåò ìåôáâëçôÝò ôùí ôïðéêþí ñõèìßóåùí, üðùò ïé `LC_CTYPE`, `LC_CTIME`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äéáâÜóôå ôçí ôåêìçñßùóç ôïõ FreeBSD ðïõ ó÷åôßæåôáé ìå ôçí õðïóôÞñéîç ôçò åðéèõìçôÞò ãëþóóáò.

Èá ðñÝðåé íá èÝóåôå ôéò äýï ðáñáêÜôù ìåôáâëçôÝò ðåñéâÜëëïíôïò, óôá áñ÷åßá ñõèìßóåùí:

- Ôçí `LANG` ãéá ëåéôïõñãßåò ðïõ áíÞêïõí óôçí ïéêïãÝíåéá POSIX setlocale(3)
- Ôçí `MM_CHARSET` ãéá ôï óýíïëï ÷áñáêôÞñùí MIME ôùí åöáñìïãþí.

Ôï ðáñáðÜíù ðåñéëáìâÜíåé ôçí ñýèìéóç ôïõ êåëýöïõò ÷ñÞóôç, ôçí ñýèìéóç ãéá ìéá óõãêåêñéìÝíç åöáñìïãÞ, êáé ôç ñýèìéóç ãéá ôá X11.

24.3.4.1 ÌÝèïäïé ÁëëáãÞò Ôïðéêþí Ñõèìßóåùí

ÕðÜñ÷ïõí äýï ìÝèïäïé ãéá ôçí áëëáãÞ ôùí ôïðéêþí ñõèìßóåùí, ôéò ïðïßåò êáé ðåñéãñÜöïõìå ðáñáêÜôù. Ç ðñþôç (ôçí ïðïßá êáé óõíéóôïýìå) õëïðïéåßôáé èÝôïíôáò ôéìÝò óôéò ìåôáâëçôÝò ðåñéâÜëëïíôïò óôï login class, êáé ç äåýôåñç áëëÜæïíôáò ôéò ôéìÝò ôùí ìåôáâëçôþí ðåñéâÜëëïíôïò óôï áñ÷åßï åêêßíçóçò ôïõ êåëýöïõò ôïõ ÷ñÞóôç.

24.3.4.1.1 ÌÝèïäïò ÊëÜóåùí Åéóüäïõ (Login Class)

Ç ìÝèïäïò áõôÞ åðéôñÝðåé íá ãßíåé ç ñýèìéóç ôùí ìåôáâëçôþí ðåñéâÜëëïíôïò ìéá öïñÜ ãéá êÜèå êÝëõöïò, áíôß íá ÷ñåéÜæåôáé íá ôåèïýí óõãêåêñéìÝíåò ôéìÝò óôï áñ÷åßï åêêßíçóçò ôïõ êáèåíüò ÷ùñéóôÜ. Ïé Ñõèìßóåéò óå Åðßðåäï ×ñÞóôç ìðïñïýí íá ãßíïõí áðü ôïí ßäéï ôï ÷ñÞóôç, åíþ ïé Ñõèìßóåéò óå Åðßðåäï Äéá÷åéñéóôÞ áðáéôïýí ðñïíüìéá õðåñ÷ñÞóôç.

24.3.4.1.1.1 Ñõèìßóåéò óå Åðßðåäï ×ñÞóôç

Ôï ðáñáêÜôù áðëü ðáñÜäåéãìá, äåß÷íåé Ýíá áñ÷åßï `.login_conf` óôïí êáôÜëïãï êÜðïéïõ ÷ñÞóôç óôï ïðïßï êáé ïé äýï ìåôáâëçôÝò Ý÷ïõí ôåèåß ãéá êùäéêïðïßçóç Latin-1:

```
me:\
        :charset=ISO-8859-1:\
        :lang=de_DE.ISO8859-1:
```

ÐáñáêÜôù âëÝðåôå Ýíá `.login_conf` óôï ïðïßï ïé ìåôáâëçôÝò Ý÷ïõí ôåèåß ãéá ÐáñáäïóéáêÜ ÊéíÝæéêá óå êùäéêïðïßçóç BIG-5. ÐáñáôçñÞóôå üôé Ý÷ïõìå èÝóåé ðïëý ðåñéóóüôåñåò ìåôáâëçôÝò, êáèþò êÜðïéåò åöáñìïãÝò äåí óÝâïíôáé óùóôÜ ôéò ìåôáâëçôÝò ãéá ÊéíÝæéêá, ÃéáðùíÝæéêá êáé ÊïñåÜôéêá.

```
#Users who do not wish to use monetary units or time formats
#of Taiwan can manually change each variable
me:\
        :lang=zh_TW.Big5:\
        :setenv=LC_ALL=zh_TW.Big5:\
        :setenv=LC_COLLATE=zh_TW.Big5:\
        :setenv=LC_CTYPE=zh_TW.Big5:\
        :setenv=LC_MESSAGES=zh_TW.Big5:\
        :setenv=LC_MONETARY=zh_TW.Big5:\
        :setenv=LC_NUMERIC=zh_TW.Big5:\
        :setenv=LC_TIME=zh_TW.Big5:\
        :charset=big5:\
        :xmodifiers="@im=gcin": #Set gcin as the XIM Input Server
```

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôéò Ñõèìßóåéò óå Åðßðåäï Äéá÷åéñéóôÞ êáé ôçí login.conf(5).

24.3.4.1.1.2 Ñõèìßóåéò óå Åðßðåäï Äéá÷åéñéóôÞ

Âåâáéùèåßôå üôé Ý÷åé ïñéóèåß ç óùóôÞ ãëþóóá ôçò êëÜóçò ôïõ ÷ñÞóôç, óôï áñ÷åßï `/etc/login.conf`. Óôï áñ÷åßï áõôü èá ðñÝðåé íá õðÜñ÷ïõí ïé ðáñáêÜôù ñõèìßóåéò:

```
language_name|Account Type Description:\
        :charset=MIME_charset:\
        :lang=locale_name:\
        :tc=default:
```

Ìå âÜóç ôï ðñïçãïýìåíï ðáñÜäåéãìá ìáò ðïõ ÷ñçóéìïðïéÞóáìå Latin-1, ôï áñ÷åßï èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
german|German Users Accounts:\
        :charset=ISO-8859-1:\
        :lang=de_DE.ISO8859-1:\
        :tc=default:
```

Ðñéí êÜíåôå áëëáãÝò óôéò ÊëÜóåéò Åéóüäïõ (Login Classes) ôùí ÷ñçóôþí, åêôåëÝóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# cap_mkdb /etc/login.conf
```

þóôå íá åíåñãïðïéçèïýí óôï óýóôçìá ïé áëëáãÝò ðïõ êÜíáôå óôï `/etc/login.conf`.

ÁëëáãÞ ÊëÜóåùí Åéóüäïõ ìÝóù ôçò vipw(8)

×ñçóéìïðïéÞóôå ôçí `vipw` ãéá íá ðñïóèÝóåôå íÝïõò ÷ñÞóôåò, êáé êÜíôå ôçí êáôá÷þñçóç íá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
user:password:1111:11:language:0:0:User Name:/home/user:/bin/sh
```

ÁëëáãÞ ÊëÜóåùí Åéóüäïõ ìÝóù ôçò adduser(8)

×ñçóéìïðïéÞóôå ôçí `adduser` ãéá íá ðñïóèÝóåôå íÝïõò ÷ñÞóôåò, êáé Ýðåéôá áêïëïõèÞóôå ôéò ðáñáêÜôù ïäçãßåò:

- ÈÝóôå ôï `defaultclass = language` óôï `/etc/adduser.conf`. Íá Ý÷åôå õðüøç óáò üôé óå áõôÞ ôçí ðåñßðôùóç, èá ðñÝðåé íá ïñßóåôå ìéá êëÜóç `default` ãéá üëïõò ôïõò ÷ñÞóôåò Üëëùí ãëùóóþí.
- Ìéá åíáëëáêôéêÞ ëýóç, åßíáé íá áðáíôÜôå êÜèå öïñÜ óôçí åñþôçóç

  ```
  Enter login class: default []:
  ```

  ðïõ åìöáíßæåôáé áðü ôçí adduser(8).
- Áêüìá ìéá åíáëëáêôéêÞ ëýóç, åßíáé íá ÷ñçóéìïðïéÞóåôå ôï ðáñáêÜôù óå êÜèå ÷ñÞóôç ðïõ èÝëåôå íá ðñïóèÝóåôå êáé ï ïðïßïò ÷ñçóéìïðïéåß äéáöïñåôéêÞ ãëþóóá:

  ```
  # adduser -class language
  ```

ÁëëáãÞ ÊëÜóåùí Åéóüäïõ ìÝóù ôçò pw(8)

Áí ÷ñçóéìïðïéåßôå ôçí pw(8) ãéá íá ðñïóèÝóåôå íÝïõò ÷ñÞóôåò, êáëÝóôå ôçí ìå ôïí ðáñáêÜôù ôñüðï:

```
# pw useradd user_name -L language
```

24.3.4.1.2 ÌÝèïäïò Áñ÷åßùí Åêêßíçóçò Êåëýöïõò

> **Óçìåßùóç:** Ç ìÝèïäïò áõôÞ äåí óõíßóôáôáé, êáèþò áðáéôåß äéáöïñåôéêÝò ñõèìßóåéò ãéá êÜèå äéáöïñåôéêü ðñüãñáììá êåëýöïõò ðïõ ÷ñçóéìïðïéåßôáé. ÐñïôéìÞóôå êáëýôåñá ôçí ìÝèïäï ôùí ÊëÜóåùí Åéóüäïõ.

Ãéá íá ðñïóèÝóåôå ôéò ôïðéêÝò ñõèìßóåéò êáé ôï óåô ÷áñáêôÞñùí MIME, ñõèìßóôå áðëþò ôéò äýï ìåôáâëçôÝò ðåñéâÜëëïíôïò ðïõ öáßíïíôáé ðáñáêÜôù óôï áñ÷åßï `/etc/profile` Þ/êáé óôï `/etc/csh.login`. Èá ÷ñçóéìïðïéÞóïõìå ôá Ãåñìáíéêü ùò ãëþóóá ãéá ôï ðáñáêÜôù ðáñÜäåéãìá:

Óôï `/etc/profile`:

```
LANG=de_DE.ISO8859-1; export LANG
MM_CHARSET=ISO-8859-1; export MM_CHARSET
```

[1] óôï `/etc/csh.login`:

```
setenv LANG de_DE.ISO8859-1
setenv MM_CHARSET ISO-8859-1
```

Åíáëëáêôéêü, ìðïñåßôå íá ðñïóèÝóåôå ôéò ðáñáðÜíù ïäçãßåò óôï `/usr/share/skel/dot.profile` (áíôßóôïé÷á ìå ôéò ïäçãßåò ãéá ôï `/etc/profile` ðïõ åßäáìå ðáñáðÜíù), Þ óôï `/usr/share/skel/dot.login` (áíôßóôïé÷á ìå ôéò ïäçãßåò ãéá ôï `/etc/csh.login` ðïõ åßäáìå åðßóçò ðáñáðÜíù).

Ãéá ôï X11:

Óôï `$HOME/.xinitrc`:

```
LANG=de_DE.ISO8859-1; export LANG
```

[1]:

```
setenv LANG de_DE.ISO8859-1
```

ÁíÜëïãá ìå ôï êÝëõöïò ðïõ ÷ñçóéìïðïéåßôå (äåßôå ðáñáðÜíù).

24.3.5 Ñõèìßóåéò ãéá ôçí Êïíóüëá

Ãéá üëá ôá single C óåô ÷áñáêôÞñùí, ìðïñåßôå íá èÝóåôå ôéò ãñáììáôïóåéñÝò ôçò êïíóüëáò óôï `/etc/rc.conf` ãéá ôçí åðéèõìçôÞ ãëþóóá, ãñÜöïíôáò:

```
font8x16=font_name
font8x14=font_name
font8x8=font_name
```

Ôï *`font_name`* åäþ ðñïêýðôåé áðü ôï áíôßóôïé÷ï áñ÷åßï ôïõ êáôáëüãïõ `/usr/share/syscons/fonts`, áöáéñþíôáò ôçí êáôÜëçîç `.fnt`.

Áí ÷ñåéÜæåôáé, ÷ñçóéìïðïéÞóôå ôçí êáôÜëëçëç áíôéóôïß÷çóç ðëçêôñïëïãßïõ (keymap) êáé ïèüíçò ãéá ôï óåô ÷áñáêôÞñùí single C ðïõ ÷ñçóéìïðïéåßôå, ìÝóù ôïõ `sysinstall`. Ìüëéò åêôåëÝóåôå ôï **sysinstall**, åðéëÝîôå ôï Configure, êáé Ýðåéôá ôï Console. ÅíáëëáêôéêÜ, ìðïñåßôå íá ðñïóèÝóåôå ôï ðáñáêÜôù óôï `/etc/rc.conf`:

```
scrnmap=screenmap_name
keymap=keymap_name
keychange="fkey_number sequence"
```

Óôçí ðåñßðôùóç áõôÞ, ôï *`screenmap_name`* ðñïÝñ÷åôáé áðü Ýíá áñ÷åßï ôïõ êáôáëüãïõ `/usr/share/syscons/scrnmaps`, ÷ùñßò ôçí êáôÜëçîç `.scm`. Ç áíôéóôïß÷çóç ïèüíçò ìáæß ìå ôçí áíôßóôïé÷ç ãñáììáôïóåéñÜ, ÷ñçóéìïðïéåßôáé óõíÞèùò ãéá ôçí åðÝêôáóç ôïõ 8ïõ bit óôï 9o, ãéá êÜñôåò VGA ðïõ ÷ñçóéìïðïéïýí ìÞôñá ÷áñáêôÞñùí ìå 8 óôÞëåò.

Áí Ý÷åôå åíåñãïðïéçìÝíï ôïí äáßìïíá **moused** óôï áñ÷åßï `/etc/rc.conf`:

```
moused_enable="YES"
```

êáëü èá åßíáé íá åîåôÜóåôå ôéò ðëçñïöïñßåò ó÷åôéêÜ ìå ôïí äñïìÝá ôïõ ðïíôéêéïý ðïõ åìöáíßæïíôáé óôçí ðáñáêÜôù ðáñÜãñáöï.

Ï ðñïåðéëåãìÝíïò äñïìÝáò ôïõ ðïíôéêéïý ðïõ ÷ñçóéìïðïéåßôáé áðü ôï ðñüãñáììá ïäÞãçóçò syscons(4), êáôáëáìâÜíåé ôéò èÝóåéò 0xd0-0xd3 ôïõ óõíüëïõ ÷áñáêôÞñùí. Áí áõôÞ ç ðåñéï÷Þ ÷áñáêôÞñùí äåí åßíáé äéáèÝóéìç óôç ãëþóóá ðïõ ÷ñçóéìïðïéåßôå, èá ðñÝðåé íá ìåôáêéíÞóåôå ôçí ðåñéï÷Þ ôïõ äñïìÝá Ýîù áðü áõôÞí. Ãéá íá ãßíåé áõôü óôï FreeBSD, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï `/etc/rc.conf`:

```
mousechar_start=3
```

Ôï *`keymap_name`* ðñïÝñ÷åôáé áðü Ýíá áñ÷åßï ôïõ êáôáëüãïõ `/usr/share/syscons/keymaps`, ÷ùñßò ôçí êáôÜëçîç `.kbd`. Áí äåí åßóôå óßãïõñïé ãéá ôçí áíôéóôïß÷çóç ðëçêôñïëïãßïõ ðïõ ÷ñåéÜæåôáé íá ÷ñçóéìïðïéÞóåôå, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï kbdmap(1) ãéá íá êÜíåôå äïêéìÝò óå äéÜöïñåò áíôéóôïé÷ßóåéò, ÷ùñßò íá ÷ñåéÜæåôáé íá êÜíåôå åðáíåêêßíçóç.

Ç ëåéôïõñãßá `keychange` ÷ñçóéìïðïéåßôáé óõíÞèùò ãéá ôïí ðñïãñáììáôéóìü ôùí ðëÞêôñùí ëåéôïõñãéþí (function keys), þóôå íá ôáéñéÜæïõí ìå ôïí åðéëåãìÝíï ôýðï ôåñìáôéêïý, êáèþò ïé áêïëïõèßåò ôùí ðëÞêôñùí ëåéôïõñãéþí äåí ìðïñïýí íá êáèïñéóôïýí óôéò áíôéóôïé÷ßåò ðëçêôñïëïãßïõ.

Âåâáéùèåßôå åðßóçò üôé Ý÷åôå ñõèìßóåé ôï óùóôü ôýðï ôåñìáôéêïý óôï `/etc/ttys` ãéá üëåò ôéò êáôá÷ùñßóåéò `ttyv*`. Ôç äåäïìÝíç óôéãìÞ, ïé ðñïêáèïñéóìÝíåò áíôéóôïé÷ßåò åßíáé:

Óåô ×áñáêôÞñùí	**Ôýðïò Ôåñìáôéêïý**
ISO8859-1 Þ ISO8859-15	`cons25l1`
ISO8859-2	`cons25l2`
ISO8859-7	`cons25l7`
KOI8-R	`cons25r`
KOI8-U	`cons25u`
CP437 (ðñïåðéëåãìÝíï VGA)	`cons25`
US-ASCII	`cons25w`

Ãéá ãëþóóåò ìå ÷áñáêôÞñåò wide Þ multibyte, ÷ñçóéìïðïéÞóôå ôï óùóôü FreeBSD port óôïí êáôÜëïãï `/usr/ports/`*`language`*. ÌåñéêÝò èýñåò åìöáíßæïíôáé ùò êïíóüëá, åíþ ôï óýóôçìá ôéò âëÝðåé ùò óåéñéáêÜ vtty, êáé Ýôóé ðñÝðåé íá äåóìåýóåôå áñêåôÜ vtty, ôüóï ãéá ôï X11 üóï êáé ãéá ôçí øåõäï-óåéñéáêÞ êïíóüëá. ÐáñáêÜôù èá âñåßôå ìéá ìåñéêþò áíçìåñùìÝíç ëßóôá ãéá ÷ñÞóç Üëëùí ãëùóóþí óôçí êïíóüëá:

Ãëþóóá	**Ôïðïèåóßá**
ÐáñáäïóéáêÜ ÊéíÝæéêá (BIG-5)	`chinese/big5con`
ÃéáðùíÝæéêá	`japanese/kon2-16dot` Þ `japanese/mule-freewnn`
ÊïñåÜôéêá	`korean/han`

24.3.6 Ñýèìéóç ôïõ X11

Áí êáé ôï X11 äåí åßíáé ìÝñïò ôïõ FreeBSD Project, èá äþóïõìå åäþ êÜðïéåò ÷ñÞóéìåò ðëçñïöïñßåò ãéá üóïõò ôï ÷ñçóéìïðïéïýí óôï FreeBSD. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôçí éóôïóåëßäá ôïõ Xorg (http://www.x.org/), Þ ôïõ åîõðçñåôçôÞ X11 ðïõ ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå.

Óôï áñ÷åßï `~/.Xresources`, ìðïñåßôå åðéðñüóèåôá íá áëëÜîåôå êáé Üëëåò ñõèìßóåéò ðïõ ó÷åôßæïíôáé ìå ôï I18N (ð.÷. ãñáììáôïóåéñÝò, ìåíïý, ê.ë.ð.).

24.3.6.1 Áðåéêüíéóç Ãñáììáôïóåéñþí

ÅãêáôáóôÞóôå ôïí åîõðçñåôçôÞ **Xorg** (`x11-servers/xorg-server`) êáé Ýðåéôá åãêáôáóôÞóôå ôéò ãñáììáôïóåéñÝò TrueType ãéá ôçí åðéèõìçôÞ ãëþóóá. Ìå ôéò óùóôÝò ôïðéêÝò ñõèìßóåéò, èá ìðïñåßôå íá äåßôå ôçí åðéëåãìÝíç ãëþóóá óôá ìåíïý êáé ôá ìçíýìáôá ôïõ ãñáöéêïý ðåñéâÜëëïíôïò.

24.3.6.2 ÅéóáãùãÞ ìç-Áããëéêþí ×áñáêôÞñùí

Ç ìÝèïäïò åéóüäïõ X11 (XIM, X11 Input Method), åßíáé Ýíá íÝï ðñüôõðï ãéá üëïõò ôïõò ðåëÜôåò X11. ¼ëåò ïé åöáñìïãÝò ôïõ X11 èá ðñÝðåé íá ãñÜöïíôáé ùò ðåëÜôåò ôïõ XIM, êáé íá ëáìâÜíïõí åßóïäï áðü åîõðçñåôçôÝò åéóüäïõ

XIM. ÕðÜñ÷ïõí äéáèÝóéìïé äéÜöïñïé åîõðçñåôçôÝò XIM, ãéá äéáöïñåôéêÝò ãëþóóåò.

24.3.7 Ñýèìéóç ÅêôõðùôÞ

ÊÜðïéá óåô ÷áñáêôÞñùí single C åßíáé óõíÞèùò åíóùìáôùìÝíá óôï ßäéï ôï õëéêü ôùí åêôõðùôþí. Ôá óåô ÷áñáêôÞñùí ôýðïõ wide Þ multibyte áðáéôïýí åéäéêÝò ñõèìßóåéò, êáé óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ôï **apsfilter**. Ìðïñåßôå åðßóçò íá ìåôáôñÝøåôå ôï Ýããñáöï óáò óå PostScript Þ PDF, ÷ñçóéìïðïéþíôáò åñãáëåßá åéäéêÜ öôéáãìÝíá ãéá ôç óõãêåêñéìÝíç ãëþóóá.

24.3.8 ÐõñÞíáò êáé ÓõóôÞìáôá Áñ÷åßùí

Ôï óýóôçìá áñ÷åßùí FFS (fast filesystem) ôïõ FreeBSD ìðïñåß íá äéá÷åéñéóôåß ïíüìáôá áñ÷åßùí ðïõ áíÞêïõí óå óåô single C (åßíáé 8-bit clean, äåßôå êáé ôï multibyte(3)), áëëÜ äåí áðïèçêåýåé ôï óåô ÷áñáêôÞñùí ðïõ ÷ñçóéìïðïéåßôáé. Ìå Üëëá ëüãéá, åßíáé 8-bit áëëÜ äåí ãíùñßæåé ôßðïôá ãéá ôçí êùäéêïðïßçóç ôùí ÷áñáêôÞñùí. Åðßóçìá, ôï FFS äåí õðïóôçñßæåé áêüìá óåô ÷áñáêôÞñùí wide Þ multibyte. ÕðÜñ÷ïõí ùóôüóï êÜðïéá áíåîÜñôçôá patches ãéá ôï FFS ðïõ õðïóôçñßæïõí áõôÝò ôéò äõíáôüôçôåò. Ðñüêåéôáé ìüíï ãéá ðñïóùñéíÝò êáé ìç ìåôáöÝñóéìåò ëýóåéò Þ hacks, êáé Ý÷ïõìå áðïöáóßóåé íá ìçí ôá ðåñéëÜâïõìå óôï êåíôñéêü äÝíôñï ðçãáßïõ êþäéêá. Äåßôå ôéò éóôïóåëßäåò ôùí áíôßóôïé÷ùí ãëùóóþí ãéá ðåñéóóüôåñåò ðëçñïöïñßåò êáé ãéá íá áíáêôÞóåôå ôá áðáñáßôçôá áñ÷åßá.

Ôï óýóôçìá áñ÷åßùí MS-DOS óôï FreeBSD Ý÷åé ôçí äõíáôüôçôá íá ñõèìéóôåß þóôå íá ìåôáôñÝðåé ìåôáîý ôùí óåô ÷áñáêôÞñùí Unicode, ôïõ MS-DOS, êáé ôïõ óåô ÷áñáêôÞñùí ðïõ Ý÷åé åðéëåãåß ãéá ôï óýóôçìá áñ÷åßùí ôïõ FreeBSD. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äåßôå ôç óåëßäá manual mount_msdosfs(8).

24.4 Ìåôáãëþôôéóç ÐñïãñáììÜôùí I18N

ÐïëëÜ ports ôïõ FreeBSD äéáèÝôïõí õðïóôÞñéîç I18N. Óå ìåñéêÜ áðü áõôÜ, ôï -I18N åßíáé ìÝñïò ôïõ ïíüìáôïò ôïõò. Ôá ðñïãñÜììáôá áõôÜ, êáé ðïëëÜ ðåñéóóüôåñá, Ý÷ïõí åíóùìáôùìÝíç õðïóôÞñéîç ãéá I18N êáé äåí ÷ñåéÜæïíôáé Üëëåò åéäéêÝò ñõèìßóåéò.

Ùóôüóï, óå êÜðïéåò åöáñìïãÝò üðùò ç **MySQL**, èá ðñÝðåé íá ñõèìéóôåß ôï `Makefile` ìå ôï åðéèõìçôü óåô ÷áñáêôÞñùí. Áõôü óõíÞèùò ãßíåôáé ðåñíþíôáò ìéá ôéìÞ óôï **configure** óôïí ðçãáßï êþäéêá, Þ áëëÜæïíôáò ôï ßäéï ôï `Makefile`.

24.5 ÔïðéêÝò Ñõèìßóåéò ãéá ÓõãêåêñéìÝíåò Ãëþóóåò

24.5.1 Ñþóéêç Ãëþóóá (Êùäéêïðïßçóç KOI8-R)

Áñ÷éêÞ óõíåéóöïñÜ ôïõ Andrey Chernov.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí êùäéêïðïßçóç KOI8-R, äåßôå ôéò ÁíáöïñÝò Ó÷åôéêÜ ìå ôï Óåô ×áñáêôÞñùí KOIR-8 (Ñùóéêü Óýíïëï ×áñáêôÞñùí) (http://koi8.pp.ru/).

24.5.1.1 ÔïðéêÝò Ñõèìßóåéò

ÔïðïèåôÞóôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï óáò `~/.login_conf`:

```
me:My Account:\
        :charset=KOI8-R:\
        :lang=ru_RU.KOI8-R:
```

Ãéá ðáñáäåßãìáôá ðïõ ó÷åôßæïíôáé ìå ôéò ÔïðéêÝò Ñõèìßóåéò, äåßôå ðñïçãïýìåíåò åíüôçôåò óå áõôü ôï êåöÜëáéï.

24.5.1.2 Ñýèìéóç Êïíóüëáò

- ÐñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï `/etc/rc.conf`:

  ```
  mousechar_start=3
  ```

- ×ñçóéìïðïéÞóôå åðßóçò ôéò ðáñáêÜôù ñõèìßóåéò óôï `/etc/rc.conf`:

  ```
  keymap="ru.koi8-r"
  scrnmap="koi8-r2cp866"
  font8x16="cp866b-8x16"
  font8x14="cp866-8x14"
  font8x8="cp866-8x8"
  ```

- Ãéá êÜèå êáôá÷þñéóç `ttyv*` óôï áñ÷åßï `/etc/ttys`, ÷ñçóéìïðïéÞóôå ôï `cons25r` ùò ôýðï ôåñìáôéêïý.

Ãéá ðáñáäåßãìáôá ðïõ ó÷åôßæïíôáé ìå ôçí ñýèìéóç ôçò êïíóüëáò, äåßôå ðñïçãïýìåíåò åíüôçôåò áõôïý ôïõ êåöáëáßïõ.

24.5.1.3 Ñýèìéóç ÅêôõðùôÞ

Êáèþò ïé ðåñéóóüôåñïé åêôõðùôÝò ðïõ äéáèÝôïõí Ñùóéêïýò ÷áñáêôÞñåò Ý÷ïõí åíóùìáôùìÝíç ôçí êùäéêïóåëßäá CP866, èá ÷ñåéáóôåßôå åéäéêüößëôñï åîüäïõ ãéá íá ìåôáôñÝøåôå áðü ôï KOI8-R óôï CP866. Ôï ößëôñï áõôü åãêáèßóôáôáé áðü ðñïåðéëïãÞ óôï `/usr/libexec/lpr/ru/koi2alt`. Ç êáôá÷þñéóç ãéá Ýíá Ñþóéêï åêôõðùôÞ óôï `/etc/printcap` èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
lp|Russian local line printer:\
        :sh:of=/usr/libexec/lpr/ru/koi2alt:\
        :lp=/dev/lpt0:sd=/var/spool/output/lpd:lf=/var/log/lpd-errs:
```

Äåßôå ôï printcap(5) ãéá ðéï ëåðôïìåñÞ ðåñéãñáöÞ.

24.5.1.4 Óýóôçìá Áñ÷åßùí MS-DOS êáé Ñþóéêá Ïíüìáôá Áñ÷åßùí

Ôï ðáñáêÜôù õðüäåéãìá êáôá÷þñéóçò óôï fstab(5) åíåñãïðïéåß ôçí õðïóôÞñéîç ãéá Ñþóéêá ïíüìáôá áñ÷åßùí óå ðñïóáñôçìÝíá óõóôÞìáôá áñ÷åßùí ôýðïõ MS-DOS:

```
/dev/ad0s2      /dos/c  msdos   rw,-Wkoi2dos,-Lru_RU.KOI8-R 0 0
```

Ç åðéëïãÞ `-L` åðéëÝãåé ôéò ôïðéêÝò ñõèìßóåéò ðïõ èá ÷ñçóéìïðïéçèïýí, êáé ç `-W` ïñßæåé ôïí ðßíáêá ìåôáôñïðÞò ÷áñáêôÞñùí. Ãéá íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-W` âåâáéùèåßôå üôé Ý÷åôå ðñïóáñôÞóåé ôçí êáôÜôìçóç `/usr` ðñéí ôçí êáôÜôìçóç MS-DOS, êáèþò ïé ðßíáêåò ìåôáôñïðÞò âñßóêïíôáé óôï `/usr/libdata/msdosfs`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôç óåëßäá manual ôïõ mount_msdosfs(8).

24.5.1.5 Ñýèìéóç X11

1. ÅêôåëÝóôå ðñþôá ôéò ãåíéêÝò ôïðéêÝò ñõèìßóåéò ðïõ Ý÷ïõìå Þäç ðåñéãñÜøåé.
2. Áí ÷ñçóéìïðïéåßôå ôïí åîõðçñåôçôÞ **Xorg**, åãêáôáóôÞóôå ôï ðáêÝôï `x11-fonts/xorg-fonts-cyrillic`.

   ÅëÝãîôå ôçí åíüôçôá `"Files"` óôï áñ÷åßï `/etc/X11/xorg.conf`. Èá ðñÝðåé íá ðñïóèÝóåôå ôçí ðáñáêÜôù ãñáììÞ *ðñéí* áðü ïðïéáäÞðïôå Üëëç êáôá÷þñéóç `FontPath`:

   ```
   FontPath   "/usr/local/lib/X11/fonts/cyrillic"
   ```

   > **Óçìåßùóç:** Äåßôå óôçí ÓõëëïãÞ ôùí Ports ãéá ðåñéóóüôåñåò ãñáììáôïóåéñÝò.

3. Ãéá ôçí åíåñãïðïßçóç ôïõ Ñùóéêïý ðëçêôñïëïãßïõ, ðñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôçí åíüôçôá `"Keyboard"` ôïõ áñ÷åßïõ `xorg.conf`:

   ```
   Option "XkbLayout"   "us,ru"
   Option "XkbOptions"  "grp:toggle"
   ```

   Âåâáéùèåßôå åðßóçò üôé ç ãñáììÞ `XkbDisable` åßíáé áíåíåñãÞ (ìáñêáñéóìÝíç ùò ó÷üëéï).

   Áí ÷ñçóéìïðïéÞóåôå ôï `grp:toggle` ç åíáëëáãÞ RUS/LAT èá ãßíåôáé ìå ôï **Äåîéü Alt**, åíþ áí èÝóåôå `grp:ctrl_shift_toggle`, ç åíáëëáãÞ èá ãßíåôáé ìå ôï **Ctrl**+**Shift**. Ãéá `grp:caps_toggle`, ç åíáëëáãÞ RUS/LAT èá ãßíåôáé ìå ôï **CapsLock**. Ç êáíïíéêÞ ëåéôïõñãßá ôïõ **CapsLock** åîáêïëïõèåß íá åßíáé äéáèÝóéìç ìÝóù ôïõ óõíäõáóìïý ðëÞêôñùí **Shift**+**CapsLock** (ìüíï óå êáôÜóôáóç LAT). Ôï `grp:caps_toggle` ãéá êÜðïéï Üãíùóôï ëüãï, äåí ëåéôïõñãåß óôï **Xorg**.

   Áí ôï ðëçêôñïëüãéï óáò äéáèÝôåé ðëÞêôñá “Windows”, êáé Ý÷åôå ðáñáôçñÞóåé üôé êÜðïéá áðü ôá ìç-áëöáñéèìçôéêÜ ðëÞêôñá Ý÷ïõí ëÜèïò áíôéóôïß÷éóç üôáí åßóôå óå êáôÜóôáóç RUS, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `xorg.conf`:

   ```
   Option "XkbVariant" ",winkeys"
   ```

   > **Óçìåßùóç:** Ôï Ñþóéêï XKB ðëçêôñïëüãéï ßóùò äåí ëåéôïõñãåß ìå åöáñìïãÝò ðïõ äåí Ý÷ïõí öôéá÷ôåß ãéá ôéò áíôßóôïé÷åò ôïðéêÝò ñõèìßóåéò.

> **Óçìåßùóç:** Ïé åöáñìïãÝò ðïõ ôçñïýí ôéò åëÜ÷éóôåò ðñïäéáãñáöÝò ôïðéêþí ñõèìßóåùí, èá ðñÝðåé íá êáëïýí áðü íùñßò ôç óõíÜñôçóç `XtSetLanguageProc (NULL, NULL, NULL);` ìÝóá óôïí êþäéêá ôïõò.
>
> Äåßôå ôï KOI8-R ãéá ôï óýóôçìá X Window (http://koi8.pp.ru/xwin.html) ãéá ðåñéóóüôåñåò ïäçãßåò ó÷åôéêÜ ìå ôçí äçìéïõñãßá åöáñìïãþí X11 ðïõ íá ÷ñçóéìïðïéïýí ôïðéêÝò ñõèìßóåéò.

24.5.2 ÔïðéêÝò Ñõèìßóåéò ãéá Ðáñáäïóéáêܒ ÊéíÝæéêá ÔáúâÜí

Ôï FreeBSD-Taiwan Project Ý÷åé äçìéïõñãÞóåé Ýíá HOWTO ãéá ôá ÊéíÝæéêá óôï FreeBSD, ôï ïðïßï ìðïñåßôå íá âñåßôå óôç äéåýèõíóç http://netlab.cse.yzu.edu.tw/~statue/freebsd/zh-tut/, ÷ñçóéìïðïéþíôáò ðïëëÜ ÊéíÝæéêá ports. Ï ôñÝ÷ùí óõíôÜêôçò ôïõ `ÊéíÝæéêïõ FreeBSD Howto` åßíáé ï Shen Chuan-Hsing <`statue@freebsd.sinica.edu.tw`>.

Ï Chuan-Hsing Shen <`statue@freebsd.sinica.edu.tw`> Ý÷åé äçìéïõñãÞóåé ôçí ÊéíÝæéêç ÓõëëïãÞ FreeBSD (CFC) (http://netlab.cse.yzu.edu.tw/~statue/cfc/) ÷ñçóéìïðïéþíôáò ôçí êùäéêïðïßçóç `zh-L10N-tut` ôïõ FreeBSD-ÔáÀâÜí. Ôá ðáêÝôá êáé ôá scripts äéáôßèåíôáé óôç äéåýèõíóç ftp://freebsd.csie.nctu.edu.tw/pub/taiwan/CFC/.

24.5.3 ÔïðéêÝò Ñõèìßóåéò ãéá ôçí ÃåñìáíéêÞ Ãëþóóá (ãéá ¼ëåò ôéò Ãëþóóåò ðïõ Âáóßæïíôáé óôï ISO 8859-1)

Ï Slaven Rezic <`eserte@cs.tu-berlin.de`> Ý÷åé ãñÜøåé Ýíá ïäçãü ãéá ôçí ÷ñÞóç ôùí umlauts óå Ýíá ìç÷Üíçìá FreeBSD. Ï ïäçãüò åßíáé ãñáììÝíïò óôá ÃåñìáíéêÜ êáé äéáôßèåôáé óôçí ôïðïèåóßá http://user.cs.tu-berlin.de/~eserte/FreeBSD/doc/umlaute/umlaute.html.

24.5.4 ÔïðéêÝò Ñõèìßóåéò ãéá ôçí ÅëëçíéêÞ Ãëþóóá

Ï Nikos Kokkalis <`nickkokkalis@gmail.com`> Ý÷åé ãñÜøåé Ýíá ðëÞñåò Üñèñï ãéá ôçí õðïóôÞñéîç ôçò ÅëëçíéêÞò ãëþóóáò óôï FreeBSD. Ôï Üñèñï áõôü äéáôßèåôáé ùò ìÝñïò ôçò åðßóçìçò ÅëëçíéêÞò ôåêìçñßùóçò ôïõ FreeBSD, óôçí ôïðïèåóßá http://www.freebsd.org/doc/el_GR.ISO8859-7/artilces/greek-language-support/index.html (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/greek-language-support/index.html).

24.5.5 ÔïðéêÝò Ñõèìßóåéò Ãéá Ãéáðùíéêá êáé ÊïñåÜôéêá

Ãéá ÃéáðùíÝæéêá, äåßôå óôçí ôïðïèåóßá http://www.jp.FreeBSD.org/, åíþ ãéá ÊïñåÜôéêá, äåßôå óôçí ôïðïèåóßá http://www.kr.FreeBSD.org/.

24.5.6 Ôåêìçñßùóç ôïõ FreeBSD óå Ãëþóóåò Åêôüò ôçò ÁããëéêÞò

ÊÜðïéïé åèåëïíôÝò ôïõ FreeBSD Ý÷ïõí ìåôáöñÜóåé ôìÞìáôá ôçò ôåêìçñßùóçò ôïõ óå Üëëåò ãëþóóåò. Ïé ìåôáöñÜóåéò áõôÝò äéáôßèåíôáé ìÝóù óõíäÝóìùí óôçí êýñéá äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD (http://www.FreeBSD.org/index.html) Þ óôïí êáôÜëïãï `/usr/share/doc`.

ÊåöÜëáéï 25 ÅíçìÝñùóç êáé ÁíáâÜèìéóç ôïõ FreeBSD

ÁíáäïìÞèçêå, áíáäéïñãáíþèçêå, êáé ôìÞìáôá ôïõ áíáíåþèçêáí áðü ôïí Jim Mock. Áñ÷éêÞ óõíåéóöïñÜ áðü ôïõò Jordan Hubbard, Poul-Henning Kamp, John Polstra, êáé Nik Clayton.

25.1 Óýíïøç

Ôï FreeBSD âñßóêåôáé õðü óõíå÷Þ åîÝëéîç ìåôáîý ôùí åðßóçìùí åêäüóåùí ôïõ. Ìåñéêïß Üíèñùðïé ðñïôéìïýí íá ÷ñçóéìïðïéïýí ôéò åðßóçìåò åêäüóåéò, åíþ Üëëïé ðñïôéìïýí íá êñáôïýí ôï óýóôçìá ôïõò åíçìåñùìÝíï ìå ôéò ôåëåõôáßåò åîåëßîåéò. Ùóôüóï, áêüìá êáé ïé åðßóçìåò åêäüóåéò åíçìåñþíïíôáé óõ÷íÜ ìå äéïñèþóåéò êñßóéìùí óöáëìÜôùí êáé áóöáëåßáò. ¼ðïéá Ýêäïóç êáé íá ÷ñçóéìïðïéÞóåôå, ôï FreeBSD ðáñÝ÷åé üëá ôá áðáñáßôçôá åñãáëåßá ãéá íá êñáôÞóåôå ôï óýóôçìá óáò åíçìåñùìÝíï, êáé åðßóçò óáò åðéôñÝðåé íá áíáâáèìéóôåßôå åýêïëá óå êÜðïéá åðüìåíç Ýêäïóç. Ôï êåöÜëáéï áõôü èá óáò âïçèÞóåé íá áðïöáóßóåôå áí èÝëåôå íá ðáñáêïëïõèåßôå ôï óýóôçìá áíÜðôõîçò, Þ áí èá ðñïôéìÞóåôå íá ðáñáìåßíåôå óå ìéá áðü ôéò ðáãéùìÝíåò åêäüóåéò. Èá ðáñïõóéÜóïõìå åðßóçò ôá âáóéêÜ åñãáëåßá ðïõ áðáéôïýíôáé ãéá ôçí åíçìÝñùóç êáé áíáâÜèìéóç ôïõ óõóôÞìáôïò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðïéá âïçèçôéêÜ ðñïãñÜììáôá ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ãéá íá åíçìåñþóåôå ôï óýóôçìá êáé ôçí ÓõëëïãÞ ôùí Ports.
- Ðùò íá äéáôçñåßôå ôï óýóôçìá óáò åíçìåñùìÝíï ìå ôá ðñïãñÜììáôá **freebsd-update CVSup**, **CVS**, Þ **CTM**.
- Ðùò íá óõãêñßíåôå ôçí êáôÜóôáóç åíüò åãêáôåóôçìÝíïõ óõóôÞìáôïò, ìå áíáöïñÜ Ýíá ãíùóôü êáé åããõçìÝíá óùóôü óýóôçìá.
- Ðùò íá äéáôçñÞóåôå ôçí ôåêìçñßùóç óáò åíçìåñùìÝíç ìÝóù ôïõ **CVSup** Þ ôùí ports ôçò ôåêìçñßùóçò .
- Ôç äéáöïñÜ ìåôáîý ôùí äýï êëÜäùí ðïõ âñßóêïíôáé óå åîÝëéîç: ôïõ FreeBSD-STABLE êáé ôïõ FreeBSD-CURRENT.
- Ðùò íá îáíáöôéÜîåôå êáé íá åðáíåãêáôáóôÞóåôå ïëüêëçñï ôï âáóéêü óýóôçìá ìå ôçí `make buildworld` (êëð).

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá ñõèìßóåôå óùóôÜ ôç óýíäåóç óáò óôï äßêôõï (ÊåöÜëáéï 32).
- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

> **Óçìåßùóç:** Óôï êåöÜëáéï áõôü ãßíåôáé óõ÷íÜ ÷ñÞóç ôçò åíôïëÞò `cvsup` ãéá ôçí áíÜêôçóç Þ åíçìÝñùóç ôùí áñ÷åßùí ðçãáßïõ êþäéêá ôïõ FreeBSD. Ãéá íá ôçí ÷ñçóéìïðïéÞóåôå, èá ðñÝðåé íá åãêáôáóôÞóåôå Ýíá ðáêÝôï Þ port üðùò ôï `net/cvsup` (áí äåí èÝëåôå íá åãêáôáóôÞóåôå ãñáöéêü ðñüãñáììá `cvsup`, ìðïñåßôå íá åãêáôáóôÞóåôå ôï port `net/cvsup-without-gui`). Ìðïñåßôå íá áíôéêáôáóôÞóåôå áõôÞ ôçí åíôïëÞ ìå ôçí csup(1) ç ïðïßá áíÞêåé óôï âáóéêü óýóôçìá.

25.2 Åíçìåñþíïíôáò ôï FreeBSD

ÃñÜöçêå áðü ôïí Tom Rhodes. Âáóßóôçêå óå óçìåéþóåéò ðïõ ðáñåß÷å ï Colin Percival.

Ç åöáñìïãÞ åíçìåñþóåùí áóöáëåßáò áðïôåëåß Ýíá óçìáíôéêü ôìÞìá ôçò óõíôÞñçóçò ëïãéóìéêïý, åéäéêÜ üôáí ðñüêåéôáé ãéá ôï ëåéôïõñãéêü óýóôçìá. Ãéá ìåãÜëï äéÜóôçìá, ç äéáäéêáóßá áõôÞ äåí Þôáí åýêïëç óôï FreeBSD. ¸ðñåðå íá åöáñìüóïõí patches óôïí ðçãáßï êþäéêá, íá ãßíåé ìåôáãëþôôéóç ôïõ áðü ôçí áñ÷Þ, êáé íá åãêáôáóôáèïýí îáíÜ ôá íÝá åêôåëÝóéìá.

Áõôü äåí åßíáé ðëÝïí áíáãêáßï, êáèþò ôï FreeBSD äéáèÝôåé ôþñá Ýíá âïçèçôéêü ðñüãñáììá, ôï `freebsd-update`. Ôï ðñüãñáììá ðáñÝ÷åé äýï äéáöïñåôéêÝò ëåéôïõñãßåò. Ç ðñþôç åßíáé ç äõíáôüôçôá äõáäéêÞò (binary) åíçìÝñùóçò ôïõ âáóéêïý óõóôÞìáôïò ìå ôéò ôåëåõôáßåò äéïñèþóåéò áóöáëåßáò êáé ëáèþí, ÷ùñßò íá ÷ñåéÜæåôáé îáíÜ ìåôáãëþôôéóç êáé åãêáôÜóôáóç. Ç äåýôåñç åßíáé ç äõíáôüôçôá áíáâÜèìéóçò ôïõ óõóôÞìáôïò óå ìéá íÝá ìéêñÞ Þ ìåãÜëç åðßóçìç Ýêäïóç (release).

> **Óçìåßùóç:** ÄõáäéêÝò äéïñèþóåéò ëáèþí êáé áóöÜëåéáò, äéáôßèåíôáé ãéá üëåò ôéò áñ÷éôåêôïíéêÝò êáé åêäüóåéò ðïõ õðïóôçñßæïíôáé áðü ôçí ïìÜäá áóöÜëåéáò. Ðñéí ðñï÷ùñÞóåôå óôçí áíáâÜèìéóç óå ìéá íÝá Ýêäïóç, èá ðñÝðåé íá äéáâÜóåôå ôéò ó÷åôéêÝò ìå áõôÞí áíáêïéíþóåéò, êáèþò ìðïñåß íá ðåñéÝ÷ïõí óçìáíôéêÝò ðëçñïöïñßåò. Ìðïñåßôå íá äåßôå ôéò áíáêïéíþóåéò åêäüóåùí óôçí ðáñáêÜôù ôïðïèåóßá: http://www.FreeBSD.org/releases/.

Áí õðÜñ÷åé êÜðïéï `crontab` ðïõ ÷ñçóéìïðïéåß ôéò äõíáôüôçôåò ôïõ `freebsd-update`, èá ðñÝðåé íá áðåíåñãïðïéçèåß ðñéí îåêéíÞóåé ç ðáñáêÜôù äéáäéêáóßá. Ìðïñåßôå íá åãêáôáóôÞóåôå ôçí ôåëåõôáßá Ýêäïóç ôïõ `freebsd-update` êáôåâÜæïíôáò ôï óõìðéåóìÝíï ðáêÝôï áðü ôï ðáñáðÜíù URL êáé åêôåëþíôáò ôéò ðáñáêÜôù åíôïëÝò:

```
# gunzip -c freebsd-update-upgrade.tgz | tar xvf -
# mv freebsd-update.sh /usr/sbin/freebsd-update
# mv freebsd-update.conf /etc
```

Äåí áðáéôåßôáé íá êáôåâÜóåôå ôçí ôåëåõôáßá Ýêäïóç, áí ÷ñçóéìïðïéåßôå êÜðïéá áðü ôéò ôñÝ÷ïõóåò åêäüóåéò ôïõ FreeBSD.

25.2.1 Ôï Áñ÷åßï Ñõèìßóåùí

ÊÜðïéïé ÷ñÞóôåò ßóùò èÝëïõí íá áëëÜîïõí ôï ðñïåðéëåãìÝíï áñ÷åßï ñõèìßóåùí `/etc/freebsd-update.conf`, þóôå íá Ý÷ïõí êáëýôåñï Ýëåã÷ï ôçò äéáäéêáóßáò. Ïé åðéëïãÝò åßíáé ãåíéêÜ áñêåôÜ êáëÜ ôåêìçñéùìÝíåò, áëëÜ ïé ðáñáêÜôù ßóùò íá ÷ñåéÜæïíôáé êÜðïéåò åðéðëÝïí åðåîçãÞóåéò:

```
# Components of the base system which should be kept updated.
Components src world kernel
```

ÁõôÞ ç ðáñÜìåôñïò åëÝã÷åé ðïéá ôìÞìáôá ôïõ FreeBSD èá äéáôçñïýíôáé åíçìåñùìÝíá. Ç ðñïåðéëïãÞ åßíáé íá åíçìåñþíåôáé ï ðçãáßïò êþäéêáò, üëï ôï âáóéêü óýóôçìá, êáé ï ðõñÞíáò. Ôá ôìÞìáôá åßíáé ôá ßäéá ðïõ äéáôßèåíôáé êáé êáôÜ ôçí åãêáôÜóôáóç, ãéá ðáñÜäåéãìá áí âÜëåôå ôçí åðéëïãÞ `world/games` èá åãêáèßóôáíôáé åíçìåñþóåéò ãéá ôá ðáé÷íßäéá. Áí âÜëåôå `src/bin` èá åðéôñÝøåôå ôçí åíçìÝñùóç ôïõ ðçãáßïõ êþäéêá ôïõ êáôáëüãïõ `src/bin`.

Ç êáëýôåñç åðéëïãÞ åßíáé íá áöÞóåôå åäþ ôçí ðñïåðéëåãìÝíç ôéìÞ, êáèþò áí ôçí áëëÜîåôå þóôå íá ðåñéÝ÷åé óõãêåêñéìÝíá ìüíï ôìÞìáôá, èá áíáãêáóôåßôå íá áíáöÝñåôå ÷ùñéóôÜ ìÝóá óôï áñ÷åßï ñõèìßóåùí êÜèå ôìÞìá ðïõ èÝëåôå íá åíçìåñþíåôáé. Áõôü ßóùò Ý÷åé êáôáóôñïöéêÜ áðïôåëÝóìáôá, êáèþò åßíáé ðéèáíü ï ðçãáßïò êþäéêáò êáé ôá åêôåëÝóéìá ðñïãñÜììáôá íá ìçí åßíáé ðëÝïí óå óõã÷ñïíéóìü ìåôáîý ôïõò.

```
# Paths which start with anything matching an entry in an IgnorePaths
# statement will be ignored.
IgnorePaths
```

ÐñïóèÝóôå äéáäñïìÝò óå êáôáëüãïõò, üðùò `/bin` Þ `/sbin` ãéá íá áöÞóåôå áðåßñá÷ôïõò ôïõò óõãêåêñéìÝíïõò êáôáëüãïõò êáôÜ ôçí äéáäéêáóßá åíçìÝñùóçò. Ç åðéëïãÞ áõôÞ ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá áðïôñÝøåé ôï `freebsd-update` íá ãñÜøåé ðÜíù óå ðéèáíüí äéêÝò óáò ôïðéêÝò áëëáãÝò.

```
# Paths which start with anything matching an entry in an UpdateIfUnmodified
# statement will only be updated if the contents of the file have not been
# modified by the user (unless changes are merged; see below).
UpdateIfUnmodified /etc/ /var/ /root/ /.cshrc /.profile
```

Ç åðéëïãÞ áõôÞ èá åíçìåñþóåé ôá áñ÷åßá ñõèìßóåùí óôïõò êáôáëüãïõò ðïõ êáèïñßæïíôáé, ìüíï áí áõôÜ äåí Ý÷ïõí ìåôáâëçèåß áðü ôï ÷ñÞóôç. Áí õðÜñ÷ïõí ôïðéêÝò áëëáãÝò, äåí èá ãßíåé åíçìÝñùóç. ÕðÜñ÷åé ìéá áêüìá åðéëïãÞ, ç `KeepModifiedMetadata`, ç ïðïßá ïäçãåß ôï `freebsd-update` íá áðïèçêåýóåé ôéò áëëáãÝò ìåôáîý ôùí äýï åêäüóåùí êáôÜ ôç äéÜñêåéá ôçò óõã÷þíåõóçò (merge).

```
# When upgrading to a new FreeBSD release, files which match MergeChanges
# will have any local changes merged into the version from the new release.
MergeChanges /etc/ /var/named/etc/
```

Ðñüêåéôáé ãéá ôç ëßóôá ôùí êáôáëüãùí ðïõ ðåñéÝ÷ïõí áñ÷åßá ñõèìßóåùí, êáé óôá ïðïßá ôï `freebsd-update` èá åðé÷åéñÞóåé ôçí äéáäéêáóßá óõã÷þíåõóçò áëëáãþí. Ç äéáäéêáóßá óõã÷þíåõóçò ãßíåôáé ìå ìéá óåéñÜ áðü patches ôýðïõ diff(1) ðáñüìïéá ìå ôï mergemaster(8) áëëÜ ìå ëéãüôåñåò åðéëïãÝò. Ïé óõã÷ùíåýóåéò åßôå ãßíïíôáé äåêôÝò, åßôå ðñïêáëïýí ôï Üíïéãìá êÜðïéïõ óõíôÜêôç êåéìÝíïõ, äéáöïñåôéêÜ ç åêôÝëåóç ôïõ `freebsd-update` áêõñþíåôáé. Áí äåí åßóôå óßãïõñïé, êñáôÞóôå áíôßãñáöï áóöáëåßáò ôïõ êáôáëüãïõ `/etc` êáé áðëþò äå÷èåßôå ôéò áëëáãÝò. Äåßôå ôï ÔìÞìá 25.7.11.1 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åíôïëÞ `mergemaster`.

```
# Directory in which to store downloaded updates and temporary
# files used by FreeBSD Update.
# WorkDir /var/db/freebsd-update
```

Óôïí êáôÜëïãï áõôü öõëÜóóïíôáé üëá ôá patches êáé ôá ðñïóùñéíÜ áñ÷åßá. Óå ðåñéðôþóåéò üðïõ ï ÷ñÞóôçò åêôåëåß áíáâÜèìéóç óå ìéá íåüôåñç Ýêäïóç ôïõ FreeBSD, èá ðñÝðåé íá äéáèÝôåé ôïõëÜ÷éóôïí Ýíá gigabyte åëåýèåñïõ ÷þñïõ.

```
# When upgrading between releases, should the list of Components be
# read strictly (StrictComponents yes) or merely as a list of components
# which *might* be installed of which FreeBSD Update should figure out
# which actually are installed and upgrade those (StrictComponents no)?
# StrictComponents no
```

Áí èÝóåôå ôçí ðáñáðÜíù åðéëïãÞ óôï `yes`, ôï `freebsd-update` èá õðïèÝóåé üôé ç ëßóôá `Components` åßíáé ðëÞñçò êáé äåí èá åðé÷åéñÞóåé íá ðñï÷ùñÞóåé óå áëëáãÝò åêôüò ëßóôáò. ÏõóéáóôéêÜ, ôï `freebsd-update` èá ðñïóðáèÞóåé íá åíçìåñþóåé êÜèå áñ÷åßï ðïõ áíÞêåé óôç ëßóôá `Components`.

25.2.2 Patches Ó÷åôéêÜ ìå ôçí ÁóöÜëåéá

Ôá patches ðïõ ó÷åôßæïíôáé ìå ôçí áóöÜëåéá, áðïèçêåýïíôáé óå Ýíá áðïìáêñõóìÝíï ìç÷Üíçìá êáé ìðïñïýí íá ìåôáöïñôùèïýí êáé íá åãêáôáóôáèïýí ìå ôçí áêüëïõèç åíôïëÞ:

```
# freebsd-update fetch
# freebsd-update install
```

Áí ìå ôçí ðáñáðÜíù åíôïëÞ åãêáôáóôáèïýí åíçìåñþóåéò óôïí ðõñÞíá, èá ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôï óýóôçìá. Áí üëá ðÜíå êáëÜ, ôï óýóôçìá èá åßíáé ðëÝïí åíçìåñùìÝíï êáé ìðïñåßôå íá åêôåëåßôå ôï `freebsd-update` áõôüìáôá ìå ôçí âïÞèåéá ôïõ cron(8). Ìéá áðëÞ êáôá÷þñéóç óôï áñ÷åßï `/etc/crontab` åßíáé åðáñêÞò ãéá áõôü ôï óêïðü:

```
@daily                                  root    freebsd-update cron
```

Ç ðáñáðÜíù êáôá÷þñéóç ïñßæåé üôé ôï `freebsd-update` èá åêôåëåßôáé ìéá öïñÜ ôçí çìÝñá. Ìå ôïí ôñüðï áõôü, êáé üôáí ç åêôÝëåóç åßíáé ìÝóù ôçò åðéëïãÞò `cron`, ôï `freebsd-update` áðëþò èá åëÝã÷åé ãéá åíçìåñþóåéò. Áí õðÜñ÷ïõí, ç åöáñìïãÞ èá ôéò êáôåâÜæåé, áëëÜ äåí èá ôéò åãêáèéóôÜ. Èá óôÝëíåé üìùò Ýíá email óôïí ÷ñÞóôç `root` þóôå íá ôéò åãêáôáóôÞóåé ÷åéñïêßíçôá.

Áí ïôéäÞðïôå ðÜåé óôñáâÜ, ôï `freebsd-update` Ý÷åé ôçí éêáíüôçôá íá åðéóôñÝöåé óôçí ðñïçãïýìåíç óôáèåñÞ êáôÜóôáóç, áíáéñþíôáò ôï ôåëåõôáßï óåô áëëáãþí ìå ôçí áêüëïõèç åíôïëÞ:

```
# freebsd-update rollback
```

Ìå ôçí ïëïêëÞñùóç ôçò åíôïëÞò, èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï óýóôçìá áí Ý÷ïõí ãßíåé áëëáãÝò óôïí ðõñÞíá Þ óå êÜðïéï áðü ôá áñèñþìáôá ôïõ. Áõôü èá åðéôñÝøåé óôï FreeBSD íá öïñôþóåé ôá íÝá åêôåëÝóéìá óôç ìíÞìç.

Ôï âïçèçôéêü ðñüãñáììá `freebsd-update` ìðïñåß íá åíçìåñþóåé áõôüìáôá ìüíï ôïí ðõñÞíá `GENERIC`. Áí ÷ñçóéìïðïéåßôáé ðñïóáñìïóìÝíïò ðõñÞíáò, èá ðñÝðåé íá ìåôáãëùôôéóôåß îáíÜ, üôáí ôï `freebsd-update` ôåëåéþóåé ìå ôçí åãêáôÜóôáóç ôùí õðüëïéðùí åíçìåñþóåùí. Ùóôüóï, ôï `freebsd-update` èá áíé÷íåýóåé êáé èá åíçìåñþóåé ôïí ðõñÞíá `GENERIC` óôï `/boot/GENERIC` (áí õðÜñ÷åé), áêüìá êáé áí äåí åßíáé ï åíåñãüò ðõñÞíáò ôïõ óõóôÞìáôïò (áõôüò ðïõ åêôåëåßôáé ôç óõãêåêñéìÝíç óôéãìÞ).

> **Óçìåßùóç:** Åßíáé ãåíéêÜ êáëÞ éäÝá íá Ý÷åôå ðÜíôá Ýíá áíôßãñáöï ôïõ ðõñÞíá `GENERIC` óôïí êáôÜëïãï `/boot/GENERIC`. Èá óáò âïçèÞóåé óôçí äéÜãíùóç äéÜöïñùí ðñïâëçìÜôùí, êáèþò êáé óôçí áíáâÜèìéóç óå åðüìåíåò åêäüóåéò ôïõ FreeBSD, ìÝóù ôïõ `freebsd-update`. Ç äéáäéêáóßá áõôÞ ðåñéãñÜöåôáé óôï ÔìÞìá 25.2.3.

Áí äåí Ý÷ïõí ãßíåé áëëáãÝò óôéò ðñïåðéëåãìÝíåò ñõèìßóåéò óôï áñ÷åßï `/etc/freebsd-update.conf`, ôï `freebsd-update` èá åãêáôáóôÞóåé ôá áíáíåùìÝíá áñ÷åßá ðçãáßïõ êþäéêá ìáæß ìå ôéò õðüëïéðåò åíçìåñþóåéò. Ìðïñåßôå Ýðåéôá íá ðñï÷ùñÞóåôå óôç ìåôáãëþôôéóç êáé åãêáôÜóôáóç íÝïõ ðñïóáñìïóìÝíïõ ðõñÞíá, ìå ôï óõíÞèç ôñüðï.

> **Óçìåßùóç:** Ïé åíçìåñþóåéò ðïõ äéáíÝìïíôáé ìÝóù ôïõ `freebsd-update` äåí ðåñéëáìâÜíïõí ðÜíôïôå áëëáãÝò óôïí ðõñÞíá. Äåí åßíáé áðáñáßôçôï íá åðáíáìåôáãëùôôßóåôå ôïí ðñïóáñìïóìÝíï ðõñÞíá óáò, áí ç åêôÝëåóç ôïõ `freebsd-update install` äåí åðÝöåñå áëëáãÝò óôá áñ÷åßá ðçãáßïõ êþäéêá ôïõ ðõñÞíá. Ùóôüóï, ôï `freebsd-update` åíçìåñþíåé ðÜíôïôå ôï áñ÷åßï `/usr/src/sys/conf/newvers.sh`. Ôï áñ÷åßï áõôü ðåñéÝ÷åé ôï ôñÝ÷ïí åðßðåäï åíçìåñþóåùí (patch level) ôï ïðïßï êáé áíáöÝñåôáé ùò áñéèìüò `-p` áðü åíôïëÝò üðùò ç `uname -r`. Ìåôáãëùôôßæïíôáò îáíÜ ôïí ðñïóáñìïóìÝíï ðõñÞíá óáò (áêüìá êáé áí äåí õðÜñ÷ïõí Üëëåò áëëáãÝò) èá äþóåôå ôç äõíáôüôçôá óôçí uname(1) íá áíáöÝñåé ìå áêñßâåéá ôï åðßðåäï åíçìåñþóåùí. Áõôü ìðïñåß íá åßíáé

éäéáßôåñá ÷ñÞóéìï üôáí óõíôçñåßôå ðïëëáðëÜ óõóôÞìáôá, êáèþò óáò åðéôñÝðåé íá áíéïëïãÞóåôå ìå ìéá ìáôéÜ ôé åíçìåñþóåéò Ý÷ïõí åãêáôáóôáèåß óôï êáèÝíá.

25.2.3 Áíáâáèìßóåéò óå ÌéêñÝò êáé ÌåãÜëåò Åêäüóåéò

Ç äéáäéêáóßá áõôÞ èá áðïìáêñýíåé ôá ðáëéÜ áñ÷åßá áíôéêåéìåíéêïý êþäéêá (object files) êáèþò êáé ôéò ðáëéÝò âéâëéïèÞêåò, êÜíïíôáò ôéò ðåñéóóüôåñåò åöáñìïãÝò ôñßôùí êáôáóêåõáóôþí íá ìç ëåéôïõñãïýí. Óáò óõíéóôïýìå åßôå íá áðåãêáôáóôÞóåôå üëá ôá åãêáôåóôçìÝíá ports êáé íá ôá åãêáôáóôÞóåôå îáíÜ, Þ íá ôá áíáâáèìßóåôå áñãüôåñá, ÷ñçóéìïðïéþíôáò ôï âïçèçôéêü ðñüãñáììá `ports-mgmt/portupgrade`. Ïé ðåñéóóüôåñïé ÷ñÞóôåò èá èÝëïõí íá êÜíïõí ìéá äïêéìáóôéêÞ ìåôáãëþôôéóç ÷ñçóéìïðïéþíôáò ôçí áêüëïõèç åíôïëÞ:

```
# portupgrade -af
```

Ìå áõôü ôïí ôñüðï åîáóöáëßæåôáé üôé ôá ðÜíôá èá åðáíåãêáôáóôáèïýí óùóôÜ. Óçìåéþóôå üôé áí èÝóåôå ôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `BATCH` óôçí ôéìÞ `yes`, üëåò ïé ðéèáíÝò åñùôÞóåéò ðïõ èá åìöáíéóôïýí êáôÜ ôç äéáäéêáóßá, èá áðáíôçèïýí áõôüìáôá ìå `yes`. ¸ôóé äåí õðÜñ÷åé ðëÝïí áíÜãêç ãéá ðáñÝìâáóç ôïõ ÷ñÞóôç êáôÜ ôç äéÜñêåéá ôçò äéáäéêáóßáò ìåôáãëþôôéóçò.

Áí ÷ñçóéìïðïéåßôáé ðñïóáñìïóìÝíïò ðõñÞíáò, ç äéáäéêáóßá áíáâÜèìéóçò åßíáé åëáöñÜ ðéï ðïëýðëïêç. Èá ÷ñåéáóôåßôå Ýíá áíôßãñáöï ôïõ ðõñÞíá `GENERIC` óôïí êáôÜëïãï `/boot/GENERIC`. Áí äåí õðÜñ÷åé Þäç ï ðõñÞíáò `GENERIC` óôï óýóôçìá óáò, ìðïñåßôå íá ôïí áíáêôÞóåôå ÷ñçóéìïðïéþíôáò ìéá áðü ôéò ðáñáêÜôù ìåèüäïõò:

- Áí Ý÷åôå ìåôáãëùôôßóåé ðñïóáñìïóìÝíï ðõñÞíá ìüíï ìéá öïñÜ, ï ðõñÞíáò óôïí êáôÜëïãï `/boot/kernel.old` åßíáé óôçí ðñáãìáôéêüôçôá ï `GENERIC`. Áðëþò ìåôïíïìÜóôå ôïí êáôÜëïãï óå `/boot/GENERIC`.
- Áí Ý÷åôå öõóéêÞ ðñüóâáóç óôï ìç÷Üíçìá, ìðïñåßôå íá åãêáôáóôÞóåôå Ýíá áíôßãñáöï ôïõ ðõñÞíá `GENERIC` áðü ôï CD-ROM ôçò åãêáôÜóôáóçò. Ôïðïèåôåßóôå ôï CD-ROM óôïí ïäçãü êáé ÷ñçóéìïðïéÞóôå ôéò ðáñáêÜôù åíôïëÝò:

  ```
  # mount /cdrom
  # cd /cdrom/X.Y-RELEASE/kernels
  # ./install.sh GENERIC
  ```

  Áíôéêáôáóôåßóôå ôï *`X.Y-RELEASE`* ìå ôïõò ðñáãìáôéêïýò áñéèìïýò ôçò Ýêäïóçò ðïõ ÷ñçóéìïðïéåßôå. Ï ðõñÞíáò `GENERIC` èá åãêáôáóôáèåß áðü ðñïåðéëïãÞ óôïí êáôÜëïãï `/boot/GENERIC`.
- Áí äåí Ý÷åôå êÜðïéá áðü ôéò ðáñáðÜíù åðéëïãÝò, ìðïñåßôå íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå ôïí ðõñÞíá `GENERIC` ìÝóù ôïõ ðçãáßïõ êþäéêá:

  ```
  # cd /usr/src/
  # env DESTDIR=/boot/GENERIC make kernel
  # mv /boot/GENERIC/boot/kernel/* /boot/GENERIC
  # rm -rf /boot/GENERIC/boot
  ```

  Ãéá íá áíáãíùñéóôåß áõôüò ï ðõñÞíáò ùò `GENERIC` áðü ôï `freebsd-update`, äåí èá ðñÝðåé íá Ý÷ïõí ãßíåé áëëáãÝò óôï áñ÷åßï ñõèìßóåùí ôïõ `GENERIC`. Óõíßóôáôáé åðßóçò ç ìåôáãëþôôéóç íá ãßíåé ÷ùñßò Üëëåò åîåéäéêåõìÝíåò ñõèìßóåéò (êáôÜ ðñïôßìçóç ìå êåíü ôï `/etc/make.conf`).

Äåí ÷ñåéÜæåôáé ôç äåäïìÝíç óôéãìÞ íá åðáíåêêéíÞóåôå ìå ôïí ðõñÞíá `GENERIC`.

Åßíáé äõíáôÝò ïé áíáâáèìßóåéò ôüóï óå ìéêñÝò üóï êáé óå ìåãÜëåò åêäüóåéò, äßíïíôáò óôçí åíôïëÞ `freebsd-update` ôïí åðéèõìçôü áñéèìü Ýêäïóçò. Ãéá ðáñÜäåéãìá, ç áêüëïõèç åíôïëÞ èá áíáâáèìßóåé ôï óýóôçìá óå FreeBSD 8.1:

```
# freebsd-update -r 8.1-RELEASE upgrade
```

ÌåôÜ ôç ëÞøç ôçò åíôïëÞò, ôï `freebsd-update` èá áîéïëïãÞóåé ôçí êáôÜóôáóç ôïõ óõóôÞìáôïò êáé ôïõ áñ÷åßïõ ñõèìßóåùí ôïõ, óå ìéá áðüðåéñá íá ìáæÝøåé ôéò áðáñáßôçôåò ðëçñïöïñßåò ãéá ôçí áíáâÜèìéóç ôïõ óõóôÞìáôïò. Ïé ðëçñïöïñßåò ðïõ áíé÷íåýèçêáí èá åìöáíéóôïýí óôçí ïèüíç ìå ôç ìïñöÞ ìéáò ëßóôáò åãêáôåóôçìÝíùí ðñïãñáììÜôùí. Ãéá ðáñÜäåéãìá:

```
Looking up update.FreeBSD.org mirrors... 1 mirrors found.
Fetching metadata signature for 8.0-RELEASE from update1.FreeBSD.org... done.
Fetching metadata index... done.
Inspecting system... done.

The following components of FreeBSD seem to be installed:
kernel/smp src/base src/bin src/contrib src/crypto src/etc src/games
src/gnu src/include src/krb5 src/lib src/libexec src/release src/rescue
src/sbin src/secure src/share src/sys src/tools src/ubin src/usbin
world/base world/info world/lib32 world/manpages

The following components of FreeBSD do not seem to be installed:
kernel/generic world/catpages world/dict world/doc world/games
world/proflibs

Does this look reasonable (y/n)? y
```

Óôï óçìåßï áõôü, ôï `freebsd-update` èá êáôåâÜóåé üëá ôá áñ÷åßá ðïõ áðáéôïýíôáé ãéá ôçí áíáâÜèìéóç. Óå ìåñéêÝò ðåñéðôþóåéò, ï ÷ñÞóôçò èá êëçèåß íá áðáíôÞóåé óå åñùôÞóåéò ó÷åôéêÜ ìå ôï ôé èá åãêáôáóôáèåß Þ ðùò ðñÝðåé íá ðñï÷ùñÞóåé ç äéáäéêáóßá.

¼ôáí ÷ñçóéìïðïéåßôáé ðñïóáñìïóìÝíïò ðõñÞíáò, ôï ðáñáðÜíù âÞìá èá ðñïêáëÝóåé ôçí åìöÜíéóç ôçò ðáñáêÜôù ðñïåéäïðïßçóçò:

```
WARNING: This system is running a "MYKERNEL" kernel, which is not a
kernel configuration distributed as part of FreeBSD 8.0-RELEASE.
This kernel will not be updated: you MUST update the kernel manually
before running "/usr/sbin/freebsd-update install"
```

Ìðïñåßôå íá áãíïÞóåôå áõôÞ ôçí ðñïåéäïðïßçóç. Èá ÷ñçóéìïðïéÞóïõìå ôïí åíçìåñùìÝíï ðõñÞíá `GENERIC` ùò åíäéÜìåóï âÞìá óôç äéáäéêáóßá áíáâÜèìéóçò.

Áöïý ìåôáöïñôùèïýí üëá ôá patches óôï ôïðéêü óýóôçìá, èá ãßíåé êáé ç åöáñìïãÞ ôïõò. Ç äéáäéêáóßá áõôÞ ßóùò ðÜñåé ëßãï ÷ñüíï, áíÜëïãá ìå ôçí ôá÷ýôçôá êáé ôï öïñôßï ôïõ ìç÷áíÞìáôïò. ¸ðåéôá èá ãßíåé ç óõã÷þíåõóç ôùí áñ÷åßùí ñõèìßóåùí. Áõôü ôï ìÝñïò ôçò äéáäéêáóßáò áðáéôåß ðáñÝìâáóç ôïõ ÷ñÞóôç, êáèþò óå êÜðïéá áñ÷åßá èá ÷ñåéáóôåß ç óõã÷þíåõóç íá ãßíåé ÷åéñïêßíçôá ìå ôç âïÞèåéá êÜðïéïõ óõíôÜêôç êåéìÝíïõ. Ï ÷ñÞóôçò èá åíçìåñþíåôáé ãéá ôï áðïôÝëåóìá êÜèå åðéôõ÷çìÝíçò óõã÷þíåõóçò êáèþò åîåëßóóåôáé ç äéáäéêáóßá. Óå ðåñßðôùóç áðïôõ÷çìÝíçò óõã÷þíåõóçò (Þ áãíüçóçò ôçò), ç äéáäéêáóßá áíáâÜèìéóçò èá äéáêïðåß. Åíäå÷ïìÝíùò íá èÝëåôå íá êñáôÞóåôå áíôßãñáöï áóöáëåßáò ôïõ êáôáëüãïõ `/etc` êáé íá óõã÷ùíåýóåôå áñãüôåñá (÷åéñïêßíçôá) êÜðïéá óçìáíôéêÜ áñ÷åßá, üðùò ôï `master.passwd` Þ ôï `group`.

> **Óçìåßùóç:** Óôï óçìåßï áõôü äåí Ý÷åé ãßíåé áêüìá êáìéÜ áëëáãÞ óôï óýóôçìá, êáèþò üëç ç äéáäéêáóßá ôçò áíáâÜèìéóçò êáé óõã÷þíåõóçò ãßíåôáé óå äéáöïñåôéêü êáôÜëïãï. ¼ôáí åöáñìïóôïýí åðéôõ÷þò üëá ôá patches êáé ïëïêëçñùèåß ìå åðéôõ÷ßá ç äéáäéêáóßá ôçò óõã÷þíåõóçò üëùí ôùí áñ÷åßùí ñýèìéóçò, ï ÷ñÞóôçò èá ðñÝðåé íá åðéâåâáéþóåé ôçí ôåëéêÞ åãêáôÜóôáóç.

Ìå ôï ôÝëïò áõôÞò ôç äéáäéêáóßáò, ç áíáâÜèìéóç ìðïñåß íá ïñéóôéêïðïéçèåß óôï äßóêï, ìå ôç ÷ñÞóç ôçò áêüëïõèçò åíôïëÞò:

```
# freebsd-update install
```

Óôçí ðñþôç öÜóç, èá áëëá÷èåß ï ðõñÞíáò êáé ôá ó÷åôéêÜ áñèñþìáôá. Óôï óçìåßï áõôü, èá ðñÝðåé íá ãßíåé åðáíåêêßíçóç ôïõ ìç÷áíÞìáôïò. Óå ìç÷Üíçìá ìå ðñïóáñìïóìÝíï ðõñÞíá, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ nextboot(8) þóôå íá èÝóåôå ôïí ðõñÞíá ãéá ôçí åðüìåíç åêêßíçóç óôïí `/boot/GENERIC` (ï ïðïßïò Ý÷åé Þäç áíáâáèìéóôåß):

```
# nextboot -k GENERIC
```

> **Ðñïåéäïðïßçóç:** Ðñéí åðáíåêêéíÞóåôå ìå ôïí ðõñÞíá `GENERIC`, âåâáéùèåßôå üôé ðåñéÝ÷åé üëá ôá ðñïãñÜììáôá ïäÞãçóçò ðïõ áðáéôïýíôáé ãéá ôçí åðéôõ÷Þ åêêßíçóç ôïõ óõóôÞìáôïò óáò (êáé ôç ëåéôïõñãßá ôïõ äéêôýïõ, áí áíáâáèìßæåôå êÜðïéï áðïìáêñõóìÝíï ìç÷Üíçìá). Åéäéêüôåñá, áí ï ðñïçãïýìåíïò ðñïóáñìïóìÝíïò ðõñÞíáò ðåñéåß÷å ëåéôïõñãßåò ðïõ óõíÞèùò ðáñÝ÷ïíôáé áðü áñèñþìáôá (modules), âåâáéùèåßôå üôé öïñôßóáôå íá öïñôùèïýí ðñïóùñéíÜ óôïí ðõñÞíá `GENERIC` ÷ñçóéìïðïéþíôáò ôéò äõíáôüôçôåò ôïõ áñ÷åßïõ `/boot/loader.conf`. ºóùò åðßóçò íá èÝëåôå íá áðåíåñãïðïéÞóåôå õðçñåóßåò, ðñïóáñôÞóåéò äßóêùí êáé äéêôýïõ ê.ë.ð. ðïõ äåí åßíáé áðáñáßôçôåò, ìÝ÷ñé ôçí ïëïêëÞñùóç ôçò äéáäéêáóßáò áíáâÜèìéóçò.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí áêüëïõèç åíôïëÞ ãéá íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá ìå ôïí íÝï ðõñÞíá:

```
# shutdown -r now
```

Ìüëéò ôï óýóôçìá åðáíÝëèåé óå ëåéôïõñãßá, èá ðñÝðåé íá åêôåëÝóåôå îáíÜ ôï `freebsd-update`. Ç ðñïçãïýìåíç ëåéôïõñãßá Ý÷åé áðïèçêåõèåß, êáé Ýôóé ôï `freebsd-update` äåí èá îåêéíÞóåé áðü ôçí áñ÷Þ, áëëÜ èá áðïìáêñýíåé üëåò ôéò ðáëéÝò êïéíü÷ñçóôåò âéâëéïèÞêåò êáé ôá áñ÷åßá áíôéêåéìåíéêïý êþäéêá. Ãéá íá óõíå÷ßóåôå óå áõôü ôï óôÜäéï, äþóôå ôçí áêüëïõèç åíôïëÞ:

```
# freebsd-update install
```

> **Óçìåßùóç:** ÁíÜëïãá ìå ôï áí õðÞñîáí áëëáãÝò óôïõò áñéèìïýò åêäüóåùí ôùí âéâëéïèçêþí, ßóùò íá õðÜñ÷ïõí ìüíï äýï öÜóåéò åãêáôÜóôáóçò áíôß ãéá ôñåéò.

¼ëï ôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ èá ðñÝðåé ôþñá íá ìåôáãëùôôéóôåß êáé íá åðáíåãêáôáóôáèåß áðü ôçí áñ÷Þ. Áõôü áðáéôåßôáé êáèþò ôï åãêáôåóôçìÝíï ëïãéóìéêü ßóùò åîáñôÜôáé áðü âéâëéïèÞêåò ïé ïðïßåò áöáéñÝèçêáí êáôÜ ôç äéáäéêáóßá ôçò áíáâÜèìéóçò. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `ports-mgmt/portupgrade` ãéá íá áõôïìáôïðïéÞóåôå áõôÞ ôç äéáäéêáóßá. Ãéá íá îåêéíÞóåôå, äþóôå ôéò ðáñáêÜôù åíôïëÝò:

```
# portupgrade -f ruby
# rm /var/db/pkg/pkgdb.db
# portupgrade -f ruby18-bdb
# rm /var/db/pkg/pkgdb.db /usr/ports/INDEX-*.db
# portupgrade -af
```

Ìüëéò ïëïêëçñùèåß ôï ðáñáðÜíù, ïëïêëçñþóôå ôç äéáäéêáóßá áíáâÜèìéóçò ìå ìéá ôåëåõôáßá êëÞóç ôçò åíôïëÞò `freebsd-update`. Äþóôå ôçí ðáñáêÜôù åíôïëÞ ãéá íá ïëïêëçñþóåôå ïôéäÞðïôå Ý÷åé áðïìåßíåé óôç äéáäéêáóßá áíáâÜèìéóçò:

```
# freebsd-update install
```

Áí ÷ñçóéìïðïéÞóáôå ðñïóùñéíÜ ôïí ðõñÞíá `GENERIC`, áõôÞ åßíáé ç êáôÜëëçëç óôéãìÞ ãéá íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå íÝï ðñïóáñìïóìÝíï ðõñÞíá, ìå ôï óõíÞèç ôñüðï.

ÅðáíåêêéíÞóôå ôï ìç÷Üíçìá óáò óôçí íÝá Ýêäïóç ôïõ FreeBSD. Ç äéáäéêáóßá Ý÷åé ïëïêëçñùèåß.

25.2.4 Óýãêñéóç ÊáôÜóôáóçò ôïõ ÓõóôÞìáôïò

Ôï âïçèçôéêü ðñüãñáììá `freebsd-update` ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá åëÝãîåôå ôçí êáôÜóôáóç ôçò åãêáôåóôçìÝíçò Ýêäïóçò ôïõ FreeBSD óå ó÷Ýóç ìå ìéá ãíùóôÞ êáé óùóôÞ åãêáôÜóôáóç. Ç åðéëïãÞ áõôÞ óõãêñßíåé êáé áîéïëïãåß ôçí ôñÝ÷ïõóá Ýêäïóç ôùí ðñïãñáììÜôùí óõóôÞìáôïò, ôùí âéâëéïèçêþí êáé ôùí áñ÷åßùí ñýèìéóçò. Ãéá íá îåêéíÞóåôå ôç óýãêñéóç, äþóôå ôçí áêüëïõèç åíôïëÞ:

```
# freebsd-update IDS >> outfile.ids
```

> **Ðñïåéäïðïßçóç:** Áí êáé ôï üíïìá ôçò åíôïëÞò åßíáé IDS, äåí èá ðñÝðåé óå êáìéÜ ðåñßðôùóç íá èåùñçèåß õðïêáôÜóôáôï åíüò óõóôÞìáôïò áíß÷íåõóçò åéóâïëÝá (intrusion detection system) üðùò åßíáé ãéá ðáñÜäåéãìá ôï `security/snort`. Êáèþò ôï `freebsd-update` áðïèçêåýåé ôá äåäïìÝíá ôïõ óôï äßóêï, õðÜñ÷åé ðÜíôá ç ðéèáíüôçôá íá Ý÷åé ãßíåé áëëïßùóç ôïõò. Áí êáé ç ðéèáíüôçôá áõôÞ ìðïñåß íá ìåéùèåß ÷ñçóéìïðïéþíôáò ôç ñýèìéóç `kern.securelevel` êáé áðïèçêåýïíôáò ôá äåäïìÝíá ôçò åíôïëÞò `freebsd-update` óå Ýíá óýóôçìá áñ÷åßùí ìüíï ãéá áíÜãíùóç, ìéá áêüìá êáëýôåñç ëýóç èá Þôáí íá óõãêñßíåôå ôï óýóôçìá ìå êÜðïéï äßóêï ðïõ èåùñåßôå óßãïõñá áóöáëÞ. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå Ýíá äßóêï DVD Þ Ýíá åîùôåñéêü äßóêï USB ðïõ öõëÜóóåôå óå áóöáëÞ ôïðïèåóßá.

Èá ãßíåé ôþñá ìéá åðéèåþñçóç ôïõ óõóôÞìáôïò êáé èá åêôõðùèåß ìéá ëßóôá áðü áñ÷åßá êáé ôéìÝò hash ôïõ ôýðïõ sha256(1), ôüóï ãéá ôï åãêáôåóôçìÝíï üóï êáé ãéá ôï ãíùóôü óýóôçìá. ÅðåéäÞ ðñüêåéôáé ãéá ìåãÜëç ëßóôá, ôçí áíáêáôåõèýíïõìå óôï áñ÷åßï `outfile.ids`. Óôçí ïèüíç ôï êåßìåíï èá êõëïýóå ðïëý ãñÞãïñá, êáé óýíôïìá èá ãÝìéæå ôçí ðñïóùñéíÞ ìíÞìç áðåéêüíéóçò ôçò êïíóüëáò.

Ïé ãñáììÝò áõôÝò Ý÷ïõí ãåíéêÜ ìåãÜëï ìÞêïò, áëëÜ åßíáé åýêïëï íá åðåîåñãáóôïýìå ôçí Ýîïäï. Ãéá ðáñÜäåéãìá, ãéá íá äåßôå ìéá ëßóôá üëùí ôùí áñ÷åßùí ðïõ äéáöÝñïõí áðü áõôÜ ôçò åðßóçìçò Ýêäïóçò, äþóôå ôçí áêüëïõèç åíôïëÞ:

```
# cat outfile.ids | awk '{ print $1 }' | more
/etc/master.passwd
/etc/motd
/etc/passwd
/etc/pf.conf
```

Ôá ðáñáðÜíù åßíáé ìüíï Ýíá ìÝñïò ôçò åîüäïõ, õðÜñ÷ïõí áêüìá ðïëëÜ äéáöïñåôéêÜ áñ÷åßá. ÊÜðïéá áðü áõôÜ ôá áñ÷åßá åßíáé öõóéïëïãéêü íá Ý÷ïõí ôñïðïðïéçèåß. Ãéá ðáñÜäåéãìá, ôï `/etc/passwd` Ý÷åé ôñïðïðïéçèåß, êáèþò Ý÷ïõí ðñïóôåèåß ÷ñÞóôåò óôï óýóôçìá. Óå ìåñéêÝò ðåñéðôþóåéò, ìðïñåß íá õðÜñ÷ïõí êáé Üëëá áñ÷åßá, üðùò ð.÷. áñèñþìáôá ðõñÞíá ôá ïðïßá äéáöÝñïõí áöïý Ý÷ïõí åíçìåñùèåß ìÝóù ôçò `freebsd-update`. Ãéá íá åîáéñÝóåôå óõãêåêñéìÝíá áñ÷åßá Þ êáôáëüãïõò, ðñïóèÝóôå ôá óôçí åðéëïãÞ `IDSIgnorePaths` óôï áñ÷åßï ñõèìßóåùí `/etc/freebsd-update.conf`.

Åêôüò áðü ôçí ÷ñÞóç ðïõ áíáöÝñáìå ðñïçãïõìÝíùò, ôï óýóôçìá áõôü ìðïñåß íá ÷ñçóéìïðïéçèåß êáé ùò ôìÞìá ìéáò ëåðôïìåñïýò äéáäéêáóßáò áíáâÜèìéóçò.

25.3 Portsnap: ¸íá Åñãáëåßï ÅíçìÝñùóçò ôçò ÓõëëïãÞò ôùí Ports

ÃñÜöçêå áðü ôïí Tom Rhodes. ÂáóéóìÝíï óå óçìåéþóåéò ðïõ ðáñåß÷å ï Colin Percival.

Ôï âáóéêü óýóôçìá ôïõ FreeBSD ðåñéëáìâÜíåé åðßóçò Ýíá âïçèçôéêü ðñüãñáììá ãéá ôçí åíçìÝñùóç ôçò ÓõëëïãÞò ôùí Ports. Ðñüêåéôáé ãéá ôï portsnap(8). ¼ôáí ôï åêôåëÝóåôå, èá óõíäåèåß óå Ýíá áðïìáêñõóìÝíï äéáêïìéóôÞ, èá åðáëçèåýóåé ôï êëåéäß ôïõ ðçãáßïõ êþäéêá, êáé èá êáôåâÜóåé Ýíá íÝï áíôßãñáöï ôçò ÓõëëïãÞò ôùí Ports. Ôï êëåéäß ÷ñçóéìïðïéåßôáé ãéá íá åðáëçèåýóåé ôçí áêåñáéüôçôá üëùí ôùí áñ÷åßùí ðïõ ìåôáöïñôþíïíôáé, åîáóöáëßæïíôáò üôé äåí Ý÷ïõí áëëïéùèåß êáôÜ ôçí ìåôáöïñÜ. Ãéá íá êáôåâÜóåôå ôá ôåëåõôáßá áñ÷åßá ôçò ÓõëëïãÞò ôùí Ports, åêôåëÝóôå ôçí áêüëïõèç åíôïëÞ:

```
# portsnap fetch
Looking up portsnap.FreeBSD.org mirrors... 3 mirrors found.
Fetching snapshot tag from portsnap1.FreeBSD.org... done.
Fetching snapshot metadata... done.
Updating from Wed Aug  6 18:00:22 EDT 2008 to Sat Aug 30 20:24:11 EDT 2008.
Fetching 3 metadata patches.. done.
Applying metadata patches... done.
Fetching 3 metadata files... done.
Fetching 90 patches.....10....20....30....40....50....60....70....80....90. done.
Applying patches... done.
Fetching 133 new ports or files... done.
```

Ôï ðáñáðÜíù ðáñÜäåéãìá äåß÷íåé üôé ôï portsnap(8) âñÞêå êáé åðáëÞèåõóå áñêåôÜ patches ôá ïðïßá ðñÝðåé íá åöáñìïóôïýí óôï õðÜñ÷ïí äÝíôñï ôùí ports. Áõôü äåß÷íåé åðßóçò üôé ôï ðñüãñáììá Ý÷åé åêôåëåóôåß êáôÜ ôï ðáñåëèüí. Áí áõôÞ Þôáí ç ðñþôç öïñÜ ðïõ åêôåëïýíôáí, èá ãßíïíôáí áðëþò êáôÝâáóìá ôçò óõëëïãÞò.

¼ôáí ôï portsnap(8) åêôåëÝóåé åðéôõ÷þò ôç ëåéôïõñãßá `fetch`, ç ÓõëëïãÞ ôùí Ports êáé ôá áíôßóôïé÷á patches Ý÷ïõí áðïèçêåõèåß óôï ôïðéêü óýóôçìá êáé Ý÷åé ãßíåé ç åðáëÞèåõóç ôïõò. Ôçí ðñþôç öïñÜ ðïõ èá åêôåëÝóåôå ôï `portsnap`, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï `extract` ãéá íá åãêáôáóôÞóåôå ôá åíçìåñùìÝíá áñ÷åßá:

```
# portsnap extract
/usr/ports/.cvsignore
/usr/ports/CHANGES
/usr/ports/COPYRIGHT
/usr/ports/GIDs
/usr/ports/KNOBS
/usr/ports/LEGAL
/usr/ports/MOVED
/usr/ports/Makefile
/usr/ports/Mk/bsd.apache.mk
/usr/ports/Mk/bsd.autotools.mk
/usr/ports/Mk/bsd.cmake.mk
...
```

Áí Ý÷åôå Þäç åãêáôáóôçìÝíç ôçí ÓõëëïãÞ ôùí Ports, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `portsnap update` ãéá íá ôçí åíçìÝñùóåôå:

```
# portsnap update
```

Ç äéáäéêáóßá Ý÷åé ðëÝïí ïëïêëçñùèåß, êáé ìðïñåßôå íá åãêáôáóôÞóåôå Þ íá áíáâáèìßóåôå åöáñìïãÝò ÷ñçóéìïðïéþíôáò ôçí åíçìåñùìÝíç ÓõëëïãÞ ôùí Ports.

Ìðïñåßôå íá åêôåëÝóåôå ôéò äéáäéêáóßåò `fetch` êáé `extract` Þ `update` äéáäï÷éêÜ, üðùò öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá:

```
# portsnap fetch update
```

Ç ðáñáðÜíù åíôïëÞ èá êáôåâÜóåé ôçí ôåëåõôáßá Ýêäïóç ôçò ÓõëëïãÞò ôùí Ports êáé èá åíçìåñþóåé ôá ôïðéêÜ áñ÷åßá óáò óôïí êáôÜëïãï `/usr/ports`.

25.4 Åíçìåñþíïíôáò ôçí Ôåêìçñßùóç

Åêôüò áðü ôï âáóéêü óýóôçìá êáé ôçí ÓõëëïãÞ ôùí Ports, ç ôåêìçñßùóç áðïôåëåß åðßóçò âáóéêü ôìÞìá åíüò óõóôÞìáôïò FreeBSD. Áí êáé ðÜíôá ìðïñåßôå íá âñåßôå ôçí ðéï ðñüóöáôç ôåêìçñßùóç óôçí éóôïóåëßäá ôïõ FreeBSD (http://www.freebsd.org/doc/), ïñéóìÝíïé ÷ñÞóôåò ßóùò Ý÷ïõí áñãÞ Þ ìç óôáèåñÞ óýíäåóç ìå ôï Äéáäßêôõï. Åõôõ÷þò õðÜñ÷ïõí áñêåôïß ôñüðïé ãéá íá åíçìåñþóåôå ôçí ôåêìçñßùóç ç ïðïßá ðáñÝ÷åôáé ìå êÜèå åðßóçìç Ýêäïóç, äéáôçñþíôáò ôï äéêü óáò ôïðéêü áíôßãñáöï ôçò ðéï ðñüóöáôçò ôåêìçñßùóçò ôïõ FreeBSD.

25.4.1 ×ñçóéìïðïéþíôáò ôï CVSup ãéá ôçí ÅíçìÝñùóç ôçò Ôåêìçñßùóçò

Ï ðçãáßïò êþäéêáò êáé ôï åãêáôåóôçìÝíï áíôßãñáöï ôçò ôåêìçñßùóçò ôïõ FreeBSD, ìðïñïýí íá åíçìåñùèïýí ìå ôçí âïÞèåéá ôïõ **CVSup**, ÷ñçóéìïðïéþíôáò Ýíá ìç÷áíéóìü ðáñüìïéï ìå áõôüí ðïõ ÷ñçóéìïðïéåßôáé óôï âáóéêü óýóôçìá (äåßôå ôï ÔìÞìá 25.7). Ç åíüôçôá áõôÞ ðåñéãñÜöåé:

- Ðùò íá åãêáôáóôÞóåôå ôá åñãáëåßá ðïõ áðáéôïýíôáé ãéá ôçí ôåêìçñßùóç, ìå ôá ïðïßá ìðïñåßôå íá äçìéïõñãÞóåôå ôçí ôåêìçñßùóç ôïõ FreeBSD îåêéíþíôáò áðü ôïí ðçãáßï ôçò êþäéêá.
- Ðùò íá êáôåâÜóåôå Ýíá áíôßãñáöï ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò óôïí êáôÜëïãï `/usr/doc` ÷ñçóéìïðïéþíôáò ôï **CVSup**.
- Ðùò íá áíáäçìéïõñãÞóåôå ôçí ôåêìçñßùóç ôïõ FreeBSD áðü ôïí ðçãáßï ôçò êþäéêá, êáé íá ôçí åãêáôáóôÞóåôå óôïí êáôÜëïãï `/usr/share/doc/`.

25.4.2 Åãêáèéóôþíôáò ôï CVSup êáé ôç ÓåéñÜ Åñãáëåßùí ôçò Ôåêìçñßùóçò

Ç áíáäçìéïõñãßá ôçò ôåêìçñßùóçò ôïõ FreeBSD áðü ôïí ðçãáßï ôçò êþäéêá, áðáéôåß ìéá ó÷åôéêÜ ìåãÜëç óõëëïãÞ åñãáëåßùí. Ôá åñãáëåßá áõôÜ äåí åßíáé ìÝñïò ôïõ âáóéêïý óõóôÞìáôïò ôïõ FreeBSD, êáèþò ÷ñåéÜæïíôáé áñêåôü ÷þñï óôï äßóêï êáé äåí åßíáé ÷ñÞóéìá óå üëïõò ôïõò ÷ñÞóôåò. Åßíáé ÷ñÞóéìá ìüíï óôïõò ÷ñÞóôåò ðïõ áó÷ïëïýíôáé ìå ôç óõããñáöÞ íÝáò ôåêìçñßùóçò ãéá ôï FreeBSD, Þ ðïõ åíçìåñþíïõí óõ÷íÜ ôçí ôïðéêÞ ôïõò ôåêìçñßùóç ìÝóù ôïõ ðçãáßïõ êþäéêá.

¼ëá ôá áðáéôïýìåíá åñãáëåßá äéáôßèåíôáé ìÝóù ôçò ÓõëëïãÞò ôùí Ports. Ôï `textproc/docproj` åßíáé ôï êýñéï port ôï ïðïßï Ý÷åé áíáðôõ÷èåß áðü ôçí ÏìÜäá Ôåêìçñßùóçò ôïõ FreeBSD, ãéá íá âïçèÞóåé óôçí áñ÷éêÞ åãêáôÜóôáóç êáé ôéò ìåëëïíôéêÝò áíáâáèìßóåéò áõôþí ôùí åñãáëåßùí.

> **Óçìåßùóç:** Áí äåí áðáéôåßôáé ç äçìéïõñãßá ôåêìçñßùóçò óå ìïñöÝò PostScript Þ PDF, ìðïñåßôå íá åãêáôáóôÞóåôå ôï port `textproc/docproj-nojadetex`. ÁõôÞ ç Ýêäïóç ôùí åñãáëåßùí ðåñéÝ÷åé ôá ðÜíôá åêôüò áðü ôçí ìç÷áíÞ óôïé÷åéïèåóßáò **teTeX**. Ôï **teTeX** åßíáé ìéá áñêåôÜ ìåãÜëç óõëëïãÞ åñãáëåßùí, êáé äåí Ý÷åé íüçìá íá ôï åãêáôáóôÞóåôå áí äåí óáò åßíáé áðáñáßôçôç ç ðáñáãùãÞ ôçò ôåêìçñßùóçò óå ìïñöÞ PDF.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç êáé ÷ñÞóç ôïõ **CVSup**, äåßôå ôçí åíüôçôá ×ñçóéìïðïéþíôáò ôï CVSup.

25.4.3 Åíçìåñþíïíôáò ôïí Ðçãáßï Êþäéêá ôçò Ôåêìçñßùóçò

Ôï âïçèçôéêü ðñüãñáììá **CVSup** ìðïñåß íá êáôåâÜóåé Ýíá êáèáñü áíôßãñáöï ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò, ÷ñçóéìïðïéþíôáò ôï `/usr/share/examples/cvsup/doc-supfile` ùò ðñüôõðï áñ÷åßï ñõèìßóåùí. Ï ðñïåðéëåãìÝíïò õðïëïãéóôÞò åíçìåñþóåùí óôï ðáñáðÜíù áñ÷åßï åßíáé ñõèìéóìÝíïò óå ðëáóìáôéêÞ ôéìÞ. Ùóôüóï, ç cvsup(1) äÝ÷åôáé üíïìá õðïëïãéóôÞ ìÝóù ôçò ãñáììÞò åíôïëþí, Ýôóé ìðïñåßôå íá áíáêôÞóåôå ôïí ðçãáßï êþäéêá ôçò ôåêìçñßùóçò ìÝóù êÜðïéïõ åîõðçñåôçôÞ **CVSup** ãñÜöïíôáò:

```
# cvsup -h cvsup.FreeBSD.org -g -L 2 /usr/share/examples/cvsup/doc-supfile
```

ÁëëÜîôå ôï *`cvsup.FreeBSD.org`* ìå ôïí êïíôéíüôåñï óáò åîõðçñåôçôÞ **CVSup**. Äåßôå ôï ÔìÞìá A.6.7 ãéá ìéá ðëÞñç ëßóôá ôùí mirror sites.

Ôï áñ÷éêü êáôÝâáóìá ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò ìðïñåß íá äéáñêÝóåé áñêåôÞ þñá. ÁöÞóôå ôï íá åêôåëåßôáé ìÝ÷ñé íá ïëïêëçñùèåß.

Ìðïñåßôå íá óõíå÷ßóåôå íá åíçìåñþíåôå ôïí ðçãáßï êþäéêá ôçò ôåêìçñßùóçò ÷ñçóéìïðïéþíôáò ôçí ßäéá åíôïëÞ. Ôï âïçèçôéêü ðñüãñáììá **CVSup** êáôåâÜæåé êáé áíôéãñÜöåé ìüíï ôéò åíçìåñþóåéò óå ó÷Ýóç ìå ôçí ôåëåõôáßá åêôÝëåóç ôïõ, Ýôóé êÜèå åêôÝëåóç ôïõ **CVSup** ìåôÜ ôçí ðñþôç èá ðñÝðåé íá åßíáé áñêåôÜ ãñÞãïñç.

ÌåôÜ ôçí áñ÷éêÞ áíÜêôçóç ôïõ ðçãáßïõ êþäéêá, Ýíáò åíáëëáêôéêüò ôñüðïò åíçìÝñùóçò ôçò ôåêìçñßùóçò åßíáé ìÝóù ôïõ áñ÷åßïõ `Makefile` óôïí êáôÜëïãï `/usr/doc`. ÈÝôïíôáò ôéò ìåôáâëçôÝò `SUP_UPDATE`, `SUPHOST` êáé `DOCSUPFILE` óôï áñ÷åßï `/etc/make.conf`, ìðïñåßôå íá åêôåëÝóåôå:

```
# cd /usr/doc
# make update
```

ÔõðéêÝò ôéìÝò ãéá ôéò ðáñáðÜíù åðéëïãÝò ôïõ make(1) óôï áñ÷åßï `/etc/make.conf` åßíáé:

```
SUP_UPDATE= yes
SUPHOST?= cvsup.freebsd.org
DOCSUPFILE?= /usr/share/examples/cvsup/doc-supfile
```

> **Óçìåßùóç:** Áí èÝóåôå ôéò ôéìÝò ôùí `SUPHOST` êáé `DOCSUPFILE` óå `?=`, èá ìðïñåßôå íá ïñßóåôå Üëëåò ôéìÝò ãéá áõôÝò óôç ãñáììÞ åíôïëÞò ôïõ make. Áõôüò åßíáé êáé ï óõíéóôþìåíïò ôñüðïò íá ðñïóèÝóåôå åðéëïãÝò óôï `make.conf`, þóôå íá áðïöåýãåôå íá ôñïðïðïéåßôå óõíÝ÷åéá ôï áñ÷åßï êÜèå öïñÜ ðïõ èÝëåôå íá äïêéìÜóåôå ìéá íÝá ôéìÞ óå ìéá åðéëïãÞ.

25.4.4 ÐñïóáñìïãÞ Åðéëïãþí óôïí Ðçãáßï Êþäéêá ôçò Ôåêìçñßùóçò

Ôï óýóôçìá åíçìÝñùóçò êáé ìåôáãëþôôéóçò ôçò ôåêìçñßùóçò ôïõ FreeBSD, õðïóôçñßæåé ìåñéêÝò åðéëïãÝò ðïõ äéåõêïëýíïõí ôç äéáäéêáóßá åíçìÝñùóçò åíüò ìüíï ìÝñïõò ôçò ôåêìçñßùóçò, Þ ôçí ìåôáãëþôôéóç ôçò ôåêìçñßùóçò êÜðïéùí óõãêåêñéìÝíùí ìåôáöñÜóåùí. Áí èÝëåôå ïé åðéëïãÝò áõôÝò íá éó÷ýïõí ìüíéìá, ìðïñåßôå íá ôéò ïñßóåôå ìÝóá óôï áñ÷åßï `/etc/make.conf`, äéáöïñåôéêÜ ìðïñåßôå íá ôéò ïñßæåôå êÜèå öïñÜ óôç ãñáììÞ åíôïëÞò ôçò make(1).

ÊÜðïéåò áðü ôéò åðéëïãÝò áõôÝò öáßíïíôáé ðáñáêÜôù:

`DOC_LANG`

Ëßóôá ôùí ãëùóóþí êáé êùäéêïðïéÞóåùí ðïõ èá ìåôáãëùôôéóôïýí êáé èá åãêáôáóôáèïýí, ð.÷. `en_US.ISO8859-1` áí åßíáé åðéèõìçôÞ ìüíï ç ÁããëéêÞ ôåêìçñßùóç.

`FORMATS`

Ç ìïñöÞ (Þ ìéá ëßóôá áðü ìïñöÝò) óôçí ïðïßá èá ðáñá÷èåß ç ìåôáãëùôôéóìÝíç ôåêìçñßùóç. Ôç äåäïìÝíç óôéãìÞ õðïóôçñßæïíôáé ïé ìïñöÝò `html`, `html-split`, `txt`, `ps`, `pdf` êáé `rtf`.

`SUPHOST`

Ôï üíïìá ôïõ åîõðçñåôçôÞ **CVSup** ðïõ èá ÷ñçóéìïðïéçèåß êáôÜ ôçí åíçìÝñùóç.

`DOCDIR`

Ï êáôÜëïãïò óôïí ïðïßï èá åãêáôáóôáèåß ç ôåêìçñßùóç. Áðü ðñïåðéëïãÞ åßíáé ï `/usr/share/doc`.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ìåôáâëçôÝò ôïõ make ðïõ õðïóôçñßæïíôáé ùò åðéëïãÝò óõóôÞìáôïò óôï FreeBSD, äåßôå ôçí óåëßäá manual ôïõ make.conf(5).

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò êáé ìåôáâëçôÝò make ðïõ õðïóôçñßæïíôáé áðü ôï óýóôçìá ìåôáãëþôôéóçò ôçò ôåêìçñßùóçò ôïõ FreeBSD, ðáñáêáëïýìå äåßôå ôéò Ïäçãßåò ôçò ÏìÜäáò Ôåêìçñßùóçò ôïõ FreeBSD ãéá ÍÝïõò Óõããñáöåßò (http://www.FreeBSD.org/doc/en_US.ISO8859-1/books/fdp-primer).

25.4.5 ÅãêáôÜóôáóç ôçò Ôåêìçñßùóçò ôïõ FreeBSD áðü ôïí Ðçãáßï Êþäéêá

¸÷ïíôáò åíçìåñþóåé ôï ôïðéêü áíôßãñáöï ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò óôïí êáôÜëïãï `/usr/doc`, åßìáóôå Ýôïéìïé ãéá ôçí åíçìÝñùóç ôçò åãêáôåóôçìÝíçò ôåêìçñßùóçò.

Ìðïñåßôå íá ðñï÷ùñÞóåôå óå ðëÞñç åíçìÝñùóç üëùí ôùí ãëùóóþí ðïõ ïñßæïíôáé óôçí åðéëïãÞ `DOC_LANG` ôïõ Makefile, ãñÜöïíôáò:

```
# cd /usr/doc
# make install clean
```

Áí Ý÷åôå ñõèìßóåé ôï `make.conf` ìå ôéò óùóôÝò ôéìÝò ãéá ôéò åðéëïãÝò `DOCSUPFILE`, `SUPHOST` êáé `SUP_UPDATE`, ìðïñåßôå íá óõíäõÜóåôå ôá âÞìáôá åíçìÝñùóçò êáé åãêáôÜóôáóçò ôïõ ðçãáßïõ êþäéêá óå Ýíá, ãñÜöïíôáò:

```
# cd /usr/doc
# make update install clean
```

Áí åðéèõìåßôå ôçí åíçìÝñùóç ìéáò ìüíï óõãêåêñéìÝíçò ãëþóóáò, ìðïñåßôå íá êáëÝóåôå ôçí make(1) óå Ýíá óõãêåêñéìÝíï õðïêáôÜëïãï ôïõ `/usr/doc`, ð.÷.:

```
# cd /usr/doc/en_US.ISO8859-1
# make update install clean
```

Ìðïñåßôå íá êáèïñßóåôå ôç ìïñöÞ ôçò ôåêìçñßùóçò ðïõ èá åãêáôáóôáèåß, ñõèìßæïíôáò ôç ìåôáâëçôÞ `FORMATS` ôïõ make, ð.÷.:

```
# cd /usr/doc
# make FORMATS='html html-split' install clean
```

25.4.6 ×ñçóéìïðïéþíôáò ôá Ports ôçò Ôåêìçñßùóçò

ÂáóéóìÝíï óå åñãáóßá ôïõ Marc Fonvieille.

Óôçí ðñïçãïýìåíç åíüôçôá, ðáñïõóéÜóáìå ìéá ìÝèïäï ãéá ôçí åíçìÝñùóç ôçò ôåêìçñßùóçò ôïõ FreeBSD ìÝóù ôïõ ðçãáßïõ êþäéêá. Ùóôüóï, ïé åíçìåñþóåéò ðïõ âáóßæïíôáé óôïí ðçãáßï êþäéêá ìðïñåß íá ìçí åßíáé äõíáôÝò Þ ðñáêôéêÝò ãéá êÜèå óýóôçìá FreeBSD. Ç äéáäéêáóßá ìåôáãëþôôéóçò ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò áðáéôåß ó÷åôéêÜ ìåãÜëï áñéèìü åñãáëåßùí êáé âïçèçôéêþí ðñïãñáììÜôùí, ãíùóôÜ ùò *åñãáëåßá ôåêìçñßùóçò*. Áðáéôåß åðßóçò êáé ìéá ó÷åôéêÞ åîïéêåßùóç ìå ôï **CVS** êáé ôç äéáäéêáóßá áíÜêôçóçò ôùí áñ÷åßùí áðü áõôü, êáèþò êáé ìéá óåéñÜ áðü âÞìáôá ãéá ôç ìåôáãëþôôéóç ôïõ êþäéêá. Óôçí åíüôçôá áõôÞ ðåñéãñÜöïõìå Ýíá åíáëëáêôéêü ôñüðï åíçìÝñùóçò ôçò ôåêìçñßùóçò ðïõ åãêáèßóôáôáé ìáæß ìå ôï FreeBSD. Ç ìÝèïäïò áõôÞ ÷ñçóéìïðïéåß ôçí ÓõëëïãÞ ôùí Ports êáé äßíåé ôéò ðáñáêÜôù äõíáôüôçôåò:

- ÊáôÝâáóìá êáé åãêáôÜóôáóç ðñï-ìåôáãëùôôéóìÝíùí óôéãìéüôõðùí ôçò ôåêìçñßùóçò, ÷ùñßò íá áðáéôåßôáé êáìéÜ ôïðéêÞ ìåôáãëþôôéóç (åîáëåßöïíôáò Ýôóé êáé ôçí áíÜãêç åãêáôÜóôáóçò üëùí ôùí åñãáëåßùí ôåêìçñßùóçò).
- ÊáôÝâáóìá ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò êáé ìåôáãëþôôéóç ôïõ ìÝóù ôùí äõíáôïôÞôùí ðïõ ðáñÝ÷ïõí ôá åñãáëåßá ôùí ports (áðëïðïéþíôáò ìå áõôü ôïí ôñüðï ôç ÷åéñïêßíçôç äéáäéêáóßá áíÜêôçóçò êáé ìåôáãëþôôéóçò).

ÁõôÝò ïé äýï ìÝèïäïé åíçìÝñùóçò ôçò ôåêìçñßùóçò ôïõ FreeBSD õðïóôçñßæïíôáé áðü ìéá óåéñÜ áðü *ports ôåêìçñßùóçò* ôá ïðïßá åíçìåñþíïíôáé êÜèå ìÞíá áðü ôçí ÏìÜäá Áñ÷éôåêôïíéêÞò ôçò Ôåêìçñßùóçò <`doceng@FreeBSD.org`>. Óôç ÓõëëïãÞ ôùí Ports, èá ôá âñåßôå êÜôù áðü ôçí êáôçãïñßá docs (http://www.freshports.org/docs/).

25.4.6.1 Ìåôáãëþôôéóç êáé ÅãêáôÜóôáóç ôùí Ports ôçò Ôåêìçñßùóçò

Ôá ports ôçò ôåêìçñßùóçò ÷ñçóéìïðïéïýí ôéò äõíáôüôçôåò ìåôáãëþôôéóçò ðïõ ðáñÝ÷åé ôï óýóôçìá ôùí ports þóôå íá äéåõêïëýíïõí ôç äéáäéêáóßá äçìéïõñãßáò ôçò ôåêìçñßùóçò. Ìå áõôü ôïí ôñüðï ç áíÜêôçóç ôïõ ðçãáßïõ êþäéêá ôçò ôåêìçñßùóçò ãßíåôáé áõôüìáôá ìå ôçí åêôÝëåóç ôçò make(1) êáé ôéò êáôÜëëçëåò ñõèìßóåéò óôï ðåñéâÜëëïí. Ç åãêáôÜóôáóç êáé áðåãêáôÜóôáóç ôçò ôåêìçñßùóçò åßíáé ôï ßäéï åýêïëç ìå ôçí åãêáôÜóôáóç ïðïéïõäÞðïôå Üëëïõ port Þ ðáêÝôïõ óôï FreeBSD.

> **Óçìåßùóç:** Óå ðåñßðôùóç ôïðéêÞò ìåôáãëþôôéóçò ôùí ports ôçò ôåêìçñßùóçò, áðáéôåßôáé êáé ç åãêáôÜóôáóç ôùí *åñãáëåßùí ôåêìçñßùóçò*. Ôá åñãáëåßá áõôÜ ùóôüóï èá åãêáôáóôáèïýí áõôüìáôá.

Ç ïñãÜíùóç ôùí ports ôåêìçñßùóçò öáßíåôáé ðáñáêÜôù:

- ÕðÜñ÷åé Ýíá êåíôñéêü “master port”, ôï `misc/freebsd-doc-en` ôï ïðïßï äéáèÝôåé ôá áðáñáßôçôá áñ÷åßá êáé áðïôåëåß ôçí âÜóç üëùí ôùí Üëëùí ports ôåêìçñßùóçò. Áðü ðñïåðéëïãÞ, ôï port áõôü ìåôáãëùôôßæåé ìüíï ôçí ÁããëéêÞ ôåêìçñßùóç.
- ÕðÜñ÷åé Ýíá port “üëá óå Ýíá”, ôï `misc/freebsd-doc-all` ôï ïðïßï ìåôáãëùôôßæåé êáé åãêáèéóôÜ üëç ôçí ôåêìçñßùóç óå üëåò ôéò äéáèÝóéìåò ãëþóóåò.
- ÔÝëïò, õðÜñ÷åé Ýíá “åîáñôþìåíï port” ãéá êÜèå ìåôÜöñáóç, ð.÷.: `misc/freebsd-doc-el` ãéá ôçí ÅëëçíéêÞ ôåêìçñßùóç. ¼ëá áõôÜ ôá ports åîáñôþíôáé áðü ôï master port êáé åãêáèéóôïýí ôçí ôåêìçñßùóç ðïõ Ý÷åé ìåôáöñáóôåß óôçí áíôßóôïé÷ç ãëþóóá.

Ãéá íá åãêáôáóôÞóåôå Ýíá port ôåêìçñßùóçò áðü ôïí ðçãáßï êþäéêá, åêôåëÝóôå ôéò ðáñáêÜôù åíôïëÝò (ùò `root`):

```
# cd /usr/ports/misc/freebsd-doc-en
# make install clean
```

Ôï ðáñáðÜíù èá ìåôáãëùôôßóåé êáé èá åãêáôáóôÞóåé ôçí ÁããëéêÞ ôåêìçñßùóç óå ìïñöÞ ôìçìáôéêþí HTML êåéìÝíùí (üðùò ÷ñçóéìïðïéïýíôáé êáé óôï http://www.FreeBSD.org), óôïí êáôÜëïãï `/usr/local/share/doc/freebsd`.

25.4.6.1.1 *ÓõíçèéóìÝíåò ÅðéëïãÝò êáé ÐáñÜìåôñïé Ìåôáãëþôôéóçò*

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áñêåôÝò åðéëïãÝò ãéá ôçí ôñïðïðïßçóç ôçò ðñïåðéëåãìÝíçò óõìðåñéöïñÜò ôùí ports ôåêìçñßùóçò. ÐáñáêÜôù äåß÷íïõìå ìåñéêÝò ìüíï áðü áõôÝò:

`WITH_HTML`

ÅðéôñÝðåé ôç äçìéïõñãßá ôçò ôåêìçñßùóçò óå ìïñöÞ HTML. Èá äçìéïõñãçèåß Ýíá áñ÷åßï HTML ãéá êÜèå êåßìåíï. Ç ìïñöïðïéçìÝíç ôåêìçñßùóç èá áðïèçêåõèåß, áíÜëïãá ìå ôçí ðåñßðôùóç, óå Ýíá áñ÷åßï ìå üíïìá `article.html` Þ `book.html`. Èá ãßíåé åðßóçò êáé áðïèÞêåõóç ôùí áíôßóôïé÷ùí åéêüíùí.

`WITH_PDF`

ÅðéôñÝðåé ôç äçìéïõñãßá åããñÜöïõ óå ìïñöÞ Adobe Portable Document Format (PDF) ãéá ÷ñÞóç ìå ôïí Adobe Acrobat Reader, ôï **Ghostscript**, Þ Üëëá ðñïãñÜììáôá ðñïâïëÞò åããñÜöùí PDF. Ç ìïñöïðïéçìÝíç ôåêìçñßùóç èá áðïèçêåõèåß, áíÜëïãá ìå ôçí ðåñßðôùóç, óå Ýíá áñ÷åßï `article.pdf` Þ `book.pdf`.

`DOCBASE`

Ðñüêåéôáé ãéá ôçí èÝóç óôçí ïðïßá èá åãêáôáóôáèåß ç ôåêìçñßùóç. Áðü ðñïåðéëïãÞ, åßíáé ï êáôÜëïãïò `/usr/local/share/doc/freebsd`.

> **Óçìåßùóç:** ÐáñáôçñÞóôå üôé ï ðñïåðéëåãìÝíïò êáôÜëïãïò äéáöÝñåé áðü áõôüí ðïõ ÷ñçóéìïðïéåßôáé óôç ìÝèïäï **CVSup**. Áõôü óõìâáßíåé åðåéäÞ ãßíåôáé åãêáôÜóôáóç port, ôá ïðïßá áðü ðñïåðéëïãÞ ÷ñçóéìïðïéïýí ôïí êáôÜëïãï `/usr/local`. Ìðïñåßôå íá ðáñáêÜìøåôå áõôÞ ôçí ðñïåðéëïãÞ, áëëÜæïíôáò ôçí ôéìÞ ôçò ìåôáâëçôÞò `PREFIX`.

ÐáñáêÜôù èá âñåßôå Ýíá óýíôïìï ðáñÜäåéãìá ó÷åôéêü ìå ôç ÷ñÞóç ôùí ìåôáâëçôþí ãéá ôçí åãêáôÜóôáóç ôçò ÁããëéêÞò ôåêìçñßùóçò óå ìïñöÞ PDF:

```
# cd /usr/ports/misc/freebsd-doc-en
# make -DWITH_PDF DOCBASE=share/doc/freebsd/en install clean
```

25.4.6.2 ×ñÞóç ¸ôïéìùí ÐáêÝôùí Ôåêìçñßùóçò

Ç ìåôáãëþôôéóç ôùí ports ôåêìçñßùóçò áðü ôïí ðçãáßï êþäéêá (üðùò åßäáìå óôçí ðñïçãïýìåíç åíüôçôá), áðáéôåß ôïðéêÞ åãêáôÜóôáóç ôùí áíôßóôïé÷ùí åñãáëåßùí ôåêìçñßùóçò êáé åðÜñêåéá ÷þñïõ óôï äßóêï ãéá ôçí äéáäéêáóßá. ¼ôáí äåí äéáôßèåíôáé ïé áðáñáßôçôïé ðüñïé ãéá ôçí åãêáôÜóôáóç ôùí åñãáëåßùí ôåêìçñßùóçò (Þ åðåéäÞ ç ìåôáãëþôôéóç áðü ôá ports èá ÷ñçóéìïðïéïýóå ðïëý ÷þñï), ç åãêáôÜóôáóç ìðïñåß íá ãßíåé ìÝóù Ýôïéìùí ðáêÝôùí ôåêìçñßùóçò.

H ÏìÜäá Áñ÷éôåêôïíéêÞò ôçò Ôåêìçñßùóçò <`doceng@FreeBSD.org`> ðñïåôïéìÜæåé ìçíéáßá óôéãìéüôõðá ðáêÝôùí ôåêìçñßùóçò ôïõ FreeBSD. Ôá Ýôïéìá áõôÜ ðáêÝôá ìðïñïýí íá ÷ñçóéìïðïéçèïýí ìå ôçí âïÞèåéá ïðïéïõäÞðïôå åñãáëåßïõ äéá÷åßñéóçò ðáêÝôùí ðïõ äéáôßèåôáé ìå ôï FreeBSD, üðùò ãéá ðáñÜäåéãìá ôá pkg_add(1), pkg_delete(1) ê.ë.ð.

> **Óçìåßùóç:** ¼ôáí ÷ñçóéìïðïéåßôå Ýôïéìá ðáêÝôá, ç åãêáôÜóôáóç ôçò ôåêìçñßùóçò ôçò åðéëåãìÝíçò ãëþóóáò èá ãßíåôáé óå üëåò ôéò äéáèÝóéìåò ìïñöÝò.

Ãéá ðáñÜäåéãìá, ç ðáñáêÜôù åíôïëÞ èá åãêáôáóôÞóåé ôçí ôåëåõôáßá Ýêäïóç ôïõ Ýôïéìïõ ðáêÝôïõ ôçò ÅëëçíéêÞò ôåêìçñßùóçò:

```
# pkg_add -r el-freebsd-doc
```

> **Óçìåßùóç:** Ôá ðáêÝôá ÷ñçóéìïðïéïýí ôç ìïñöÞ *lang*`-freebsd-doc` óôï üíïìá ôïõò, ç ïðïßá äéáöÝñåé áðü ôçí áíôßóôïé÷ç ìïñöÞ ôïõ port. Ôï *lang* åßíáé ç óýíôïìç ìïñöÞ ôçò ãëþóóáò, ð.÷. `el` ãéá ÅëëçíéêÜ Þ `zh_cn` ãéá ÁðëïðïéçìÝíá ÊéíÝæéêá.

25.4.6.3 Åíçìåñþíïíôáò ôá Ports ôçò Ôåêìçñßùóçò

Ãéá íá åíçìåñþóåôå Ýíá Þäç åãêáôåóôçìÝíï port ôåêìçñßùóçò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ïðïéïäÞðïôå åñãáëåßï áíáâÜèìéóçò ports. Ãéá ðáñÜäåéãìá, ç ðáñáêÜôù åíôïëÞ åíçìåñþíåé ôçí åãêáôåóôçìÝíç ÅëëçíéêÞ ôåêìçñßùóç ìÝóù ôïõ åñãáëåßïõ `ports-mgmt/portupgrade` ìå ôç ÷ñÞóç ìüíï Ýôïéìùí ðáêÝôùí:

```
# portupgrade -PP el-freebsd-doc
```

25.5 Ðáñáêïëïýèçóç Åíüò ÊëÜäïõ ÁíÜðôõîçò

ÕðÜñ÷ïõí äýï êëÜäïé áíÜðôõîçò óôï FreeBSD, ôï FreeBSD-CURRENT êáé ôï FreeBSD-STABLE. Óôçí åíüôçôá áõôÞ, èá åîçãÞóïõìå êÜðïéá ðñÜãìáôá ó÷åôéêÜ ìå áõôïýò ôïõò êëÜäïõò, êáé èá ðåñéãñÜøïõìå ðùò ìðïñåßôå íá äéáôçñÞóåôå ôï óýóôçìá óáò åíçìåñùìÝíï óå êÜðïéïí áðü áõôïýò. Èá ìéëÞóïõìå áñ÷éêÜ ãéá ôï FreeBSD-CURRENT êáé Ýðåéôá ãéá ôï FreeBSD-STABLE.

25.5.1 Ðáñáêïëïõèþíôáò ôï FreeBSD-CURRENT

Êáèþò äéáâÜæåôå áõôü ôï êåßìåíï, íá Ý÷åôå õðüøéí óáò üôé ôï FreeBSD-CURRENT åßíáé ðñÜãìáôé ç “êüøç ôïõ îõñáöéïý” óôçí áíÜðôõîç ôïõ FreeBSD. Ïé ÷ñÞóôåò ôïõ FreeBSD-CURRENT áíáìÝíåôáé íá Ý÷ïõí áõîçìÝíåò ôå÷íéêÝò ãíþóåéò, êáé íá åßíáé éêáíïß íá åðéëýïõí äýóêïëá ðñïâëÞìáôá ôïõ óõóôÞìáôïò ôïõò, ÷ùñßò âïÞèåéá. Áí åßóôå êáéíïýñéïò óôï FreeBSD, ìÜëëïí èá ðñÝðåé íá ôï îáíáóêåöôåßôå ðñéí ôï åãêáôáóôÞóåôå.

25.5.1.1 Ôé Åßíáé ôï FreeBSD-CURRENT;

Ôï FreeBSD-CURRENT áðïôåëåßôáé áðü ôïí ðëÝïí ðñüóöáôï ëåéôïõñãéêü ðçãáßï êþäéêá ôïõ FreeBSD. ÐåñéëáìâÜíåé áëëáãÝò ðïõ âñßóêïíôáé óå åîÝëéîç, ðåéñáìáôéêÝò áëëáãÝò, êáé ìç÷áíéóìïýò ìåôÜâáóçò ïé ïðïßïé äåí åßíáé óßãïõñï üôé èá ðåñéëáìâÜíïíôáé óôçí åðüìåíç åðßóçìç Ýêäïóç ôïõ ëïãéóìéêïý. Áí êáé ðïëëÜ ìÝëç ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD ìåôáãëùôôßæïõí êáèçìåñéíÜ ôïí ðçãáßï êþäéêá ôïõ FreeBSD-CURRENT, õðÜñ÷ïõí ÷ñïíéêÝò ðåñßïäïé ðïõ ç ìåôáãëþôôéóç ôïõ åßíáé áäýíáôç. Ôá ðñïâëÞìáôá áõôÜ ãåíéêÜ åðéëýïíôáé üóï ðéï ãñÞãïñá ãßíåôáé, áëëÜ ôï áí ôï FreeBSD-CURRENT èá óáò öÝñåé ôçí êáôáóôñïöÞ Þ êÜðïéï ðïëõðüèçôï ÷áñáêôçñéóôéêü, åßíáé ðåñéóóüôåñï èÝìá ôçò ÷ñïíéêÞò óôéãìÞò ðïõ èá åðéëÝîåôå íá áíáêôÞóåôå ôïí ðçãáßï êþäéêá!

25.5.1.2 Ðïéïò ×ñåéÜæåôáé ôï FreeBSD-CURRENT;

Ôï FreeBSD-CURRENT äéáôßèåôáé êáé åíäéáöÝñåé êõñßùò ôéò ðáñáêÜôù ôñåéò ïìÜäåò:

1. ÌÝëç ôçò êïéíüôçôáò ôïõ FreeBSD ðïõ äïõëåýïõí åíåñãÜ óå êÜðïéï ôìÞìá ôïõ ðçãáßïõ êþäéêá, êáé ãéá ôïõò ïðïßïõò ç ðáñáêïëïýèçóç ôïõ FreeBSD-CURRENT åßíáé áðüëõôá áðáñáßôçôç.
2. ÌÝëç ôçò êïéíüôçôáò ôïõ FreeBSD ðïõ åßíáé åíåñãïß testers êáé åßíáé ðñüèõìïé íá áíáëþóïõí ôï ÷ñüíï ôïõò ãéá íá ëýóïõí ðñïâëÞìáôá, þóôå íá åîáóöáëßóïõí üôé ôï FreeBSD-CURRENT èá ðáñáìåßíåé üóï ôï äõíáôüí ðéï óùóôü. ÓõíÞèùò, ôá ìÝëç áõôÜ êÜíïõí ðñïôÜóåéò ãéá ôïðéêÝò áëëáãÝò êáé ãéá ôçí ãåíéêÞ êáôåýèõíóç ôïõ FreeBSD, êáé óôÝëíïõí patches ãéá ôçí ðñáãìáôïðïßçóç ôïõò.
3. Áõôïß ðïõ áðëþò èÝëïõí íá âëÝðïõí ôéò ôåëåõôáßåò åîåëßîåéò, Þ íá ÷ñçóéìïðïéïýí ôïí ôåëåõôáßï ðçãáßï êþäéêá ùò áíáöïñÜ (ð.÷. ãéá *ìåëÝôç* êáé ü÷é ãéá åêôÝëåóç). ÌÝëç áõôÞò ôçò ïìÜäáò ìðïñåß åðßóçò ðåñéóôáóéáêÜ íá óõíåéóöÝñïõí ó÷üëéá Þ êþäéêá.

25.5.1.3 Ôé *Äåí* Åßíáé ôï FreeBSD-CURRENT;

1. Äåí åßíáé Ýíáò ãñÞãïñïò ôñüðïò íá ðÜñåôå êþäéêá ï ïðïßïò äåí Ý÷åé êõêëïöïñÞóåé áêüìá óå êÜðïéá Ýêäïóç, ìå ôçí åëðßäá üôé ðåñéÝ÷åé êÜðïéá íÝá åêðëçêôéêÞ äõíáôüôçôá êáé èÝëåôå íá åßóôå ï ðñþôïò ðïõ ôç ÷ñçóéìïðïéåß. Áí åßóôå ðñÜãìáôé ï ðñþôïò ðïõ ôçí ÷ñçóéìïðïéåß, èá åßóôå åðßóçò êáé ï ðñþôïò ðïõ èá óõíáíôÞóåôå ôá íÝá ðñïâëÞìáôá êáé bugs.
2. Äåí åßíáé Ýíáò ãñÞãïñïò ôñüðïò ãéá íá áíáêôÞóåôå äéïñèþóåéò ðñïâëçìÜôùí. ÊÜèå íÝá Ýêäïóç ôïõ FreeBSD-CURRENT ìðïñåß íá åéóÜãåé ôüóá íÝá bugs üóá êáé áõôÜ ðïõ äéïñèþíåé.
3. Ôï FreeBSD-CURRENT äåí áðïôåëåß "åðßóçìá õðïóôçñéæüìåíï" êþäéêá. Áí êáé êáôáâÜëëïõìå êÜèå äõíáôÞ ðñïóðÜèåéá íá âïçèÞóïõìå üóïõò áíÞêïõí "ðñáãìáôéêÜ" óå êÜðïéá áðü ôéò ôñåéò ïìÜäåò ðïõ áíáöÝñáìå, ùóôüóï *äåí Ý÷ïõìå ôï ÷ñüíï* íá ðáñÝ÷ïõìå ôå÷íéêÞ õðïóôÞñéîç. Áõôü äåí óõìâáßíåé åðåéäÞ åßìáóôå êáêïÞèåéò êáé äýóêïëïé êáé äåí èÝëïõìå íá âïçèÜìå ôïõò áíèñþðïõò (äåí èá åß÷áìå êáí äçìéïõñãÞóåé ôï FreeBSD áí óêåöôüìáóôáí Ýôóé). Ðïëý áðëÜ, äåí ìðïñïýìå íá áðáíôÜìå åêáôïíôÜäåò ìçíýìáôá ôçí çìÝñá êáé *ôáõôü÷ñïíá* íá äïõëåýïõìå óôï FreeBSD! Áí äþóåôå óå ïðïéïäÞðïôå ìÝëïò ôçò ïìÜäáò áíÜðôõîçò ôçí åðéëïãÞ íá áðáíôÜåé óå ðïëëÝò åñùôÞóåéò ó÷åôéêÜ ìå ðåéñáìáôéêü êþäéêá Þ íá äïõëÝøåé ãéá ôç âåëôßùóç ôïõ FreeBSD, èá åðéëÝîåé óßãïõñá ôï äåýôåñï.

25.5.1.4 ×ñçóéìïðïéþíôáò ôï FreeBSD-CURRENT

1. Ãñáöôåßôå óôéò ëßóôåò freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current) êáé svn-src-head (http://lists.FreeBSD.org/mailman/listinfo/svn-src-head). Äåí åßíáé áðëþò êáëÞ éäÝá, åßíáé *âáóéêü* íá ôï êÜíåôå. Áí äåí åßóôå ãñáììÝíïò óôç ëßóôá *freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current)*, äåí èá âëÝðåôå ôá ó÷üëéá ó÷åôéêÜ ìå ôçí ôñÝ÷ïõóá êáôÜóôáóç ôïõ óõóôÞìáôïò áðü üóïõò ôï ÷ñçóéìïðïéïýí, êáé Ýôóé ðéèáíþò èá êáôáëÞîåôå íá áíôéìåôùðßæåôå ðïëëÜ ðñïâëÞìáôá ðïõ Üëëïé Ý÷ïõí Þäç áíáêáëýøåé êáé ëýóåé. Áêüìá ðéï óçìáíôéêü åßíáé üôé èá ÷Üíåôå óçìáíôéêÝò áíáêïéíþóåéò, ïé ïðïßåò ìðïñåß íá åßíáé êñßóéìåò ãéá ôçí äéáôÞñçóç ôïõ óõóôÞìáôïò óáò óå õãéÞ êáôÜóôáóç.

   Ç ëßóôá svn-src-head (http://lists.FreeBSD.org/mailman/listinfo/svn-src-head) èá óáò åðéôñÝøåé íá âëÝðåôå ôéò êáôá÷ùñÞóåéò óôï commit log ãéá êÜèå áëëáãÞ ðïõ ãßíåôáé, êáèþò êáé ðëçñïöïñßåò ãéá ðéèáíÝò ðáñåíÝñãåéåò ðïõ ìðïñåß íá Ý÷åé.

   Ãéá íá ãñáöôåßôå óå áõôÝò, Þ óå ïðïéåóäÞðïôå áðü ôéò õðÜñ÷ïõóåò ëßóôåò, åðéóêåöèåßôå ôçí ôïðïèåóßá http://lists.FreeBSD.org/mailman/listinfo êáé åðéëÝîôå ôç ëßóôá óôçí ïðïßá èÝëåôå íá ãßíåôå óõíäñïìçôÞò. Ïäçãßåò ãéá ôçí õðüëïéðç äéáäéêáóßá èá âñåßôå åêåß. Áí óáò åíäéáöÝñåé íá ðáñáêïëïõèåßôå ôéò áëëáãÝò óå üëï ôï äÝíôñï ðçãáßïõ êþäéêá, óáò óõíéóôïýìå íá åããñáöåßôå óôç ëßóôá svn-src-all (http://lists.FreeBSD.org/mailman/listinfo/svn-src-all).

2. ÁíáêôÞóôå ôïí ðçãáßï êþäéêá áðü Ýíá mirror site ôïõ FreeBSD. Áõôü ìðïñåß íá ãßíåé ìå äýï ôñüðïõò:

   a. ×ñçóéìïðïéÞóôå ôï ðñüãñáììá cvsup óå óõíäõáóìü ìå ôï `supfile` ìå ôçí ïíïìáóßá `standard-supfile` ôï ïðïßï èá âñåßôå óôïí êáôÜëïãï `/usr/share/examples/cvsup`. Áõôü åßíáé êáé ç ðëÝïí óõíéóôþìåíç ìÝèïäïò, êáèþò óáò åðéôñÝðåé íá áíáêôÞóåôå üëç ôç óõëëïãÞ ìå ìéá êßíçóç, êáé ôéò åðüìåíåò áíáíåþóåéò èá ðåñéÝ÷ïõí ìüíï ôéò áëëáãÝò. Ðïëëïß ÷ñÞóôåò åêôåëïýí ôï `cvsup` ìÝóù ôïõ `cron` þóôå íá êñáôÜíå ôïí ðçãáßï êþäéêá ôïõ óõóôÞìáôïò ôïõò ðÜíôá áíáíåùìÝíï áõôüìáôá. Èá ðñÝðåé íá ðñïóáñìüóåôå ôï õðüäåéãìá ôïõ `supfile` ðïõ äßíïõìå ðáñáðÜíù, êáé íá ñõèìßóåôå ôï cvsup ãéá ôï ðåñéâÜëëïí óáò.

      > **Óçìåßùóç:** Ôï õðüäåéãìá ôïõ áñ÷åßïõ `standard-supfile` ðñïïñßæåôáé ãéá ÷ñÞóç ìå êÜðïéï óõãêåêñéìÝíï êëÜäï áóöáëåßáò (security branch) ôïõ FreeBSD, êáé ü÷é ìå ôï FreeBSD-CURRENT. Èá ðñÝðåé íá åðåîåñãáóôåßôå ôï áñ÷åßï êáé íá áíôéêáôáóôÞóåôå ôçí ðáñáêÜôù ãñáììÞ:
      >
      > ```
      > *default release=cvs tag=RELENG_X_Y
      > ```
      >
      > ìå ôçí áêüëïõèç:
      >
      > ```
      > *default release=cvs tag=.
      > ```
      >
      > Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôá tags ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå, ðáñáêáëïýìå äéáâÜóôå óôï Åã÷åéñßäéï ôçí åíüôçôá ÅôéêÝôåò (Tags) ãéá ôï CVS.

   b. ×ñçóéìïðïéÞóôå ôçí õðçñåóßá **CTM**. Áí Ý÷åôå ðïëý êáêÞ óõíäåóéìüôçôá (õøçëü êüóôïò óýíäåóçò Þ ðñüóâáóç ìüíï ìÝóù email) ôï **CTM** áðïôåëåß ãéá óáò ìéá åíáëëáêôéêÞ ëýóç. Ìðïñåß üìùò íá óáò äçìéïõñãÞóåé ðñïâëÞìáôá êáé íá êáôáëÞîåôå ìå ÷áëáóìÝíá áñ÷åßá. Ãéá ôï ëüãï áõôü, ôï **CTM** ÷ñçóéìïðïéåßôáé óðÜíéá, êÜôé ôï ïðïßï áõîÜíåé áêüìá ðåñéóóüôåñï ôçí ðéèáíüôçôá íá ìç äïõëåýåé óùóôÜ ãéá ìåãÜëá ÷ñïíéêÜ äéáóôÞìáôá. Óáò óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ôï **CVSup** áí äéáèÝôåôå modem 9600 bps Þ ôá÷ýôåñï.

3. Áí óêïðåýåôå íá áíáêôÞóåôå ôïí ðçãáßï êþäéêá ãéá êáíïíéêÞ ÷ñÞóç (åêôÝëåóç) êáé ü÷é áðëþò ãéá íá ôïí äåßôå, ôüôå áíáêôÞóôå *ïëüêëçñï* ôï FreeBSD-CURRENT êáé ü÷é êÜðïéá åðéëåãìÝíá ôìÞìáôá. Óå äéáöïñåôéêÞ ðåñßðôùóç, åßíáé áñêåôÜ ðéèáíü íá óõíáíôÞóåôå ðñïâëÞìáôá, êáèþò ðïëëÜ êïììÜôéá ôïõ êþäéêá åîáñôþíôáé áðü áíáíåþóåéò óå Üëëá, êáé äåí ìðïñïýí íá ìåôáãëùôôéóôïýí áõôüíïìá.

   Ðñéí ìåôáãëùôôßóåôå ôï FreeBSD-CURRENT, äéáâÜóôå ðñïóåêôéêÜ ôï `Makefile` óôïí êáôÜëïãï `/usr/src`. Èá ðñÝðåé íá ìåôáãëùôôßóåôå ôïí ðõñÞíá êáé üëï ôï âáóéêü óýóôçìá (world) ôçí ðñþôç öïñÜ, ùò ìÝñïò ôçò äéáäéêáóßáò áíáâÜèìéóçò. ÄéáâÜæïíôáò ôçí çëåêôñïíéêÞ ëßóôá ôçò Ýêäïóçò FreeBSD-CURRENT (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current) êáé ôï `/usr/src/UPDATING` èá åßóôå åíçìåñùìÝíïé ãéá íÝåò äéáäéêáóßåò üóïí áöïñÜ ôçí åêêßíçóç óôï íÝï óáò óýóôçìá. Ïé äéáäéêáóßåò áõôÝò åßíáé óõ÷íÜ áðáñáßôçôåò üóï ðëçóéÜæïõìå óå ìéá íÝá åðßóçìç Ýêäïóç.

4. Ãßíåôå åíåñãü ìÝëïò! Áí ÷ñçóéìïðïéåßôå ôï FreeBSD-CURRENT, èÝëïõìå íá îÝñïõìå ôç ãíþìç óáò ãéá áõôü, åéäéêÜ áí Ý÷åôå ðñïôÜóåéò ãéá âåëôéþóåéò Þ äéïñèþóåéò ëáèþí. ÐñïôÜóåéò ðïõ óõíïäåýïíôáé êáé áðü êþäéêá ãßíïíôáé äåêôÝò ìå åíèïõóéáóìü!

25.5.2 ×ñçóéìïðïéþíôáò ôï FreeBSD-STABLE

25.5.2.1 Ôé Åßíáé ôï FreeBSD-STABLE;

Ôï FreeBSD-STABLE åßíáé Ýíáò êëÜäïò áíÜðôõîçò áðü ôïí ïðïßï ðñïêýðôïõí ïé “ìåãÜëåò” (major) åêäüóåéò. Ïé áëëáãÝò åéóÜãïíôáé óå áõôü ôïí êëÜäï ìå äéáöïñåôéêü ñõèìü, êáé ìå ôç ãåíéêÞ ðáñáäï÷Þ üôé Ý÷ïõí ðñþôá ðåñÜóåé áðü ôï FreeBSD-CURRENT ãéá äïêéìÞ. Ùóôüóï, *äåí ðáýåé* íá åßíáé Ýíáò êëÜäïò áíÜðôõîçò, êáé áõôü óçìáßíåé üôé ï êþäéêáò ôïõ FreeBSD-STABLE ìðïñåß ìéá äåäïìÝíç ÷ñïíéêÞ óôéãìÞ íá åßíáé áêáôÜëëçëïò ãéá óõãêåêñéìÝíåò åöáñìïãÝò. Ðñüêåéôáé ãéá ìéá áêüìá ãñáììÞ áíÜðôõîçò ãéá ôïõò ðñïãñáììáôéóôÝò, êáé äåí åßíáé áðáñáßôçôá êáôÜëëçëç ãéá ôïõò ôåëéêïýò ÷ñÞóôåò.

25.5.2.2 Ðïéïò ×ñåéÜæåôáé ôï FreeBSD-STABLE;

Áí óáò åíäéáöÝñåé íá ðáñáêïëïõèåßôå Þ íá óõìâÜëëåôå óôçí áíÜðôõîç ôïõ FreeBSD, êáé åéäéêÜ üóï áöïñÜ ôçí åðüìåíç åðßóçìç Ýêäïóç ôïõ áðü ôïí ßäéï êëÜäï (point release), åßíáé êáëÞ éäÝá íá ðáñáêïëïõèåßôå ôï FreeBSD-STABLE.

Áí êáé åßíáé áëÞèåéá üôé ïé äéïñèþóåéò áóöáëåßáò ãßíïíôáé êáé óôïí êëÜäï FreeBSD-STABLE, ùóôüóï *äåí ÷ñåéÜæåôáé* íá ðáñáêïëïõèåßôå ôï FreeBSD-STABLE ìüíï ãéá áõôü ôï ëüãï. ÊÜèå áíáöïñÜ ðñïâëÞìáôïò áóöÜëåéáò ôïõ FreeBSD åîçãåß ðùò íá äéïñèþóåôå ôï ðñüâëçìá ãéá êÜèå åðßóçìç Ýêäïóç ç ïðïßá åðçñåÜæåôáé áðü áõôü [1], êáé ç ðáñáêïëïýèçóç åíüò êëÜäïõ áíÜðôõîçò ìüíï ãéá ëüãïõò áóöáëåßáò, ðéèáíüí íá öÝñåé åðßóçò êáé Üëëåò áíåðéèýìçôåò áëëáãÝò ìáæß ôçò.

Áí êáé êáôáâÜëëïõìå êÜèå äõíáôÞ ðñïóðÜèåéá þóôå íá åîáóöáëßóïõìå üôé ï êëÜäïò FreeBSD-STABLE ìðïñåß íá ìåôáãëùôôéóôåß êáé íá åêôåëåóôåß óå êÜèå äåäïìÝíç ÷ñïíéêÞ óôéãìÞ, äåí ìðïñïýìå ùóôüóï íá ôï åããõçèïýìå. Åðéðñüóèåôá, áí êáé ï êþäéêáò áíáðôýóóåôáé óôï FreeBSD-CURRENT ðñéí ðåñÜóåé óôï FreeBSD-STABLE, ï êüóìïò ðïõ åêôåëåß ôï FreeBSD-STABLE åßíáé ðåñéóóüôåñïò, êáé Ýôóé åßíáé áíáðüöåõêôï íá áíáêáëýðôïíôáé ðéï ðïëëÜ óöÜëìáôá êáé áêñáßåò ðåñéðôþóåéò óôï FreeBSD-STABLE ôá ïðïßá äåí Ý÷ïõí ãßíåé åìöáíÞ óôï FreeBSD-CURRENT.

Ãéá ôïõò ëüãïõò áõôïýò, *äåí* óõíéóôïýìå íá ðáñáêïëïõèåßôå ôõöëÜ ôï FreeBSD-STABLE, êáé åéäéêüôåñá åßíáé óçìáíôéêü íá ìçí áíáâáèìßæåôå óå áõôü åîõðçñåôçôÝò óå ðåñéâÜëëïíôá ðáñáãùãÞò, ÷ùñßò íá Ý÷åôå ðñþôá åëÝãîåé åêôåíþò ôïí êþäéêá óôï äéêü óáò ðåñéâÜëëïí áíÜðôõîçò.

Áí äåí äéáèÝôåôå ôïõò ðüñïõò ãéá íá ôï êÜíåôå áõôü, óáò óõíéóôïýìå íá ÷ñçóéìïðïéåßôå ôçí ôåëåõôáßá åðßóçìç Ýêäïóç ôïõ FreeBSD, êáé íá áíáâáèìßæåóôå áðü ôç ìéá Ýêäïóç óôçí åðüìåíç ìÝóù ôïõ ìç÷áíéóìïý äõáäéêþí åíçìåñþóåùí.

25.5.2.3 ×ñçóéìïðïéþíôáò ôï FreeBSD-STABLE

1. Ãñáöôåßôå óõíäñïìçôÞò óôç ëßóôá freebsd-stable (http://lists.FreeBSD.org/mailman/listinfo/freebsd-stable). Èá åßóôå Ýôóé åíçìåñùìÝíïé ãéá åîáñôÞóåéò ìåôáãëþôôéóçò ðïõ ßóùò åìöáíéóôïýí óôï FreeBSD-STABLE, Þ ãéá Üëëá ðñïâëÞìáôá ðïõ ÷ñÞæïõí åéäéêÞò ðñïóï÷Þò. Óôç ëßóôá áõôÞ èá âñåßôå åðßóçò áíáêïéíþóåéò áðü ìÝëç ôçò ïìÜäáò áíÜðôõîçò, üôáí ðñüêåéôáé íá óõìðåñéëçöèåß êÜðïéá áìöéëåãüìåíç áëëáãÞ Þ äéüñèùóç, äßíïíôáò Ýôóé óôïõò ÷ñÞóôåò ôçí åõêáéñßá íá åêöñÜóïõí ãíþìç ó÷åôéêÜ ìå ôá ðñïâëÞìáôá ðïõ èá ðñïêáëÝóåé ç ðñïôåéíüìåíç áëëáãÞ.

   Èá ðñÝðåé íá åããñáöåßôå óôçí êáôÜëëçëç ëßóôá **SVN** áíÜëïãá ìå ôïí êëÜäï ðïõ ðáñáêïëïõèåßôå. Ãéá ðáñÜäåéãìá, áí ðáñáêïëïõèåßôå ôïí êëÜäï 7-STABLE, ç êáôÜëëçëç ëßóôá åßíáé ç svn-src-stable-7 (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-7). Áõôü èá óáò åðéôñÝøåé íá âëÝðåôå ôéò êáôá÷ùñÞóåéò óôï commit log ãéá êÜèå áëëáãÞ ðïõ ãßíåôáé, êáèþò êáé ðëçñïöïñßåò ãéá ðéèáíÝò ðáñåíÝñãåéåò ðïõ ìðïñåß íá Ý÷åé.

   Ãéá íá ãñáöôåßôå óå áõôÝò, Þ óå ïðïéåóäÞðïôå áðü ôéò õðÜñ÷ïõóåò ëßóôåò, åðéóêåöèåßôå ôçí ôïðïèåóßá http://lists.FreeBSD.org/mailman/listinfo êáé åðéëÝîôå ôç ëßóôá óôçí ïðïßá èÝëåôå íá ãßíåôå óõíäñïìçôÞò. Ïäçãßåò ãéá ôçí õðüëïéðç äéáäéêáóßá èá âñåßôå åðéôüðïõ. Áí óáò åíäéáöÝñåé íá ðáñáêïëïõèåßôå ôéò áëëáãÝò óå üëï ôï äÝíôñï ðçãáßïõ êþäéêá, óáò óõíéóôïýìå íá åããñáöåßôå óôç ëßóôá svn-src-all (http://lists.FreeBSD.org/mailman/listinfo/svn-src-all).

2. Áí ðñüêåéôáé íá åãêáôáóôÞóåôå Ýíá íÝï óýóôçìá ìå óêïðü íá åêôåëåßôå ôá ìçíéáßá snapshot ôïõ FreeBSD-STABLE, ðáñáêáëïýìå íá åëÝãîåôå ôçí ôïðïèåóßá Snapshots (http://www.FreeBSD.org/snapshots/) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò. Åíáëëáêôéêü, åßíáé äõíáôüí íá åãêáôáóôÞóåôå ôï ðéï ðñüóöáôï FreeBSD-STABLE áðü êÜðïéï mirror site áêïëïõèþíôáò ôéò ðáñáêÜôù ïäçãßåò þóôå íá áíáâáèìßóåôå ôï óýóôçìá óáò óôçí ðëÝïí ðñüóöáôç Ýêäïóç ðçãáßïõ êþäéêá ôïõ FreeBSD-STABLE.

   Áí äéáèÝôåôå Þäç êÜðïéá ðñïçãïýìåíç Ýêäïóç ôïõ FreeBSD êáé åðéèõìåßôå íá áíáâáèìéóôåßôå ìÝóù ôïõ ðçãáßïõ êþäéêá, ìðïñåßôå åýêïëá íá ÷ñçóéìïðïéÞóåôå êÜðïéï mirror site ôïõ FreeBSD. ÕðÜñ÷ïõí äýï ôñüðïé ãéá íá ãßíåé áõôü:

   a. ×ñçóéìïðïéÞóôå ôï ðñüãñáììá cvsup óå óõíäõáóìü ìå ôï `supfile` ìå ôçí ïíïìáóßá `stable-supfile` ôï ïðïßï èá âñåßôå óôïí êáôÜëïãï `/usr/share/examples/cvsup`. ÁõôÞ åßíáé êáé ç ðëÝïí óõíéóôþìåíç ìÝèïäïò, êáèþò óáò åðéôñÝðåé íá áíáêôÞóåôå üëç ôç óõëëïãÞ ìå ìéá êßíçóç, êáé óôéò åðüìåíåò áíáíåþóåéò èá ðáßñíåôå ìüíï ôéò áëëáãÝò. Ðïëëïß ÷ñÞóôåò åêôåëïýí ôï `cvsup` ìÝóù ôïõ `cron` þóôå íá êñáôÜíå ôïí ðçãáßï êþäéêá ôïõ óõóôÞìáôïò ôïõò ðÜíôá áíáíåùìÝíï áõôüìáôá. Èá ðñÝðåé íá ðñïóáñìüóåôå ôï õðüäåéãìá ôïõ `supfile` ðïõ äßíïõìå ðáñáðÜíù, êáé íá ñõèìßóåôå ôï cvsup ãéá ôï ðåñéâÜëëïí óáò.

   b. ×ñçóéìïðïéÞóôå ôçí õðçñåóßá **CTM**. Áí äåí Ý÷åôå ãñÞãïñç êáé öôçíÞ óýíäåóç ìå ôï Internet, áõôÞ åßíáé ç óõíéóôþìåíç ìÝèïäïò.

3. Ïõóéáóôéêü, áí ÷ñåéÜæåóôå ãñÞãïñç êáé êáôÜ áðáßôçóç ðñüóâáóç óôïí ðçãáßï êþäéêá, êáé ôï åýñïò æþíçò ôçò óýíäåóçò äåí áðïôåëåß ðñüâëçìá, ÷ñçóéìïðïéÞóôå ôï `cvsup` Þ ôï `ftp`. Äéáöïñåôéêü, ÷ñçóéìïðïéÞóôå ôï **CTM**.

4. Ðñéí ìåôáãëùôôßóåôå ôï FreeBSD-STABLE, äéáâÜóôå ðñïóåêôéêÜ ôï `Makefile` óôïí êáôÜëïãï `/usr/src`. Èá ðñÝðåé íá ìåôáãëùôôßóåôå ôïí ðõñÞíá êáé üëï ôï âáóéêü óýóôçìá (world) ôçí ðñþôç öïñÜ, ùò ìÝñïò ôçò äéáäéêáóßáò áíáâÜèìéóçò. ÄéáâÜæïíôáò ôçí çëåêôñïíéêÞ ëßóôá ôïõ FreeBSD-STABLE

(http://lists.FreeBSD.org/mailman/listinfo/freebsd-stable) êáé ôï `/usr/src/UPDATING` èá åßóôå åíçìåñùìÝíïé ãéá íÝåò äéáäéêáóßåò üóï áöïñÜ ôçí åêêßíçóç ôïõ íÝï óáò óýóôçìá. Ïé äéáäéêáóßåò áõôÝò åßíáé óõ÷íÜ áðáñáßôçôåò üóï ðëçóéÜæïõìå óå ìéá íÝá åðßóçìç Ýêäïóç.

25.6 Óõã÷ñïíßæïíôáò ôïí Ðçãáßï óáò Êþäéêá

ÕðÜñ÷ïõí äéÜöïñïé ôñüðïé íá ÷ñçóéìïðïéÞóåôå ìéá óýíäåóç Internet (Þ email) ãéá íá åíçìåñþíåôå ïðïéïäÞðïôå ôìÞìá ðçãáßïõ êþäéêá ôïõ FreeBSD Project óáò åíäéáöÝñåé, Þ êáé üëá áí ôï åðéèõìåßôå. Ïé âáóéêÝò õðçñåóßåò ðïõ ðñïóöÝñïõìå åßíáé ôï Áíþíõìï CVS, ôï CVSup, êáé ôï CTM.

> **Ðñïåéäïðïßçóç:** Áí êáé åßíáé äõíáôü íá åíçìåñþóåôå ìüíï êÜðïéá ôìÞìáôá ôïõ äÝíôñïõ ðçãáßïõ êþäéêá, ç ìüíç äéáäéêáóßá åíçìÝñùóçò ðïõ õðïóôçñßæåôáé åßíáé ç åíçìÝñùóç ïëüêëçñïõ ôïõ äÝíôñïõ. ÌåôÜ ôçí åíçìÝñùóç, èá ðñÝðåé íá ìåôáãëùôôßóåôå îáíÜ üëï ôï userland (äçë. ôá ðñïãñÜììáôá ðïõ åêôåëïýíôáé óôïí ÷þñï ÷ñÞóôç, üðùò áõôÜ ðïõ âñßóêïíôáé óôïõò êáôáëüãïõò `/bin` êáé `/sbin`) üóï êáé ôïí ðçãáßï êþäéêá ôïõ ðõñÞíá. Áí åíçìåñþóåôå ìüíï Ýíá ôìÞìá ôïõ ðçãáßïõ êþäéêá, ìüíï ôïí ðõñÞíá Þ ìüíï ôï userland, èá áíôéìåôùðßóåôå ðñïâëÞìáôá. Ôá ðñïâëÞìáôá áõôÜ ìðïñåß íá êõìáßíïíôáé áðü óöÜëìáôá ìåôáãëþôôéóçò ìÝ÷ñé kernel panic êáé êáôáóôñïöÞ äåäïìÝíùí.

Ôï **Áíþíõìï CVS** êáé ôï **CVSup** ÷ñçóéìïðïéïýí ôç ìÝèïäï *pull* ãéá ôçí åíçìÝñùóç ôïõ ðçãáßïõ êþäéêá. Óôçí ðåñßðôùóç ôïõ **CVSup**, ï ÷ñÞóôçò (Þ êÜðïéï script ðïõ åêôåëåßôáé ìÝóù `cron`) åêôåëåß ôï ðñüãñáììá `cvsup` ôï ïðïßï áëëçëåðéäñÜ ìå Ýíá áðïìáêñõóìÝíï åîõðçñåôçôÞ `cvsupd` þóôå íá åíçìåñþóåé ôá ó÷åôéêÜ áñ÷åßá. Ïé åíçìåñþóåéò ðïõ ëáìâÜíåôå åßíáé ðÜíôïôå ïé ôåëåõôáßåò äéáèÝóéìåò, êáé èá ôéò ëÜâåôå ìüíï üôáí ôéò æçôÞóåôå. Ìðïñåßôå åýêïëá íá ðåñéïñßóåôå ôéò åíçìåñþóåéò óå óõãêåêñéìÝíá áñ÷åßá Þ êáôáëüãïõò ðïõ óáò åíäéáöÝñïõí. Ïé åíçìåñþóåéò äçìéïõñãïýíôáé äõíáìéêÜ áðü ôïí åîõðçñåôçôÞ, áíÜëïãá ìå ôï ôé Ý÷åôå Þäç êáé ôé èÝëåôå íá ëÜâåôå. Ôï **Áíþíõìï CVS** åßíáé êÜðùò ðéï áðëïúêü áðü ôï **CVSup**, äåäïìÝíïõ üôé åßíáé áðëþò ìéá åðÝêôáóç ôïõ **CVS** ðïõ åðéôñÝðåé ôçí áíÜêôçóç áëëáãþí áðåõèåßáò áðü êÜðïéï áðïìáêñõóìÝíï CVS repository. Ôï **CVSup** åßíáé áñêåôÜ ðéï áðïôåëåóìáôéêü óå áõôüí ôï ôïìÝá, áëëÜ ôï **Áíþíõìï CVS** åßíáé áðëïýóôåñï óôç ÷ñÞóç.

Áðü ôçí Üëëç ìåñéÜ, ôï **CTM** äåí óõãêñßíåé Üìåóá ôïí ðçãáßï êþäéêá ðïõ Ý÷åôå ìå áõôüí ðïõ õðÜñ÷åé óôïí êåíôñéêü åîõðçñåôçôÞ þóôå íá áíáêôÞóåé ìüíï ôéò áëëáãÝò. Áíôßèåôá, óôïí êåíôñéêü ìç÷Üíçìá CTM, åêôåëåßôáé áñêåôÝò öïñÝò ôçí çìÝñá Ýíá script. Ôï script áõôü áíé÷íåýåé ôéò áëëáãÝò óôá áñ÷åßá óå ó÷Ýóç ìå ôçí ðñïçãïýìåíç åêôÝëåóç ôïõ, êáé Ýðåéôá ðáêåôÜñåé êáé óõìðéÝæåé ôéò áëëáãÝò ìå ôñüðï êáôÜëëçëï ãéá áðïóôïëÞ ìÝóù email (ìüíï åêôõðþóéìïé ASCII ÷áñáêôÞñåò). Óå êÜèå ôÝôïéï ðáêÝôï áëëáãþí áíôéóôïé÷ßæåôáé Ýíáò ìïíáäéêüò áñéèìüò áêïëïõèßáò (sequence number) ðïõ ôï áíáãíùñßæåé. ÌåôÜ ôç ëÞøç ôïõò, ìðïñåßôå íá äþóåôå áõôÜ ôá áñ÷åßá äéáöïñþí ôïõ **CTM** ("CTM deltas") óôï âïçèçôéêü ðñüãñáììá ctm_rmail(1) ôï ïðïßï áõôüìáôá èá ôá áðïêùäéêïðïéÞóåé, èá ôá åðáëçèåýóåé, êáé èá åöáñìüóåé ôéò áëëáãÝò óôï áíôßãñáöï ðçãáßïõ êþäéêá ôïõ ÷ñÞóôç. Ç äéáäéêáóßá áõôÞ åßíáé ðïëý ðéï áðïäïôéêÞ áðü ôï **CVSup**, êáé åðéâáñýíåé ëéãüôåñï ôïõò åîõðçñåôçôÝò ìáò, êáèþò åßíáé ìéá äéáäéêáóßá ôýðïõ *push* áíôß ãéá *pull*.

ÕðÜñ÷ïõí öõóéêÜ êÜðïéá óçìåßá ðïõ õóôåñåß. Áí áðü ëÜèïò äéáãñÜøåôå êÜðïéá ôìÞìáôá ôïõ ðçãáßïõ óáò êþäéêá, ôï **CVSup** èá áíé÷íåýóåé êáé èá äéïñèþóåé áõôüìáôá ôç âëÜâç ãéá óáò. Ôï **CTM** äåí èá ôï êÜíåé áõôü, êáé áí óâÞóåôå êÜðïéï ôìÞìá ôïõ (êáé äåí Ý÷åôå áíôßãñáöï áóöáëåßáò) èá ðñÝðåé íá îåêéíÞóåôå áðü ôçí áñ÷Þ (áðü ôï ðéï ðñüóöáôï CVS "base delta") êáé íá ôï îáíá÷ôßóåôå áðü ôçí áñ÷Þ ìå ôï **CTM**. Ìå ôï **Áíþíõìï CVS**, ìðïñåßôå áðëþò íá äéáãñÜøåôå ôá ðñïâëçìáôéêÜ áñ÷åßá êáé íá óõã÷ñïíßóåôå îáíÜ ôïí ðçãáßï óáò êþäéêá.

25.7 Ìåôáãëùôôßæïíôáò ôï Âáóéêü Óýóôçìá (“world”)

¸÷ïíôáò óõã÷ñïíßóåé ôï ôïðéêü óáò äÝíôñï ðçãáßïõ êþäéêá óå êÜðïéá óõãêåêñéìÝíç Ýêäïóç ôïõ FreeBSD (FreeBSD-STABLE, FreeBSD-CURRENT, ê.ï.ê.), ìðïñåßôå Ýðåéôá íá ôï ÷ñçóéìïðïéÞóåôå ãéá íá ìåôáãëùôôßóåôå ôï óýóôçìá óáò áðü ôçí áñ÷Þ.

ÄçìéïõñãÞóôå ¸íá Áíôßãñáöï Áóöáëåßáò: Äåí ìðïñïýìå ðáñÜ íá ôïíßóïõìå ðüóï óçìáíôéêü åßíáé íá äçìéïõñãÞóåôå Ýíá áíôßãñáöï áóöáëåßáò ôïõ óõóôÞìáôïò óáò *ðñéí* îåêéíÞóåôå áõôÞ ôç äéáäéêáóßá. Áí êáé ç ìåôáãëþôôéóç ôïõ âáóéêïý óõóôÞìáôïò åßíáé (üóï ôïõëÜ÷éóôïí áêïëïõèåßôå áõôÝò ôéò ïäçãßåò) ìéá ó÷åôéêÜ áðëÞ äéáäéêáóßá, áíáìößâïëá èá õðÜñîïõí êáé ðåñéðôþóåéò ðïõ ëÜèç äéêÜ óáò, Þ Üëëùí (óôï äÝíôñï ðçãáßïõ êþäéêá), èá óáò ïäçãÞóïõí óå Ýíá óýóôçìá ðïõ äåí èá ìðïñåß íá åêêéíÞóåé.

Âåâáéùèåßôå üôé Ý÷åôå åíçìåñùìÝíï áíôßãñáöï áóöáëåßáò. Êáëü èá åßíáé íá Ý÷åôå åðßóçò ðñü÷åéñç ìéá äéóêÝôá fixit Þ Ýíá CD åêêßíçóçò. ºóùò íá ìçí ÷ñåéáóôåß ðïôÝ íá ôá ÷ñçóéìïðïéÞóåôå, áëëÜ êáëýôåñá íá åßóôå áóöáëÞò ðáñÜ íá ôï ìåôáíïéþíåôå áñãüôåñá!

Ãßíåôå ÓõíäñïìçôÞò óôç ÓùóôÞ Ëßóôá Çë. Ôá÷õäñïìåßïõ: Áðü ôç öýóç ôïõò, ïé êëÜäïé FreeBSD-STABLE êáé FreeBSD-CURRENT âñßóêïíôáé óå óõíå÷Þ *áíÜðôõîç*. ¼óïé óõíåéóöÝñïõí óôï FreeBSD åßíáé áðëþò Üíèñùðïé, êáé ðåñéóôáóéáêÜ ëÜèç áðëþò óõìâáßíïõí.

ÏñéóìÝíåò öïñÝò ôá ëÜèç áõôÜ åßíáé ìÜëëïí áêßíäõíá, êáé ôï ìüíï ðïõ êÜíïõí åßíáé íá åìöáíßæïõí ìåñéêÝò äéáãíùóôéêÝò ðñïåéäïðïéÞóåéò óôï óýóôçìá óáò. [1] ìðïñåß ç áëëáãÞ íá åßíáé êáôáóôñïöéêÞ, êáé íá ïäçãÞóåé ôï óýóôçìá óáò óå áäõíáìßá åêêßíçóçò Þ áêüìá êáé íá êáôáóôñÝøåé ôá óõóôÞìáôá áñ÷åßùí óáò (Þ êáé áêüìá ÷åéñüôåñåò óõíÝðåéåò).

Áí óõìâåß êÜôé ôÝôïéï ðñüâëçìá, óýíôïìá èá åìöáíéóôåß Ýíá ìÞíõìá ôýðïõ “heads up” óôéò ó÷åôéêÝò ëßóôåò ôá÷õäñïìåßïõ, ôï ïðïßï èá åîçãåß ôï ðñüâëçìá êáé ðïéá óõóôÞìáôá åðçñåÜæåé. ¼ôáí ôï ðñüâëçìá ëõèåß, èá ãßíåé ìéá áíôßóôïé÷ç “all clear” áíáêïßíùóç.

Áí ðñïóðáèåßôå íá áêïëïõèÞóåôå ôï FreeBSD-STABLE Þ ôï FreeBSD-CURRENT, êáé äåí äéáâÜæåôå ôéò áíôßóôïé÷åò ëßóôåò freebsd-stable (http://lists.FreeBSD.org/mailman/listinfo/freebsd-stable) êáé freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current), øÜ÷íåôå ãéá ìðåëÜäåò.

Ìçí ×ñçóéìïðïéÞóåôå ôçí åíôïëÞ `make world`: ÌåãÜëï ìÝñïò ôçò ðáëáéüôåñçò ôåêìçñßùóçò, óõíéóôÜ ôç ÷ñÞóç ôçò åíôïëÞò `make world`. Áí ôçí ÷ñçóéìïðïéÞóåôå, èá ðáñáëåéöèïýí ïñéóìÝíá óçìáíôéêÜ âÞìáôá ôçò äéáäéêáóßáò. ×ñçóéìïðïéÞóôå ôç ìüíï áí åßóôå áðüëõôá óßãïõñïé ãéá áõôü ðïõ êÜíåôå. Ãéá ôéò ðåñéóóüôåñåò ðåñéðôþóåéò, ç åíôïëÞ `make world` åßíáé ëáíèáóìÝíç, êáé áíôß ãéá áõôÞ èá ðñÝðåé íá áêïëïõèÞóåôå ôç äéáäéêáóßá ðïõ ðåñéãñÜöïõìå ðáñáêÜôù.

25.7.1 Ï Êáíïíéêüò Ôñüðïò íá Åíçìåñþóåôå ôï Óýóôçìá óáò

Ðñéí åíçìåñþóåôå ôï óýóôçìá óáò, èá ðñÝðåé íá åëÝãîåôå ôï `/usr/src/UPDATING` ãéá ôõ÷üí âÞìáôá ðïõ èá ðñÝðåé íá åêôåëÝóåôå ðñéí ôçí åêêßíçóç ôçò ìåôáãëþôôéóçò. Ôá âÞìáôá áõôÜ åîáñôþíôáé áðü ôçí Ýêäïóç ôïõ ðçãáßïõ êþäéêá ðïõ ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå. ¸ðåéôá, áêïëïõèÞóôå ôç äéáäéêáóßá ðïõ ðåñéãñÜöåôáé óôéò åðüìåíåò ðáñáãñÜöïõò.

Ç äéáäéêáóßá áíáâÜèìéóçò ç ïðïßá ðåñéãñÜöåôáé åäþ âáóßæåôáé óôçí õðüèåóç üôé Ý÷åôå Þäç åãêáôáóôÞóåé ìéá ðáëéüôåñç Ýêäïóç ôïõ FreeBSD, ìå ìéá ðáëéÜ Ýêäïóç ôïõ ìåôáãëùôôéóôÞ, Ýíá ðáëéü ðõñÞíá, ðáëéÜ “åñãáëåßá

÷ñÞóôç” êáé áñ÷åßá ñõèìßóåùí. Åñãáëåßá ÷ñÞóôç èåùñïýíôáé ôá âáóéêÜ åêôåëÝóéìá, ïé âéâëéïèÞêåò êáé ôá áñ÷åßá ðñïãñáììáôéóìïý. Ï ìåôáãëùôôéóôÞò åßíáé êé áõôüò ìÝñïò ôùí “åñãáëåßùí ÷ñÞóôç” óôï FreeBSD, áëëÜ ÷ñåéÜæåôáé åéäéêÞ ìåôá÷åßñéóç êáôÜ ôç äéáäéêáóßá áíáâÜèìéóçò.

ÕðïèÝôïõìå, åðßóçò, üôé Ý÷åôå Þäç êáôåâÜóåé ìéá åíçìåñùìÝíç Ýêäïóç áðü ôïí ðçãáßï êþäéêá ôïõ óõóôÞìáôïò. Áí ï ðçãáßïò êþäéêáò óôï óõãêåêñéìÝíï óýóôçìá åßíáé áðü ðáëéüôåñç Ýêäïóç, äåßôå ôï ÔìÞìá 25.6 ãéá ëåðôïìåñåßò ïäçãßåò ó÷åôéêÜ ìå ôï ðùò íá óõã÷ñïíßóåôå ôïí ðçãáßï êþäéêá óå ìéá íåüôåñç Ýêäïóç.

Ç áíáâÜèìéóç ôïõ FreeBSD áðü ôïí ðçãáßï êþäéêÜ ôïõ öáßíåôáé íá åßíáé ðïëý áðëÞ äéáäéêáóßá. Óôçí ðñáãìáôéêüôçôá, Ý÷åé êÜðïéåò éäéáéôåñüôçôåò. Ìå ôá ÷ñüíéá, êáèþò ïé åîáñôÞóåéò ìåôáîý ôùí âçìÜôùí ôçò áíáâÜèìéóçò áíáêáëýðôïíôáé Þ áíáëýïíôáé êáëýôåñá, ïé ðñïãñáììáôéóôÝò ôïõ FreeBSD áëëÜæïõí óéãÜ-óéãÜ áõôÞ ôç äéáäéêáóßá. Ïé ðáñáêÜôù ðáñÜãñáöïé ðåñéãñÜöïõí ôç ëïãéêÞ ìå ôçí ïðïßá Ý÷åé ó÷åäéáóèåß ç ðñïôåéíüìåíç äéáäéêáóßá áíáâÜèìéóçò.

Ìéá åðéôõ÷Þò äéáäéêáóßá áíáâÜèìéóçò ðñÝðåé íá êáëýøåé ôïõëÜ÷éóôïí ôéò äýï ðéï âáóéêÝò éäéáéôåñüôçôåò ìéáò áíáâÜèìéóçò áðü ðçãáßï êþäéêá:

- Ï ðáëéüò ìåôáãëùôôéóôÞò óõóôÞìáôïò ìðïñåß íá åßíáé áêáôÜëëçëïò ãéá ìåôáãëþôôéóç ôïõ íÝïõ ðõñÞíá. (Êáé ïé ìåôáãëùôôéóôÝò Ý÷ïõí ïñéóìÝíåò öïñÝò ðñïâëÞìáôá, üðùò êÜèå Üëëï ëïãéóìéêü.) Ïðüôå ï íÝïò ðõñÞíáò ðñÝðåé íá ìåôáãëùôôéóôåß ìå ôï íÝï ìåôáãëùôôéóôÞ. Ðéï óõãêåêñéìÝíá, ï íÝïò ìåôáãëùôôéóôÞò ðñÝðåé íá áíáâáèìéóôåß ðñéí áðü ôï íÝï ðõñÞíá. Áõôü äå óçìáßíåé âÝâáéá üôé áõôüò ï íÝïò ìåôáãëùôôéóôÞò ðñÝðåé íá *åãêáôáóôáèåß* ðñéí ìåôáãëùôôéóôåß ï íÝïò ðõñÞíáò.
- Ôá íÝá åñãáëåßá ÷ñÞóôç áðü ôï âáóéêü óýóôçìá ôïõ FreeBSD ìðïñåß íá åîáñôþíôáé áðü ôïí ôñüðï ëåéôïõñãßáò ôïõ íÝïõ ðõñÞíá. Ïðüôå ï íÝïò ðõñÞíáò ðñÝðåé íá åãêáôáóôáèåß ðñéí áðü ôï íÝï âáóéêü óýóôçìá.

ÁõôÜ ôá äýï óçìåßá åßíáé ïé âáóéêïß ëüãïé ãéá ôïõò ïðïßïõò ðñïôåßíïíôáé ôá êåíôñéêÜ âÞìáôá ìéáò áíáâÜèìéóçò, ôá âÞìáôá `buildworld`, `buildkernel`, `installkernel`, êáé `installworld`. Óôéò åðüìåíåò ðáñáãñÜöïõò èá ðåñéãñÜøïõìå ðéï áíáëõôéêÜ áõôÜ ôá âÞìáôá. ÕðÜñ÷ïõí êé Üëëïé ëüãïé üìùò ãéá ôïõò ïðïßïõò ÷ñåéÜæåôáé ðñïóï÷Þ üôáí êÜíåôå ìéá ôÝôïéá áíáâÜèìéóç. Ìåñéêïß áðü áõôïýò åßíáé ïé åîÞò:

- Ôá ðáëéÜ åñãáëåßá ôïõ âáóéêïý óõóôÞìáôïò ìðïñåß íá ìçí ôñÝ÷ïõí óùóôÜ ìå ôï íÝï ðõñÞíá. Ãé áõôü ðñÝðåé íá åãêáôáóôáèåß ôï åíçìåñùìÝíï âáóéêü óýóôçìá áìÝóùò ìåôÜ ôçí åãêáôÜóôáóç ôïõ íÝïõ ðõñÞíá.
- ÌåñéêÝò öïñÝò ÷ñåéÜæïíôáé áëëáãÝò óôá áñ÷åßá ñõèìßóåùí ðñéí åãêáôáóôáèåß ôï íÝï âáóéêü óýóôçìá. ¶ëëåò öïñÝò ç åãêáôÜóôáóç üëùí ôùí áñ÷åßùí ñõèìßóåùí ìðïñåß íá äçìéïõñãÞóåé ðñïâëÞìáôá óôçí åãêáôÜóôáóç. Ãé áõôü Ý÷ïõìå ÷ùñßóåé ôçí åíçìÝñùóç ôùí áñ÷åßùí ñõèìßóåùí óå äýï îå÷ùñéóôÜ âÞìáôá.
- Óôçí ðëåéïøçößá ôùí ðåñéðôþóåùí ç äéáäéêáóßá åãêáôÜóôáóçò áíôéêáèéóôÜ Þ ðñïóèÝôåé áñ÷åßá ôïõ óõóôÞìáôïò· äå óâÞíåé êáíÝíá õðÜñ÷ïí áñ÷åßï. Óå ìåñéêÝò ðåñéðôþóåéò áõôü ìðïñåß íá äçìéïõñãÞóåé ðñïâëÞìáôá. ¼ôáí õðÜñ÷åé ôÝôïéá ðåñßðôùóç, ç äéáäéêáóßá åãêáôÜóôáóçò ôõðþíåé åíçìåñùôéêÜ ìçíýìáôá ãéá ôá áñ÷åßá ôá ïðïßá ðñÝðåé íá óâçóôïýí ÷åéñïêßíçôá. Áõôü ôï âÞìá ìðïñåß íá áõôïìáôïðïéçèåß óôï ìÝëëïí.

¸÷ïíôáò üëåò áõôÝò ôéò éäéáéôåñüôçôåò ìéáò áíáâÜèìéóçò áðü ðçãáßï êþäéêá, êáôáëÞîáìå óôçí ðáñáêÜôù äéáäéêáóßá áíáâÜèìéóçò. ÏñéóìÝíåò öïñÝò ìðïñåß íá ÷ñåéÜæåôáé íá ðñïóèÝóåôå êÜðïéá âÞìáôá óå áõôÞ ôç äéáäéêáóßá. Ôá âáóéêÜ âÞìáôá üìùò ðáñáìÝíïõí ôá ßäéá, êé åßíáé ôá åîÞò:

1. `make buildworld`

   Áõôü ôï âÞìá ìåôáãëùôôßæåé ðñþôá ìéá åíçìåñùìÝíç Ýêäïóç ôïõ ßäéïõ ôïõ ìåôáãëùôôéóôÞ óõóôÞìáôïò êáé ìåñéêþí áðáñáßôçôùí åñãáëåßùí. ¾óôåñá, ÷ñçóéìïðïéþíôáò ôï íÝï ìåôáãëùôôéóôÞ, ðñïåôïéìÜæåé ìéá íÝá Ýêäïóç üëïõ ôïõ âáóéêïý óõóôÞìáôïò ôïõ FreeBSD. Ôá åíçìåñùìÝíá åêôåëÝóéìá, âéâëéïèÞêåò êáé áñ÷åßá ðñïãñáììáôéóìïý êáôáëÞãïõí óôïí êáôÜëïãï `/usr/obj`.

2. `make buildkernel`

   Óå áíôßèåóç ìå ðáëéüôåñåò äéáäéêáóßåò áíáâÜèìéóçò (ïé ïðïßåò êáëïýóáí ÷åéñïêßíçôá ôï config(8) êáé ôï make(1)) áõôü ôï âÞìá ìåôáãëùôôßæåé ôïí ðõñÞíá ôïõ FreeBSD ÷ñçóéìïðïéþíôáò ôïí åíçìåñùìÝíï ìåôáãëùôôéóôÞ ôïõ óõóôÞìáôïò áðü ôïí êáôÜëïãï `/usr/obj`. Áõôü óáò ðñïóôáôåýåé áðü ðñïâëÞìáôá áóõìâáôüôçôáò ìåôáîý ôïõ ìåôáãëùôôéóôÞ êáé ôïõ ðõñÞíá.

3. `make installkernel`

   ÅãêáôÜóôáóç ôïõ íÝïõ ðõñÞíá êáé ôùí áñèñùìÜôùí ôïõ óôï äßóêï ôïõ óõóôÞìáôïò. ¸ôóé ìðïñåß ðëÝïí ôï óýóôçìá íá îåêéíÞóåé ìå ôï íÝï, åíçìåñùìÝíï ðõñÞíá.

4. Åêêßíçóç óå ëåéôïõñãßá single user.

   Ç ëåéôïõñãßá single user åëá÷éóôïðïéåß ôçí ðéèáíüôçôá íá Ý÷åôå ðñïâëÞìáôá åðåéäÞ áíáâáèìßæåôå êÜðïéï ðñüãñáììá ðïõ ôñÝ÷åé Þäç. Åßíáé åðßóçò ðéï áóöáëÝò, áöïý äå ÷ñåéÜæåôáé íá ôñÝîåôå ôéò åöáñìïãÝò ôïõ ðáëéïý âáóéêïý óõóôÞìáôïò ìå ôï íÝï ðõñÞíá.

5. `mergemaster -p`

   Áõôü ôï âÞìá åíçìåñþíåé ôá áñ÷åßá ñõèìßóåùí ôïõ FreeBSD, ãéá íá ìðïñÝóåôå íá åãêáôáóôÞóåôå óùóôÜ ôï íÝï âáóéêü óýóôçìá. Åíçìåñþíåé, ãéá ðáñÜäåéãìá, ôç âÜóç ÷ñçóôþí êáé ïìÜäùí ÷ñçóôþí ôïõ FreeBSD. ÊÜèå öïñÜ ðïõ ðñïóôßèåíôáé Ýíáò íÝïò ÷ñÞóôçò óõóôÞìáôïò Þ ìéá íÝá ïìÜäá ÷ñçóôþí, ôï âÞìá `installworld` ôçò áíáâÜèìéóçò èåùñåß üôé Ý÷åôå Þäç ñõèìßóåé ôïõò íÝïõò ÷ñÞóôåò Þ ôéò íÝåò ïìÜäåò. Áõôü áêñéâþò êÜíåé óå áõôü ôï óçìåßï ôï åñãáëåßï mergemaster(8).

6. `make installworld`

   Ôï åðüìåíï âÞìá åßíáé íá åãêáôáóôÞóåôå ôï åíçìåñùìÝíï âáóéêü óýóôçìá áðü ôïí êáôÜëïãï `/usr/obj`. ÌåôÜ áðü áõôü Ý÷åôå ðëÝïí Ýíá íÝï ðõñÞíá êáé Ýíá åíçìåñùìÝíï âáóéêü óýóôçìá, ôï ïðïßï ôáéñéÜæåé ìå ôïí íÝï ðõñÞíá.

7. `mergemaster`

   ¸íá áðü ôá ôåëåõôáßá âÞìáôá åßíáé ç áíáâÜèìéóç ôùí áñ÷åßùí ñõèìßóåùí ôïõ óõóôÞìáôïò. Ôï åñãáëåßï mergemaster(8) ìðïñåß íá óáò âïçèÞóåé óå áõôü ôï âÞìá, áöïý åíçìåñþíåé ôá áñ÷åßá ñõèìßóåùí êñáôþíôáò êáé ïðïéåóäÞðïôå ôïðéêÝò áëëáãÝò Ý÷åôå êÜíåé óôï óýóôçìÜ óáò.

8. Åðáíåêêéíßóôå ôï óýóôçìá.

   Ìéá ôåëåõôáßá åðáíåêêßíçóç ôïõ óõóôÞìáôïò óáò åîáóöáëßæåé üôé ôï óýóôçìá îåêéíÜåé ìå ôï íÝï ðõñÞíá, ôï åíçìåñùìÝíï âáóéêü óýóôçìá êáé ôá êáéíïýñéá áñ÷åßá ñõèìßóåùí.

Áí ç áíáâÜèìéóç ðïõ êÜíåôå åßíáé áðü ìéá Ýêäïóç ôïõ FreeBSD óå ìéá ðéï êáéíïýñéá Ýêäïóç ôïõ ßäéïõ êëÜäïõ áíÜðôõîçò, ð.÷. áðü 7.0 óå 7.1, ôüôå ìåñéêÜ áðü ôá âÞìáôá áõôÞ ôçò äéáäéêáóßáò ìðïñåß íá ìç ÷ñåéÜæïíôáé áöïý åßíáé ëéãüôåñï ðéèáíü íá óõíáíôÞóåôå áóõìâáôüôçôåò ìåôáîý ôïõ ìåôáãëùôôéóôÞ óõóôÞìáôïò, ôïõ ðõñÞíá, ôïõ âáóéêïý óõóôÞìáôïò êáé ôùí áñ÷åßùí ñõèìßóåùí. Ç áíáâÜèìéóç óå ôÝôïéåò ðåñéðôþóåéò, ìåôáîý äýï minor åêäüóåùí ôïõ FreeBSD, ßóùò ìðïñåß íá ãßíåé êáé ìå ôçí ðáëéüôåñç äéáäéêáóßá: ôñÝ÷ïíôáò`make world` êáé ýóôåñá ìåôáãëùôôßæïíôáò êáé óôÞíïíôáò Ýíá íÝï ðõñÞíá.

¼ôáí üìùò áíáâáèìßæåôå ôï FreeBSD ìåôáîý major åêäüóåùí, êáëýôåñá íá ÷ñçóéìïðïéÞóåôå ôç äéáäéêáóßá ðïõ ðåñéãñÜöïõìå åäþ. Áëëéþò ìðïñåß íá áíôéìåôùðßóåôå ðñïâëÞìáôá åßôå êáôÜ ôç äéÜñêåéá ôçò áíáâÜèìéóçò Þ áöïý Ý÷åé ðëÝïí ïëïêëçñùèåß.

ÊÜðïéåò áðü ôéò áíáâáèìßóåéò (ð.÷. áðü ìéá Ýêäïóç 4.*X* óå 5.0) ìðïñåß íá áðáéôïýí ìåñéêÜ ÷åéñïêßíçôá âÞìáôá (üðùò ôï íá ìåôáêéíÞóåôå Þ íá óâÞóåôå óõãêåêñéìÝíá áñ÷åßá ðñéí ôï âÞìá `installworld`). Ðñéí áðü êÜèå áíáâÜèìéóç äéáâÜóôå ðñïóåêôéêÜ ôéò ïäçãßåò óôï áñ÷åßï `/usr/src/UPDATING`· åéäéêÜ ôéò ïäçãßåò óôï ôÝëïò ôïõ áñ÷åßïõ, ïé ïðïßåò ðåñéãñÜöïõí áíáëõôéêÜ ôçí ðñïôåéíüìåíç äéáäéêáóßá áíáâÜèìéóçò.

ÁõôÞ ç äéáäéêáóßá áíáâÜèìéóçò åîåëßóóåôáé êáé äéïñèþíåôáé êáèþò ïé ðñïãñáììáôéóôÝò ôïõ FreeBSD áíáêáëýðôïõí êáéíïýñéåò åîáñôÞóåéò ìåôáîý ôùí óõóôáôéêþí ôïõ óõóôÞìáôïò Þ êÜíïõí äéïñèþóåéò ãéá íá áðïöýãïõí áóõìâáôüôçôåò ìåôáîý ôùí äéáöïñåôéêþí õðïóõóôçìÜôùí. Åëðßæïõìå üôé ôá êåíôñéêÜ âÞìáôá ôçò äéáäéêáóßáò ðïõ ðåñéãñÜöåôáé åäþ äå èá áëëÜîïõí ðïëý ãéá áñêåôü êáéñü ðëÝïí.

Áíáêåöáëáéþíïíôáò üëá ôá âÞìáôá ôá ïðïßá ðåñéãñÜøáìå ðáñáðÜíù, ç ðñïôåéíüìåíç äéáäéêáóßá áíáâÜèìéóçò ôïõ FreeBSD áðü ôïí ðçãáßï êþäéêá ôïõ óõóôÞìáôïò åßíáé:

```
# cd /usr/src
# make buildworld
# make buildkernel
# make installkernel
# shutdown -r now
```

> **Óçìåßùóç:** ÕðÜñ÷ïõí êÜðïéåò ìÜëëïí óðÜíéåò ðåñéðôþóåéò, ðïõ áðáéôåßôáé ìéá åðéðëÝïí åêôÝëåóç ôïõ `mergemaster -p` ðñéí ôï âÞìá `buildworld`. Ïé ðåñéðôþóåéò áõôÝò ðåñéãñÜöïíôáé óôï `UPDATING`. Óå ãåíéêÝò ãñáììÝò ðÜíôùò, ìðïñåßôå ìå áóöÜëåéá íá ðáñáëåßøåôå áõôü ôï âÞìá, áí äåí áíáâáèìßæåôå ôï óýóôçìá óáò ìåôáîý ðïëëáðëþí åêäüóåùí ôïõ FreeBSD.

ÌåôÜ ôçí åðéôõ÷Þ ïëïêëÞñùóç ôïõ `installkernel`, èá ðñÝðåé íá åðáíåêêéíÞóåôå óå êáôÜóôáóç åíüò ÷ñÞóôç (ð.÷. ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `boot -s` óôçí ðñïôñïðÞ ôïõ öïñôùôÞ åêêßíçóçò). ¸ðåéôá åêôåëÝóôå:

```
# mount -u /
# mount -a -t ufs
# adjkerntz -i
# mergemaster -p
# cd /usr/src
# make installworld
# mergemaster
# reboot
```

> **ÄéáâÜóôå ôéò ÅðéðëÝïí ÅîçãÞóåéò:** Ç äéáäéêáóßá ðïõ ðåñéãñÜøáìå ðáñáðÜíù åßíáé ìéá áðëÞ ðåñßëçøç ãéá íá óáò âïçèÞóåé íá îåêéíÞóåôå. Èá ðñÝðåé ùóôüóï íá äéáâÜóåôå ôéò ðáñáêÜôù åíüôçôåò ãéá íá êáôáíïÞóåôå ðëÞñùò êÜèå âÞìá, åéäéêÜ áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå äéêü óáò ðñïóáñìïóìÝíï ðõñÞíá.

25.7.2 ÄéáâÜóôå ôï `/usr/src/UPDATING`

Ðñéí êÜíåôå ïôéäÞðïôå Üëëï, äéáâÜóôå ôï `/usr/src/UPDATING` (Þ ôï áíôßóôïé÷ï áñ÷åßï, áí Ý÷åôå áðïèçêåýóåé ôïí ðçãáßï êþäéêá óå Üëëï êáôÜëïãï). Ôï áñ÷åßï áõôü ðåñéÝ÷åé óçìáíôéêÝò ðëçñïöïñßåò ó÷åôéêÜ ìå ðñïâëÞìáôá ðïõ ìðïñåß íá óõíáíôÞóåôå Þ ßóùò íá êáèïñßæåé ôç óåéñÜ ìå ôçí ïðïßá ðñÝðåé íá åêôåëåóôïýí êÜðïéåò åíôïëÝò. Áí ôï áñ÷åßï `UPDATING` Ýñ÷åôáé óå óýãêñïõóç ìå êÜôé ðïõ äéáâÜóáôå åäþ, ðñïôåñáéüôçôá Ý÷åé ôï áñ÷åßï `UPDATING`.

> **Óçìáíôéêü:** Ç áíÜãíùóç ôïõ áñ÷åßïõ `UPDATING` äåí åßíáé áðïäåêôü õðïêáôÜóôáôï ôçò óõíäñïìÞò óôç óùóôÞ ëßóôá çëåêôñïíéêïý ôá÷õäñïìåßïõ, üðùò ðåñéãñÜøáìå ðñïçãïõìÝíùò. Ïé äýï áðáéôÞóåéò åßíáé óõìðëçñùìáôéêÝò, äåí áëëçëïáíáéñïýíôáé.

25.7.3 ÅëÝãîôå ôï `/etc/make.conf`

ÅîåôÜóôå ôá áñ÷åßá `/usr/share/examples/etc/make.conf` êáé `/etc/make.conf`. Ôï ðñþôï ðåñéÝ÷åé êÜðïéåò ðñïåðéëåãìÝíåò ìåôáâëçôÝò (defines), ïé ðåñéóóüôåñåò áðü ôéò ïðïßåò åßíáé ùò ó÷üëéá. Ãéá íá ôá ÷ñçóéìïðïéÞóåôå üôáí ìåôáãëùôôßæåôå ôï óýóôçìá óáò, ðñïóèÝóôå ôá óôï `/etc/make.conf`. Íá Ý÷åôå õðüøç óáò, ðùò ïôéäÞðïôå ðñïóèÝôåôå óôï áñ÷åßï `/etc/make.conf` ÷ñçóéìïðïéåßôå åðßóçò êÜèå öïñÜ ðïõ åêôåëåßôå ôçí åíôïëÞ `make`, Ýôóé åßíáé ãåíéêÜ êáëÞ éäÝá íá âÜëåôå ôéìÝò ðïõ åßíáé ëïãéêÝò ãéá ôï óýóôçìá óáò.

¸íáò ôõðéêüò ÷ñÞóôçò èá èÝëåé ðéèáíþò íá áíôéãñÜøåé ôéò ãñáììÝò `CFLAGS` êáé `NO_PROFILE` áðü ôï áñ÷åßï `/usr/share/examples/etc/make.conf` óôï `/etc/make.conf` áöáéñþíôáò ôáõôü÷ñïíá êáé ôï óýìâïëï ôïõ ó÷ïëßïõ.

ÅîåôÜóôå êáé ôéò Üëëåò ìåôáâëçôÝò (`COPTFLAGS`, `NOPORTDOCS` ê.ï.ê.) êáé áðïöáóßóôå áí ó÷åôßæïíôáé ìå ôï åðéèõìçôü ãéá óáò áðïôÝëåóìá.

25.7.4 Åíçìåñþóôå ôá Áñ÷åßá óôï `/etc`

Ï êáôÜëïãïò `/etc` ðåñéÝ÷åé ìåãÜëï ìÝñïò ôùí ðëçñïöïñéþí ñýèìéóçò ôïõ óõóôÞìáôïò óáò, üðùò åðßóçò êáé scripts ðïõ åêôåëïýíôáé êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. ÌåñéêÜ áðü ôá scripts áõôÜ áëëÜæïõí áðü Ýêäïóç óå Ýêäïóç ôïõ FreeBSD.

ÏñéóìÝíá áðü ôá áñ÷åßá ñõèìßóåùí ÷ñçóéìïðïéïýíôáé åðßóçò êáôÜ ôçí êáèçìåñéíÞ ÷ñÞóç ôïõ óõóôÞìáôïò. Ôï `/etc/group` åßíáé Ýíá áðü áõôÜ.

¸÷ïõí õðÜñîåé ðåñéðôþóåéò óôï ðáñåëèüí, üðïõ ôï `make installworld` áíÝìåíå áðü ðñéí ôçí ýðáñîç óõãêåêñéìÝíùí ïíïìÜôùí ÷ñçóôþí (usernames) Þ ïìÜäùí (groups). ÊáôÜ ôç äéáäéêáóßá ôçò áíáâÜèìéóçò Þôáí áñêåôÜ ðéèáíü áõôïß ïé ÷ñÞóôåò Þ ïìÜäåò íá ìçí õðÞñ÷áí. Áõôü äçìéïõñãïýóå ðñïâëÞìáôá óôçí äéáäéêáóßá. Óå êÜðïéåò ðåñéðôþóåéò, ôï `make buildworld` èá åëÝãîåé áí õðÜñ÷ïõí áõôïß ïé ÷ñÞóôåò Þ ïìÜäåò.

Ìéá ôÝôïéá ðåñßðôùóç ðáñïõóéÜóôçêå üôáí ðñïóôÝèçêå ï ÷ñÞóôçò `smmsp`. Ç äéáäéêáóßá áíáâÜèìéóçò áðïôýã÷áíå óå ðïëëïýò ÷ñÞóôåò, ôç óôéãìÞ ðïõ ôï mtree(8) ðñïóðáèïýóå íá äçìéïõñãÞóåé ôïí êáôÜëïãï `/var/spool/clientmqueue`.

Ç ëýóç åßíáé íá åêôåëÝóåôå ôï mergemaster(8) óå êáôÜóôáóç ðñï-åãêáôÜóôáóçò, äßíïíôáò ôçí åðéëïãÞ `-p`. ÁõôÞ èá óõãêñßíåé ìüíï ôá áñ÷åßá ðïõ åßíáé áðáñáßôçôá ãéá ôçí åðéôõ÷ßá åêôÝëåóçò ôïõ `buildworld` Þ ôïõ `installworld`. Áí ç Ýêäïóç ôïõ `mergemaster` ðïõ Ý÷åôå åßíáé ðáëéÜ êáé äåí õðïóôçñßæåé ôï `-p`, ÷ñçóéìïðïéÞóôå ôçí íÝá Ýêäïóç áðü ôï äÝíôñï ôïõ ðçãáßïõ êþäéêá üôáí ôçí åêôåëÝóåôå ãéá ðñþôç öïñÜ:

```
# cd /usr/src/usr.sbin/mergemaster
# ./mergemaster.sh -p
```

Õðüäåéîç: Áí áéóèÜíåóôå éäéáßôåñá ðáñáíïúêüò, ìðïñåßôå íá åëÝãîåôå ôï óýóôçìá óáò ãéá íá äåßôå ðïéá áñ÷åßá áíÞêïõí óôçí ïìÜäá ðïõ ìåôïíïìÜæåôå Þ äéáãñÜöåôå:

```
# find / -group GID -print
```

Ç ðáñáðÜíù åíôïëÞ èá óáò äåßîåé üëá ôá áñ÷åßá ôá ïðïßá áíÞêïõí óôçí ïìÜäá *`GID`* (ìðïñåßôå íá äþóåôå üíïìá Þ áñéèìçôéêü áíáãíùñéóôéêü ôçò ïìÜäáò).

25.7.5 Ìåôáâåßôå óå ÊáôÜóôáóç Åíüò ×ñÞóôç

ºóùò ðñïôéìÜôå íá ìåôáãëùôôßóåôå ôï óýóôçìá óå êáôÜóôáóç åíüò ÷ñÞóôç. Åêôüò áðü ôï ðñïöáíÝò ðëåïíÝêôçìá ôçò åëáöñÜ ìåãáëýôåñçò ôá÷ýôçôáò, ç åðáíåãêáôÜóôáóç ôïõ óõóôÞìáôïò èá åðçñåÜóåé ðïëëÜ óçìáíôéêÜ áñ÷åßá ôïõ óõóôÞìáôïò, üëá ôá åêôåëÝóéìá áñ÷åßá ôïõ âáóéêïý óõóôÞìáôïò, ôéò âéâëéïèÞêåò, ôá áñ÷åßá include ê.á. Áí ôá áëëÜîåôå áõôÜ óå Ýíá óýóôçìá ðïõ âñßóêåôáé óå êáíïíéêÞ ëåéôïõñãßá (êáé åéäéêÜ áí õðÜñ÷ïõí åíåñãïß ÷ñÞóôåò ôçí äåäïìÝíç óôéãìÞ), øÜ÷íåôå ãéá ìðåëÜäåò.

Ìéá Üëëç ìÝèïäïò åßíáé íá ìåôáãëùôôßóåôå ôï óýóôçìá óå êáôÜóôáóç êáíïíéêÞò ëåéôïõñãßáò, áëëÜ íá ìåôáâåßôå óå êáôÜóôáóç åíüò ÷ñÞóôç ãéá ôçí åãêáôÜóôáóç. Áí èÝëåôå íá ôï êÜíåôå ìå áõôü ôïí ôñüðï, áðëþò ìçí åêôåëÝóåôå ôá áêüëïõèá âÞìáôá ìÝ÷ñé ôï ôÝëïò ôçò ìåôáãëþôôéóçò. Ìðïñåßôå íá áíáâÜëëåôå ôç ìåôÜâáóç óå êáôÜóôáóç åíüò ÷ñÞóôç ìÝ÷ñé íá åßóôå Ýôïéìïé ãéá ôï `installkernel` Þ `installworld`.

Ùò õðåñ÷ñÞóôçò ìðïñåßôå íá åêôåëÝóåôå:

```
# shutdown now
```

óå Ýíá óýóôçìá óå êáíïíéêÞ ëåéôïõñãßá ãéá íá ìåôáâåßôå óå êáôÜóôáóç åíüò ÷ñÞóôç.

Åíáëëáêôéêü, åðáíåêêéíÞóôå ôï óýóôçìá êáé óôçí ðñïôñïðÞ ôïõ öïñôùôÞ åêêßíçóçò, åðéëÝîôå “single user”. Ôï óýóôçìá èá îåêéíÞóåé óå êáôÜóôáóç åíüò ÷ñÞóôç. Óôçí ðñïôñïðÞ ôçò ãñáììÞò åíôïëþí èá ðñÝðåé íá ãñÜøåôå:

```
# fsck -p
# mount -u /
# mount -a -t ufs
# swapon -a
```

Èá ãßíåé Ýëåã÷ïò óôá óõóôÞìáôá áñ÷åßùí, êáé ðñïóÜñôçóç ôïõ `/` ìå äõíáôüôçôá áíÜãíùóçò/åããñáöÞò. ¸ðåéôá èá ðñïóáñôçèïýí üëá ôá Üëëá óõóôÞìáôá áñ÷åßùí UFS ôá ïðïßá áíáöÝñïíôáé óôï `/etc/fstab`, êáé èá åíåñãïðïéçèåß ôï swap.

> **Óçìåßùóç:** Áí ôï CMOS ñïëüé ôïõ õðïëïãéóôÞ óáò åßíáé ñõèìéóìÝíï óå ôïðéêÞ þñá êáé ü÷é óå GMT (áõôü åßíáé áëÞèåéá áí ç Ýîïäïò ôçò åíôïëÞò date(1) äåí äåß÷íåé óùóôÞ çìåñïìçíßá êáé þñá), ßóùò ÷ñåéáóôåß íá åêôåëÝóåôå åðßóçò ôçí ðáñáêÜôù åíôïëÞ:
>
> ```
> # adjkerntz -i
> ```
>
> Ìå áõôü ôïí ôñüðï èá âåâáéùèåßôå üôé ïé ôïðéêÝò óáò ñõèìßóåéò þñáò Ý÷ïõí ñõèìéóôåß óùóôÜ. ÄéáöïñåôéêÜ, ìðïñåß íá óõíáíôÞóåôå ðñïâëÞìáôá áñãüôåñá.

25.7.6 ÄéáãñÜøôå ôï `/usr/obj`

Êáèþò ãßíåôáé ç åðáíáìåôáãëþôôéóç, ôìÞìáôá ôïõ óõóôÞìáôïò ôïðïèåôïýíôáé áðü ðñïåðéëïãÞ óå õðïêáôáëüãïõò ôïõ `/usr/obj`. Ïé õðïêáôÜëïãïé áõôïß áíôéãñÜöïõí ôç äïìÞ ðïõ áêïëïõèåßôáé óôï `/usr/src`.

Ìðïñåßôå íá åðéôá÷ýíåôå ôç äéáäéêáóßá ôïõ `make buildworld` êáé åðßóçò íá ãëõôþóåôå áðü êÜðïéá ðéèáíÜ ðñïâëÞìáôá, áí äéáãñÜøåôå êáé áõôü ôïí êáôÜëïãï.

ÊÜðïéá áñ÷åßá óå õðïêáôáëüãïõò ôïõ `/usr/obj` ìðïñåß íá Ý÷ïõí ÷áñáêôçñéóôåß ùò immutable ìÝóù ôïõ áíôßóôïé÷ïõ flag (ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò äåßôå ôï chflags(1)). Ðñéí äéáãñÜøåôå áõôÜ ôá áñ÷åßá, èá ðñÝðåé ðñþôá íá êáôáñãÞóåôå áõôü ôï flag.

```
# cd /usr/obj
# chflags -R noschg *
# rm -rf *
```

25.7.7 Åðáíáìåôáãëùôôßóôå ôï Âáóéêü Óýóôçìá

25.7.7.1 Áðïèçêåýóôå ôçí ¸îïäï

Êáèþò åêôåëåßôáé ç make(1), åßíáé êáëÞ éäÝá ç Ýîïäïò ôçò íá áðïèçêåýåôáé óå êÜðïéï Üëëï áñ÷åßï. Áí êÜôé ðÜåé óôñáâÜ, èá Ý÷åôå Ýíá áíôßãñáöï ôïõ ìçíýìáôïò ëÜèïõò. Áí êáé áõôü ßóùò äåí óáò âïçèÞóåé íá âñåßôå ôé ðÞãå óôñáâÜ, ìðïñåß íá âïçèÞóåé Üëëïõò áí óôåßëåôå ôï ìÞíõìá óáò óå ìéá áðü ôéò ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ ôïõ FreeBSD.

Ï åõêïëüôåñïò ôñüðïò ãéá íá ãßíåé áõôü, åßíáé ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ script(1) ìå ìéá ðáñÜìåôñï ðïõ íá êáèïñßæåé ôï üíïìá ôïõ áñ÷åßïõ óôï ïðïßï èá áðïèçêåõôåß ç Ýîïäïò. Èá ðñÝðåé íá ôï åêôåëÝóåôå áìÝóùò ðñéí îåêéíÞóåôå ôçí ìåôáãëþôôéóç ôïõ âáóéêïý óõóôÞìáôïò, êáé íá ãñÜøåôå **`exit`** ìüëéò ç äéáäéêáóßá ïëïêëçñùèåß.

```
# script /var/tmp/mw.out
Script started, output file is /var/tmp/mw.out
# make TARGET
... ìåôáãëþôôéóç, ìåôáãëþôôéóç, ìåôáãëþôôéóç ...
# exit
Script done, ...
```

Áí áðïöáóßóåôå íá áðïèçêåýóåôå ôçí Ýîïäï, *ìç ÷ñçóéìïðïéÞóåôå* ãéá áõôü ôï óêïðü ôïí êáôÜëïãï `/tmp`. Ôá ðåñéå÷üìåíá áõôïý ôïõ êáôáëüãïõ ðéèáíþò íá äéáãñáöïýí ôçí åðüìåíç öïñÜ ðïõ èá åêêéíÞóåôå ôï óýóôçìá óáò. ¸íáò êáëýôåñïò êáôÜëïãïò ãéá ôçí áðïèÞêåõóç ôïõ åßíáé ï `/var/tmp` (üðùò óôï ðñïçãïýìåíï ðáñÜäåéãìá) Þ ï ðñïóùðéêüò êáôÜëïãïò ôïõ `root`.

25.7.7.2 Ìåôáãëùôôßóôå ôï Âáóéêü Óýóôçìá

Èá ðñÝðåé íá âñßóêåóôå óôïí êáôÜëïãï `/usr/src`:

```
# cd /usr/src
```

(åêôüò áí öõóéêÜ Ý÷åôå áðïèçêåýóåé ôïí ðçãáßï êþäéêá óå êÜðïéï Üëëï êáôÜëïãï, ïðüôå áðëþò ìåôáêéíçèåßôå óå áõôüí).

Ãéá íá åðáíáìåôáãëùôôßóåôå ôï âáóéêü óýóôçìá, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ make(1). Ç åíôïëÞ áõôÞ äéáâÜæåé ôéò ó÷åôéêÝò ïäçãßåò áðü ôï áñ÷åßï `Makefile`, ôï ïðïßï ðåñéãñÜöåé ìå ðïéï ôñüðï ðñÝðåé íá ìåôáãëùôôéóôïýí ôá ðñïãñÜììáôá áðü ôá ïðïßá áðïôåëåßôáé ôï FreeBSD, ôç óåéñÜ ìå ôçí ïðïßá ðñÝðåé íá ãßíåé ç ìåôáãëþôôéóç ê.ï.ê.

Ç ãåíéêÞ ìïñöÞ ôçò åíôïëÞò ðïõ èá ðëçêôñïëïãÞóåôå åßíáé ç ðáñáêÜôù:

```
# make -x -DVARIABLE target
```

Óôï ðáñÜäåéãìá áõôü, ôï *`-x`* áíôéðñïóùðåýåé ìéá åðéëïãÞ ðïõ èÝëåôå íá äþóåôå óôçí make(1). Äåßôå ôçí óåëßäá manual ôïõ make(1) ãéá ðáñáäåßãìáôá äõíáôþí åðéëïãþí.

Ç åðéëïãÞ `-DVARIABLE` ðåñíÜåé ìéá ìåôáâëçôÞ óôï `Makefile`. Ç óõìðåñéöïñÜ ôïõ `Makefile` åëÝã÷åôáé áðü ôÝôïéïõ åßäïõò ìåôáâëçôÝò. Ðñüêåéôáé ãéá ôéò ßäéåò ìåôáâëçôÝò ðïõ êáèïñßæïíôáé êáé óôï `/etc/make.conf`, êáé áõôüò åßíáé Ýíáò áêüìá ôñüðïò êáèïñéóìïý ôïõò.

```
# make -DNO_PROFILE target
```

Ôï ðáñáðÜíù äåß÷íåé Ýíá åðéðëÝïí ôñüðï íá êáèïñßóåôå üôé äåí èÝëåôå íá ìåôáãëùôôéóôïýí ïé âéâëéïèÞêåò ìå ðëçñïöïñßåò profiling, êáé áíôéóôïé÷åß ìå ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/make.conf`:

```
NO_PROFILE=    true     #    Avoid compiling profiled libraries
```

Ôï *`target`* äçëþíåé óôï make(1) ôé èÝëåôå íá êÜíåôå. Óå êÜèå `Makefile` ïñßæåôáé Ýíáò áñéèìüò äéáöïñåôéêþí “targets”, êáé ç åðéëïãÞ ðïõ èá êÜíåôå, êáèïñßæåé ôé áêñéâþò èá ãßíåé.

ÊÜðïéá áðü ôá targets ðïõ êáèïñßæïíôáé óôï `Makefile`, äåí ðñïïñßæïíôáé ãéá Üìåóç åêôÝëåóç áðü ôï ÷ñÞóôç. Áíôß ãéá áõôü, ÷ñçóéìïðïéïýíôáé áðü ôç äéáäéêáóßá ìåôáãëþôôéóçò ãéá íá ìïéñáóôåß ï áñéèìüò ôùí âçìÜôùí ðïõ áðáéôïýíôáé ãéá ôç ìåôáãëþôôéóç ôïõ óõóôÞìáôïò, óå Ýíá áñéèìü õðï-âçìÜôùí.

Óôéò ðåñéóóüôåñåò ðåñéðôþóåéò äåí èá ÷ñåéáóôåß íá äþóåôå êáìßá ðáñÜìåôñï óôï make(1), êáé Ýôóé ç åíôïëÞ óáò èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
# make target
```

¼ðïõ ôï *`target`* èá åßíáé ìéá áðü ôéò ðïëëÝò åðéëïãÝò ìåôáãëþôôéóçò. Ôï ðñþôï target èá ðñÝðåé ðÜíôá íá åßíáé ôï `buildworld`.

¼ðùò åííïåßôáé êáé áðü ôï üíïìá, ôï `buildworld` ìåôáãëùôôßæåé Ýíá ðëÞñåò äÝíôñï ìÝóá óôïí êáôÜëïãï `/usr/obj`, åíþ ôï `installworld`, åãêáèéóôÜ áõôü ôï äÝíôñï óôï ôñÝ÷ïí ìç÷Üíçìá.

Ç ýðáñîç äéáöïñåôéêþí åðéëïãþí, åßíáé ÷ñÞóéìç ãéá äýï ëüãïõò. Ðñþôá áðü üëá, óáò åðéôñÝðåé íá åêôåëÝóåôå ôç äéáäéêáóßá ìåôáãëþôôéóçò ìå áóöÜëåéá, ãíùñßæïíôáò üôé äåí ðñüêåéôáé íá åðçñåáóôåß êáíÝíá ôìÞìá ôïõ ôñÝ÷ïíôïò óõóôÞìáôüò óáò. Ç äéáäéêáóßá ìåôáãëþôôéóçò åßíáé “self hosted”, áðïìïíùìÝíç áðü ôçí ëåéôïõñãßá ôïõ ìç÷áíÞìáôïò. Ìðïñåßôå Ýôóé íá åêôåëÝóåôå ôï `buildworld` óå Ýíá ìç÷Üíçìá ðïõ âñßóêåôáé óå êáíïíéêÞ ëåéôïõñãßá (ðïëëáðëþí ÷ñçóôþí) ÷ùñßò íá õðÜñ÷åé öüâïò ðáñåíÝñãåéáò. Ùóôüóï, óõíßóôáôáé íá åêôåëÝóåôå ôï `installworld` óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç.

Ï äåýôåñïò ëüãïò åßíáé üôé óáò åðéôñÝðåé íá ÷ñçóéìïðïéÞóåôå ðñïóáñôÞóåéò NFS ãéá íá áíáâáèìßóåôå ðïëëÜ ìç÷áíÞìáôá ôïõ äéêôýïõ óáò. Áí Ý÷åôå ôñßá ìç÷áíÞìáôá, ôá `A`, `B` êáé `C` ôá ïðïßá èÝëåôå íá áíáâáèìßóåôå, åêôåëÝóôå ôï `make buildworld` êáé ôï `make installworld` óôï ìç÷Üíçìá `A`. Ôï `B` êáé ôï `C` ìðïñïýí íá ðñïóáñôÞóïõí ôïí êáôÜëïãï `/usr/src` êáé ôïí `/usr/obj` áðü ôïí `A` ìÝóù NFS, êáé Ýðåéôá ìðïñåßôå íá åêôåëÝóåôå ôï `make installworld` ãéá íá åãêáôáóôÞóåôå ôï Ýôïéìï ðëÝïí óýóôçìá óôïí `B` êáé `C`.

Áí êáé õðÜñ÷åé áêüìá ôï target `world`, äåí óõíßóôáôáé ðëÝïí ç ÷ñÞóç ôïõ.

ÅêôåëÝóôå ôçí åíôïëÞ:

```
# make buildworld
```

Ìðïñåßôå íá êáèïñßóåôå ôçí åðéëïãÞ `-j` óôçí `make` þóôå íá åêôåëåóôåß óå ðïëëáðëÝò äéåñãáóßåò. Áõôü åßíáé ðåñéóóüôåñï ÷ñÞóéìï óå ìç÷áíÞìáôá ìå ðïëëáðëïýò åðåîåñãáóôÝò, ùóôüóï êáèþò ôï ìåãáëýôåñï ìÝñïò ôçò äéáäéêáóßáò ìåôáãëþôôéóçò êáèõóôåñåß åîáéôßáò ôïõ óêëçñïý äßóêïõ (IO bound) êáé ü÷é ôçò CPU, ìðïñåß íá óáò öáíåß ÷ñÞóéìï áêüìá êáé óå ìç÷áíÞìáôá ìå Ýíá åðåîåñãáóôÞ.

Óå Ýíá ôõðéêü ìç÷Üíçìá ìå ìéá CPU, èá ìðïñïýóáôå íá äþóåôå:

```
# make -j4 buildworld
```

Ìå ôçí ðáñáðÜíù åíôïëÞ, ôï make(1) èá ÷ñçóéìïðïéåß ìÝ÷ñé 4 äéåñãáóßåò êÜèå ÷ñïíéêÞ óôéãìÞ. Áðü ôçí åìðåéñßá ðïõ Ý÷ïõìå êáé áðü üôé áíáöÝñïõí ïé ÷ñÞóôåò óôéò ëßóôåò, öáßíåôáé üôé ç ñýèìéóç áõôÞ äßíåé ãåíéêÜ ôçí êáëýôåñç áðüäïóç.

Áí Ý÷åôå ìç÷Üíçìá ìå ðïëëïýò åðåîåñãáóôÝò, êáé ÷ñçóéìïðïéåßôå ðõñÞíá ìå äõíáôüôçôá SMP, äïêéìÜóôå ôéìÝò ìåôáîý ôïõ 6 êáé ôïõ 10 ãéá íá äåßôå ðïéá åðéôá÷ýíåé êáëýôåñá ôï áðïôÝëåóìá.

25.7.7.3 ×ñüíïò Ìåôáãëþôôéóçò

Ï ÷ñüíïò ðïõ áðáéôåßôáé ãéá ôçí ìåôáãëþôôéóç åîáñôÜôáé áðü ðïëëïýò ðáñÜãïíôåò. Ùóôüóï, óå óýã÷ñïíá ìç÷áíÞìáôá ç äéáäéêáóßá äåí èñáôÜåé ðåñéóóüôåñï áðü ìßá Þ äýï þñåò, üôáí ãßíåôáé ìåôáãëþôôéóç ôïõ äÝíôñïõ FreeBSD-STABLE, êáé ìÜëéóôá ÷ùñßò íá ÷ñåéÜæåôáé íá ãßíïõí åéäéêÝò ñõèìßóåéò Þ êüëðá. Ôï äÝíôñï FreeBSD-CURRENT ÷ñåéÜæåôáé ãåíéêÜ ëßãï ðåñéóóüôåñï ÷ñüíï ãéá íá ìåôáãëùôôéóôåß.

25.7.8 Ìåôáãëùôôßóôå êáé Åãêáôáóôçóôå ÍÝï ÐõñÞíá

Ãéá íá åêìåôáëëåõèåßôå ðëÞñùò ôï íÝï óáò óýóôçìá, èá ðñÝðåé íá åðáíáìåôáãëùôôßóåôå ôïí ðõñÞíá. Áõôü åßíáé ðñáêôéêÜ áíáãêáßï, êáèþò êÜðïéåò äïìÝò óôç ìíÞìç ðéèáíþò íá Ý÷ïõí áëëÜîåé, êáé Ýôóé ðñïãñÜììáôá üðùò ôá ps(1) êáé top(1) äåí èá ëåéôïõñãïýí óùóôÜ ìÝ÷ñé íá óõã÷ñïíßóåôå ôïí ðõñÞíá ìå ôçí Ýêäïóç ðçãáßïõ êþäéêá ôïõ âáóéêïý óõóôÞìáôïò.

Ï áðëïýóôåñïò êáé ðéï áóöáëÞò ôñüðïò, åßíáé íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå Ýíá ðõñÞíá âáóéóìÝíï óôïí `GENERIC`. Áí êáé ï `GENERIC` ìðïñåß íá ìçí ðåñéÝ÷åé üëåò ôéò áðáñáßôçôåò óõóêåõÝò ãéá ôï óýóôçìá óáò, èá ðñÝðåé íá ðåñéÝ÷åé üôé ÷ñåéÜæåôáé þóôå íá îåêéíÞóåôå îáíÜ ôï óýóôçìá óáò óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç. Áõôü åßíáé Ýíá êáëü ôåóô óùóôÞò ëåéôïõñãßáò ôïõ óõóôÞìáôïò. ÌåôÜ ôçí åêêßíçóç ìå ôïí `GENERIC`, êáé áöïý åðáëçèåýóåôå ôç óùóôÞ ëåéôïõñãßá ôïõ óõóôÞìáôïò, ìðïñåßôå íá ìåôáãëùôôßóåôå Ýíá íÝï ðõñÞíá âáóéóìÝíï óôï äéêü óáò ðñïóáñìïóìÝíï áñ÷åßï ñõèìßóåùí.

Óôï FreeBSD åßíáé óçìáíôéêü íá åêôåëÝóåôå ôï build world ðñéí ìåôáãëùôôßóåôå íÝï ðõñÞíá.

> **Óçìåßùóç:** Áí èÝëåôå íá ìåôáãëùôôßóåôå íÝï ðõñÞíá, êáé Ý÷åôå Þäç Ýíá áñ÷åßï ìå ðñïóáñìïóìÝíåò ñõèìßóåéò, ÷ñçóéìïðïéÞóôå áðëþò ôçí åðéëïãÞ `KERNCONF=MYKERNEL` ìå ôïí ôñüðï ðïõ öáßíåôáé ðáñáêÜôù:
>
> ```
> # cd /usr/src
> # make buildkernel KERNCONF=MYKERNEL
> # make installkernel KERNCONF=MYKERNEL
> ```

Óçìåéþóôå üôé áí Ý÷åôå áíåâÜóåé ôçí ôéìÞ ôïõ `kern.securelevel` ðÜíù áðü ôï 1, *êáé* Ý÷åôå èÝóåé ôï flag `noschg` Þ êÜðïéï áíôßóôïé÷ï óôï åêôåëÝóéìï áñ÷åßï ôïõ ðõñÞíá, ìÜëëïí èá ÷ñåéáóôåß íá ìåôáâåßôå óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç ãéá íá ÷ñçóéìïðïéÞóåôå ôï `installkernel`. Äéáöïñåôéêü, ìðïñåßôå íá åêôåëÝóåôå êáé ôéò äýï áõôÝò åíôïëÝò áðü ôçí êáíïíéêÞ êáôÜóôáóç ëåéôïõñãßáò (ðïëëþí ÷ñçóôþí) ÷ùñßò íá äçìéïõñãçèïýí ðñïâëÞìáôá. Äåßôå ôç óåëßäá manual ôïõ init(8) ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôç ñýèìéóç `kern.securelevel` êáé ôç óåëßäá ôïõ chflags(1) ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôá äéÜöïñá flags ðïõ ÷ñçóéìïðïéïýíôáé óå áñ÷åßá.

25.7.9 Åðáíåêêéíçóôå óå ÊáôÜóôáóç Ëåéôïõñãßáò Åíüò ×ñÞóôç

Èá ðñÝðåé íá åðáíåêêéíÞóåôå óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç ãéá íá åðáëçèåýóåôå ôç ëåéôïõñãßá ôïõ íÝïõ ðõñÞíá. Ãéá ôï óêïðü áõôü, ÷ñçóéìïðïéÞóôå ôéò ïäçãßåò ðïõ åßäáìå óôï ÔìÞìá 25.7.5.

25.7.10 ÅãêáôáóôÞóôå ôá ÍÝá ÅêôåëÝóéìá ôïõ ÓõóôÞìáôïò

Èá ðñÝðåé ôþñá íá ÷ñçóéìïðïéÞóåôå ôï `installworld` ãéá íá åãêáôáóôÞóåôå ôá íÝá åêôåëÝóéìá ôïõ óõóôÞìáôïò.

ÅêôåëÝóôå ôéò ðáñáêÜôù åíôïëÝò:

```
# cd /usr/src
# make installworld
```

> **Óçìåßùóç:** Áí Ý÷åôå êáèïñßóåé ìåôáâëçôÝò óôç ãñáììÞ åíôïëþí ôïõ `make buildworld` èá ðñÝðåé íá êáèïñßóåôå ôéò ßäéåò ìåôáâëçôÝò êáé óôçí ãñáììÞ åíôïëþí ôïõ `make installworld`. Áõôü äåí åßíáé áðáñáßôçôá áëÞèåéá ãéá Üëëåò åðéëïãÝò. Ãéá ðáñÜäåéãìá, ç åðéëïãÞ `-j` äåí ðñÝðåé ðïôÝ íá ÷ñçóéìïðïéåßôå ìå ôï `installworld`.
>
> Ãéá ðáñÜäåéãìá áí åêôåëÝóåôå:
>
> ```
> # make -DNO_PROFILE buildworld
> ```
>
> Èá ðñÝðåé íá åãêáôáóôÞóåôå ôï áðïôÝëåóìá ÷ñçóéìïðïéþíôáò:
>
> ```
> # make -DNO_PROFILE installworld
> ```
>
> äéáöïñåôéêÜ ôï make(1) èá ðñïóðáèÞóåé íá åãêáôáóôÞóåé âéâëéïèÞêåò ìå profiling, ôéò ïðïßåò üìùò äåí ìåôáãëùôôßóôçêáí êáôÜ ôç äéÜñêåéá ôçò öÜóçò `make buildworld`.

25.7.11 ÅíçìåñþóôÝ ¼óá Áñ÷åßá äåí Åíçìåñþèçêáí áðü ôï `make installworld`

Ç åðáíáìåôáãëþôôéóç ôïõ âáóéêïý óõóôÞìáôïò äåí èá åíçìåñþóåé ïñéóìÝíïõò êáôáëüãïõò (åéäéêüôåñá ôïõò `/etc`, `/var` êáé `/usr`) ìå ôá íÝá Þ áëëáãìÝíá áñ÷åßá ñõèìßóåùí.

Ï áðëïýóôåñïò ôñüðïò ãéá íá åíçìåñþóåôå ôá áñ÷åßá áõôÜ åßíáé íá ÷ñçóéìïðïéÞóåôå ôï mergemaster(8), áí êáé ìðïñåßôå íá ôï êÜíåôå êáé ÷åéñïêßíçôá áí ðñïôéìÜôå. ¶ó÷åôá áðü ôïí ôñüðï ðïõ èá ðñïôéìÞóåôå, âåâáéùèåßôå üôé Ý÷åôå ðÜñåé áíôßãñáöï áóöáëåßáò ôïõ `/etc` óå ðåñßðôùóç ðïõ êÜôé ðÜåé óôñáâÜ.

25.7.11.1 `mergemaster`

Óõíåéóöïñü ôïõ Tom Rhodes.

Ôï âïçèçôéêü ðñüãñáììá mergemaster(8) åßíáé Ýíá Bourne script ôï ïðïßï èá óáò âïçèÞóåé íá êáèïñßóåôå ôéò äéáöïñÝò ìåôáîý ôùí åãêáôåóôçìÝíùí óôï `/etc` áñ÷åßùí ñõèìßóåùí, êáé ôùí áíôßóôïé÷ùí óôï äÝíôñï ðçãáßïõ êþäéêá óôï `/usr/src/etc`. ÁõôÞ åßíáé êáé ç óõíéóôþìåíç ëýóç ãéá íá åíçìåñþóåôå ôá áñ÷åßá ñõèìßóåùí ôïõ óõóôÞìáôïò ìå ôõ÷üí áëëáãÝò ðïõ Ý÷ïõí ãßíåé óôïí íÝï ðçãáßï êþäéêá.

Ãéá íá îåêéíÞóåôå, áðëþò ãñÜøôå `mergemaster` óôçí ðñïôñïðÞ ôçò ãñáììÞò åíôïëþí êáé ðáñáêïëïõèÞóôå ôçí êáèþò ëåéôïõñãåß. Ôï `mergemaster` èá äçìéïõñãÞóåé Ýíá ðñïóùñéíü ðåñéâÜëëïí root, áðü ôï `/` êáé êÜôù, êáé èá ôï ãåìßóåé ìå äéÜöïñá áñ÷åßá ñõèìßóåùí ôïõ óõóôÞìáôïò. ¸ðåéôá èá ãßíåé óýãêñéóç áõôþí ôùí áñ÷åßùí ìå ôá áíôßóôïé÷á ôïõ âñßóêïíôáé Þäç åãêáôåóôçìÝíá óôï óýóôçìá óáò. Óôï óçìåßï áõôü, èá óáò äåßîåé ôá áñ÷åßá ðïõ äéáöÝñïõí ìå ìïñöÞ diff(1), üðïõ ïé ãñáììÝò ðïõ Ý÷ïõí ôñïðïðïéçèåß Þ åßíáé íÝåò èá öáßíïíôáé ìå Ýíá +, åíþ ìå ôï - èá öáßíïíôáé ïé ãñáììÝò ðïõ åßôå áöáéñïýíôáé åíôåëþò Þ ðïõ áíôéêáèßóôáíôáé áðü ìéá íÝá ãñáììÞ. Äåßôå ôç óåëßäá manual ôïõ diff(1) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç óýíôáîç ôïõ diff(1) êáé ãéá ôïí ôñüðï ìå ôïí ïðïßï öáßíïíôáé ïé äéáöïñÝò ìåôáîý ôùí áñ÷åßùí.

Ôï mergemaster(8) èá óáò äåßîåé Ýðåéôá êÜèå áñ÷åßï ðïõ ðáñïõóéÜæåé äéáöïñÝò, êáé óôï óçìåßï áõôü èá Ý÷åôå ôçí äõíáôüôçôá åßôå íá äéáãñÜøåôå ôï íÝï áñ÷åßï (ôï ïðïßï áíáöÝñåôáé ùò ðñïóùñéíü áñ÷åßï), åßôå íá åãêáôáóôÞóåôå ôï ðñïóùñéíü áñ÷åßï ÷ùñßò íá êÜíåôå óå áõôü êáìéÜ áëëáãÞ, åßôå íá óõã÷ùíåýóåôå ôéò áëëáãÝò ôùí äýï áñ÷åßùí, Þ ôÝëïò íá îáíáäåßôå ôéò äéáöïñÝò ìÝóù ôçò diff(1).

Áí åðéëÝîåôå íá äéáãñÜøåôå ôï ðñïóùñéíü áñ÷åßï, ôï mergemaster(8) èá êáôáëÜâåé üôé åðéèõìåßôå íá äéáôçñÞóåôå ôï ôñÝ÷ïí áñ÷åßï óáò ÷ùñßò áëëáãÝò, êáé íá äéáãñÜøåôå ôç íÝá Ýêäïóç. Ç åðéëïãÞ áõôÞ ãåíéêÜ äåí óõíßóôáôáé, åêôüò áí äåí âëÝðåôå êáíÝíá ëüãï íá áëëÜîåôå ôï ôñÝ÷ïí áñ÷åßï. Ìðïñåßôå íá äåßôå âïÞèåéá ïðïéáäÞðïôå óôéãìÞ êáôÜ ôç äéÜñêåéá ôçò äéáäéêáóßáò, ðëçêôñïëïãþíôáò **?** óôçí ðñïôñïðÞ ôïõ mergemaster(8). Áí áðïöáóßóåôå íá ðáñáëåßøåôå êÜðïéï áñ÷åßï, áõôü èá åìöáíéóôåß îáíÜ ìåôÜ ôï ôÝëïò üëùí ôùí Üëëùí áñ÷åßùí.

Áí åðéëÝîåôå íá åãêáôáóôÞóåôå ôï ðñïóùñéíü áñ÷åßï ÷ùñßò áëëáãÝò, áõôü èá áíôéêáôáóôÞóåé ôï Þäç åãêáôåóôçìÝíï óáò áñ÷åßï. ÁõôÞ åßíáé êáé ç êáëýôåñç åðéëïãÞ ãéá ôá áñ÷åßá ôá ïðïßá äåí Ý÷åôå áëëÜîåé åóåßò ÷åéñïêßíçôá.

Áí åðéëÝîåôå íá óõã÷ùíåýóåôå ôá äýï áñ÷åßá, èá åìöáíéóôåß Ýíáò åðåîåñãáóôÞò êåéìÝíïõ ìå ôá ðåñéå÷üìåíá êáé ôùí äýï áñ÷åßùí. Ìðïñåßôå ôþñá íá ôá óõã÷ùíåýóåôå ðáñáôçñþíôáò ôáõôü÷ñïíá êáé ôá äýï áñ÷åßá äßðëá-äßðëá, êáé åðéëÝãïíôáò ôìÞìáôá êáé áðü ôá äýï ãéá íá äçìéïõñãÞóåôå ôçí ôåëéêÞ Ýêäïóç. ÊáôÜ ôç óýãêñéóç áõôÞ, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ðëÞêôñï **l** ãéá íá åðéëÝîåôå ôá ðåñéå÷üìåíá ðïõ öáßíïíôáé óôçí áñéóôåñÞ ðëåõñÜ, Þ ôï **r** ãéá ôá áíôßóôïé÷á ðåñéå÷üìåíá óôç äåîéÜ. Ôï ôåëéêü áðïôÝëåóìá èá åßíáé Ýíá áñ÷åßï ðïõ èá áðïôåëåßôáé áðü ôìÞìáôá êáé ôùí äýï áñ÷åßùí, êáé ôï ïðïßï ìðïñåßôå íá åãêáôáóôÞóåôå. Ç åðéëïãÞ áõôÞ ÷ñçóéìïðïéåßôáé óõíÞèùò ãéá áñ÷åßá ôùí ïðïßùí ôá ðåñéå÷üìåíá Ý÷åé ìåôáâëçèåß áðü ôï ÷ñÞóôç.

Áí åðéëÝîåôå íá äåßôå îáíÜ ôéò äéáöïñÝò ìÝóù ôçò diff(1), áõôÝò èá åìöáíéóôïýí áêñéâþò üðùò Ýãéíå êáé ðñéí óáò ñùôÞóåé ôï mergemaster(8) íá åðéëÝîåôå ôé èÝëåôå íá êÜíåôå ìå ôï áñ÷åßï.

Ìüëéò ïëïêëçñùèåß ç ëåéôïõñãßá ôïõ mergemaster(8) óôá áñ÷åßá óõóôÞìáôïò, èá óáò ñùôÞóåé ãéá Üëëåò åðéëïãÝò. Ôï mergemaster(8) ßóùò óáò ñùôÞóåé áí èÝëåôå íá áíáäçìéïõñãÞóåôå ôï áñ÷åßï ôùí êùäéêþí (password file), êáé èá ôåëåéþóåé äßíïíôáò óáò ôçí åðéëïãÞ íá äéáãñÜøåôå ôõ÷üí ðñïóùñéíÜ áñ÷åßá ðïõ äçìéïõñãÞèçêáí êáôÜ ôçí äéáäéêáóßá.

25.7.11.2 ×åéñïêßíçôç ÅíçìÝñùóç

Áí åðéèõìåßôå íá êÜíåôå ôçí åíçìÝñùóç ÷åéñïêßíçôá, äåí ìðïñåßôå áðëþò íá áíôéãñÜøåôå ôá áñ÷åßá áðü ôïí êáôÜëïãï `/usr/src/etc` óôïí `/etc` êáé íá ðåñéìÝíåôå üôé ôï óýóôçìá óáò èá ëåéôïõñãÞóåé óùóôÜ. ÊÜðïéá áðü áõôÜ ôá áñ÷åßá èá ðñÝðåé íá “åãêáôáóôáèïýí” ðñþôá. Áõôü óõìâáßíåé åðåéäÞ ï êáôÜëïãïò `/usr/src/etc` *äåí åßíáé* êáíïíéêü áíôßãñáöï ôïõ `/etc`. Åðéðñüóèåôá, õðÜñ÷ïõí áñ÷åßá ôá ïðïßá ðñÝðåé íá âñßóêïíôáé óôïí êáôÜëïãï `/etc`, áëëÜ äåí õðÜñ÷ïõí óôïí `/usr/src/etc`.

Áí ÷ñçóéìïðïéåßôå ôï mergemaster(8) (üðùò êáé óõíßóôáôáé), ìðïñåßôå íá äéáâÜóåôå êáôåõèåßáí ôçí åðüìåíç åíüôçôá.

Ï áðëïýóôåñïò ôñüðïò íá ôï êÜíåôå áõôü ÷åéñïêßíçôá, åßíáé íá åãêáôáóôÞóåôå ôá áñ÷åßá óå Ýíá íÝï êáôÜëïãï, êáé Ýðåéôá íá ôá åîåôÜóåôå Ýíá-Ýíá øÜ÷íïíôáò ãéá ôéò áëëáãÝò.

> **ÊñáôÞóôå ¸íá Áíôßãñáöï Áóöáëåßáò ôïõ Êáôáëüãïõ `/etc`:** Áí êáé èåùñçôéêÜ, ôßðïôá äåí ðñüêåéôáé íá ðåéñÜîåé áõôü ôïí êáôÜëïãï áõôüìáôá, åßíáé ðÜíôá êáëýôåñá íá åßìáóôå óßãïõñïé. Ãéá ôï ëüãï áõôü, áíôéãñÜøôå ôïí õðÜñ÷ïíôá êáôÜëïãï `/etc` óå êÜðïéï áóöáëÝò ìÝñïò. ×ñçóéìïðïéÞóôå ìéá åíôïëÞ üðùò ç ðáñáêÜôù:

```
# cp -Rp /etc /etc.old
```

Ç åðéëïãÞ `-R` ðñáãìáôïðïéåß áíáäñïìéêÞ áíôéãñáöÞ, åíþ ç `-p` äéáôçñåß ôá äéêáéþìáôá, ôçí éäéïêôçóßá, ôéò çìåñïìçíßåò ôùí áñ÷åßùí, ê.ï.ê.

Èá ðñÝðåé íá äçìéïõñãÞóåôå ìéá øåõôï-äïìÞ êáôáëüãùí ãéá íá åãêáôáóôÞóåôå ôï íÝï êáôÜëïãï `/etc` êáé Üëëá áñ÷åßá. Ìéá ëïãéêÞ åðéëïãÞ åßíáé ï êáôÜëïãïò `/var/tmp/root`, êáé êÜôù áðü áõôüí, èá ðñÝðåé åðßóçò íá äçìéïõñãÞóåôå êáé ìéá ïëüêëçñç óåéñÜ áðü ôïõò õðïêáôáëüãïõò ðïõ áðáéôïýíôáé.

```
# mkdir /var/tmp/root
# cd /usr/src/etc
# make DESTDIR=/var/tmp/root distrib-dirs distribution
```

Ïé ðáñáðÜíù åíôïëÝò èá äçìéïõñãÞóïõí ôçí áðáéôïýìåíç äïìÞ êáôáëüãùí êáé èá åãêáôáóôÞóïõí ôá áñ÷åßá. ÌåãÜëï ìÝñïò ôùí õðïêáôáëüãùí ðïõ Ý÷ïõí äçìéïõñãçèåß êÜôù áðü ôïí `/var/tmp/root` åßíáé Üäåéïé, êáé ðñÝðåé íá äéáãñáöïýí. Ï áðëïýóôåñïò ôñüðïò ãéá íá ãßíåé áõôü, öáßíåôáé ðáñáêÜôù:

```
# cd /var/tmp/root
# find -d . -type d | xargs rmdir 2>/dev/null
```

Áõôü èá äéáãñÜøåé üëïõò ôïõò Üäåéïõò õðïêáôáëüãïõò. (Ç Ýîïäïò óöáëìÜôùí áíáêáôåõèýíåôáé óôï `/dev/null` þóôå íá ìçí åìöáíßæïíôáé óôçí ïèüíç ðñïåéäïðïéÞóåéò ãéá êáôáëüãïõò ðïõ äåí åßíáé Üäåéïé.)

Ôþñá, ï `/var/tmp/root` ðåñéÝ÷åé üëá ôá áñ÷åßá ðïõ èá ðñÝðåé íá ôïðïèåôçèïýí óå êáôÜëëçëåò èÝóåéò êÜôù áðü ôïí `/`. Èá ðñÝðåé ôþñá íá äéáôñÝîåôå êáèÝíá áðü áõôÜ ôá áñ÷åßá, êáé íá êáèïñßóåôå ðùò êáèÝíá áðü áõôÜ äéáöÝñåé áðü ôï áíôßóôïé÷ï õðÜñ÷ïí (åãêáôåóôçìÝíï) áñ÷åßï.

Óçìåéþóôå üôé êÜðïéá áðü ôá áñ÷åßá ôá ïðïßá Ý÷ïõí åãêáôáóôáèåß óôïí `/var/tmp/root` Ý÷ïõí ìéá áñ÷éêÞ “.”. Ôç óôéãìÞ ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò, ôá ìüíá áñ÷åßá óôá ïðïßá óõìâáßíåé áõôü åßíáé ôá áñ÷åßá åêêßíçóçò ôïõ êåëýöïõò óôïí êáôÜëïãï `/var/tmp/root/` êáé `/var/tmp/root/root/`, áí êáé ìðïñåß íá õðÜñ÷ïõí êáé Üëëá (áíÜëïãá ìå ôï ðüôå äéáâÜæåôå ôï êåßìåíï). Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôçí åíôïëÞ `ls -a` ãéá íá ôá äåßôå üëá.

Ï áðëïýóôåñïò ôñüðïò ãéá íá óõãêñßíåôå äýï áñ÷åßá, åßíáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ diff(1):

```
# diff /etc/shells /var/tmp/root/etc/shells
```

Ç ðáñáðÜíù åíôïëÞ èá óáò äåßîåé ôéò äéáöïñÝò ìåôáîý ôïõ áñ÷åßïõ `/etc/shells` êáé ôïõ íÝïõ áñ÷åßïõ `/var/tmp/root/etc/shells`. ×ñçóéìïðïéÞóôå ôéò äéáöïñÝò áõôÝò ãéá íá áðïöáóßóåôå áí èá ðñÝðåé íá óõã÷ùíåýóåôå ôéò áëëáãÝò ðïõ Ý÷åôå êÜíåé, Þ áðëþò íá áíôéãñÜøåôå ôï ðáëéü óáò áñ÷åßï ðÜíù áðü ôï íÝï.

ÐñïóèÝóôå ôçí Çìåñïìçíßá óôï ¼íïìá ôïõ ÍÝïõ Root Êáôáëüãïõ, (`/var/tmp/root`) ¿óôå íá Ìðïñåßôå Åýêïëá íá Óõãêñßíåôå ÄéáöïñåôéêÝò Åêäüóåéò Ìåôáîý ôïõò: Áí ìåôáãëùôôßæåôå óõ÷íÜ ôï âáóéêü óýóôçìá, èá ðñÝðåé åðßóçò íá åíçìåñþíåôå óõ÷íÜ ôïí êáôÜëïãï `/etc`, ôï ïðïßï ìðïñåß íá åßíáé åíï÷ëçôéêü.

Ìðïñåßôå íá åðéôá÷ýíåôå áõôÞ ôç äéáäéêáóßá, ôçñþíôáò Ýíá áíôßãñáöï ôïõ ôåëåõôáßïõ óåô áëëáãìÝíùí áñ÷åßùí ôá ïðïßá óõã÷ùíåýóáôå óôïí êáôÜëïãï `/etc`. Ç ðáñáêÜôù äéáäéêáóßá èá óáò äþóåé ìéá éäÝá ãéá ôï ðùò ìðïñåß íá ãßíåé áõôü:

1. Ìåôáãëùôôßóôå ôï âáóéêü óýóôçìá üðùò êÜíåôå óõíÞèùò. ¼ôáí èÝëåôå íá åíçìåñþóåôå ôïí `/etc` êáé ôïõò Üëëïõò êáôáëüãïõò, äþóôå óôïí êáôÜëïãï ðñïïñéóìïý Ýíá üíïìá âáóéóìÝíï óôçí ôñÝ÷ïõóá çìåñïìçíßá. Áí ôï êÜíáôå áõôü óôéò 14 Öåâñïõáñßïõ 1998, èá ãñÜöáôå êÜôé óáí ôï ðáñáêÜôù:

   ```
   # mkdir /var/tmp/root-19980214
   ```

```
# cd /usr/src/etc
# make DESTDIR=/var/tmp/root-19980214 \
    distrib-dirs distribution
```

2. Óõã÷ùíåýóôå ôéò áëëáãÝò áðü áõôü ôïí êáôÜëïãï, ìå ôïí ôñüðï ðïõ ðåñéãñÜøáìå ðáñáðÜíù.

   Ìçí äéáãñÜøåôå ôïí êáôÜëïãï `/var/tmp/root-19980214` üôáí ôåëåéþóåôå ìå ôçí ðáñáðÜíù äéáäéêáóßá.

3. ¼ôáí êáôåâÜóåôå ôçí ôåëåõôáßá Ýêäïóç ôïõ ðçãáßïõ êþäéêá êáé ôïí ìåôáãëùôôßóåôå îáíÜ, áêïëïõèÞóôå ôï âÞìá 1. Áõôü èá óáò äþóåé Ýíá êáôÜëïãï ðïõ ìðïñåß íá ïíïìÜæåôáé `/var/tmp/root-19980221` (áí áíÜìåóá óôéò äýï ìåôáãëùôôßóåéò ðáñåìâÜëëåôáé äéÜóôçìá ìéáò åâäïìÜäáò).

4. Ìðïñåßôå ôþñá íá äåßôå ôéò äéáöïñÝò ðïõ õðÜñ÷ïõí áíÜìåóá óôéò äýï åâäïìÜäåò, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ diff(1) óå áíáäñïìéêÞ ëåéôïõñãßá ãéá íá äçìéïõñãÞóåôå ôéò äéáöïñÝò ìåôáîý ôùí äýï êáôáëüãùí:

   ```
   # cd /var/tmp
   # diff -r root-19980214 root-19980221
   ```

   ÔõðéêÜ, áõôü ôï óåô áëëáãþí èá åßíáé ðïëý ìéêñüôåñï áðü áõôü ìåôáîý ôïõ `/var/tmp/root-19980221/etc` êáé ôïõ `/etc`. Êáèþò áõôü ôï óåô áëëáãþí åßíáé ìéêñüôåñï, åßíáé êáé ðéï åýêïëï íá åöáñìüóåôå áõôÝò ôéò áëëáãÝò óôïí êáôÜëïãï `/etc`.

5. Ìðïñåßôå ôþñá íá äéáãñÜøåôå ôïí ðáëéüôåñï áðü ôïõò äýï êáôáëüãïõò `/var/tmp/root-*`:

   ```
   # rm -rf /var/tmp/root-19980214
   ```

6. ÅðáíáëÜâåôå áõôÞ ôç äéáäéêáóßá êÜèå öïñÜ ðïõ èÝëåôå íá óõã÷ùíåýóåôå ôéò áëëáãÝò óôïí êáôÜëïãï `/etc`.

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ date(1) ãéá íá áõôïìáôïðïéÞóåôå ôçí äçìéïõñãßá ôùí ïíïìÜôùí êáôáëüãùí:

```
# mkdir /var/tmp/root-‘date "+%Y%m%d"‘
```

25.7.12 Åðáíåêêßíçóç

Ç äéáäéêáóßá Ý÷åé ó÷åäüí ïëïêëçñùèåß. Áöïý åðáëçèåýóåôå üôé üëá âñßóêïíôáé óôéò óùóôÝò èÝóåéò, ìðïñåßôå íá åðáíåêêéíÞóåôå ôï óýóôçìá. Ìéá áðëÞ åíôïëÞ shutdown(8) åßíáé åðáñêÞò:

```
# shutdown -r now
```

25.7.13 ÏëïêëÞñùóç

¸÷åôå ðëÝïí áíáâáèìßóåé ôï FreeBSD óýóôçìá óáò. Óõã÷áñçôÞñéá.

Áí ôá ðñÜãìáôá äåí ðÞãáí åíôåëþò óùóôÜ, åßíáé åýêïëï íá ìåôáãëùôôßóåôå îáíÜ ïðïéïäÞðïôå ôìÞìá ôïõ óõóôÞìáôïò. Ãéá ðáñÜäåéãìá, áí äéáãñÜøáôå êáôÜ ëÜèïò ôï `/etc/magic` ùò ìÝñïò ìéáò áíáâÜèìéóçò Þ óõã÷þíåõóçò ôïõ `/etc`, ç åíôïëÞ file(1) èá óôáìáôÞóåé íá ëåéôïõñãåß. Óôçí ðåñßðôùóç áõôÞ, ç äéüñèùóç åßíáé íá åêôåëÝóåôå:

```
# cd /usr/src/usr.bin/file
# make all install
```

25.7.14 ÅñùôÞóåéò

1. ÐñÝðåé íá ìåôáãëùôôßóù îáíÜ ïëüêëçñï ôï âáóéêü óýóôçìá óå êÜèå áëëáãÞ;

Äåí õðÜñ÷åé åýêïëç áðÜíôçóç óå áõôü ôï åñþôçìá, êáèþò åîáñôÜôáé áðü ôç öýóç ôçò áëëáãÞò. Ãéá ðáñÜäåéãìá, áí åêôåëÝóåôå ôï **CVSup**, êáé äåßôå üôé åíçìåñþèçêáí ôá ðáñáêÜôù áñ÷åßá:

```
src/games/cribbage/instr.c
src/games/sail/pl_main.c
src/release/sysinstall/config.c
src/release/sysinstall/media.c
src/share/mk/bsd.port.mk
```

Ôï ðéèáíüôåñï åßíáé üôé äåí ÷ñåéÜæåôáé íá ìåôáãëùôôßóåôå îáíÜ üëï ôï âáóéêü óýóôçìá. Ìðïñåßôå áðëþò íá ìåôáâåßôå óôïõò ó÷åôéêïýò õðïêáôáëüãïõò êáé íá åêôåëÝóåôå ôï `make all install`, êáé èá Ý÷åôå ôåëåéþóåé. Áí üìùò õðÜñ÷åé êÜðïéá óçìáíôéêÞ áëëáãÞ, ãéá ðáñÜäåéãìá ôï `src/lib/libc/stdlib`, èá ðñÝðåé åßôå íá åðáíáìåôáãëùôôßóåôå ôï âáóéêü óýóôçìá, Þ ôïõëÜ÷éóôïí áõôÜ ôá êïììÜôéá ôá ïðïßá åßíáé óôáôéêÜ óõíäåäåìÝíá (üðùò êáé ïôéäÞðïôå Üëëï Ý÷åôå ðñïóèÝóåé åóåßò êáé ôï ïðïßï åßíáé óôáôéêÜ óõíäåäåìÝíï).

Ôåëéêá, ç áðüöáóç åßíáé äéêÞ óáò. Ìðïñåß íá åßóôå éêáíïðïéçìÝíïò áí ìåôáãëùôôßæåôå ôï âáóéêü óýóôçìá êÜèå äýï âäïìÜäåò, áöÞíïíôáò ôéò áëëáãÝò íá óõãêåíôñùèïýí óôç äéÜñêåéá áõôïý ôïõ äéáóôÞìáôïò. [1] ìðïñåß íá èÝëåôå íá ìåôáãëùôôßóåôå ìüíï ôéò áëëáãÝò, áí Ý÷åôå ôçí ðåðïßèçóç üôé ìðïñåßôå íá åíôïðßóåôå üëåò ôéò åîáñôÞóåéò ôïõò.

Êáé öõóéêÜ, üëá áõôÜ åîáñôþíôáé áðü ôï ðüóï óõ÷íÜ èÝëåôå íá åíçìåñþíåôå ôï óýóôçìá óáò, êáé áðü ôï áí áêïëïõèåßôå ôï FreeBSD-STABLE Þ ôï FreeBSD-CURRENT.

2. Ç ìåôáãëþôôéóç ìïõ áðÝôõ÷å ìå ðëÞèïò ìçíõìÜôùí signal 11 (Þ Üëëá óÞìáôá). Ôé Ý÷åé óõìâåß;

Áõôü óõíÞèùò äåß÷íåé ðñïâëÞìáôá õëéêïý. Ç äéáäéêáóßá ìåôáãëþôôéóçò ôïõ âáóéêïý óõóôÞìáôïò åßíáé Ýíáò áðïôåëåóìáôéêüò ôñüðïò íá äïêéìÜóåôå ôï õëéêü óáò óôá üñéá ôïõ, êáé óõ÷íÜ èá äåßîåé ðñïâëÞìáôá ðïõ ó÷åôßæïíôáé ìå ôç ìíÞìç. Ôï ðéï óýíçèåò óýìðôùìá, åßíáé ç áðüôïìç äéáêïðÞ ôçò ìåôáãëþôôéóçò, ìå ôïí ìåôáãëùôôéóôÞ íá öáßíåôáé üôé Ý÷åé ëÜâåé êÜðïéï ìõóôçñéþäåò óÞìá.

¸íá óßãïõñï óçìÜäé ãéá ôï ðáñáðÜíù, åßíáé íá åðáíåêêéíÞóåôå ôç äéáäéêáóßá, êáé áõôÞ íá óôáìáôÞóåé óå äéáöïñåôéêü óçìåßï.

Óôçí ðåñßðôùóç áõôÞ, äåí õðÜñ÷ïõí êáé ðïëëÜ ðïõ ìðïñåßôå íá êÜíåôå, åêôüò áðü ôï íá áñ÷ßóåôå íá áëëÜæåôå åîáñôÞìáôá óôï ìç÷Üíçìá óáò ìÝ÷ñé íá âñåßôå áõôü ðïõ åßíáé õðáßôéï.

3. Ìðïñþ íá äéáãñÜøù ôï `/usr/obj` üôáí ôåëåéþóù;

Ç óýíôïìç áðÜíôçóç åßíáé íáé.

Ôï `/usr/obj` ðåñéÝ÷åé üëá ôá áíôéêåéìåíéêÜ áñ÷åßá ðïõ ðáñÜãïíôáé êáôÜ ôç äéÜñêåéá ôçò ìåôáãëþôôéóçò. ÓõíÞèùò, Ýíá áðü ôá ðñþôá âÞìáôá óôçí äéáäéêáóßá `make buildworld` åßíáé ç äéáãñáöÞ áõôïý ôïõ êáôáëüãïõ êáé ç áíáäçìéïõñãßá ôïõ. Óôçí ðåñßðôùóç áõôÞ, ôï íá êñáôÞóåôå ôïí êáôÜëïãï `/usr/obj` áöïý Ý÷åôå ôåëåéþóåé, äåí Ý÷åé êáé ðïëý íüçìá, åíþ áí ôïí óâÞóåôå èá êåñäßóåôå Ýíá ìåãÜëï êïììÜôé åëåýèåñïõ ÷þñïõ (ôçí ðáñïýóá óôéãìÞ ðåñßðïõ 2 GB).

¼ìùò, áí îÝñåôå ôé êÜíåôå, ìðïñåßôå íá ïäçãÞóåôå ôï `make buildworld` íá ðáñáëåßøåé áõôü ôï âÞìá. Áõôü èá åðéôá÷ýíåé éäéáßôåñá ôéò íÝåò ìåôáãëùôôßóåéò, êáèþò ôá ðåñéóóüôåñá ôìÞìáôá ôïõ ðçãáßïõ êþäéêá äåí èá ÷ñåéÜæïíôáé îáíÜ ìåôáãëþôôéóç. Ôï ìåéïíÝêôçìá åßíáé üôé ïñéóìÝíåò öïñÝò åìöáíßæïíôáé ðñïâëÞìáôá ðïõ Ý÷ïõí ó÷Ýóç ìå ü÷é êáé ôüóï åìöáíåßò åîáñôÞóåéò, êáé ìðïñåß íá ïäçãÞóïõí óå ìõóôçñéþäç áðïôõ÷ßá ôçò ìåôáãëþôôéóçò. ÔÝôïéá ðñïâëÞìáôá óõ÷íÜ äçìéïõñãïýí “èüñõâï” óôéò ëßóôåò ôïõ FreeBSD, üôáí êÜðïéïò ÷ñÞóôçò ðáñáðïíéÝôáé üôé ç ìåôáãëþôôéóç ôïõ áðïôõã÷Üíåé, ÷ùñßò íá áíôéëáìâÜíåôáé üôé áõôü ïöåßëåôáé óôçí ðñïóðÜèåéá ôïõ íá óõíôïìåýóåé ôçí äéáäéêáóßá.

4. Ìðïñþ íá óõíå÷ßóù ìéá ìåôáãëþôôéóç ðïõ äéÝêïøá;

Áõôü åîáñôÜôáé áðü ôï ðüóï Ý÷åôå ðñï÷ùñÞóåé óôç äéáäéêáóßá ìÝ÷ñé ôç óôéãìÞ ðïõ âñÞêáôå ôï ðñüâëçìá.

Óå ãåíéêÝò ãñáììÝò (êáé áõôüò äåí åßíáé êáíüíáò ðïõ éó÷ýåé ðÜíôá), ç äéåñãáóßá ôïõ `make buildworld` ìåôáãëùôôßæåé íÝá áíôßãñáöá âáóéêþí åñãáëåßùí (üðùò ôá gcc(1), êáé make(1)) êáèþò êáé ôùí âéâëéïèçêþí óõóôÞìáôïò. ¸ðåéôá åãêáèéóôþíôáé áõôÜ ôá åñãáëåßá êáé ïé âéâëéïèÞêåò. Ôá íÝá åñãáëåßá êáé âéâëéïèÞêåò ÷ñçóéìïðïéïýíôáé Ýðåéôá ãéá íá åðáíáìåôáãëùôôßóïõí ôïõò åáõôïýò ôïõò, êáé åãêáèßóôáíôáé îáíÜ. Ïëüêëçñï ôï óýóôçìá (ôï ïðïßï ôþñá ðåñéëáìâÜíåé êáé ôá óõíçèéóìÝíá ðñïãñÜììáôá ÷ñÞóôç üðùò ôï ls(1) Þ ôï grep(1)) åðáíáìåôáãëùôôßæåôáé ÷ñçóéìïðïéþíôáò ôá íÝá áñ÷åßá ôïõ óõóôÞìáôïò.

Áí âñßóêåóôå óôï ôåëåõôáßï óôÜäéï, ôï ïðïßï èá ôï ãíùñßæåôå êïéôÜæïíôáò ôçí Ýîïäï ðïõ Ý÷åôå áðïèçêåýóåé, åßíáé ó÷åôéêÜ áóöáëÝò íá êÜíåôå:

```
... fix the problem ...
# cd /usr/src
# make -DNO_CLEAN all
```

Ìå ôïí ôñüðï áõôü äåí èá áíáéñÝóåôå ôçí åñãáóßá ðïõ Ý÷åé ãßíåé áðü ôï ðñïçãïýìåíï `make buildworld`.

Áí äåßôå ôï ìÞíõìá:

```
--------------------------------------------------------------
Building everything..
--------------------------------------------------------------
```

óôçí Ýîïäï ôçò åíôïëÞò `make buildworld`, ôüôå åßíáé ìÜëëïí áóöáëÝò íá ðñï÷ùñÞóåôå ìå áõôü ôïí ôñüðï.

Áí äåí äåßôå áõôü ôï ìÞíõìá, Þ áí äåí åßóôå óßãïõñïò, ôüôå åßíáé êáëýôåñá íá êÜíåôå ðëÞñç ìåôáãëþôôéóç ðáñÜ íá ìåôáíéþíåôå áñãüôåñá.

5. Ðùò ìðïñþ íá åðéôá÷ýíù ôç ìåôáãëþôôéóç ôïõ âáóéêïý óõóôÞìáôïò;

- ÅêôåëÝóôå ôçí óå êáôÜóôáóç åíüò ÷ñÞóôç.
- ÂÜëôå ôïõò êáôáëüãïõò `/usr/src` êáé `/usr/obj` óå äéáöïñåôéêÜ óõóôÞìáôá áñ÷åßùí ôá ïðïßá âñßóêïíôáé êáé óå äéáöïñåôéêïýò öõóéêïýò äßóêïõò. Áí åßíáé äõíáôüí, âÜëôå áõôïýò ôïõò äßóêïõò óå ÷ùñéóôïýò åëåãêôÝò.
- Áêüìá êáëýôåñá, ìïéñÜóôå áõôÜ ôá óõóôÞìáôá áñ÷åßùí óå ðïëëáðëïýò äßóêïõò, ÷ñçóéìïðïéþíôáò ôï ðñüãñáììá ïäÞãçóçò ccd(4) (concatenated disk driver, ïäÞãçóçò óõíåíùìÝíùí äßóêùí).
- ÁðåíåñãïðïéÞóôå ôï profiling (èÝóôå ôçí ìåôáâëçôÞ “NO_PROFILE=true” óôï `/etc/make.conf`). Åßíáé ó÷åäüí óßãïõñï üôé äåí ôï ÷ñåéÜæåóôå.
- Óôï áñ÷åßï `/etc/make.conf`, èÝóôå ôï `CFLAGS` óå êÜôé üðùò `-O -pipe`. Ç âåëôéóôïðïßçóç `-O2` ÷ñåéÜæåôáé áñêåôÜ ðåñéóóüôåñï ÷ñüíï, êáé ç äéáöïñÜ áðüäïóçò ìåôáîý `-O` êáé `-O2` åßíáé óõíÞèùò áìåëçôÝá. Ôï `-pipe` åðéôñÝðåé óôïí ìåôáãëùôôéóôÞ íá ÷ñçóéìïðïéÞóåé pipes ãéá åðéêïéíùíßá áíôß ãéá ðñïóùñéíÜ áñ÷åßá. Áõôü êáôáíáëþíåé ðåñéóóüôåñç ìíÞìç, áëëÜ ÷ñçóéìïðïéåß ëéãüôåñï ôï óêëçñü äßóêï.

- ×ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-j`*n* óôï make(1) þóôå íá åêôåëïýíôáé ðáñÜëëçëá ðïëëáðëÝò äéåñãáóßåò ìåôáãëþôôéóçò. Áõôü óõíÞèùò âïçèÜåé áêüìá êáé óå ðåñßðôùóç ðïõ Ý÷åôå ìç÷Üíçìá ìå Ýíá åðåîåñãáóôÞ.
- Ìðïñåßôå íá ðñïóáñôÞóåôå (Þ íá åðáíáðñïóáñôÞóåôå) ôï óýóôçìá áñ÷åßùí óôï ïðïßï åßíáé áðïèçêåõìÝíï ôï `/usr/src` ìå ôçí åðéëïãÞ `noatime`. Áõôü áðïôñÝðåé ôçí êáôáãñáöÞ çìåñïìçíßáò / þñáò ðñüóâáóçò óôï óýóôçìá áñ÷åßùí. ÊáôÜ ðÜóá ðéèáíüôçôá, äåí ÷ñåéÜæåóôå áõôÞ ôçí ðëçñïöïñßá Ýôóé êáé áëëéþò.

  ```
  # mount -u -o noatime /usr/src
  ```

  > **Ðñïåéäïðïßçóç:** Ôï ðáñÜäåéãìá ðñïûðïèÝôåé üôé Ý÷åôå ôï `/usr/src` óôï äéêü ôïõ óýóôçìá áñ÷åßùí. Áí áõôü äåí óõìâáßíåé (áí åßíáé ìÝñïò ôïõ `/usr` ãéá ðáñÜäåéãìá) èá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå áõôü ôï óçìåßï ðñïóÜñôçóçò, êáé ü÷é ôï `/usr/src`.

- Ìðïñåßôå íá ðñïóáñôÞóåôå (Þ íá åðáíáðñïóáñôÞóåôå) ôï óýóôçìá áñ÷åßùí ðïõ ðåñéÝ÷åé ôï `/usr/obj` ìå ôçí åðéëïãÞ `async`. Ìå ôïí ôñüðï áõôü, ïé åããñáöÝò óôï äßóêï èá ãßíïíôáé áóýã÷ñïíá. Ìå Üëëá ëüãéá, ïé åããñáöÝò èá ïëïêëçñþíïíôáé Üìåóá, åíþ ç ðñáãìáôéêÞ åããñáöÞ óôï äßóêï èá ãßíåôáé ëßãá äåõôåñüëåðôá áñãüôåñá. Áõôü åðéôñÝðåé ôçí ïìáäïðïßçóç ôùí åããñáöþí, ôï ïðïßï ìðïñåß íá ðñïóöÝñåé äñáìáôéêÞ âåëôßùóç áðüäïóçò.

  > **Ðñïåéäïðïßçóç:** Íá Ý÷åôå õðüøéí óáò üôé áõôÞ ç åðéëïãÞ ìðïñåß íá êÜíåé ôï óýóôçìá áñ÷åßùí óáò ðéï ðïëý åõáßóèçôï. Ìå ôçí åðéëïãÞ áõôÞ, õðÜñ÷åé áõîçìÝíç ðéèáíüôçôá ôï óýóôçìá áñ÷åßùí íá âñåèåß óå ìç åðéóêåõÜóéìç êáôÜóôáóç áí ðôþóåé ç ôñïöïäïóßá.
  >
  > Áí ôï óýóôçìá áñ÷åßùí ðåñéÝ÷åé ìüíï ôï `/usr/obj`, ôï ðáñáðÜíù äåí åßíáé ðñüâëçìá. Áí ùóôüóï Ý÷åôå êáé Üëëá ðïëýôéìá äåäïìÝíá óôï ßäéï óýóôçìá áñ÷åßùí, óéãïõñåõôåßôå üôé Ý÷åôå åíçìåñùìÝíá áíôßãñáöá áóöáëåßáò ðñéí åíåñãïðïéÞóåôå áõôÞ ôçí åðéëïãÞ.

  ```
  # mount -u -o async /usr/obj
  ```

  > **Ðñïåéäïðïßçóç:** ¼ðùò êáé ðñïçãïõìÝíùò, áí ôï `/usr/obj` äåí åßíáé óýóôçìá áñ÷åßùí áðü ìüíï ôïõ, áíôéêáôáóôÞóôå ôï óôï ðáñÜäåéãìá ìå ôï üíïìá ôïõ ðñáãìáôéêïý óçìåßïõ ðñïóÜñôçóçò.

6. Ôé íá êÜíù áí êÜôé ðÜåé óôñáâÜ;

Óéãïõñåõôåßôå üôé ôï ðåñéâÜëëïí óáò äåí Ý÷åé õðïëåßììáôá áðü ðñïçãïýìåíåò ìåôáãëùôôßóåéò. Áõôü åßíáé áñêåôÜ áðëü.

```
# chflags -R noschg /usr/obj/usr
# rm -rf /usr/obj/usr
# cd /usr/src
# make cleandir
# make cleandir
```

Íáé, èá ðñÝðåé íá åêôåëÝóåôå ôï `make cleandir` äýï öïñÝò.

ÅðáíåêêéíÞóôå Ýðåéôá üëç ôç äéáäéêáóßá, îåêéíþíôáò ìå ôï `make buildworld`.

Áí Ý÷åôå áêüìá ðñïâëÞìáôá, óôåßëôå ôï ìÞíõìá ëÜèïõò êáé ôçí Ýîïäï ôïõ `uname -a` óôçí çëåêôñïíéêÞ ëßóôá ãåíéêþí åñùôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions). Íá åßóôå ðñïåôïéìáóìÝíïé íá áðáíôÞóåôå åðéðëÝïí åñùôÞóåéò ó÷åôéêÜ ìå ôçí åãêáôÜóôáóç óáò!

25.8 ÄéáãñáöÞ Ðáñù÷çìÝíùí Áñ÷åßùí, Êáôáëüãùí êáé Âéâëéïèçêþí

ÂáóéóìÝíï óå óçìåéþóåéò ðïõ ðáñåß÷å ï Anton Shterenlikht.

ÊáôÜ ôçí óõíå÷Þ áíÜðôõîç ôïõ FreeBSD åßíáé öõóéïëïãéêü êÜðïéá áñ÷åßá êáôÜ êáéñïýò íá ÷áñáêôçñßæïíôáé ùò ðáñù÷çìÝíá. Áõôü ìðïñåß íá óõìâåß áí ïé ëåéôïõñãßåò ðïõ ðáñåß÷áí õëïðïéïýíôáé ðëÝïí äéáöïñåôéêÜ, áí ï ï áñéèìüò Ýêäïóçò ôçò âéâëéïèÞêçò Ý÷åé áëëÜîåé Þ áêüìá êáé áí Ý÷åé äéáãñáöåß ïëéóôéêÜ áðü ôï óýóôçìá. Óôá áñ÷åßá áõôÜ ðåñéëáìâÜíïíôáé åðßóçò âéâëéïèÞêåò êáôÜëïãïé ðïõ ðñÝðåé íá äéáãñáöïýí üôáí ãßíåôáé áíáâÜèìéóç ôïõ óõóôÞìáôïò. Ôï üöåëïò ãéá ôï ÷ñÞóôç åßíáé üôé ôï óýóôçìá ôïõ äåí ãåìßæåé áðü ðáëéÜ áñ÷åßá ôá ïðïßá êáôáëáìâÜíïõí Ü÷ñçóôï ÷þñï óôï ìÝóï áðïèÞêåõóçò êáé óôï backup. Åðéðñüóèåôá, áí êÜðïéá ðáëéÜ âéâëéïèÞêç åß÷å ðñïâëÞìáôá óôáèåñüôçôáò Þ áóöÜëåéáò èá ðñÝðåé íá ôçí áíáâáèìßóåôå ãéá íá êñáôÞóåôå ôï óýóôçìá óáò óôáèåñü êáé áóöáëÝò. Ôá áñ÷åßá, ïé êáôÜëïãïé êáé ïé âéâëéïèÞêåò ðïõ èåùñïýíôáé ðáñù÷çìÝíåò öáßíïíôáé óôï `/usr/src/ObsoleteFiles.inc`. Ïé ðáñáêÜôù ïäçãßåò èá óáò âïçèÞóïõí íá äéáãñÜøåôå áõôÜ ôá áñ÷åßá êáôÜ ôç äéáäéêáóßá áíáâÜèìéóçò ôïõ óõóôÞìáôïò.

ÕðïèÝôïõìå üôé ÷ñçóéìïðïéåßôå ôá âÞìáôá ðïõ ðåñéãñÜöïíôáé óôï ÔìÞìá 25.7.1. ÌåôÜ ôçí åðéôõ÷Þ åêôÝëåóç ôçò åíôïëÞò `make installworld` êáé ôïõ `mergemaster` ðïõ áêïëïõèåß, èá ðñÝðåé íá åëÝãîåôå ãéá ðáñù÷çìÝíá áñ÷åßá êáé âéâëéïèÞêåò üðùò öáßíåôáé ðáñáêÜôù:

```
# cd /usr/src
# make check-old
```

Áí âñåèïýí ðáñù÷çìÝíá áñ÷åßá, ìðïñåßôå íá ôá äéáãñÜøåôå ìå ôéò ðáñáêÜôù åíôïëÝò:

```
# make delete-old
```

Õðüäåéîç: Äåßôå ôï `/usr/src/Makefile` ãéá ðåñéóóüôåñåò åíäéáöÝñïõóåò åðéëïãÝò ôçò `make`.

Ãéá êÜèå áñ÷åßï ðïõ èá äéáãñáöåß, èá óáò æçôçèåß íá åðéâåâáéþóåôå ôçí åíÝñãåéá. Ìðïñåßôå íá ðáñáëåßøåôå ôçí åñþôçóç êáé íá áöÞóåôå ôï óýóôçìá íá äéáãñÜøåé áõôÜ ôá áñ÷åßá áõôüìáôá ÷ñçóéìïðïéþíôáò ôçí ìåôáâëçôÞ ôïõ make `BATCH_DELETE_OLD_FILES` ìå ôïí ôñüðï ðïõ öáßíåôáé ðáñáêÜôù:

```
# make -DBATCH_DELETE_OLD_FILES delete-old
```

Ðñïåéäïðïßçóç: Ç äéáãñáöÞ ðáñù÷çìÝíùí áñ÷åßùí, èá ðñïêáëÝóåé äõóëåéôïõñãßá ôùí åöáñìïãþí ðïõ åîáêïëïõèïýí íá âáóßæïíôáé óå áõôÜ. Áõôü óõìâáßíåé éäéáßôåñá óå ðáëéÝò âéâëéïèÞêåò. Óôéò ðåñéóóüôåñåò ðåñéðôþóåéò, èá ðñÝðåé íá åðáíáìåôáãëùôôßóåôå ôá ðñïãñÜììáôá, ports Þ âéâëéïèÞêåò ðïõ ÷ñçóéìïðïéïýóáí ôçí ðáëéÜ âéâëéïèÞêç ðñéí åêôåëÝóåôå ôçí åíôïëÞ `make delete-old-libs`.

Ìðïñåßôå íá âñåßôå ðñïãñÜììáôá ðïõ åëÝã÷ïõí ôéò åîáñôÞóåéò ôùí êïéíü÷ñçóôùí âéâëéïèçêþí óôç ÓõëëïãÞ ôùí Ports, óôï `sysutils/libchk` Þ `sysuilts/bsdadminscripts`.

Ïé ðáñù÷çìÝíåò êïéíü÷ñçóôåò âéâëéïèÞêåò ìðïñïýí íá äçìéïõñãÞóïõí ðñïâëÞìáôá ëüãù óõãêñïýóåùí ìå íåþôåñåò åêäüóåéò. Óå áõôÝò ôéò ðåñéðôþóåéò, èá äåßôå ìçíýìáôá üðùò ôá ðáñáêÜôù:

```
/usr/bin/ld: warning libz.so.4, needed by /usr/local/lib/libtiff.so, may conflict with libz.so.5
/usr/bin/ld: warning: librpcsvc.so.4, needed by /usr/local/lib/libXext.so may conflict with librp
```

Ãéá íá åðéëýóåôå ôÝôïéïõ åßäïõò ðñïâëÞìáôá, âñåßôå ðïéï port åãêáôÝóôçóå ôçí âéâëéïèÞêç:

```
# pkg_info -W /usr/local/lib/libtiff.so
/usr/local/lib/libtiff.so was installed by package tiff-3.9.4
# pkg_info -W /usr/local/lib/libXext.so
/usr/local/lib/libXext.so was installed by package libXext-1.1.1,1
```

¸ðåéôá, áðåãêáôáóôÞóôå, åðáíáìåôáãëùôôßóôå êáé åðáíåãêáôáóôÞóôå ôï port. Ãéá íá áõôïìáôïðïéÞóåôå áõôÞ ôç äéáäéêáóßá ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá âïçèçôéêÜ ðñïãñÜììáôá `ports-mgmt/portmaster` êáé `ports-mgmt/portupgrade`. Áöïý âåâáéùèåßôå üôé ïé ðáëéÝò âéâëéïèÞêåò äåí ÷ñçóéìïðïéïýíôáé ðëÝïí áðü êáíÝíá ðñüãñáììá, ìðïñåßôå íá ôéò äéáãñÜøåôå ìå ôçí ðáñáêÜôù åíôïëÞ:

```
# make delete-old-libs
```

25.9 Äéáäéêáóßá ãéá ÐïëëáðëÜ Ìç÷áíÞìáôá

ÓõíåéóöïñÜ ôïõ Mike Meyer.

Áí Ý÷åôå ðïëëáðëÜ ìç÷áíÞìáôá óôá ïðïßá ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ôï ßäéï äÝíôñï ðçãáßïõ êþäéêá, åßíáé óðáôÜëç ðüñùí (äßóêïõ, äéêôýïõ êáé åðåîåñãáóôÞ) íá åðáíáëáìâÜíåôå óå üëá ôç äéáäéêáóßá áíÜêôçóçò êáé ìåôáãëþôôéóçò. Ç ëýóç åßíáé íá ïñßóåôå Ýíá ìç÷Üíçìá íá åêôåëåß ôï ìåãáëýôåñï ìÝñïò ôçò åñãáóßáò, åíþ ôá õðüëïéðá èá ìðïñïýí íá ôçí áíáêôïýí ìÝóù NFS. Óôçí åíüôçôá áõôÞ èá ðåñéãñÜøïõìå Ýíá ôñüðï ìå ôïí ïðïßï ìðïñåß íá ãßíåé áõôü.

25.9.1 ÐñïêáôáñêôéêÜ

Ðñþôá áðü üëá, áíáãíùñßóôå ôï óåô ôùí ìç÷áíçìÜôùí óôá ïðïßá óêïðåýåôå íá ÷ñçóéìïðïéÞóåôå ôá ßäéá åêôåëÝóéìá. Èá ïíïìÜóïõìå áõôÞ ôçí ïìÜäá *óåô ìåôáãëþôôéóçò*. ÊÜèå ìç÷Üíçìá ìðïñåß íá Ý÷åé äéêü ôïõ ðñïóáñìïóìÝíï ðõñÞíá, áëëÜ èá Ý÷ïõí üëá ôá ßäéá åêôåëÝóéìá userland. Áðü ôï óåô áõôü, åðéëÝîôå Ýíá ìç÷Üíçìá ôï ïðïßï èá ãßíåé ôï *ìç÷Üíçìá ìåôáãëþôôéóçò*. Èá åßíáé ôï ìç÷Üíçìá óôï ïðïßï èá ìåôáãëùôôßæåôáé ôï âáóéêü óýóôçìá êáé ï ðõñÞíáò. Ôï éäáíéêü åßíáé íá åðéëÝîåôå Ýíá ãñÞãïñï ìç÷Üíçìá, óôï ïðïßï íá õðÜñ÷åé áñêåôüò åëåýèåñïò ÷ñüíïò óôïí åðåîåñãáóôÞ ãéá íá åêôåëåß ôá `make buildworld` êáé `make buildkernel`. Èá ðñÝðåé åðßóçò íá åðéëÝîåôå Ýíá *ìç÷Üíçìá äïêéìþí* óôï ïðïßï èá äïêéìÜæåôå ôéò åíçìåñþóåéò ëïãéóìéêïý ðñéí ôéò ìåôáöÝñåôå óôçí ðáñáãùãÞ. Ìðïñåß íá åßíáé êáé ôï ßäéï ôï ìç÷Üíçìá ìåôáãëþôôéóçò, áëëÜ áõôü äåí åßíáé áðáñáßôçôï.

¼ëá ôá ìç÷áíÞìáôá óôï óåô ìåôáãëþôôéóçò ÷ñåéÜæåôáé íá ðñïóáñôÞóïõí ôï `/usr/obj` êáé ôï `/usr/src` áðü ôï ßäéï ìç÷Üíçìá, êáé óôï ßäéï óçìåßï ðñïóÜñôçóçò. Ôï éäáíéêü åßíáé áõôÜ ôá äýï óõóôÞìáôá áñ÷åßùí íá âñßóêïíôáé óå äéáöïñåôéêü öõóéêü äßóêï óôï ìç÷Üíçìá ìåôáãëþôôéóçò, áëëÜ ìðïñåßôå íá ôá ðñïóáñôÞóåôå ìÝóù NFS áêüìá êáé óå áõôü ôï ìç÷Üíçìá. Áí Ý÷åôå ðïëëáðëÜ óåô ìåôáãëþôôéóçò, ôï `/usr/src` èá ðñÝðåé íá âñßóêåôáé óå Ýíá áðü ôá ìç÷áíÞìáôá ìåôáãëþôôéóçò, êáé íá ðñïóáñôÜôáé óôá õðüëïéðá ìÝóù NFS.

ÔÝëïò, âåâáéùèåßôå üôé ôá áñ÷åßá `/etc/make.conf` êáé `/etc/src.conf` óå üëá ôá ìç÷áíÞìáôá ôïõ óåô ìåôáãëþôôéóçò, åßíáé ßäéá ìå ôá áíôßóôïé÷á óôï ìç÷Üíçìá ìåôáãëþôôéóçò. Áõôü óçìáßíåé üôé ôï ìç÷Üíçìá ìåôáãëþôôéóçò èá ðñÝðåé íá ìåôáãëùôôßæåé üëá ôá ôìÞìáôá ôïõ âáóéêïý óõóôÞìáôïò ôá ïðïßá èá åãêáôáóôáèïýí óå êÜèå ìç÷Üíçìá ôïõ óåô. Åðßóçò, óå êÜèå ìç÷Üíçìá óôï óåô ìåôáãëþôôéóçò èá ðñÝðåé íá ïñéóôåß ôï üíïìá ôïõ äéêïý ôïõ ðñïóáñìïóìÝíïõ ðõñÞíá ìÝóù ôçò ìåôáâëçôÞò `KERNCONF` óôï `/etc/make.conf`, åíþ êáé ôï ìç÷Üíçìá ìåôáãëþôôéóçò èá ðñÝðåé íá Ý÷åé ìéá ëßóôá üëùí ôùí Üëëùí óôï `KERNCONF`, îåêéíþíôáò áðü ôï äéêü ôïõ. Ôï ìç÷Üíçìá ìåôáãëþôôéóçò, èá ðñÝðåé íá Ý÷åé ôá áñ÷åßá ñýèìéóçò ôïõ ðõñÞíá üëùí ôùí Üëëùí ìç÷áíçìÜôùí óôïí êáôÜëïãï `/usr/src/sys/`*`arch`*`/conf` áí ðñüêåéôáé íá ìåôáãëùôôßæåé ôïõò ðõñÞíåò ôïõò.

25.9.2 Ôï Âáóéêü Óýóôçìá

¸÷ïíôáò ðñáãìáôïðïéÞóåé üëá ôá ðáñáðÜíù, åßóôå Ýôïéìïò íá ìåôáãëùôôßóåôå ôá ðÜíôá. Ìåôáãëùôôßóôå ôïí ðõñÞíá êáé ôï âáóéêü óýóôçìá üðùò ðåñéãñÜøáìå óôï ÔìÞìá 25.7.7.2 ÷ñçóéìïðïéþíôáò ôï ìç÷Üíçìá ìåôáãëþôôéóçò, áëëÜ ìçí åãêáôáóôÞóåôå ôßðïôá. ÌåôÜ ôï ôÝëïò ôçò ìåôáãëþôôéóçò, ÷ñçóéìïðïéÞóôå ôï ìç÷Üíçìá äïêéìþí êáé åãêáôáóôÞóôå ôïí ðõñÞíá ðïõ ìüëéò äçìéïõñãÞóáôå. Áí ôï ìç÷Üíçìá áõôü ðñïóáñôÜ ôï `/usr/src` êáé ôï `/usr/obj` ìÝóù NFS, üôáí ôï åðáíåêêéíÞóåôå óå êáôÜóôáóç åíüò ÷ñÞóôç, èá ÷ñåéáóôåß íá åíåñãïðïéÞóåôå ôï äßêôõï êáé íá ôá ðñïóáñôÞóåôå. Ï åõêïëüôåñïò ôñüðïò ãéá áõôü, åßíáé íá åêêéíÞóåôå óå êáôÜóôáóç ðïëëáðëþí ÷ñçóôþí êáé Ýðåéôá íá åêôåëÝóåôå `shutdown now` ãéá íá ìåôáâåßôå óå êáôÜóôáóç åíüò ÷ñÞóôç. Ìüëéò ãßíåé áõôü, ìðïñåßôå íá åãêáôáóôÞóåôå ôïí íÝï ðõñÞíá êáé ôï âáóéêü óýóôçìá, êáé íá åêôåëÝóåôå ôï `mergemaster` üðùò èá êÜíáôå óõíÞèùò. ¼ôáí ôåëåéþóåôå, åðáíåêêéíÞóôå áõôü ôï ìç÷Üíçìá óôçí êáíïíéêÞ ëåéôïõñãßá ðïëëáðëþí ÷ñçóôþí.

¼ôáí âåâáéùèåßôå üôé üëá ëåéôïõñãïýí óùóôÜ óôï ìç÷Üíçìá äïêéìþí, ÷ñçóéìïðïéÞóôå ôçí ßäéá äéáäéêáóßá ãéá íá åãêáôáóôÞóåôå ôï íÝï ëïãéóìéêü óå êÜèå Ýíá áðü ôá õðüëïéðá ìç÷áíÞìáôá ôïõ óåô ìåôáãëþôôéóçò.

25.9.3 Ports

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôéò ßäéåò éäÝåò êáé ãéá ôï äÝíôñï ôùí ports. Ôï ðñþôï êñßóéìï âÞìá åßíáé íá ðñïóáñôÞóåôå ôï `/usr/ports` áðü ôï ßäéï ìç÷Üíçìá, óå üëá ôá ìç÷áíÞìáôá ôïõ óåô ìåôáãëþôôéóçò. Ìðïñåßôå Ýðåéôá íá ñõèìßóåôå ôï `/etc/make.conf` þóôå íá äéáìïéñÜæïíôáé ôá distfiles. Èá ðñÝðåé íá èÝóåôå ôï `DISTDIR` óå Ýíá êïéíü÷ñçóôï êáôÜëïãï, óôïí ïðïßï èá äþóåôå äéêáéþìáôá åããñáöÞò óå ïðïéïäÞðïôå ÷ñÞóôç Ý÷åôå äçëþóåé ùò `root` óôï NFS. Óå êÜèå ìç÷Üíçìá èá ðñÝðåé åðßóçò íá ïñéóôåß ç ìåôáâëçôÞ `WRKDIRPREFIX` þóôå íá äåß÷íåé óå Ýíá ôïðéêü êáôÜëïãï. ÔÝëïò, áí óêïðåýåôå íá ìåôáãëùôôßæåôå êáé íá äéáíÝìåôå Ýôïéìá ðáêÝôá, èá ðñÝðåé íá èÝóåôå ôçí ìåôáâëçôÞ `PACKAGES` óå Ýíá êáôÜëïãï, üðùò êÜíáôå êáé ìå ôçí `DISTDIR`.

Óçìåéþóåéò

1. Áõôü âÝâáéá äåí åßíáé áðüëõôá áëçèéíü. Äåí ìðïñïýìå íá óõíå÷ßóïõìå íá õðïóôçñßæïõìå ôéò ðáëéÝò åêäüóåéò ôïõ FreeBSD ãéá ðÜíôá, áí êáé ôéò õðïóôçñßæïõìå ãéá ðïëëÜ ÷ñüíéá. Ãéá ðëÞñç ðåñéãñáöÞ ôçò ôñÝ÷ïõóáò ðïëéôéêÞò üóï áöïñÜ ôçí áóöÜëåéá ôùí ðáëéþí åêäüóåùí ôïõ FreeBSD, äåßôå http://www.FreeBSD.org/security/.

ÊåöÜëáéï 26 DTrace

ÃñÜöçêå áðü ôïí Tom Rhodes.

26.1 Óýíïøç

Ôï DTrace, ãíùóôü åðßóçò ùò Dynamic Tracing, åßíáé Ýíá åñãáëåßï ôï ïðïßï áíáðôý÷èçêå áðü ôçí Sun ãéá ôïí åíôïðéóìü ðñïâëçìÜôùí áðüäïóçò óå óõóôÞìáôá ðïõ ðñüêåéôáé íá ÷ñçóéìïðïéçèïýí Þ ÷ñçóéìïðïéïýíôáé Þäç óôçí ðáñáãùãÞ. Äåí ðñüêåéôáé ãéá åñãáëåßï áðïóöáëìÜôùóçò, áëëÜ ãéá åñãáëåßï áíÜëõóçò ðñáãìáôéêïý ÷ñüíïõ, ìå ôï ïðïßï ìðïñïýí íá åíôïðéóôïýí ðñïâëÞìáôá áðüäïóçò êáé Üëëåò êáôáóôÜóåéò.

Ôï DTrace åßíáé Ýíá èáõìÜóéï åñãáëåßï profiling êáé äéáèÝôåé åíôõðùóéáêü ðëÞèïò ÷áñáêôçñéóôéêþí ãéá ôçí äéÜãíùóç ðñïâëçìÜôùí ôïõ óõóôÞìáôïò. Ìðïñåß åðßóçò íá ÷ñçóéìïðïéçèåß ãéá íá åêôåëÝóåé áðü ðñéí Ýôïéìá scripts, ìå ôá ïðïßá ìðïñåßôå íá åêìåôáëëåõèåßôå ôéò äõíáôüôçôåò ôïõ. Ïé ÷ñÞóôåò ìðïñïýí áêüìá íá ãñÜøïõí êáé ôá äéêÜ ôïõò âïçèçôéêÜ ðñïãñÜììáôá, ÷ñçóéìïðïéþíôáò ôçí Ãëþóóá D ðïõ ðáñÝ÷åé ôï DTrace, êáé íá ðñïóáñìüóïõí ìå áõôü ôïí ôñüðï ôï profiling óôéò äéêÝò ôïõò áíÜãêåò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ãíùñßæåôå:

- Ôé åßíáé ôï DTrace êáé ôé äõíáôüôçôåò ðáñÝ÷åé.
- Ôéò äéáöïñÝò õëïðïßçóçò ìåôáîý ôïõ DTrace ôïõ Solaris êáé ôïõ FreeBSD.
- Ðùò íá åíåñãïðïéÞóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôï DTrace óôï FreeBSD.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå âáóéêÝò Ýííïéåò ôïõ UNIX êáé ôïõ FreeBSD (ÊåöÜëáéï 4).
- Íá åßóôå åîïéêåéùìÝíïé ìå ôéò âáóéêÝò äéáäéêáóßåò ñýèìéóçò êáé ìåôáãëþôôéóçò ðñïóáñìïóìÝíïõ ðõñÞíá (ÊåöÜëáéï 9).
- Íá åßóôå åîïéêåéùìÝíïé ìå ôçí áóöÜëåéá êáé ôïí ôñüðï ðïõ áõôÞ ó÷åôßæåôáé ìå ôï FreeBSD (ÊåöÜëáéï 15).
- Íá êáôáíïåßôå ðùò ìðïñåßôå íá áíáêôÞóåôå ôïí ðçãáßï êþäéêá ôïõ FreeBSD êáé íá ôïí ÷ñçóéìïðïéÞóåôå þóôå íá åðáíáìåôáãëùôôßóåôå ôï óýóôçìá óáò (ÊåöÜëáéï 25).

> **Ðñïåéäïðïßçóç:** Ôç äåäïìÝíç óôéãìÞ, ôï DTrace èåùñåßôáé üôé åßíáé óå ðåéñáìáôéêü óôÜäéï. ÏñéóìÝíåò åðéëïãÝò ìðïñåß íá õðïëåßðïíôáé óå ëåéôïõñãéêüôçôá, êáé êÜðïéá ôìÞìáôá ßóùò íá ìç ëåéôïõñãïýí êáèüëïõ. Ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ, ïé ðáñáðÜíù äõíáôüôçôåò èá èåùñçèïýí Ýôïéìåò ãéá ÷ñÞóç óå ìç÷áíÞìáôá ðáñáãùãÞò, êáé ç ðáñïýóá ôåêìçñßùóç èá áíáíåùèåß þóôå íá áíôéðñïóùðåýåé áõôÞ ôçí êáôÜóôáóç.

26.2 ÄéáöïñÝò óôçí Õëïðïßçóç

Áí êáé ôï DTrace óôï FreeBSD åßíáé áñêåôÜ üìïéï ìå áõôü ôïõ Solaris, õðÜñ÷ïõí êÜðïéåò äéáöïñÝò ðïõ èá ðñÝðåé íá ôéò åîçãÞóïõìå ðñéí óõíå÷ßóïõìå. Ç ìåãáëýôåñç äéáöïñÜ ðïõ èá ðáñáôçñÞóïõí ïé ÷ñÞóôåò, åßíáé üôé óôï FreeBSD ôï DTrace ðñÝðåé íá åíåñãïðïéçèåß ÷åéñïêßíçôá. ÕðÜñ÷ïõí åðéëïãÝò ñýèìéóçò êáé áñèñþìáôá ôïõ ðõñÞíá ðïõ ðñÝðåé íá åíåñãïðïéçèïýí þóôå ôï DTrace íá ëåéôïõñãÞóåé óùóôÜ. Èá åîçãÞóïõìå áñãüôåñá áõôÝò ôéò ñõèìßóåéò.

Ç åðéëïãÞ `DDB_CTF` ôïõ ðõñÞíá ÷ñçóéìïðïéåßôáé ãéá íá åíåñãïðïéÞóåé ôçí õðïóôÞñéîç öïñôþìáôïò ôùí äåäïìÝíùí CTF áðü ôïí ðõñÞíá êáé ôá áñèñþìáôá ôïõ. Ôï CTF åßíáé ôï Compact C Type format ôïõ Solaris, ôï ïðïßï åíèõëáêþíåé ìéá åëáôôùìÝíç ìïñöÞ ðëçñïöïñéþí áðïóöáëìÜôùóçò (debugging), üìïéá ìå ôï DWARF êáé ôá stabs. ÁõôÜ ôá äåäïìÝíá CTF ðñïóôßèåíôáé óôá åêôåëÝóéìá ìÝóù ôùí åñãáëåßùí `ctfconvert` êáé `ctfmerge`. Ôï âïçèçôéêü ðñüãñáììá `ctfconvert` åñìçíåýåé ôá ôìÞìáôá ôùí DWARF ELF ðïõ ðåñéÝ÷ïõí ðëçñïöïñßåò debug (äçìéïõñãïýíôáé áðü ôï ìåôáãëùôôéóôÞ), êáé ôï `ctfmerge` óõã÷ùíåýåé ôá ôìÞìáôá CTF êáé ELF áðü ôá áíôéêåßìåíá óå Üëëá åêôåëÝóéìá Þ êïéíü÷ñçóôåò âéâëéïèÞêåò. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôçí åíåñãïðïßçóç ôùí ðáñáðÜíù óôç ìåôáãëþôôéóç ôïõ ðõñÞíá êáé ôïõ óõóôÞìáôïò ôïõ FreeBSD, èá äïýìå ðáñáêÜôù.

Óôï FreeBSD êÜðïéïé ðáñï÷åßò åßíáé äéáöïñåôéêïß óå ó÷Ýóç ìå ôï Solaris. Ï ðéï áîéïóçìåßùôïò åßíáé ï ðáñï÷Ýáò `dtmalloc` ï ïðïßïò åðéôñÝðåé ôï tracing ôïõ `malloc()` áíÜëïãá ìå ôïí ôýðï ôïõ, óôïí ðõñÞíá ôïõ FreeBSD.

Ìüíï ï `root` ìðïñåß íá ÷ñçóéìïðïéÞóåé ôï DTrace óôï FreeBSD. Áõôü ó÷åôßæåôáé ìå äéáöïñÝò óôçí áóöÜëåéá, êáèþò ôï Solaris äéáèÝôåé êÜðïéïõò åëÝã÷ïõò áóöáëåßáò ÷áìçëïý åðéðÝäïõ, ïé ïðïßïé äåí õðÜñ÷ïõí áêüìá óôï FreeBSD. Ãéá ôï ëüãï áõôü, ç ÷ñÞóç ôçò óõóêåõÞò `/dev/dtrace/dtrace` áðáãïñåýåôáé áõóôçñÜ ãéá üëïõò ôïõò ÷ñÞóôåò åêôüò áðü ôïí `root`.

ÔÝëïò, ôï ëïãéóìéêü DTrace âñßóêåôáé õðü ôçí Üäåéá CDDL ôçò Sun. Ìðïñåßôå íá äéáâÜóåôå ôï êåßìåíï ôçò Üäåéáò `Common Development and Distribution License` óôï FreeBSD, óôï áñ÷åßï `/usr/src/cddl/contrib/opensolaris/OPENSOLARIS.LICENSE` Þ íá ôï äéáâÜóåôå online óôç äéåýèõíóç http://www.opensolaris.org/os/licensing.

Ç Üäåéá ïõóéáóôéêÜ óçìáßíåé üôé Ýíáò ðõñÞíáò FreeBSD ìå ôéò åðéëïãÝò ôïõ DTrace, åîáêïëïõèåß íá âñßóêåôáé õðü ôçí Üäåéá BSD. Ùóôüóï ôï CDDL åìðëÝêåôáé ôç óôéãìÞ ðïõ ãßíåôáé äéáíïìÞ ôùí áñèñùìÜôùí óå äõáäéêÞ ìïñöÞ, Þ ôç óôéãìÞ ðïõ öïñôþíïíôáé.

26.3 Åíåñãïðïßçóç ôçò ÕðïóôÞñéîçò DTrace

Ãéá íá åíåñãïðïéÞóåôå ôçí õðïóôÞñéîç ãéá ôï DTrace, ðñïóèÝóôå ôéò áêüëïõèåò ãñáììÝò óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá:

```
options         KDTRACE_HOOKS
options         DDB_CTF
```

Óçìåßùóç: Ïé ÷ñÞóôåò ôçò áñ÷éôåêôïíéêÞò AMD64 èá èÝëïõí íá ðñïóèÝóïõí ôçí áêüëïõèç ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá ôïõò:

```
options         KDTRACE_FRAME
```

Ç åðéëïãÞ áõôÞ ðáñÝ÷åé õðïóôÞñéîç ãéá ôç ëåéôïõñãßá FBT. Ôï DTrace ìðïñåß íá ëåéôïõñãÞóåé êáé ÷ùñßò áõôÞí. Ùóôüóï, èá ðáñÝ÷åé ðåñéïñéóìÝíç õðïóôÞñéîç ãéá function boundary tracing.

¼ëïò ï ðçãáßïò êþäéêáò èá ðñÝðåé íá ìåôáãëùôôéóôåß îáíÜ ìå ôéò åðéëïãÝò CTF. Ãéá íá ãßíåé áõôü, ìåôáãëùôôßóôå îáíÜ ôï FreeBSD ÷ñçóéìïðïéþíôáò:

```
# cd /usr/src
# make WITH_CTF=1 kernel
```

Èá ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôï óýóôçìá.

ÌåôÜ ôçí åðáíåêêßíçóç, êáé ìå ôïí íÝï ðõñÞíá öïñôùìÝíï ðëÝïí óôç ìíÞìç, èá ðñÝðåé íá ðñïóèÝóåôå õðïóôÞñéîç ãéá ôï êÝëõöïò Korn. Áõôü áðáéôåßôáé, êáèþò ôá åñãáëåßá DTrace ðåñéëáìâÜíïõí äéÜöïñá âïçèçôéêÜ ðñïãñÜììáôá ôá ïðïßá åßíáé ãñáììÝíá óå `ksh`. ÅãêáôáóôÞóôå ôï port `shells/ksh93`. Ìðïñåßôå åðßóçò íá åêôåëÝóåôå áõôÜ ôá åñãáëåßá êáé ìÝóù ôïõ `shells/pdksh` Þ ôïõ `shells/mksh`.

ÔÝëïò, áíáêôÞóôå ôçí ôñÝ÷ïõóá óåéñÜ åñãáëåßùí DTrace. Ç ôåëåõôáßá Ýêäïóç äéáôßèåôáé óôçí ôïðïèåóßá http://www.opensolaris.org/os/community/dtrace/dtracetoolkit/. Äéáôßèåôáé êáé ðñüãñáììá åãêáôÜóôáóçò, ôï ïðïßï äåí åßíáé ùóôüóï áðáñáßôçôï íá åêôåëÝóåôå ðñïêåéìÝíïõ íá ÷ñçóéìïðïéÞóåôå ôá åñãáëåßá.

26.4 ×ñçóéìïðïéþíôáò ôï DTrace

Ðñéí ÷ñçóéìïðïéÞóåôå ôéò ëåéôïõñãßåò ôïõ DTrace, èá ðñÝðåé íá õðÜñ÷åé ç áíôßóôïé÷ç óõóêåõÞ. Ãéá íá öïñôþóåôå ôç óõóêåõÞ, èá ðñÝðåé íá äþóåôå ôçí ðáñáêÜôù åíôïëÞ:

```
# kldload dtraceall
```

Èá ðñÝðåé íá Ý÷åôå ðëÝïí õðïóôÞñéîç DTrace. Ãéá íá äåßôå üëá ôá probes, èá ðñÝðåé íá åêôåëÝóåôå ùò äéá÷åéñéóôÞò ôçí ðáñáêÜôù åíôïëÞ:

```
# dtrace -l | more
```

¼ëç ç Ýîïäïò ðåñíÜåé ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò `more`, äéáöïñåôéêÜ ãñÞãïñá èá õðåñ÷åßëéæå ôçí ðñïóùñéíÞ ìíÞìç ôçò ïèüíçò. Óôï óçìåßï áõôü, èá ðñÝðåé íá èåùñçèåß üôé ôï DTrace ëåéôïõñãåß. Åßíáé ðëÝïí þñá íá åîåôÜóïõìå áõôÞ ôç óåéñÜ åñãáëåßùí.

Ç óåéñÜ ôùí åñãáëåßùí åßíáé ìéá óõëëïãÞ áðü Ýôïéìá scripts ðïõ åêôåëïýíôáé ìå ôï DTrace þóôå íá óõëëÝîïõí ðëçñïöïñßåò ó÷åôéêÜ ìå ôï óýóôçìá. ÕðÜñ÷ïõí scripts ðïõ åëÝã÷ïõí ãéá áíïéêôÜ áñ÷åßá, ôç ìíÞìç, ôç ÷ñÞóç ôçò CPU êáé ðïëëÜ áêüìá. ÊÜíôå åîáãùãÞ ôùí scripts ìå ôçí áêüëïõèç åíôïëÞ:

```
# gunzip -c DTraceToolkit* | tar xvf -
```

Ìåôáêéíçèåßôå óôïí êáôÜëïãï ðïõ ôá áðïóõìðéÝóáôå ìå ôçí åíôïëÞ `cd` êáé áëëÜîôå ôá äéêáéþìáôá åêôÝëåóçò óå üëá ôá áñ÷åßá, üðùò óôá áñ÷åßá ìå ôá ìéêñÜ ãñÜììáôá, óå `755`.

Èá ÷ñåéáóôåß íá ãßíïõí áëëáãÝò óôïí ðåñéå÷üìåíï óå üëá ôá scripts. ¼óá ðåñéÝ÷ïõí ôï `/usr/bin/ksh` èá ðñÝðåé íá áëëá÷èïýí óå `/usr/local/bin/ksh`, ôá Üëëá ðïõ ðåñéÝ÷ïõí ôï `/usr/bin/sh` èá ðñÝðåé íá áëëá÷èïýí óå `/bin/sh`, êáé ôÝëïò áõôÜ ðïõ ðåñéÝ÷ïõí ôï `/usr/bin/perl` èá ðñÝðåé íá áëëá÷èïýí óå `/usr/local/bin/perl`.

> **Óçìáíôéêü:** Óôï óçìåßï áõôü åßíáé óçìáíôéêü íá õðåíèõìßóïõìå óôïí áíáãíþóôç üôé ç õðïóôÞñéîç DTrace óôï FreeBSD åßíáé *áôåëÞò* êáé ðåéñáìáôéêÞ. ÐïëëÜ áðü áõôÜ ôá scripts äåí èá ëåéôïõñãÞóïõí, êáèþò åßíáé åßôå ðïëý ðñïóáíáôïëéóìÝíá óôï Solaris, Þ ÷ñçóéìïðïéïýí probes ôá ïðïßá äåí õðïóôçñßæïíôáé ôç äåäïìÝíç óôéãìÞ.

Ôç óôéãìÞ ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò, ìüíï äýï scripts áðü ôç óåéñÜ åñãáëåßùí ôïõ DTrace õðïóôçñßæïíôáé ðëÞñùò óôï FreeBSD: ôï `hotkernel` êáé ôï `procsystime`. ÁõôÜ ôá äýï èá åîåñåõíÞóïõìå óôá åðüìåíá ôìÞìáôá áõôÞò ôçò åíüôçôáò.

Ôï `hotkernel` Ý÷åé ó÷åäéáóôåß íá áíáãíùñßæåé ðïéá óõíÜñôçóç êáôáíáëþíåé ôï ìåãáëýôåñï ÷ñüíï óôïí ðõñÞíá. Åêôåëþíôáò ôï õðü êáíïíéêÝò óõíèÞêåò, èá äåßôå Ýîïäï ðáñüìïéá ìå ôçí ðáñáêÜôù:

```
# ./hotkernel
```

```
Sampling... Hit Ctrl-C to end.
```

Ï äéá÷åéñéóôÞò ôïõ óõóôÞìáôïò èá ðñÝðåé íá ÷ñçóéìïðïéÞóåé ôï óõíäõáóìü ðëÞêôñùí **Ctrl+C** ãéá íá óôáìáôÞóåé ôç äéåñãáóßá. Ìå ôïí ôåñìáôéóìü ôïõ, ôï script èá áðåéêïíßóåé ìéá óåéñÜ áðü óõíáñôÞóåéò ôïõ ðõñÞíá êáé ðëçñïöïñßåò ó÷åôéêÜ ìå ôï ÷ñüíï ôïõò, ôáîéíïìþíôáò ôéò óå áýîïõóá óåéñÜ áíÜëïãá ìå ôï ÷ñüíï:

```
kernel‘_thread_lock_flags                                   2   0.0%
0xc1097063                                                  2   0.0%
kernel‘sched_userret                                        2   0.0%
kernel‘kern_select                                          2   0.0%
kernel‘generic_copyin                                       3   0.0%
kernel‘_mtx_assert                                          3   0.0%
kernel‘vm_fault                                             3   0.0%
kernel‘sopoll_generic                                       3   0.0%
kernel‘fixup_filename                                       4   0.0%
kernel‘_isitmyx                                             4   0.0%
kernel‘find_instance                                        4   0.0%
kernel‘_mtx_unlock_flags                                    5   0.0%
kernel‘syscall                                              5   0.0%
kernel‘DELAY                                                5   0.0%
0xc108a253                                                  6   0.0%
kernel‘witness_lock                                         7   0.0%
kernel‘read_aux_data_no_wait                                7   0.0%
kernel‘Xint0x80_syscall                                     7   0.0%
kernel‘witness_checkorder                                   7   0.0%
kernel‘sse2_pagezero                                        8   0.0%
kernel‘strncmp                                              9   0.0%
kernel‘spinlock_exit                                       10   0.0%
kernel‘_mtx_lock_flags                                     11   0.0%
kernel‘witness_unlock                                      15   0.0%
kernel‘sched_idletd                                       137   0.3%
0xc10981a5                                              42139  99.3%
```

Ôï script áõôü ëåéôïõñãåß åðßóçò ìå áñèñþìáôá ôïõ ðõñÞíá. Ãéá íá ÷ñçóéìïðïéÞóåôå áõôü ôï ÷áñáêôçñéóôéêü, åêôåëÝóôå ôï ìå ôçí åðéëïãÞ `-m`:

```
# ./hotkernel -m
Sampling... Hit Ctrl-C to end.
^C
MODULE                                                  COUNT   PCNT
0xc107882e                                                  1   0.0%
0xc10e6aa4                                                  1   0.0%
0xc1076983                                                  1   0.0%
0xc109708a                                                  1   0.0%
0xc1075a5d                                                  1   0.0%
0xc1077325                                                  1   0.0%
0xc108a245                                                  1   0.0%
0xc107730d                                                  1   0.0%
0xc1097063                                                  2   0.0%
0xc108a253                                                 73   0.0%
kernel                                                    874   0.4%
0xc10981a5                                             213781  99.6%
```

Ôï `procsystime` script óõëëáìâÜíåé êáé ôõðþíåé ôïí ÷ñüíï ôùí êëÞóåùí óõóôÞìáôïò ãéá ìéá óõãêåêñéìÝíç äéåñãáóßá ìÝóù ôïõ PID Þ ôïõ ïíüìáôïò ôçò. Óôï ðáñáêÜôù ðáñÜäåéãìá Ý÷ïõìå îåêéíÞóåé ìéá íÝá äéåñãáóßá ôïõ `/bin/csh`. ÅêôåëÝóáìå ôï `procsystime` êáé ôï áöÞóáìå óôçí áíáìïíÞ êáèþò ãñÜöáìå ìåñéêÝò åíôïëÝò óôï `csh` ðïõ åß÷áìå áíïßîåé. ÁõôÜ åßíáé ôá áðïôåëÝóìáôá ôçò äïêéìÞò ìáò:

```
# ./procsystime -n csh
Tracing... Hit Ctrl-C to end...
^C

Elapsed Times for processes csh,

         SYSCALL          TIME (ns)
          getpid               6131
       sigreturn               8121
           close              19127
           fcntl              19959
             dup              26955
         setpgid              28070
            stat              31899
       setitimer              40938
           wait4              62717
       sigaction              67372
     sigprocmask             119091
    gettimeofday             183710
           write             263242
          execve             492547
           ioctl             770073
           vfork            3258923
      sigsuspend            6985124
            read         3988049784
```

¼ðùò öáßíåôáé, ç êëÞóç ôïõ óõóôÞìáôïò ãéá áíÜãíùóç (`read()`) åßíáé áõôÞ ðïõ êáôáíáëþíåé ôïí ðåñéóóüôåñï ÷ñüíï óå íáíïäåõôåñüëåðôá, åíþ ôï ëéãüôåñï ôïí êáôáíáëþíåé ç êëÞóç óõóôÞìáôïò `getpid()`.

26.5 Ç Ãëþóóá D

Ç óåéñÜ åñãáëåßùí DTrace, ðåñéëáìâÜíåé áñêåôÜ scripts ãñáììÝíá óôçí åéäéêÞ ãëþóóá ôïõ DTrace. Ç ãëþóóá áõôÞ ïíïìÜæåôáé “ç ãëþóóá D” óôçí ôåêìçñßùóç ôçò Sun, êáé åßíáé áñêåôÜ üìïéá ìå ôç C++. ÁíáëõôéêÞ ðåñéãñáöÞ áõôÞò ôçò ãëþóóáò åßíáé ðÝñá áðü ôïõò óêïðïýò áõôïý ôïõ êåéìÝíïõ. ÕðÜñ÷åé åíåñãÞ óõæÞôçóç ó÷åôéêÜ ìå áõôÞ, óôç äéåýèõíóç http://wikis.sun.com/display/DTrace/Documentation.

IV. ÄéêôõáêÝò Åðéêïéíùíßåò

Ôï FreeBSD åßíáé Ýíá áðü ôá ðéï åõñÝùò äéáäåäïìÝíá ëåéôïõñãéêÜ óõóôÞìáôá ãéá õøçëÞò áðüäïóçò äéêôõáêÝò åöáñìïãÝò êáé åîõðçñåôçôÝò. Ôá êåöÜëáéá óå áõôü ôï ôìÞìá ðåñéãñÜöïõí:

- Ôéò åðéêïéíùíßåò ìå óåéñáúêÞ óýíäåóç (serial)
- Ôá ðñùôüêïëëá PPP êáé PPP ðÜíù áðü Ethernet
- Ôçí ÇëåêôñïíéêÞ Áëëçëïãñáößá
- Ôçí ÅãêáôÜóôáóç Äéêôõáêþí Õðçñåóéþí
- Ôç Ñýèìéóç êáé Ëåéôïõñãßá ôùí Firewalls
- ¶ëëá Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùí

ÁõôÜ ôá êåöÜëáéá Ý÷ïõí ó÷åäéáóôåß ðåñéóóüôåñï ùò ïäçãüò áíáöïñÜò ðáñÜ ùò åéóáãùãéêü êåßìåíï. Ãé áõôü åßíáé ðéï ÷ñÞóéìá ùò ïäçãïß óôïõò ïðïßïõò ìðïñåßôå íá áíáôñÝîåôå üôáí ÷ñåéÜæåóôå êÜðïéá ðëçñïöïñßá ãéá ôï FreeBSD. Äå ÷ñåéÜæåôáé íá ôá äéáâÜóåôå ìå êÜðïéá óõãêåêñéìÝíç óåéñÜ, ïýôå ÷ñåéÜæåôáé íá ôá Ý÷åôå äéáâÜóåé üëá ðñéí áñ÷ßóåôå íá áó÷ïëåßóôå ìå ôï FreeBSD.

ÊåöÜëáéï 27 ÓåéñéáêÝò Åðéêïéíùíßåò

27.1 Óýíïøç

Ôï UNIX ðÜíôïôå õðïóôÞñéæå óåéñéáêÝò åðéêïéíùíßåò. Ãéá ôçí áêñßâåéá, ôá ðñþôá UNIX ìç÷áíÞìáôá âáóßæïíôáí óå óåéñéáêÝò ãñáììÝò ãéá ôçí åßóïäï êáé Ýîïäï ôïõ ÷ñÞóôç. Ôá ðñÜãìáôá ùóôüóï Ý÷ïõí áëëÜîåé ðïëý áðü ôéò ìÝñåò ðïõ ôï óõíçèéóìÝíï “ôåñìáôéêü” áðïôåëïýíôáí áðü Ýíá óåéñéáêü åêôõðùôÞ 10 ÷áñáêôÞñùí ôï äåõôåñüëåðôï êáé Ýíá ðëçêôñïëüãéï. Ôï êåöÜëáéï áõôü èá êáëýøåé êÜðïéïõò áðü ôïõò ôñüðïõò óåéñéáêÞò åðéêïéíùíßáò ðïõ ÷ñçóéìïðïéïýíôáé áðü ôï FreeBSD.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá óõíäÝóåôå ôåñìáôéêÜ óôï FreeBSD óýóôçìá óáò.
- Ðùò íá ÷ñçóéìïðïéÞóåôå Ýíá modem ãéá íá óõíäåèåßôå óå áðïìáêñõóìÝíá óõóôÞìáôá.
- Ðùò íá åðéôñÝøåôå óå áðïìáêñõóìÝíïõò ÷ñÞóôåò íá óõíäåèïýí óôï óýóôçìÜ óáò ìÝóù modem.
- Ðùò íá åêêéíÞóåôå ôï óýóôçìá óáò ìÝóù óåéñéáêÞò êïíóüëáò.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá îÝñåôå ðùò èá ñõèìßóåôå êáé èá åãêáôáóôÞóåôå Ýíá íÝï ðõñÞíá (ÊåöÜëáéï 9).
- Íá êáôáíïåßôå ôéò Üäåéåò êáé äéåñãáóßåò ôïõ UNIX (ÊåöÜëáéï 4).
- Íá Ý÷åôå ðñüóâáóç óôï ôå÷íéêü åã÷åéñßäéï ôïõ õëéêïý óáò (modem Þ êÜñôá ðïëëáðëþí óåéñéáêþí èõñþí) ðïõ èÝëåôå íá ÷ñçóéìïðïéÞóåôå óôï FreeBSD.

27.2 ÅéóáãùãÞ

Ðñïåéäïðïßçóç: Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ôùí óåéñéáêþí èõñþí ìåôïíïìÜóôçêáí áðü `/dev/cuadN` óå `/dev/cuauN` êáé áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ðáñáêÜôù ôåêìçñßùóç óýìöùíá ìå ôéò ðáñáðÜíù áëëáãÝò.

27.2.1 Ïñïëïãßá

bps

Bits ÁíÜ Äåõôåñüëåðôï — ï ñõèìüò ìåôÜäïóçò ôùí äåäïìÝíùí

DTE

Data Terminal Equipment, Ôåñìáôéêüò Åîïðëéóìüò ÄåäïìÝíùí — ãéá ðáñÜäåéãìá, ï õðïëïãéóôÞò óáò

DCE

Data Communications Equipment, Åîïðëéóìüò Åðéêïéíùíßáò ÄåäïìÝíùí — ôï modem óáò

RS-232

Ðñüôõðï ôçò EIA ãéá ôï õëéêü ðïõ ÷ñçóéìïðïéåßôáé óôéò óåéñéáêÝò åðéêïéíùíßåò

¼ôáí áíáöåñüìáóôå óôï ñõèìü ìåôÜäïóçò äåäïìÝíùí åðéêïéíùíßáò, äåí ÷ñçóéìïðïéïýìå ðÜíôïôå ôïí üñï “baud”. Ôï baud áíáöÝñåôáé óôïí áñéèìü ôùí ìåôáâÜóåùí ôïõ çëåêôñéêïý óÞìáôïò óôç ìïíÜäá ôïõ ÷ñüíïõ, åíþ êáíïíéêÜ ðñÝðåé íá ÷ñçóéìïðïéåßôáé ôï “bps” (bits áíÜ äåõôåñüëåðôï) ðïõ åßíáé ï *óùóôüò* üñïò (ç ôïõëÜ÷éóôïí äåí öáßíåôáé íá åíï÷ëåß ðïëý ôïõò ó÷ïëáóôéêïýò).

27.2.2 Èýñåò êáé Êáëþäéá

Ãéá íá óõíäÝóåôå Ýíá modem Þ ôåñìáôéêü óôï FreeBSD óýóôçìá óáò, èá ÷ñåéáóôåßôå ìéá óåéñéáêÞ èýñá óôïí õðïëïãéóôÞ óáò, êáé ôï êáôÜëëçëï êáëþäéï ãéá íá óõíäÝóåôå ôç óåéñéáêÞ óõóêåõÞ óáò. Áí åßóôå Þäç åîïéêåéùìÝíïò ìå ôï õëéêü óáò êáé ôï êáëþäéï ðïõ áðáéôåßôáé, ìðïñåßôå ìå áóöÜëåéá íá ðáñáëåßøåôå áõôÞ ôçí åíüôçôá.

27.2.2.1 Êáëþäéá

ÕðÜñ÷ïõí áñêåôïß äéáöïñåôéêïß ôýðïé óåéñéáêþí êáëùäßùí. Ïé äýï ðéï êïéíïß ôýðïé ãéá ôïõò óêïðïýò ìáò, åßíáé ôá êáëþäéá ôýðïõ null-modem êáé ôá ôõðïðïéçìÝíá êáëþäéá RS-232 (ãíùóôÜ êáé ùò “åõèåßåò”). Ç ôåêìçñßùóç ôïõ õëéêïý óáò èá ðñÝðåé íá ðåñéãñÜöåé ôïí ôýðï ôïõ êáëùäßïõ ðïõ áðáéôåßôáé.

27.2.2.1.1 Êáëþäéá Ôýðïõ Null-modem

¸íá êáëþäéï ôýðïõ null-modem, ìåôáöÝñåé áðåõèåßáò êÜðïéá óÞìáôá üðùò ç “Ãåßùóç ÓÞìáôïò (SG)”, áëëÜ áíôéóôñÝöåé ôéò óõíäÝóåéò óå êÜðïéá Üëëá. Ãéá ðáñÜäåéãìá, ï áêñïäÝêôçò “ÌåôÜäïóçò ÄåäïìÝíùí” (ãíùóôüò êáé ùò TD) ôçò ìéáò ðëåõñÜò, óõíäÝåôáé ìå ôïí áêñïäÝêôç “Ëçøçò ÄåäïìÝíùí” (ãíùóôüò êáé ùò RD) ôçò Üëëçò.

Ìðïñåßôå åðßóçò íá öôéÜîåôå ôï äéêü óáò êáëþäéï ôýðïõ null-modem (ð.÷. ãéá ëüãïõò ðïéüôçôáò) ãéá ÷ñÞóç ìå ôåñìáôéêÜ. Ï ðáñáêÜôù ðßíáêáò äåß÷íåé ôá óÞìáôá ôïõ RS-232 êáé ôïõò áñéèìïýò ôùí áêñïäåêôþí óå Ýíá óõíäÝôç DB-25. Óçìåéþóôå åðßóçò üôé ôï ðñüôõðï ïñßæåé áðåõèåßáò óýíäåóç ôùí áêñïäåêôþí 1 ôçò êÜèå Üêñçò. Ðñüêåéôáé ãéá ôïí áêñïäÝêôç ôçò *ÐñïóôáôåõôéêÞò Ãåßùóçò*, áëëÜ óõ÷íÜ ç óýíäåóç ôïõ ðáñáëåßðåôáé. ÌåñéêÜ ôåñìáôéêÜ ëåéôïõñãïýí êáíïíéêÜ ÷ñçóéìïðïéþíôáò ìüíï ôïõò áêñïäÝêôåò 2, 3 êáé 7, åíþ êÜðïéá Üëëá áðáéôïýí äéáöïñåôéêÝò ñõèìßóåéò óå ó÷Ýóç ìå ôá ðáñáäåßãìáôá ðïõ öáßíïíôáé ðáñáêÜôù.

Ðßíáêáò 27-1. Êáëþäéï Null-Modem DB-25 óå DB-25

ÓÞìá	ÁêñïäÝêôçò #		ÁêñïäÝêôçò #	ÓÞìá
SG	7	óõíäÝåôáé óôï	7	SG
TD	2	óõíäÝåôáé óôï	3	RD
RD	3	óõíäÝåôáé óôï	2	TD
RTS	4	óõíäÝåôáé óôï	5	CTS
CTS	5	óõíäÝåôáé óôï	4	RTS
DTR	20	óõíäÝåôáé óôï	6	DSR
DTR	20	óõíäÝåôáé óôï	8	DCD
DSR	6	óõíäÝåôáé óôï	20	DTR
DCD	8	óõíäÝåôáé óôï	20	DTR

ÐáñáêÜôù öáßíïíôáé äýï äéáôÜîåéò ðïõ åßíáé ðéï êïéíÝò óôéò ìÝñåò ìáò.

Ðßíáêáò 27-2. Êáëþäéï Null-Modem DB-9 óå DB-9

ÓÞìá	ÁêñïäÝêôçò #		ÁêñïäÝêôçò #	ÓÞìá
RD	2	óõíäÝåôáé óôï	3	TD
TD	3	óõíäÝåôáé óôï	2	RD
DTR	4	óõíäÝåôáé óôï	6	DSR
DTR	4	óõíäÝåôáé óôï	1	DCD
SG	5	óõíäÝåôáé óôï	5	SG
DSR	6	óõíäÝåôáé óôï	4	DTR
DCD	1	óõíäÝåôáé óôï	4	DTR
RTS	7	óõíäÝåôáé óôï	8	CTS
CTS	8	óõíäÝåôáé óôï	7	RTS

Ðßíáêáò 27-3. Êáëþäéï Null-Modem DB-9 óå DB-25

ÓÞìá	ÁêñïäÝêôçò #		ÁêñïäÝêôçò #	ÓÞìá
RD	2	óõíäÝåôáé óôï	2	TD
TD	3	óõíäÝåôáé óôï	3	RD
DTR	4	óõíäÝåôáé óôï	6	DSR
DTR	4	óõíäÝåôáé óôï	8	DCD
SG	5	óõíäÝåôáé óôï	7	SG
DSR	6	óõíäÝåôáé óôï	20	DTR
DCD	1	óõíäÝåôáé óôï	20	DTR
RTS	7	óõíäÝåôáé óôï	5	CTS
CTS	8	óõíäÝåôáé óôï	4	RTS

> **Óçìåßùóç:** ¼ôáí Ýíáò áêñïäÝêôçò óå ìéá Üêñç ÷ñåéÜæåôáé íá óõíäåèåß ìå äýï áêñïäÝêôåò óôçí Üëëç, óõíÞèùò åíþíïõìå ôïõò áêñïäÝêôåò ìåôáîý ôïõò óôç ìéá Üêñç ìå Ýíá ìéêñü êáëþäéï, êáé ÷ñçóéìïðïéïýìå Ýíá ìáêñýôåñï êáëþäéï ãéá ôçí Ýíùóç ìå ôçí Üëëç Üêñç.

Ç ðáñáðÜíù äéÜôáîç öáßíåôáé íá åßíáé ç ðéï äéáäåäïìÝíç. Óå ìéá ðáñáëëáãÞ (ðïõ åîçãåßôáé óôï âéâëßï *Ôï RS-232 ìå ÁðëÜ ÂÞìáôá*), ôï SG óõíäÝåôáé óôï SG, ôï TD óõíäÝåôáé óôï RD, ôá RTS êáé CTS óõíäÝïíôáé óôï DCD, ôï DTR óõíäÝåôáé óôï DSR, êáé áíôßóôñïöá.

27.2.2.1.2 ÔõðïðïéçìÝíá Êáëþäéá RS-232C

¸íá ôõðïðïéçìÝíï óåéñéáêü êáëþäéï RS-232C, ìåôáöÝñåé üëá ôá óÞìáôá áðåõèåßáò áðü ôç ìéá Üêñç óôçí Üëëç, ÷ùñßò êáìéÜ áëëáãÞ óôïõò áêñïäÝêôåò. Áõôü áðëÜ óçìáßíåé üôé ï áêñïäÝêôçò “ÌåôÜäïóç ÄåäïìÝíùí (TD)” ôçò ìéáò Üêñçò, óõíäÝåôáé óôïí áêñïäÝêôç “ÌåôÜäïóç ÄåäïìÝíùí (TD)” ôçò Üëëçò Üêñçò. Áõôü åßíáé êáé ôï åßäïò ôïõ êáëùäßïõ ðïõ èá ÷ñçóéìïðïéÞóåôå ãéá íá óõíäÝóåôå Ýíá modem óôï FreeBSD óýóôçìá óáò, êáé åßíáé åðßóçò êáôÜëëçëï ãéá ïñéóìÝíá ôåñìáôéêÜ.

27.2.2.2 Èýñåò

Ïé óåéñéáêÝò èýñåò åßíáé ïé óõóêåõÝò ðïõ ìåôáöÝñïõí ôá äåäïìÝíá ìåôáîý ôïõ FreeBSD óõóôÞìáôïò êáé ôïõ ôåñìáôéêïý. Ç åíüôçôá áõôÞ ðåñéãñÜöåé ôá åßäç ôùí èõñþí ðïõ õðÜñ÷ïõí, êáé ðùò ôá ÷åéñßæåôáé ôï FreeBSD.

27.2.2.2.1 Åßäç Èõñþí

ÕðÜñ÷ïõí äéÜöïñá åßäç óåéñéáêþí èõñþí. Ðñéí áãïñÜóåôå Þ êáôáóêåõÜóåôå êÜðïéï êáëþäéï, èá ðñÝðåé íá âåâáéùèåßôå üôé ôáéñéÜæåé ìå ôç èýñá ôïõ ôåñìáôéêïý êáé ôïõ FreeBSD óõóôÞìáôïò óáò.

Ôá ðåñéóóüôåñá ôåñìáôéêÜ äéáèÝôïõí èýñåò DB-25. Ïé ðñïóùðéêïß õðïëïãéóôÝò, óõìðåñéëáìâáíïìÝíùí êáé áõôþí ðïõ åêôåëïýí FreeBSD, ìðïñåß íá Ý÷ïõí èýñåò ôýðïõ DB-25 Þ DB-9. Áí äéáèÝôåôå êÜñôá ðïëëáðëþí óåéñéáêþí èõñþí óôïí õðïëïãéóôÞ óáò, ìðïñåß íá äéáèÝôåé èýñåò ôýðïõ RJ-12 Þ RJ-45.

Äåßôå ôçí ôåêìçñßùóç ðïõ óõíïäåýåé ôï õëéêü óáò, ãéá ôéò ôå÷íéêÝò ðñïäéáãñáöÝò ôçò èýñáò ðïõ ÷ñçóéìïðïéåßôå. ÓõíÞèùò ìðïñåßôå íá âãÜëåôå óõìðÝñáóìá áí áðëþò êïéôÜîåôå ôçí õðïäï÷Þ.

27.2.2.2.2 Ïíüìáôá Èõñþí

Óôï FreeBSD, Ý÷åôå ðñüóâáóç óå êÜèå óåéñéáêÞ èýñá ìÝóù ìéáò êáôá÷þñéóçò óôïí êáôÜëïãï `/dev`. ÕðÜñ÷ïõí äýï äéáöïñåôéêÜ åßäç êáôá÷ùñßóåùí:

- Ïé èýñåò ðïõ ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá åßóïäï óôï óýóôçìá, ïíïìÜæïíôáé `/dev/ttyuN` üðïõ ôï `N` åßíáé ï áñéèìüò ôçò èýñáò (ç áñßèìçóç îåêéíÜåé áðü ôï ìçäÝí). ÃåíéêÜ, ïé èýñåò áõôÝò ðñïïñßæïíôáé ãéá óýíäåóç ìå ôåñìáôéêÜ. Ïé èýñåò åéóüäïõ áðáéôïýí íá åßíáé åíåñãü ôï óÞìá áíß÷íåõóçò öÝñïíôïò (DCD) óôç óåéñéáêÞ ãñáììÞ, ðñïêåéìÝíïõ íá ëåéôïõñãÞóïõí óùóôÜ.
- Ïé èýñåò êëÞóçò Þ åîüäïõ, ïíïìÜæïíôáé `/dev/cuauN`. Ïé èýñåò áõôÝò äåí ÷ñçóéìïðïéïýíôáé óõíÞèùò ãéá ôåñìáôéêÜ, áëëÜ ãéá modems. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áõôÞ ôç èýñá ãéá êÜðïéï ôåñìáôéêü ðïõ äåí õðïóôçñßæåé ôï óÞìá áíß÷íåõóçò öÝñïíôïò.

Áí Ý÷åôå óõíäÝóåé Ýíá ôåñìáôéêü óôçí ðñþôç óåéñéáêÞ èýñá (ðïõ óôï MS-DOS áíáöÝñåôáé ùò `COM1`), èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí óõóêåõÞ `/dev/ttyu0` ãéá íá áíáöåñèåßôå óôï ôåñìáôéêü. Áí ôï ôåñìáôéêü åßíáé óôçí äåýôåñç óåéñéáêÞ èýñá (ðïõ åßíáé åðßóçò ãíùóôÞ ùò `COM2`) ÷ñçóéìïðïéÞóôå ôç óõóêåõÞ `/dev/ttyu1`, ê.ï.ê.

27.2.3 Ñýèìéóç ôïõ ÐõñÞíá

Ôï FreeBSD áðü ðñïåðéëïãÞ õðïóôçñßæåé ôÝóóåñéò óåéñéáêÝò èýñåò. Óôïí êüóìï ôïõ MS-DOS ïé èýñåò áõôÝò åßíáé ãíùóôÝò ùò: `COM1`, `COM2`, `COM3`, êáé `COM4`. Ôï FreeBSD áõôÞ ôç óôéãìÞ õðïóôçñßæåé “Ýîõðíåò” óåéñéáêÝò êÜñôåò ðïëëáðëþí èõñþí, üðùò ôéò BocaBoard 1008 êáé 2016, üðùò êáé ðéï åõöõÞò êÜñôåò, üðùò áõôÝò ðïõ êáôáóêåõÜæïíôáé áðü ôçí Digiboard êáé ôçí Stallion Technologies. Ï ðñïåðéëåãìÝíïò ðõñÞíáò ùóôüóï, åêôåëåß áíß÷íåõóç ìüíï ãéá ôéò ôõðéêÝò óåéñéáêÝò (COM) èýñåò.

Ãéá íá äåßôå áí ï ðõñÞíáò óáò áíáãíùñßæåé ïðïéáäÞðïôå áðü ôéò óåéñéáêÝò èýñåò, ðáñáôçñÞóôå ôá ìçíýìáôá êáôÜ ôç äéÜñêåéá åêêßíçóçò ôïõ óõóôÞìáôïò, Þ ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `/sbin/dmesg` ãéá íá îáíáäåßôå ôá ìçíýìáôá ôïõ ðõñÞíá êáôÜ ôç äéÜñêåéá ôçò åêêßíçóçò. Ðéï óõãêåêñéìÝíá, áíáæçôÞóôå ôá ìçíýìáôá ðïõ îåêéíïýí ìå ôïõò ÷áñáêôÞñåò `sio`.

> **Õðüäåéîç:** Ãéá íá äåßôå ìüíï ôá ìçíýìáôá ðïõ ðåñéÝ÷ïõí ôç ëÝîç `sio`, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ:

```
# /sbin/dmesg | grep ’sio’
```

Ãéá ðáñÜäåéãìá, óå Ýíá óýóôçìá ìå ôÝóóåñéò óåéñéáêÝò èýñåò, ôá ìçíýìáôá ôïõ ðõñÞíá ðïõ ó÷åôßæïíôáé ìå áõôÝò öáßíïíôáé ðáñáêÜôù:

```
sio0 at 0x3f8-0x3ff irq 4 on isa
sio0: type 16550A
sio1 at 0x2f8-0x2ff irq 3 on isa
sio1: type 16550A
sio2 at 0x3e8-0x3ef irq 5 on isa
sio2: type 16550A
sio3 at 0x2e8-0x2ef irq 9 on isa
sio3: type 16550A
```

Áí ï ðõñÞíáò óáò äåí áíáãíùñßæåé üëåò ôéò óåéñéáêÝò óáò èýñåò, ðéèáíüí íá ÷ñåéáóôåß íá ôïí ñõèìßóåôå ÷ñçóéìïðïéþíôáò ôï áñ÷åßï `/boot/device.hints`. Ìðïñåßôå åðßóçò íá ìåôáôñÝøåôå óå ó÷üëéï (Þ êáé íá äéáãñÜøåôå ôåëåßùò) ãñáììÝò ðïõ áíáöÝñïíôáé óå óõóêåõÝò ðïõ äåí õðÜñ÷ïõí óôï óýóôçìá óáò.

Ðáñáêáëïýìå áíáôñÝîôå óôç óåëßäá manual ôïõ sio(4) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò óåéñéáêÝò èýñåò êáé ôéò ñõèìßóåéò ôùí êáñôþí ðïëëáðëþí óåéñéáêþí èõñþí. Áí ÷ñçóéìïðïéåßôå áñ÷åßï ñõèìßóåùí ðïõ ðñïÝñ÷åôáé áðü êÜðïéá ðáëáéüôåñç Ýêäïóç ôïõ FreeBSD, èá ðñÝðåé íá åßóôå éäéáßôåñá ðñïóåêôéêïß, êáèþò êÜðïéåò áðü ôéò åðéëïãÝò ôùí óõóêåõþí êáé ç óýíôáîç ôïõò Ý÷ïõí áëëÜîåé óôéò íåüôåñåò åêäüóåéò.

> **Óçìåßùóç:** Ôï port `IO_COM1` õðïêáèéóôÜ ôï port `0x3f8`, `IO_COM2` åßíáé ôï `0x2f8`, `IO_COM3` åßíáé ôï `0x3e8`, êáé ôï `IO_COM4` åßíáé ôï `0x2e8`. ÁõôÝò åßíáé êáé ïé ðéï êïéíÝò ñõèìßóåéò ãéá ôéò ðáñáðÜíù èýñåò. Ïé ãñáììÝò interrupt 4, 3, 5 êáé 9 åßíáé ïé ðëÝïí óõíçèéóìÝíåò ôéò óåéñéáêÝò èýñåò. Óçìåéþóôå åðßóçò üôé ïé óõíçèéóìÝíåò óåéñéáêÝò èýñåò *äåí* ìðïñïýí íá ìïéñÜæïíôáé ôï ßäéï interrupt ìå êÜðïéá Üëëç óõóêåõÞ óå õðïëïãéóôÝò ðïõ äéáèÝôïõí äßáõëï ôýðïõ ISA (ïé êÜñôåò ðïëëáðëþí èõñþí äéáèÝôïõí åéäéêÜ êõêëþìáôá ðïõ åðéôñÝðïõí óå üëá ôá 16550Á ðïõ ÷ñçóéìïðïéåß ç êÜñôá íá ìïéñÜæïíôáé ÷ñçóéìïðïéþíôáò ìüíï ìßá Þ äýï ãñáììÝò interrupt).

27.2.4 ÅéäéêÜ Áñ÷åßá Óõóêåõþí

Ç ðñüóâáóç óôéò ðåñéóóüôåñåò óõóêåõÝò ôïõ ðõñÞíá, åðéôõã÷Üíåôáé ìÝóù “åéäéêþí áñ÷åßùí óõóêåõþí”, ôá ïðïßá âñßóêïíôáé óôïí êáôÜëïãï `/dev/`. Óôéò óõóêåõÝò `sio` ç ðñüóâáóç åðéôõã÷Üíåôáé ìÝóù ôùí áñ÷åßùí `/dev/ttyuN` (ãéá óõóêåõÝò åéóüäïõ, dial-in) êáé `/dev/cuauN` (ãéá óõóêåõÝò åîüäïõ, call-out). Ôï FreeBSD ðáñÝ÷åé åðßóçò óõóêåõÝò áñ÷éêïðïßçóçò (`/dev/ttyuN.init` êáé `/dev/cuauN.init`) êáé óõóêåõÝò êëåéäþìáôïò (`/dev/ttyuN.lock` êáé `/dev/cuauN.lock`). Ïé óõóêåõÝò áñ÷éêïðïßçóçò ÷ñçóéìïðïéïýíôáé ãéá ôçí ñýèìéóç ôùí áñ÷éêþí ðáñáìÝôñùí åðéêïéíùíßáò óôç èýñá, êÜèå öïñÜ ðïõ áíïßãåé. ÔÝôïéåò ðáñÜìåôñïé åßíáé ð.÷. ôï `crtscts` ãéá ôá modems ðïõ ÷ñçóéìïðïéïýí óçìáôïäïóßá `RTS/CTS` ãéá Ýëåã÷ï ñïÞò. Ïé óõóêåõÝò êëåéäþìáôïò ÷ñçóéìïðïéïýíôáé ãéá íá êëåéäþíïõí êÜðïéåò ñõèìßóåéò óôéò èýñåò, þóôå íá ìçí ìðïñïýí íá áëëá÷èïýí áðü Üëëïõò ÷ñÞóôåò Þ ðñïãñÜììáôá. Ãéá ðëçñïöïñßåò ó÷åôéêÝò ìå ôéò ñõèìßóåéò ôåñìáôéêþí, ôçí áñ÷éêïðïßçóç êáé ôá êëåéäþìáôá óõóêåõþí, êáé ôç ñýèìéóç ðáñáìÝôñùí óôá ôåñìáôéêÜ, äåßôå áíôßóôïé÷á ôéò óåëßäåò manual termios(4), sio(4), êáé stty(1).

27.2.5 Ñõèìßóåéò Óåéñéáêþí Èõñþí

Ç óõóêåõÞ `ttyuN` (Þ `cuauN`) åßíáé ç êáíïíéêÞ óõóêåõÞ ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå óôéò åöáñìïãÝò óáò. ¼ôáí ìéá äéáäéêáóßá áíïßãåé ìéá óõóêåõÞ, ÷ñçóéìïðïéïýíôáé êÜðïéåò ðñïåðéëåãìÝíåò ñõèìßóåéò I/O ãéá ôï ôåñìáôéêü. Ìðïñåßôå íá äåßôå áõôÝò ôéò ñõèìßóåéò ìå ôçí åíôïëÞ:

```
# stty -a -f /dev/ttyu1
```

Áí áëëÜîåôå ôéò ñõèìßóåéò óå áõôÞ ôç óõóêåõÞ, áõôÝò èá ðáñáìåßíïõí ìÝ÷ñé ôï êëåßóéìï ôçò óõóêåõÞò. ¼ôáí áíïé÷èåß îáíÜ, èá Ý÷åé åðáíÝëèåé óôéò ðñïåðéëåãìÝíåò ñõèìßóåéò. Ãéá íá áëëÜîåôå ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò, ìðïñåßôå íá áíïßîåôå êáé íá áëëÜîåôå ôéò ñõèìßóåéò ôçò óõóêåõÞò “áñ÷éêÞò êáôÜóôáóçò”. Ãéá ðáñÜäåéãìá, ãéá íá åíåñãïðïéÞóåôå ôç ëåéôïõñãßá `CLOCAL`, íá ïñßóåôå åðéêïéíùíßá 8bit êáé Ýëåã÷ï ñïÞò ìÝóù `XON/XOFF` ãéá ôç óõóêåõÞ `ttyu5`, ãñÜøôå:

```
# stty -f /dev/ttyu5.init clocal cs8 ixon ixoff
```

Ç áñ÷éêïðïßçóç ôùí óåéñéáêþí óõóêåõþí ãéá üëï ôï óýóôçìá, åëÝã÷åôáé áðü ôï áñ÷åßï `/etc/rc.d/serial`. Ôï áñ÷åßï áõôü åðçñåÜæåé ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò ôùí óåéñéáêþí óõóêåõþí.

Ãéá íá áðïôñÝøåôå ôçí áëëáãÞ óõãêåêñéìÝíùí ñõèìßóåùí áðü êÜðïéá åöáñìïãÞ, áëëÜîôå ôéò ñõèìßóåéò ôçò óõóêåõÞò “êëåéäþìáôïò”. Ãéá ðáñÜäåéãìá, ãéá íá êëåéäþóåôå ôçí ôá÷ýôçôá ôçò óõóêåõÞò `ttyu5` óôá 57600 bps, ãñÜøôå:

```
# stty -f /dev/ttyu5.lock 57600
```

Ôþñá, ìéá åöáñìïãÞ ðïõ áíïßãåé ôç èýñá `ttyu5` êáé åðé÷åéñåß íá áëëÜîåé ôçí ôá÷ýôçôá ôçò èýñáò, èá áíáãêáóôåß íá ðáñáìåßíåé óôá 57600 bps.

ÖõóéêÜ, èá ðñÝðåé íá ñõèìßóåôå ôéò óõóêåõÝò áñ÷éêïðïßçóçò êáé êëåéäþìáôïò, þóôå íá åßíáé åããñÜøéìåò ìüíï áðü ôïí ëïãáñéáóìü ôïõ `root`.

27.3 ÔåñìáôéêÜ

ÓõíåéóöïñÜ ôïõ Sean Kelly.

Ðñïåéäïðïßçóç: Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ôùí óåéñéáêþí èõñþí ìåôïíïìÜóôçêáí áðü `/dev/cuadN` óå `/dev/cuauN` êáé áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ðáñáêÜôù ôåêìçñßùóç óýìöùíá ìå ôéò ðáñáðÜíù áëëáãÝò.

Ôá ôåñìáôéêÜ ðáñÝ÷ïõí ìéá âïëéêÞ êáé ÷áìçëïý êüóôïõò ìÝèïäï ðñüóâáóçò óôï FreeBSD óýóôçìá óáò, üôáí äåí âñßóêåóôå ìðñïóôÜ óôçí êïíóüëá Þ óå êÜðïéï óõíäåìÝíï äßêôõï. Ç åíüôçôá áõôÞ ðåñéãñÜöåé ðùò íá ÷ñçóéìïðïéÞóåôå ôåñìáôéêÜ óôï FreeBSD.

27.3.1 ×ñÞóåéò êáé Åßäç Ôåñìáôéêþí

Ôá áñ÷éêÜ óõóôÞìáôá UNIX äåí åß÷áí êïíóüëåò. Áíôßèåôá, ïé ÷ñÞóôåò åéóÝñ÷ïíôáí óôï óýóôçìá êáé åêôåëïýóáí ôá ðñïãñÜììáôá ôïõò ìÝóù ôåñìáôéêþí ðïõ óõíäÝïíôáí óôéò óåéñéáêÝò èýñåò ôïõ õðïëïãéóôÞ. Áõôü ìïéÜæåé áñêåôÜ ìå ôç ÷ñÞóç modem êáé ëïãéóìéêïý åîïìïßùóçò ôåñìáôéêïý ãéá óýíäåóç óå Ýíá áðïìáêñõóìÝíï óýóôçìá. Ìå ôïí ôñüðï áõôü ìðïñåßôå âÝâáéá íá åêôåëÝóåôå åñãáóßåò ìüíï óå ðåñéâÜëëïí êåéìÝíïõ.

Ôá óçìåñéíÜ PC äéáèÝôïõí êïíóüëåò éêáíÝò íá áðåéêïíßóïõí ãñáöéêÜ ðïëý õøçëÞò ðïéüôçôáò, áëëÜ ç éêáíüôçôá óýíäåóçò óôï ìç÷Üíçìá ìÝóù óåéñéáêÞò èýñáò, õðÜñ÷åé áêüìá ó÷åäüí óå üëá ôá óçìåñéíÜ óõóôÞìáôá ôýðïõ UNIX. Ôï FreeBSD äåí áðïôåëåß åîáßñåóç. ÓõíäÝïíôáò Ýíá ôåñìáôéêü óå ìéá á÷ñçóéìïðïßçôç óåéñéáêÞ èýñá, ìðïñåßôå íá åéóÝëèåôå óôï óýóôçìá êáé íá åêôåëÝóåôå ïðïéïäÞðïôå ðñüãñáììá êåéìÝíïõ ôï ïðïßï èá ìðïñïýóáôå óõíÞèùò íá åêôåëÝóåôå óôçí êïíóüëá Þ óå Ýíá ðáñÜèõñï `xterm` ôïõ óõóôÞìáôïò X Window.

Ãéá ÷ñÞóç óå åðé÷åéñÞóåéò, åßíáé äõíáôüí íá óõíäÝóåôå ðïëëÜ ôåñìáôéêÜ óå Ýíá FreeBSD óýóôçìá êáé íá ôá ôïðïèåôÞóåôå óôéò èÝóåéò åñãáóßáò ôùí õðáëëÞëùí. ¸íáò ïéêéáêüò ÷ñÞóôçò ìðïñåß íá ÷ñçóéìïðïéÞóåé êÜðïéï ðáëéü õðïëïãéóôÞ (ð.÷. Ýíá ðáëéü IBM PC Þ Macintosh) ùò ôåñìáôéêü åíüò ðïëý éó÷õñüôåñïõ õðïëïãéóôÞ ðïõ åêôåëåß FreeBSD. Ìå ôïí ôñüðï áõôü, ìðïñåßôå íá ìåôáôñÝøåôå áõôü ðïõ èá Þôáí Ýíá ìïíü÷ñçóôï óýóôçìá óå Ýíá ðïëõ÷ñçóôéêü ðïëëáðëþí ÷ñçóôþí.

Óôï FreeBSD õðÜñ÷ïõí ôñßá åßäç ôåñìáôéêþí:

- ÊïõôÜ ÔåñìáôéêÜ
- PC ðïõ ëåéôïõñãïýí ùò ôåñìáôéêÜ
- ÔåñìáôéêÜ X

Ïé ðáñáêÜôù õðïåíüôçôåò ðåñéãñÜöïõí êáèÝíá áðü áõôïýò ôïõò ôýðïõò.

27.3.1.1 ÊïõôÜ ÔåñìáôéêÜ

Ôá êïõôÜ ôåñìáôéêÜ åßíáé åîåéäéêåõìÝíåò óõóêåõÝò ðïõ åðéôñÝðïõí ôç óýíäåóç óå õðïëïãéóôÝò ìÝóù óåéñéáêþí ãñáììþí. Áðïêáëïýíôáé "êïõôÜ" áêñéâþò åðåéäÞ ç ìüíç õðïëïãéóôéêÞ éó÷ý ðïõ Ý÷ïõí åßíáé ãéá áðåéêüíéóç, áðïóôïëÞ, êáé ëÞøç êåéìÝíïõ. Äåí ìðïñåßôå íá åêôåëÝóåôå ðñïãñÜììáôá óå áõôÜ. ¼ëç ç éó÷ýò ôïõò ðñïÝñ÷åôáé áðü ôïí õðïëïãéóôÞ ðïõ èá ôá óõíäÝóåôå, êáé ìÝóù áõôïý ìðïñåßôå íá åêôåëÝóåôå óõíôÜêôåò êåéìÝíïõ, ìåôáãëùôôéóôÝò, ðñïãñÜììáôá email, ðáé÷íßäéá ê.ï.ê.

ÕðÜñ÷ïõí åêáôïíôÜäåò åßäç êïõôþí ôåñìáôéêþí áðü áñêåôïýò êáôáóêåõáóôÝò, üðùò ôï VT-100 ôçò Digital Equipment Corporation êáé ôï WY-75 ôçò Wyse. Ó÷åäüí ïðïéïóäÞðïôå ôýðïò ìðïñåß íá ëåéôïõñãÞóåé ìå ôï FreeBSD. ÌåñéêÜ ôåñìáôéêÜ õøçëïý êüóôïõò ìðïñïýí åðßóçò íá áðåéêïíßóïõí êáé ãñáöéêÜ, áëëÜ áõôÞ ç äõíáôüôçôá ìðïñïýí íá ôçí åêìåôáëëåõèïýí ìüíï óõãêåêñéìÝíá ðáêÝôá ëïãéóìéêïý.

Ôá êïõôÜ ôåñìáôéêÜ åßíáé äçìïöéëÞ óå ðåñéâÜëëïíôá åñãáóßáò üðïõ ïé åñãáæüìåíïé äåí ÷ñåéÜæïíôáé ðñüóâáóç óå ãñáöéêÝò åöáñìïãÝò, üðùò áõôÝò ðïõ ðáñÝ÷ïíôáé áðü ôï óýóôçìá X Window.

27.3.1.2 PC ðïõ Ëåéôïõñãïýí ùò ÔåñìáôéêÜ

Áí Ýíá êïõôü ôåñìáôéêü Ý÷åé áêñéâþò ôçí éó÷ý ðïõ ÷ñåéÜæåôáé ãéá íá äå÷ôåß, íá óôÝëíåé, êáé íá ëáìâÜíåé êåßìåíï, ôüôå êáé êÜèå õðïëïãéóôÞò ðïõ óáò ðåñéóóåýåé ìðïñåß íá ëåéôïõñãÞóåé óáí êïõôü ôåñìáôéêü. Ôï ìüíï ðïõ ÷ñåéÜæåóôå åßíáé ôï óùóôü êáëþäéï êáé êÜðïéï ðñüãñáììá *åîïìïßùóçò ôåñìáôéêïý* ôï ïðïßï èá åêôåëåßôå óôïí õðïëïãéóôÞ áõôü.

Ç ðáñáðÜíù äéÜôáîç åßíáé äçìïöéëÞò ãéá ïéêéáêÞ ÷ñÞóç. Áí ãéá ðáñÜäåéãìá êÜðïéïò äïõëåýåé óôçí êïíóüëá ôïõ óõóôÞìáôïò óáò, ìðïñåßôå íá åêôåëÝóåôå ôçí åñãáóßá óáò (ìå ôçí ðñïûðüèåóÞ üôé åßíáé ìüíï êåßìåíï) ôçí ßäéá óôéãìÞ, ÷ñçóéìïðïéþíôáò Ýíá ëéãüôåñï éó÷õñü óýóôçìá ôï ïðïßï óõíäÝåôáé óôï FreeBSD óáò ùò ôåñìáôéêü.

ÕðÜñ÷ïõí äýï ôïõëÜ÷éóôïí âïçèçôéêÜ ðñïãñÜììáôá óôï âáóéêü óýóôçìá ôïõ FreeBSD ðïõ ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá íá äïõëÝøåôå ìÝóù óåéñéáêÞò óýíäåóçò: ôï cu(1) êáé ôï tip(1).

Ãéá íá óõíäåèåßôå áðü Ýíá Üëëï ìç÷Üíçìá ðïõ åêôåëåß FreeBSD óôç óåéñéáêÞ óýíäåóç åíüò Üëëïõ óõóôÞìáôïò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ðáñáêÜôù åíôïëÞ:

```
# cu -l serial-port-device
```

¼ðïõ ôï “serial-port-device” åßíáé ôï üíïìá ôïõ áñ÷åßïõ óõóêåõÞò ðïõ áíôéðñïóùðåýåé ìéá óåéñéáêÞ èýñá óôï óýóôçìá óáò. ÁõôÜ ôá áñ÷åßá óõóêåõþí êáëïýíôáé `/dev/cuauN`.

Ôï “N” óôï üíïìá ôçò óõóêåõÞò, áíôéðñïóùðåýåé ôïí áñéèìü ôçò óåéñéáêÞò èýñáò.

Óçìåßùóç: Óçìåéþóôå üôé ç áñßèìçóç ôùí óõóêåõþí óôï FreeBSD îåêéíÜ áðü ôï ìçäÝí, êáé ü÷é áðü ôï Ýíá (üðùò óõìâáßíåé ãéá ðáñÜäåéãìá óôá óõóôÞìáôá ðïõ ó÷åôßæïíôáé ìå ôï MS-DOS). Áõôü ðñáêôéêÜ óçìáßíåé üôé ç èýñá ðïõ óôï MS-DOS êáëåßôáé `COM1` èá åßíáé óõíÞèùò ç `/dev/cuau0` óôï FreeBSD.

Óçìåßùóç: ÊÜðïéïé ÷ñÞóôåò ðñïôéìïýí íá ÷ñçóéìïðïéïýí Üëëá ðñïãñÜììáôá ðïõ äéáôßèåíôáé ìÝóù ôçò ÓõëëïãÞò ôùí Ports. Ôá Ports ðåñéëáìâÜíïõí áñêåôÜ âïçèçôéêÜ ðñïãñÜììáôá ìå ëåéôïõñãßåò ðáñüìïéåò ìå ôï cu(1) êáé ôï tip(1), ãéá ðáñÜäåéãìá ôï `comms/minicom`.

27.3.1.3 ÔåñìáôéêÜ X

Ôá ôåñìáôéêÜ X åßíáé ôá ðéï åîåëéãìÝíá åßäç ôåñìáôéêþí ðïõ õðÜñ÷ïõí. Áíôß íá óõíäÝïíôáé óå óåéñéáêÞ èýñá, óõíÞèùò óõíäÝïíôáé ìÝóù äéêôýïõ, ð.÷. Ethernet. Áíôß íá ðåñéïñßæïíôáé ìüíï óå åöáñìïãÝò êåéìÝíïõ, ìðïñïýí íá áðåéêïíßóïõí ïðïéáäÞðïôå åöáñìïãÞ ôùí X.

ÁíáöÝñáìå ôá ôåñìáôéêÜ X ìüíï ãéá ëüãïõò ðëçñüôçôáò áõôÞò ôçò åíüôçôáò. Óôï êåöÜëáéï áõôü ùóôüóï, *äåí* êáëýðôåôáé ç åãêáôÜóôáóç, ñýèìéóç, êáé ÷ñÞóç ôùí ôåñìáôéêþí X.

27.3.2 Ñýèìéóç

Ç åíüôçôá áõôÞ ðåñéãñÜöåé ôé ÷ñåéÜæåôáé íá ñõèìßóåôå óôï FreeBSD óýóôçìá óáò ãéá íá åßíáé äõíáôÞ ç åßóïäïò óå áõôü ìÝóù ôåñìáôéêïý. ÐñïûðïèÝôåé üôé Ý÷åôå Þäç ñõèìßóåé ôïí ðõñÞíá óáò íá õðïóôçñßæåé ôç óåéñéáêÞ èýñá óôçí ïðïßá åßíáé óõíäåìÝíç ôï ôåñìáôéêü—êáé üôé ôï Ý÷åôå Þäç óõíäÝóåé.

Óôï ÊåöÜëáéï 13 åßäáìå üôé ç äéåñãáóßá `init` åßíáé õðåýèõíç ãéá ôïí Ýëåã÷ï ôùí Üëëùí äéåñãáóéþí, êáé ãéá ôçí áñ÷éêïðïßçóç êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ìéá áðü ôéò åñãáóßåò ðïõ åêôåëåß ç `init` åßíáé íá äéáâÜæåé ôï áñ÷åßï `/etc/ttys` êáé íá îåêéíÜ ìéá äéåñãáóßá `getty` óå êÜèå äéáèÝóéìï ôåñìáôéêü. Ç äéåñãáóßá `getty` áíáëáìâÜíåé íá äéáâÜóåé ôï üíïìá ÷ñÞóôç êáé íá îåêéíÞóåé ôï ðñüãñáììá `login`.

Ãéá íá ñõèìéóôïýí ôá ôåñìáôéêÜ óôï FreeBSD óýóôçìá óáò, èá ðñÝðåé íá êÜíåôå ôá áêüëïõèá âÞìáôá ùò `root`:

1. ÐñïóèÝóôå ìéá ãñáììÞ óôï `/etc/ttys` ìå ôï üíïìá ôçò óõóêåõÞò üðùò öáßíåôáé óôïí êáôÜëïãï `/dev`, áí äåí õðÜñ÷åé Þäç.
2. Êáèïñßóôå üôé èá åêôåëåßôáé ç `/usr/libexec/getty` óôçí èýñá, êáé åðéëÝîôå ôïí êáôÜëëçëï ôýðï *`getty`* áðü ôï áñ÷åßï `/etc/gettytab`.
3. Êáèïñßóôå ôïí ðñïåðéëåãìÝíï ôýðï ôåñìáôéêïý.
4. ÅíåñãïðïéÞóôå ôç èýñá èÝôïíôáò ôçí áíôßóôïé÷ç åðéëïãÞ óôï “on”.
5. ÅðéëÝîôå áí ç èýñá èá åßíáé áóöáëÞò ìå ôçí åðéëïãÞ “secure”.

6. ÅîáíáãêÜóôå ôçí `init` íá äéáâÜóåé îáíÜ ôï áñ÷åßï `/etc/ttys`.

Ùò ðñïáéñåôéêü âÞìá, ìðïñåßôå íá äçìéïõñãÞóåôå Ýíá ðñïóáñìïóìÝíï ôýðï *`getty`* ãéá íá ôïí ÷ñçóéìïðïéÞóåôå óôï âÞìá 2, óôçí êáôá÷þñéóç ôïõ `/etc/gettytab`. Óôï êåöÜëáéï áõôü äåí èá óáò åîçãÞóïõìå ðùò ãßíåôáé áõôü. Óáò ðñïôñÝðïõìå íá äéáâÜóåôå ôéò óåëßäåò manual ôïõ gettytab(5) êáé getty(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

27.3.2.1 ÐñïóèÝôïíôáò ìéá Êáôá÷þñéóç óôï `/etc/ttys`

Ôï áñ÷åßï `/etc/ttys` ðåñéÝ÷åé ìéá ëßóôá üëùí ôùí èõñþí ôïõ FreeBSD óõóôÞìáôïò óáò óôéò ïðïßåò èÝëåôå íá åðéôñÝðåôáé ç åßóïäïò óôï óýóôçìá. Ãéá ðáñÜäåéãìá, õðÜñ÷åé ìéá êáôá÷þñéóç óå áõôü ôï áñ÷åßï ãéá ôçí ðñþôç åéêïíéêÞ êïíóüëá `ttyv0`. ÌÝóù áõôÞò ôçò êáôá÷þñéóçò, ìðïñåßôå íá åéóÝëèåôå óôï óýóôçìá áðü ôçí êïíóüëá. Ôï áñ÷åßï áõôü ðåñéÝ÷åé åðßóçò êáôá÷ùñßóåéò ãéá Üëëåò åéêïíéêÝò êïíóüëåò, óåéñéáêÝò èýñåò êáé øåõäü-ôåñìáôéêÜ. Ãéá êÜðïéï ôåñìáôéêü ðïõ åßíáé óõíäåìÝíï áðåõèåßáò óå ìéá óåéñéáêÞ èýñá, ãñÜøôå áðëþò ôçí êáôá÷þñéóç ôçò óåéñéáêÞò óõóêåõÞò üðùò öáßíåôáé óôïí êáôÜëïãï `/dev`, ÷ùñßò íá ãñÜøåôå êáé ôïí êáôÜëïãï `/dev` (ãéá ðáñÜäåéãìá, ç óõóêåõÞ `/dev/ttyv0` èá êáôá÷ùñéóèåß ùò `ttyv0`).

Ç ðñïåðéëåãìÝíç åãêáôÜóôáóç ôïõ FreeBSD ðåñéÝ÷åé Ýíá áñ÷åßï `/etc/ttys` ôï ïðïßï õðïóôçñßæåé ôéò ðñþôåò ôÝóóåñéò óåéñéáêÝò èýñåò: `ttyu0` ùò êáé `ttyu3`. Áí óõíäÝóåôå ôåñìáôéêü óå êÜðïéá áðü áõôÝò ôéò èýñåò, äåí ÷ñåéÜæåôáé íá ðñïóèÝóåôå Üëëç êáôá÷þñéóç.

ÐáñÜäåéãìá 27-1. ÐñïóèÞêç Êáôá÷ùñßóåùí ãéá ôá ÔåñìáôéêÜ óôï `/etc/ttys`

Áò õðïèÝóïõìå üôé èÝëïõìå íá óõíäÝóïõìå äýï ôåñìáôéêÜ óôï óýóôçìá: Ýíá Wyse-50 êáé Ýíá ðáëéü IBM PC 286 óôï ïðïßï åêôåëïýìå ôçí åöáñìïãÞ **Procomm** ìå ôçí ïðïßá åîïìïéþíåôáé Ýíá ôåñìáôéêü ôýðïõ VT-100. ÓõíäÝïõìå ôï Wyse óôçí äåýôåñç óåéñéáêÞ èýñá êáé ôï 286 óôçí Ýêôç óåéñéáêÞ èýñá (ç ïðïßá âñßóêåôáé óå ìéá êÜñôá ðïëëáðëþí èõñþí). Ïé áíôßóôïé÷åò êáôá÷ùñßóåéò óôï áñ÷åßï `/etc/ttys` èá ìïéÜæïõí ìå ôéò ðáñáêÜôù:

```
ttyu1❶  "/usr/libexec/getty std.38400"❷  wy50❸  on❹  insecure❺
ttyu5   "/usr/libexec/getty std.19200"  vt100  on  insecure
```

❶ Ôï ðñþôï ðåäßï, åßíáé óõíÞèùò ôï üíïìá ôïõ åéäéêïý áñ÷åßïõ ôåñìáôéêïý üðùò öáßíåôáé óôïí êáôÜëïãï `/dev`.

❷ Ôï äåýôåñï ðåäßï, åßíáé ç åíôïëÞ ðïõ èá åêôåëåóôåß ãéá áõôÞ ôç ãñáììÞ, ç ïðïßá åßíáé óõíÞèùò ç getty(8). Ç `getty` áñ÷éêïðïéåß êáé áíïßãåé ôç ãñáììÞ, ñõèìßæåé ôçí ôá÷ýôçôá, åìöáíßæåé ôçí ðñïôñïðÞ ãéá åéóáãùãÞ ïíüìáôïò ÷ñÞóôç, êáé åêôåëåß ôï ðñüãñáììá login(1).

Ôï ðñüãñáììá `getty` äÝ÷åôáé ìéá (ðñïáéñåôéêÞ) ðáñÜìåôñï óôç ãñáììÞ åíôïëÞò ôïõ, ôïí ôýðï ôïõ *`getty`*. Ï ôýðïò ôïõ *`getty`* êáèïñßæåé ôá ÷áñáêôçñéóôéêÜ ôçò ãñáììÞò ôïõ ôåñìáôéêïý, üðùò ð.÷. ôï ñõèìü ìåôÜäïóçò óå bps êáé ôçí éóïôéìßá (parity). Ôï ðñüãñáììá `getty` äéáâÜæåé áõôÜ ôá ÷áñáêôçñéóôéêÜ áðü ôï áñ÷åßï `/etc/gettytab`.

Ôï áñ÷åßï `/etc/gettytab` ðåñéÝ÷åé ðïëëÝò êáôá÷ùñßóåéò ãéá ãñáììÝò ôåñìáôéêþí, ôüóï ðáëéÝò üóï êáé êáéíïýñéåò. Óôéò ðåñéóóüôåñåò áðü áõôÝò ôéò ðåñéðôþóåéò, ïé êáôá÷ùñßóåéò ðïõ îåêéíïýí ìå ôï êåßìåíï `std`, èá ëåéôïõñãÞóïõí ãéá áðåõèåßáò óõíäåäåìÝíá ôåñìáôéêÜ. ÁõôÝò ïé êáôá÷ùñßóåéò áãíïïýí ôçí éóïôéìßá. ÕðÜñ÷åé ìéá êáôá÷þñéóç `std` ãéá êÜèå ñõèìü ìåôÜäïóçò, áðü 110 ùò 115200. ÖõóéêÜ, ìðïñåßôå íá ðñïóèÝóåôå ôéò äéêÝò óáò êáôá÷ùñßóåéò óå áõôü ôï áñ÷åßï. Ç óåëßäá manual ôïõ gettytab(5) ðåñéÝ÷åé ðåñéóóüôåñåò ðëçñïöïñßåò.

¼ôáí ñõèìßæåôå ôïí ôýðï ôçò *`getty`* óôï áñ÷åßï `/etc/ttys`, âåâáéùèåßôå üôé ôáéñéÜæïõí ïé áíôßóôïé÷åò ñõèìßóåéò åðéêïéíùíßáò óôï ôåñìáôéêü óáò.

Óôï ðáñÜäåéãìá ìáò, ôï Wyse-50 äåí ÷ñçóéìïðïéåß éóïôéìßá êáé óõíäÝåôáé óôá 38400 bps. Ôï 286 PC äåí ÷ñçóéìïðïéåß éóïôéìßá, êáé óõíäÝåôáé óôá 19200 bps.

❸ Ôï ôñßôï ðåäßï åßíáé ï ôýðïò ôïõ ôåñìáôéêïý ðïõ óõíäÝåôáé óõíÞèùò óå áõôÞ ôç ãñáììÞ tty. Ãéá èýñåò åðéëïãéêþí óõíäÝóåùí (dial-up), ç ôéìÞ áõôïý ôïõ ðåäßïõ óõ÷íÜ èá åßíáé `unknown` Þ `dialup`, êáèþò ïé ÷ñÞóôåò èá ìðïñïýí íá ðñáãìáôïðïéÞóïõí óýíäåóç ìå ïðïéïäÞðïôå ëïãéóìéêü Þ ôåñìáôéêü. Ãéá Üìåóá óõíäåìÝíá ôåñìáôéêÜ, ï ôýðïò ôåñìáôéêïý äåí áëëÜæåé, Ýôóé ìðïñåßôå íá âÜëåôå Ýíá ðñáãìáôéêü ôýðï ôåñìáôéêïý óå áõôü ôï ðåäßï, ôïí ïðïßï èá âñåßôå óôç âÜóç äåäïìÝíùí ôïõ termcap(5).

Ãéá ðáñÜäåéãìá, ôï Wyse-50 ÷ñçóéìïðïéåß ôïí ðñáãìáôéêü ôýðï ôåñìáôéêïý ôïõ, åíþ ôï 286 PC ðïõ åêôåëåß ôï **Procomm**, Ý÷åé ñõèìéóôåß íá åîïìïéþíåé ôåñìáôéêü ôýðïõ VT-100.

❹ Ôï ôÝôáñôï ðåäßï êáèïñßæåé áí ç èýñá èá åßíáé åíåñãÞ. Ôïðïèåôþíôáò åäþ ôç ëÝîç `on`, ç `init` èá îåêéíÞóåé ôï ðñüãñáììá ðïõ áíáöÝñåôáé óôï äåýôåñï ðåäßï, ôçí `getty`. Áí âÜëåôå `off` óå áõôü ôï ðåäßï, äåí èá åêôåëåóôåß ç `getty`, êáé Ýôóé äåí èá ìðïñåß íá ãßíåé åßóïäïò óôï óýóôçìá áðü ôç óõãêåêñéìÝíç èýñá.

❺ Ôï ôåëåõôáßï ðåäßï ÷ñçóéìïðïéåßôáé ãéá íá êáèïñßóåé áí ç èýñá åßíáé áóöáëÞò. Áí ÷áñáêôçñßóåôå ìéá èýñá ùò áóöáëÞ, óçìáßíåé üôé ôçí åìðéóôåýåóôå áñêåôÜ þóôå íá åðéôñÝðåôå ôçí åßóïäï ôïõ `root` ìÝóù áõôÞò (Þ ïðïéïõäÞðïôå ëïãáñéáóìïý ìå ID 0). Äåí åðéôñÝðåôáé ç åßóïäïò ôïõ `root` óå ìéá èýñá ðïõ Ý÷åé ÷áñáêôçñéóôåß ìç-áóöáëÞò. Óå ìç-áóöáëåßò èýñåò, ïé ÷ñÞóôåò ðñÝðåé íá åéóÝñ÷ïíôáé ÷ñçóéìïðïéþíôáò Ýíá óõíçèéóìÝíï ëïãáñéáóìü ÷ñÞóôç, êáé íá ÷ñçóéìïðïéïýí ôçí åíôïëÞ su(1) Þ Üëëï áíôßóôïé÷ï ìç÷áíéóìü ãéá íá áðïêôÞóïõí ðñïíüìéá õðåñ÷ñÞóôç.

Óáò óõíéóôïýìå áíåðéöýëáêôá íá ÷ñçóéìïðïéÞóåôå ôç ñýèìéóç "insecure", áêüìá êáé ãéá ôåñìáôéêÜ ðïõ âñßóêïíôáé óå êëåéäùìÝíá äùìÜôéá. Åßíáé áñêåôÜ åýêïëï íá åéóÝëèåôå ùò êáíïíéêüò ÷ñÞóôçò êáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `su` áí ÷ñåéÜæåóôå ðñïíüìéá õðåñ÷ñÞóôç.

27.3.2.2 ÅîáíáãêÜóôå ôçí `init` íá ÎáíáäéáâÜóåé ôï `/etc/ttys`

¸÷ïíôáò êÜíåé ôéò áðáñáßôçôåò áëëáãÝò óôï áñ÷åßï `/etc/ttys`, èá ðñÝðåé íá óôåßëåôå óÞìá SIGHUP (hangup) óôçí äéåñãáóßá `init` ãéá íá ôçí áíáãêÜóåôå íá äéáâÜóåé îáíÜ ôï áñ÷åßï ñõèìßóåùí ôçò. Ãéá ðáñÜäåéãìá:

```
# kill -HUP 1
```

> **Óçìåßùóç:** Ç `init` åßíáé ðÜíôïôå ç ðñþôç äéåñãáóßá ðïõ åêôåëåßôáé óå Ýíá óýóôçìá, êáé Ýôóé èá Ý÷åé ðÜíôïôå ôïí áñéèìü äéåñãáóßáò (PID) 1.

Áí üëåò ïé ñõèìßóåéò åßíáé óùóôÝò, ôá êáëþäéá åßíáé óôç èÝóç ôïõò, êáé ôá ôåñìáôéêÜ åßíáé åíåñãÜ, èá åêôåëåóôåß ç `getty` óå êÜèå ôåñìáôéêü, êáé óôï óçìåßï áõôü èá äåßôå ôçí ðñïôñïðÞ åéóüäïõ (login) óôéò ïèüíåò ôùí ôåñìáôéêþí óáò.

27.3.3 Áíôéìåôþðéóç ÐñïâëçìÜôùí Óýíäåóçò

Áêüìá êáé áí äþóåôå ìåãÜëç ðñïóï÷Þ óôéò ëåðôïìÝñåéåò, ðÜíôá ìðïñåß íá ðÜåé êÜôé óôñáâÜ üôáí ñõèìßæåôå Ýíá ôåñìáôéêü. Åäþ èá âñåßôå ìéá ëßóôá áðü óõìðôþìáôá êáé óõíéóôþìåíåò äéïñèþóåéò.

27.3.3.1 Äåí Åìöáíßæåôáé ÐñïôñïðÞ Åéóüäïõ (login)

Âåâáéùèåßôå üôé ôï ôåñìáôéêü åßíáé óõíäåìÝíï óôï çëåêôñéêü äßêôõï êáé åíåñãïðïéçìÝíï. Áí åßíáé ðñïóùðéêüò õðïëïãéóôÞò ðïõ åíåñãåß ùò ôåñìáôéêü, âåâáéùèåßôå üôé åêôåëåß ëïãéóìéêü åîïìïßùóçò ôåñìáôéêïý óôçí óùóôÞ óåéñéáêÞ èýñá.

Âåâáéùèåßôå üôé ôï êáëþäéï åßíáé êáëÜ óõíäåìÝíï ôüóï óôï ôåñìáôéêü, üóï êáé óôïí õðïëïãéóôÞ ðïõ åêôåëåß FreeBSD. Âåâáéùèåßôå üôé åßíáé ôï óùóôü åßäïò êáëùäßïõ.

Âåâáéùèåßôå üôé ôï ôåñìáôéêü êáé ôï FreeBSD óõìöùíïýí üóï áöïñÜ ôéò ñõèìßóåéò ôçò ôá÷ýôçôáò ìåôÜäïóçò êáé éóïôéìßáò. ÅëÝãîôå ôç öùôåéíüôçôá êáé ôçí áíôßèåóç ôçò ïèüíçò ôïõ ôåñìáôéêïý, êáé áõîÞóôå ôéò áí ÷ñåéÜæåôáé. Áí ðñüêåéôáé ãéá ôåñìáôéêü ìå åêôõðùôÞ (÷ùñßò ïèüíç), âåâáéùèåßôå üôé äéáèÝôåé åðÜñêåéá ÷áñôéïý êáé ìåëáíéïý.

Âåâáéùèåßôå üôé åêôåëåßôáé ç äéáäéêáóßá `getty` ðïõ åîõðçñåôåß ôï ôåñìáôéêü. Ãéá íá äåßôå ìéá ëßóôá ìå ôéò åíåñãÝò äéáäéêáóßåò `getty`, ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `ps`:

```
# ps -axww|grep getty
```

Èá ðñÝðåé íá äåßôå ìéá êáôá÷þñéóç ãéá ôï ôåñìáôéêü óáò. Ãéá ðáñÜäåéãìá, ç áêüëïõèç ïèüíç äåß÷íåé üôé ç äéåñãáóßá `getty` åêôåëåßôå óôç äåýôåñç óåéñéáêÞ èýñá `ttyu1` êáé ÷ñçóéìïðïéåß ôçí êáôá÷þñéóç `std.38400` óôï áñ÷åßï `/etc/gettytab`:

```
22189  d1  Is+    0:00.03 /usr/libexec/getty std.38400 ttyu1
```

Áí äåí åêôåëåßôáé êáìéÜ äéåñãáóßá `getty`, âåâáéùèåßôå üôé Ý÷åôå åíåñãïðïéÞóåé ôç èýñá óôï `/etc/ttys`. Åðßóçò èõìçèåßôå íá åêôåëÝóåôå ôçí åíôïëÞ `kill -HUP 1` ìåôÜ ôçí ôñïðïðïßçóç ôïõ áñ÷åßïõ `ttys`.

Áí åêôåëåßôáé ç äéåñãáóßá `getty` áëëÜ ôï ôåñìáôéêü åîáêïëïõèåß íá ìç äåß÷íåé ðñïôñïðÞ åéóüäïõ, Þ áí äåß÷íåé ðñïôñïðÞ áëëÜ äåí óáò åðéôñÝðåé íá ãñÜøåôå, ßóùò ôï ôåñìáôéêü óáò Þ ôï êáëþäéï íá ìçí åðéôñÝðïõí óõíåííüçóç ìÝóù õëéêïý (hardware handshake). ÄïêéìÜóôå íá áëëÜîåôå ôçí êáôá÷þñéóç óôï áñ÷åßï `/etc/ttys` áðü `std.38400` óå `3wire.38400` (èõìçèåßôå íá åêôåëÝóåôå ôçí åíôïëÞ `kill -HUP 1` ìåôÜ ôçí ôñïðïðïßçóç ôïõ `/etc/ttys`). Ç êáôá÷þñéóç `3wire` åßíáé áíôßóôïé÷ç ìå ôçí `std`, áëëÜ áãíïåß ôï hardware handshaking. Ìðïñåß åðßóçò íá ÷ñåéáóôåß íá ìåéþóåôå ôï ñõèìü óçìáôïäïóßáò (baud) êáé íá åíåñãïðïéÞóåôå ôïí Ýëåã÷ï ñïÞò ìÝóù ëïãéóìéêïý üôáí ÷ñçóéìïðïéåßôå ôï `3wire`, ðñïêåéìÝíïõ íá áðïöýãåôå õðåñ÷åßëéóç ôçò ðñïóùñéíÞò ìíÞìçò (buffer overflow).

27.3.3.2 Áí ÂëÝðåôå Óêïõðßäéá Áíôß ãéá ÐñïôñïðÞ Åéóüäïõ

Âåâáéùèåßôå üôé ôï ôåñìáôéêü êáé ôï FreeBSD óõìöùíïýí óôï ñõèìü bps êáé óôéò ñõèìßóåéò éóïôéìßáò. ÅëÝãîôå ôéò äéåñãáóßåò `getty` ãéá íá âåâáéùèåßôå üôé åêôåëåßôå ôï óùóôü ôýðï *`getty`*. Áí áõôü äåí óõìâáßíåé, åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/ttys` êáé åêôåëÝóôå ôçí åíôïëÞ `kill -HUP 1`.

27.3.3.3 Ïé ×áñáêôÞñåò Åìöáíßæïíôáé Äéðëïß, ôï Password Åìöáíßæåôáé êáôÜ ôçí Ðëçêôñïëüãçóç

ÁëëÜîôå ôç ñýèìéóç ôïõ ôåñìáôéêïý (Þ ôïõ ðñïãñÜììáôïò åîïìïßùóçò ôåñìáôéêïý) áðü “half duplex” Þ “local echo” óå “full duplex”.

27.4 Õðçñåóßá Åéóüäïõ ìÝóù Åðéëïãéêãò Óýíäåóçò (dial-in)

ÓõíåéóöïñÜ ôïõ Guy Helmer. ÐñïóèÞêåò áðü ôïí Sean Kelly.

> **Ðñïåéäïðïßçóç:** Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ôùí óåéñéáêþí èõñþí ìåôïíïìÜóôçêáí áðü `/dev/cuadN` óå `/dev/cuauN` êáé áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ðáñáêÜôù ôåêìçñßùóç óýìöùíá ìå ôéò ðáñáðÜíù áëëáãÝò.

Ç ñýèìéóç ôïõ FreeBSD óõóôÞìáôïò óáò ãéá åßóïäï ìÝóù åðéëïãéêÞò óýíäåóçò, åßíáé áñêåôÜ üìïéá ìå ôç óýíäåóç ôåñìáôéêþí, åêôüò áðü ôï ãåãïíüò üôé ÷ñçóéìïðïéïýíôáé modems áíôß ãéá ôåñìáôéêÜ.

27.4.1 ÅîùôåñéêÜ êáé ÅóùôåñéêÜ Modems

Ôá åîùôåñéêÜ modems åßíáé ìÜëëïí ðéï âïëéêÜ ãéá åðéëïãéêÝò êëÞóåéò, êáèþò ïé ðåñéóóüôåñåò ñõèìßóåéò ôïõò ìðïñïýí íá áðïèçêåõèïýí ìüíéìá óôç ìÞ-ðôçôéêÞ ìíÞìç RAM ðïõ äéáèÝôïõí. Ôá åîùôåñéêÜ modems äéáèÝôïõí óõíÞèùò öùôåéíÝò åíäåßîåéò ðïõ äåß÷íïõí ôçí êáôÜóôáóç óçìáíôéêþí óçìÜôùí ôïõ RS-232. ºóùò ôá öùôÜêéá ðïõ áíáâïóâÞíïõí íá åíôõðùóéÜæïõí ôïõò åðéóêÝðôåò, áëëÜ åßíáé åðßóçò ÷ñÞóéìá ãéá íá öáßíåôáé ðüôå ôï modem ëåéôïõñãåß óùóôÜ.

Ôá åóùôåñéêÜ modems óõíÞèùò äåí äéáèÝôïõí áõôÞ ôç ìíÞìç RAM, êáé Ýôóé ïé ñõèìßóåéò ôïõò ðåñéïñßæïíôáé ìüíï óôçí áëëáãÞ èÝóçò óå êÜðïéïõò äéáêüðôåò ñõèìßóåùí (DIP switches). Áí ôï åóùôåñéêü óáò modem äéáèÝôåé öùôåéíÝò åíäåßîåéò, ìÜëëïí èá åßíáé äýóêïëï íá ôéò äåßôå üôáí ôï êÜëõììá ôïõ óõóôÞìáôïò óáò åßíáé óôç èÝóç ôïõ.

27.4.1.1 Modems êáé Êáëþäéá

Áí ÷ñçóéìïðïéåßôå åîùôåñéêü modem, èá ÷ñåéáóôåßôå öõóéêÜ ôï óùóôü êáëþäéï. ÓõíÞèùò åðáñêåß ôï ôõðïðïéçìÝíï êáëþäéï RS-232C, åöüóïí äéáèÝôåé óõíäÝóåéò ãéá üëá ôá óõíçèéóìÝíá óÞìáôá:

Ðßíáêáò 27-4. Ïíïìáóßåò ÓçìÜôùí

Áêñùíýìéá	Ïíüìáôá
RD	ËÞøç ÄåäïìÝíùí (Received Data)
TD	ÁðïóôïëÞ ÄåäïìÝíùí (Transmitted Data)
DTR	Ôåñìáôéêü ÄåäïìÝíùí óå Åôïéìüôçôá (Data Terminal Ready)
DSR	Óýíïëï ÄåäïìÝíùí óå Åôïéìüôçôá (Data Set Ready)
DCD	Áíß÷íåõóç ÖÝñïíôïò ÓÞìáôïò (Data Carrier Detect). Áíß÷íåõóç óýíäåóçò ôçò ãñáììÞò RS-232C
SG	Ãåßùóç ÓÞìáôïò (Signal Ground)
RTS	Áßôçóç ÁðïóôïëÞò (Request to Send)
CTS	Åôïéìüôçôá ãéá ÁðïóôïëÞ (Clear to Send)

Ôï FreeBSD ÷ñåéÜæåôáé ôá óÞìáôá RTS êáé CTS ãéá Ýëåã÷ï ñïÞò óå ôá÷ýôçôåò ðÜíù áðü 2400 bps, ôï óÞìá CD ãéá íá áíé÷íåýåé ðüôå Ý÷åé áðáíôçèåß ìéá êëÞóç Þ ðüôå ç ãñáììÞ Ý÷åé êëåßóåé, êáé ôï óÞìá DTR ãéá íá åðáíáöÝñåé ôï modem óôçí áñ÷éêÞ ôïõ êáôÜóôáóç ìåôÜ ôç ëÞîç ìéáò óýíäåóçò. ÌåñéêÜ êáëþäéá äåí äéáèÝôïõí üëá ôá áðáñáßôçôá óÞìáôá, Ýôóé áí Ý÷åôå ðñïâëÞìáôá ìå ôïí ôåñìáôéóìü ôçò óõíåäñßáò åéóüäïõ ìå ôï êëåßóéìï ôçò ãñáììÞò, ðéèáíüí íá åõèýíåôáé ôï êáëþäéï ðïõ ÷ñçóéìïðïéåßôå.

¼ðùò êáé Üëëá ëåéôïõñãéêÜ óõóôÞìáôá ôýðïõ UNIX, ôï FreeBSD ÷ñçóéìïðïéåß ôá óÞìáôá ôïõ õëéêïý ãéá íá áíôéëçöèåß ðüôå Ý÷åé áðáíôçèåß ìéá êëÞóç, êáèþò êáé ãéá ôïí ôåñìáôéóìü ôçò êáé ôçí åðáíáöïñÜ ôïõ modem óôçí áñ÷éêÞ ôïõ êáôÜóôáóç ìåôÜ ôï ôÝëïò ôçò. Ôï FreeBSD áðïöåýãåé íá óôÝëíåé åíôïëÝò óôï modem Þ íá ðáñáêïëïõèåß áíáöïñÝò êáôÜóôáóçò áðü áõôü. Áí åßóôå åîïéêåéùìÝíïò ìå óõíäÝóåéò modems óå BBS (Bulletin Board Systems) ðïõ âáóßæïíôáé óå PC, áõôü ìðïñåß íá óáò öáíåß Üâïëï.

27.4.2 Êõêëþìáôá ÓåéñéáêÞò Äéáóýíäåóçò

Ôï FreeBSD õðïóôçñßæåé ôá êõêëþìáôá åðéêïéíùíéþí ðïõ âáóßæïíôáé óôá NS8250, NS16450, NS16550, êáé NS16550A êáé EIA RS-232C (CCITT V.24). Ïé óõóêåõÝò 8250 êáé 16450 Ý÷ïõí åíäéÜìåóç ìíÞìç (buffer) ìåãÝèïõò åíüò ÷áñáêôÞñá. Ç óõóêåõÞ 16550 äéáèÝôåé åíäéÜìåóç ìíÞìç 16 ÷áñáêôÞñùí, ç ïðïßá åðéôñÝðåé ôçí êáëýôåñç áðüäïóç ôçò. (Ëüãù ðñïâëçìÜôùí óôç ó÷åäßáóç ôïõ 16550, äåí åßíáé äõíáôÞ ç ÷ñÞóç áõôÞò ôçò ìíÞìçò, áí åßíáé äõíáôüí ÷ñçóéìïðïéÞóôå ôá 16550Á). Êáèþò ïé óõóêåõÝò ðïõ äéáèÝôïõí åíäéÜìåóç ìíÞìç åíüò ÷áñáêôÞñá áðáéôïýí ðåñéóóüôåñç åñãáóßá áðü ôï ëåéôïõñãéêü óýóôçìá óå ó÷Ýóç ìå áõôÝò ðïõ äéáèÝôïõí 16 ÷áñáêôÞñåò, óõíßóôáíôáé éäéáßôåñá ïé óõóêåõÝò ðïõ âáóßæïíôáé óôï 16550Á. Áí ôï óýóôçìá óáò Ý÷åé ðïëëÝò åíåñãÝò óåéñéáêÝò èýñåò, Þ ðñüêåéôáé íá ëåéôïõñãÞóåé êÜôù áðü âáñý öüñôï, ïé êÜñôåò ðïõ âáóßæïíôáé óôï 16550A åßíáé êáëýôåñåò, êáèþò ðáñÝ÷ïõí åðéêïéíùíßá ìå ìéêñüôåñï ñõèìü óöáëìÜôùí.

27.4.3 ÃñÞãïñç Åðéóêüðçóç

¼ðùò êáé ìå ôá ôåñìáôéêÜ, ç `init` åêôåëåß ìéá äéåñãáóßá `getty` ãéá êÜèå óåéñéáêÞ èýñá ðïõ Ý÷åé ñõèìéóôåß ãéá åéóåñ÷üìåíåò åðéëïãéêÝò óõíäÝóåéò. Ãéá ðáñÜäåéãìá, áí Ý÷åôå óõíäÝóåé Ýíá modem óôçò èýñá `/etc/ttyu0`, ç åíôïëÞ `ps  ax` èá äåßîåé êÜôé óáí ôï ðáñáêÜôù:

```
 4850 ??  I      0:00.09 /usr/libexec/getty V19200 ttyu0
```

¼ôáí êÜðïéïò ÷ñÞóôçò êáëÝóåé óôçò ãñáììÞ áõôÞ êáé ôï modem óõíäåèåß, åíåñãïðïéåßôáé áðü ôï modem ç ãñáììÞ CD. Ï ðõñÞíáò ðáñáôçñåß üôé Ý÷åé åíåñãïðïéçèåß öÝñïí óÞìá, êáé ïëïêëçñþíåé ôç äéáäéêáóßá áíïßãìáôïò ôçò èýñáò áðü ôï modem. To `getty` óôÝëíåé ìéá ðñïôñïðÞ `login:` óôçí áðü ðñéí êáèïñéóìÝíç áñ÷éêÞ ôá÷ýôçôá ôçò èýñáò. Ôï `getty` ðáñáêïëïõèåß ãéá íá äåé áí ëáìâÜíïíôáé Ýãêõñïé ÷áñáêôÞñåò, êáé óôçí ôõðéêÞ ñýèìéóç, áí áíáêáëýøåé üôé ëáìâÜíåé óêïõðßäéá (ðéèáíþò ëüãù äéáöïñÜò óôçí ôá÷ýôçôá óýíäåóçò ôïõ modem óå ó÷Ýóç ìå ôçí ôá÷ýôçôá ôïõ `getty`), ðñïóðáèåß íá ñõèìßóåé ôçí ôá÷ýôçôá ôçò ãñáììÞò ìÝ÷ñé íá ëÜâåé öõóéïëïãéêïýò ÷áñáêôÞñåò.

Áöïý ï ÷ñÞóôçò åéóÜãåé ôïí êùäéêü ôïõ, ôï `getty` åêôåëåß ôï `/usr/bin/login`, ôï ïðïßï êáé ïëïêëçñþíåé ôç äéáäéêáóßá åéóüäïõ, æçôþíôáò áðü ôïí ÷ñÞóôç ôïí êùäéêü ôïõ, êáé îåêéíþíôáò Ýðåéôá ôï êÝëõöïò ôïõ.

27.4.4 Áñ÷åßá Ñõèìßóåùí

ÕðÜñ÷ïõí ôñßá áñ÷åßá ñõèìßóåùí óõóôÞìáôïò óôïí êáôÜëïãï `/etc`, ôá ïðïßá ðéèáíþò èá ÷ñåéáóôåß íá åðåîåñãáóôåßôå ãéá íá åðéôñÝøåôå ôçí åßóïäï ìÝóù åðéëïãéêÞò óýíäåóçò óôï FreeBSD óýóôçìá óáò. Ôï ðñþôï áñ÷åßï åßíáé ôï `/etc/gettytab`, ôï ïðïßï ðåñéÝ÷åé ðëçñïöïñßåò ñýèìéóçò ãéá ôïí äáßìïíá `/usr/libexec/getty` Ôï äåýôåñï áñ÷åßï åßíáé ôï `/etc/ttys` ôï ïðïßï ðåñéÝ÷åé ðëçñïöïñßåò ðïõ ãíùóôïðïéïýí óôçí `/sbin/init` óå ðïéåò óõóêåõÝò `tty` èá ðñÝðåé íá åêôåëïýíôáé äéåñãáóßåò `getty`. ÔÝëïò, ìðïñåßôå íá âÜëåôå åíôïëÝò áñ÷éêïðïßçóçò ôçò èýñáò óôï script `/etc/rc.d/serial`.

ÕðÜñ÷ïõí äýï “ó÷ïëÝò” üóï áöïñÜ ôç ÷ñÞóç modems ãéá åßóïäï óå Ýíá óýóôçìá UNIX. Ç ðñþôç, ðñïôéìÜ íá ñõèìßæåé ôá modems êáé ôá óõóôÞìáôá ìå ôÝôïéï ôñüðï, þóôå Üó÷åôá ìå ôé ôá÷ýôçôá óõíäÝåôáé ï áðïìáêñõóìÝíïò

÷ñÞóôçò, ç ôïðéêÞ óýíäåóç õðïëïãéóôÞ — modem ìÝóù ôïõ RS-232C íá Ý÷åé ðÜíôá ôçí ßäéá êëåéäùìÝíç ôá÷ýôçôá. Ôï üöåëïò ìéáò ôÝôïéáò ñýèìéóçò åßíáé üôé ï áðïìáêñõóìÝíïò ÷ñÞóôçò âëÝðåé ðÜíôá Üìåóá ôçí ðñïôñïðÞ åéóüäïõ. Ôï ìåéïíÝêôçìá, åßíáé üôé ôï óýóôçìá äåí ãíùñßæåé ôçí ðñáãìáôéêÞ ôá÷ýôçôá óýíäåóçò ôïõ ÷ñÞóôç, êáé Ýôóé ðñïãñÜììáôá ðëÞñïõò ïèüíçò üðùò ôï **Emacs**, äåí ãíùñßæïõí ðùò íá ñõèìßóïõí ôçí ôá÷ýôçôá áíáíÝùóçò ôçò ïèüíçò ôïõò þóôå íá áíôéìåôùðßóïõí êáëýôåñá ôéò áñãÝò óõíäÝóåéò.

Ç Üëëç ó÷ïëÞ ñõèìßæåé ôç äéåðáöÞ RS-232 ôïõ modem íá áëëÜæåé ôá÷ýôçôá, þóôå íá áêïëïõèåß ôçí ôá÷ýôçôá óýíäåóçò ôïõ áðïìáêñõóìÝíïõ ÷ñÞóôç. Ãéá ðáñÜäåéãìá, óõíäÝóåéò ôýðïõ V.32bis (14.4 Kbps) óôï modem, ìðïñåß íá ôï êÜíïõí íá ìåôáâÜëëåé ôçí ôá÷ýôçôá óýíäåóçò óôï RS-232 óå 19.2 Kbps, åíþ óõíäÝóåéò ôá÷ýôçôáò 2400 bps èá ìåôáâÜëëïõí áíôßóôïé÷á ôçí ôá÷ýôçôá ôçò äéåðáöÞò óå 2400 bps. ÅðåéäÞ ç `getty` äåí áíáãíùñßæåé ìå êÜðïéï ôñüðï ôçí ôá÷ýôçôá óýíäåóçò ðïõ áíáöÝñåé ôï modem, äßíåé ôçí ðñþôç ðñïôñïðÞ `login:` óôçí áñ÷éêÜ ñõèìéóìÝíç ôá÷ýôçôá, êáé åîåôÜæåé ôïõò ÷áñáêôÞñåò ðïõ ëáìâÜíåé ùò áðÜíôçóç. Áí ï ÷ñÞóôçò äåé óêïõðßäéá, èåùñåßôáé üôé ãíùñßæåé üôé ðñÝðåé íá ðéÝóåé ôï **Enter** ìÝ÷ñé íá ðÜñåé ìéá ðñïôñïðÞ ðïõ ìðïñåß íá áíáãíùñßóåé. Áí ïé ñõèìïß äåäïìÝíùí äåí ôáéñéÜæïõí, ç `getty` âëÝðåé ïôéäÞðïôå ãñÜöåé ï ÷ñÞóôçò ùò “óêïõðßäéá”, êáé Ýôóé äïêéìÜæåé ôçí åðüìåíç ôá÷ýôçôá êáé óôÝëíåé îáíÜ ôçí ðñïôñïðÞ `login:`. Ç äéáäéêáóßá ìðïñåß íá åðáíáëçöèåß üóåò öïñÝò ÷ñåéÜæåôáé, áëëÜ óõíÞèùò ÷ñåéÜæïíôáé ìüíï ìéá-äõï ðñïóðÜèåéåò ìÝ÷ñé ï ÷ñÞóôçò íá ëÜâåé êáíïíéêÞ ðñïôñïðÞ. Ðñïöáíþò áõôÞ ç áêïëïõèßá åéóüäïõ äåí åßíáé ôüóï êáèáñÞ üðùò ç ðñïçãïýìåíç ìÝèïäïò “êëåéäùìÝíçò ôá÷ýôçôáò”, áëëÜ êÜðïéïò ÷ñÞóôçò ðïõ âñßóêåôáé óå ãñáììÞ ÷áìçëÞò ôá÷ýôçôáò, ìÜëëïí èá ëÜâåé êáëýôåñç áðüêñéóç óå åöáñìïãÝò ðëÞñïõò ïèüíçò.

Óå áõôÞ ôçí åíüôçôá èá ðñïóðáèÞóïõìå íá óáò äþóïõìå ðëçñïöïñßåò êáé ãéá ôïõò äýï ôýðïõò ñõèìßóåùí, áëëÜ èåùñïýìå êáëýôåñï ôï åßäïò óýíäåóçò üðïõ ç ôá÷ýôçôá õðïëïãéóôÞ — modem áêïëïõèåß ôçí ôá÷ýôçôá ôçò óýíäåóçò.

27.4.4.1 `/etc/gettytab`

Ôï `/etc/gettytab` åßíáé Ýíá áñ÷åßï ôýðïõ termcap(5) ìå ðëçñïöïñßåò ñýèìéóçò ãéá ôçí getty(8). Ðáñáêáëïýìå äåßôå ôç óåëßäá manual gettytab(5) ãéá ðéï ðëÞñåéò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ìïñöÞ ôïõ áñ÷åßïõ êáé ôçí ëßóôá ìå ôéò äõíáôüôçôåò ôïõ.

27.4.4.1.1 Ñýèìéóç ãéá ÊëåéäùìÝíç Ôá÷ýôçôá

Áí ðñüêåéôáé íá êëåéäþóåôå ôçí åðéêïéíùíßá ôïõ modem óáò óå ìéá óõãêåêñéìÝíç ôá÷ýôçôá, êáôÜ ðÜóá ðéèáíüôçôá äåí èá ÷ñåéáóôåß íá êÜíåôå áëëáãÝò óôï `/etc/gettytab`.

27.4.4.1.2 Ñýèìéóç ãéá ÌåôáâëçôÞ Ôá÷ýôçôá

èá ÷ñåéáóôåß íá ðñïóèÝóåôå ìéá êáôá÷þñéóç óôï `/etc/gettytab` ãéá íá äþóåôå ðëçñïöïñßåò óôçí `getty` ó÷åôéêÜ ìå ôéò ôá÷ýôçôåò ðïõ åðéèõìåßôå íá ÷ñçóéìïðïéÞóåôå óôï modem óáò. Áí Ý÷åôå Ýíá modem 2400 bps, ìðïñåßôå ðéèáíüí íá ÷ñçóéìïðïéÞóåôå ôçí êáôá÷þñéóç `D2400`.

```
#
# Fast dialup terminals, 2400/1200/300 rotary (can start either way)
#
D2400|d2400|Fast-Dial-2400:\
        :nx=D1200:tc=2400-baud:
3|D1200|Fast-Dial-1200:\
        :nx=D300:tc=1200-baud:
5|D300|Fast-Dial-300:\
        :nx=D2400:tc=300-baud:
```

Áí Ý÷åôå modem õøçëüôåñçò ôá÷ýôçôáò, ðéèáíüí íá ÷ñåéáóôåß íá ðñïóèÝóåôå ìéá êáôá÷þñéóç óôï `/etc/gettytab`. ÐáñáêÜôù öáßíåôáé ìéá êáôá÷þñéóç ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá modem 14.4 Kbps ìå ìÝãéóôç ôá÷ýôçôá óåéñéáêÞò èýñáò 19.2 Kbps:

```
#
# Additions for a V.32bis Modem
#
um|V300|High Speed Modem at 300,8-bit:\
        :nx=V19200:tc=std.300:
un|V1200|High Speed Modem at 1200,8-bit:\
        :nx=V300:tc=std.1200:
uo|V2400|High Speed Modem at 2400,8-bit:\
        :nx=V1200:tc=std.2400:
up|V9600|High Speed Modem at 9600,8-bit:\
        :nx=V2400:tc=std.9600:
uq|V19200|High Speed Modem at 19200,8-bit:\
        :nx=V9600:tc=std.19200:
```

Áõôü èá Ý÷åé ùò áðïôÝëåóìá óõíäÝóåéò 8bit ÷ùñßò éóïôéìßá.

Ôï ðáñáðÜíù ðáñÜäåéãìá, îåêéíÜ ôï ñõèìü åðéêïéíùíßáò óôá 19.2 Kbps (ãéá ìéá óýíäåóç V.32bis), êáé Ýðåéôá äïêéìÜæåé êõêëéêÜ óôá 9600 bps (ãéá V.32), 2400 bps, 1200 bps, 300 bps, êáé ðßóù óôá 19.2 Kbps. ÁõôÞ ç êõêëéêÞ åíáëëáãÞ ñõèìïý åðéôõã÷Üíåôáé ìå ôçí éêáíüôçôá `nx=` (“next table”). ÊÜèå ìéá áðü ôéò ãñáììÝò ÷ñçóéìïðïéåß ìéá êáôá÷þñéóç `tc=` (“table continuation”) ãéá íá âñåé ôéò õðüëïéðåò “ôõðïðïéçìÝíåò” ñõèìßóåéò ãéá êÜðïéï óõãêåêñéìÝíï ñõèìü ìåôÜäïóçò äåäïìÝíùí.

Áí Ý÷åôå modem 28.8 Kbps Þ/êáé èÝëåôå íá åðùöåëçèåßôå áðü ôçí óõìðßåóç åíüò modem 14.4 Kbps, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ñõèìü åðéêïéíùíßáò ìåãáëýôåñï áðü 19.2 Kbps. ÐáñáêÜôù öáßíåôáé Ýíá ðáñÜäåéãìá ìéá êáôá÷þñéóçò óôï `gettytab` ðïõ îåêéíÜåé áðü ôá 57.6 Kbps:

```
#
# Additions for a V.32bis or V.34 Modem
# Starting at 57.6 Kbps
#
vm|VH300|Very High Speed Modem at 300,8-bit:\
        :nx=VH57600:tc=std.300:
vn|VH1200|Very High Speed Modem at 1200,8-bit:\
        :nx=VH300:tc=std.1200:
vo|VH2400|Very High Speed Modem at 2400,8-bit:\
        :nx=VH1200:tc=std.2400:
vp|VH9600|Very High Speed Modem at 9600,8-bit:\
        :nx=VH2400:tc=std.9600:
vq|VH57600|Very High Speed Modem at 57600,8-bit:\
        :nx=VH9600:tc=std.57600:
```

Áí Ý÷åôå áñãü åðåîåñãáóôÞ Þ ìåãÜëï öïñôßï, êáé ôï óýóôçìá óáò äåí äéáèÝôåé óåéñéáêÝò èýñåò ðïõ íá âáóßæïíôáé óôï 16550Á, ßóùò ëÜâåôå ëÜèç `sio` “silo” óôá 57.6 Kbps.

27.4.4.2 `/etc/ttys`

¸÷ïõìå Þäç êáëýøåé ôç ñýèìéóç ôïõ áñ÷åßïõ `/etc/ttys` óôï ÐáñÜäåéãìá 27-1. Ç ñýèìéóç ãéá modems åßíáé ðáñüìïéá, áëëÜ ðñÝðåé íá äþóïõìå äéáöïñåôéêü üñéóìá óôçí `getty` êáé íá êáèïñßóïõìå äéáöïñåôéêü ôýðï ôåñìáôéêïý. Ç ãåíéêÞ ìïñöÞ ôüóï ãéá êëåéäùìÝíç üóï êáé ãéá ìåôáâëçôÞ ôá÷ýôçôá åßíáé ç ðáñáêÜôù:

```
ttyu0   "/usr/libexec/getty xxx"   dialup on
```

Ôï ðñþôï ðåäßï óôçí ðáñáðÜíù ãñáììÞ åßíáé ôï åéäéêü áñ÷åßï óõóêåõÞò ãéá áõôÞ ôçí êáôá÷þñéóç — ôï `ttyu0` áíôéóôïé÷åß óôï áñ÷åßï `/dev/ttyu0` ôï ïðïßï êáé èá ðáñáêïëïõèåß ç `getty`. Ôï äåýôåñï ðåäßï, `"/usr/libexec/getty xxx"` (ôï *`xxx`* èá Ý÷åé ôçí áñ÷éêÞ ôéìÞ éêáíüôçôáò ôïõ `gettytab`), åßíáé ç äéåñãáóßá ðïõ èá åêôåëÝóåé ç `init` óôç óõóêåõÞ. Ôï ôñßôï ðåäßï, `dialup`, åßíáé ï ðñïåðéëåãìÝíïò ôýðïò ôåñìáôéêïý. Ç ôÝôáñôç ðáñÜìåôñïò, `on`, äåß÷íåé óôçí `init` üôé ç ãñáììÞ åßíáé óå ëåéôïõñãéêÞ êáôÜóôáóç. Ìðïñåß íá õðÜñ÷åé êáé ìéá ðÝìðôç ðáñÜìåôñïò, ç `secure`, áëëÜ èá ðñÝðåé íá ÷ñçóéìïðïéåßôáé ìüíï ãéá ôåñìáôéêÜ óôá ïðïßá ç öõóéêÞ ðñüóâáóç åßíáé áóöáëÞò (üðùò åßíáé ç êïíóüëá ôïõ óõóôÞìáôïò).

Ï ðñïåðéëåãìÝíïò ôýðïò ôåñìáôéêïý (`dialup` óôï ðáñáðÜíù ðáñÜäåéãìá) ìðïñåß íá áëëÜîåé áíÜëïãá ìå ôéò ðñïôéìÞóåéò óáò. Ôï `dialup` åßíáé ï ðáñáäïóéáêüò ôýðïò ôåñìáôéêïý ãéá åðéëïãéêÝò ãñáììÝò. Ïé ÷ñÞóôåò ìðïñïýí Ýôóé íá ðñïóáñìüæïõí ôá scripts óýíäåóçò ôïõò þóôå íá áíáãíùñßæïõí ôï `dialup` êáé íá ñõèìßæïõí áõôüìáôá ôïí ôýðï ôåñìáôéêïý. Ùóôüóï, åßíáé ìÜëëïí åõêïëüôåñï íá êáèïñßóåôå ôï `vt102` ùò ôïí ðñïåðéëåãìÝíï ôýðï ôåñìáôéêïý, êáèþò ïé ÷ñÞóôåò ÷ñçóéìïðïéïýí óõíÞèùò åîïìïéùôÝò VT102 óôá áðïìáêñõóìÝíá ôïõò óõóôÞìáôá.

Áöïý êÜíåôå ôéò áëëáãÝò óôï `/etc/ttys`, ìðïñåßôå íá óôåßëåôå óôç äéåñãáóßá `init` Ýíá óÞìá HUP ãéá íá îáíáäéáâÜóåé ôï áñ÷åßï. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí ðáñáêÜôù åíôïëÞ ãéá áõôü ôï óêïðü:

```
# kill -HUP 1
```

Áí áõôÞ åßíáé ç ðñþôç öïñÜ ðïõ ñõèìßæåôå ôï óýóôçìá óáò, ßóùò èÝëåôå íá ðåñéìÝíåôå ìÝ÷ñé íá ïëïêëçñþóåôå ðëÞñùò ôç óýíäåóç êáé ñýèìéóç ôïõ modem óáò ðñéí óôåßëåôå óÞìá óôçí `init`.

27.4.4.2.1 Ñýèìéóç ãéá ÊëåéäùìÝíç Ôá÷ýôçôá

Ãéá ëåéôïõñãßá óå êëåéäùìÝíç ôá÷ýôçôá, èá ðñÝðåé ç êáôá÷þñéóç óáò óôï `ttys` íá ðáñÝ÷åé óôçí `getty` ìéá êáôá÷þñéóç óôáèåñÞò ôá÷ýôçôáò. Ãéá Ýíá modem ìå ôá÷ýôçôá èýñáò êëåéäùìÝíç óôá 19.2 Kbps, ç êáôá÷þñéóç `ttys` èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
ttyu0   "/usr/libexec/getty std.19200"   dialup on
```

Áí ôï modem óáò åßíáé êëåéäùìÝíï óå äéáöïñåôéêü ñõèìü äåäïìÝíùí, áíôéêáôáóôÞóôå ìå ôçí êáôÜëëçëç ôéìÞ ôï `std.19200` óôçí êáôá÷þñéóç `std.`*`speed`*. Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå Ýíá Ýãêõñï ôýðï, üðùò ïñßæåôáé óôï `/etc/gettytab`.

27.4.4.2.2 Ñýèìéóç ãéá ÌåôáâëçôÞ Ôá÷ýôçôá

Óå ìéá ôÝôïéá ñýèìéóç, ç êáôá÷þñéóç óáò ãéá ôï `ttys` èá ðñÝðåé íá áíáöÝñåôáé óôçí áñ÷éêÞ “auto-baud” (sic) êáôá÷þñéóç ôïõ `/etc/gettytab`. Ãéá ðáñÜäåéãìá, áí ðñïóèÝóáôå ôçí ðáñáðÜíù óõíéóôþìåíç êáôá÷þñéóç ãéá modem ìå ìåôáâëçôÞ ôá÷ýôçôáò óåéñéáêÞò, êáé ìå áñ÷éêÞ ôá÷ýôçôá ôá 19.2 Kbps (ôçí êáôá÷þñéóç `gettytab` ðïõ ðåñéÝ÷åé ùò óçìåßï åêêßíçóçò ôï `V19200`), ç êáôá÷þñéóç óáò óôï `ttys` èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
ttyu0   "/usr/libexec/getty V19200"   dialup on
```

27.4.4.3 `/etc/rc.d/serial`

Ôá modems õøçëÞò ôá÷ýôçôáò, üðùò ôá V.32, V.32bis êáé V.34, áðáéôïýí Ýëåã÷ï ñïÞò ìÝóù õëéêïý (`RTS/CTS`). Ìðïñåßôå íá ðñïóèÝóåôå åíôïëÝò `stty` óôï `/etc/rc.d/serial` ãéá íá èÝóåôå óôïí ðõñÞíá ôïõ FreeBSD ôçí êáôÜëëçëç ðáñÜìåôñï Ýëåã÷ïõ ñïÞò ìÝóù õëéêïý ôùí èõñþí modem.

Ãéá ðáñÜäåéãìá, ãéá íá èÝóåôå ôçí åðéëïãÞ `termios` óôçí ôéìÞ `crtscts` óôéò óõóêåõÝò áñ÷éêïðïßçóçò ôçò äåýôåñçò óåéñéáêÞò èýñáò (`COM2`) ãéá åðéëïãÝò êëÞóåéò åéóüäïõ êáé åîüäïõ, èá ðñÝðåé íá ðñïóèÝóåôå ôéò ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/etc/rc.d/serial`:

```
# Serial port initial configuration
stty -f /dev/ttyu1.init crtscts
stty -f /dev/cuau1.init crtscts
```

27.4.5 Ñõèìßóåéò ÌíÞìçò

Áí Ý÷åôå Ýíá modem óôï ïðïßï ìðïñåßôå íá áðïèçêåýóåôå ôéò ðáñáìÝôñïõò ìüíéìá óôçí ìç-ðôçôéêÞ RAM ðïõ äéáèÝôåé, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå Ýíá ðñüãñáììá ôåñìáôéêïý (üðùò ôï **Telix** ìÝóù ôïõ MS-DOS Þ ôïõ `tip` óôï FreeBSD) ãéá íá ñõèìßóåôå ôéò ðáñáìÝôñïõò. Óõíäåèåßôå óôï modem ÷ñçóéìïðïéþíôáò ôçí ßäéá áñ÷éêÞ ôá÷ýôçôá åðéêïéíùíßáò ìå áõôÞ ðïõ Ý÷åôå äçëþóåé ùò áñ÷éêÞ ôá÷ýôçôá óôçí `getty`, êáé ñõèìßóôå ôéò ðáñáìÝôñïõò óôç ìíÞìç ôïõ þóôå íá ôáéñéÜæïõí ìå ôéò ðáñáêÜôù áðáéôÞóåéò:

- Ôï óÞìá CD èá åßíáé åíåñãü üôáí ôï modem åßíáé óõíäåäåìÝíï
- Ôï óÞìá DTR èá åßíáé åíåñãü êáôÜ ôç ëåéôïõñãßá. Áðåíåñãïðïßçóç ôïõ DTR êëåßíåé ôç ãñáììÞ êáé åðáíáöÝñåé ôï modem óôçí áñ÷éêÞ ôïõ êáôÜóôáóç.
- Ôï CTS èá ÷ñçóéìïðïéåßôáé ãéá Ýëåã÷ï ñïÞò ìåôáäéäüìåíùí äåäïìÝíùí
- Ï Ýëåã÷ïò ñïÞò XON/XOFF èá åßíáé áíåíåñãüò
- Ôï RTS èá ÷ñçóéìïðïéåßôáé ãéá Ýëåã÷ï ñïÞò ëçöèÝíôùí äåäïìÝíùí
- ^{1}óõ÷ç ëåéôïõñãßá (Quiet mode, ÷ùñßò áðïóôïëÞ êùäéêþí áðïôåëåóìÜôùí)
- Äåí èá ãßíåôáé echo ôùí åíôïëþí

Èá ðñÝðåé íá äéáâÜóåôå ôçí ôåêìçñßùóç ôïõ modem óáò ãéá íá âñåßôå ôéò åíôïëÝò ðïõ ðñÝðåé íá áðïóôåßëåôå. ºóùò åðßóçò ÷ñåéáóôåß íá áëëÜîåôå ôç èÝóç êÜðïéùí ñõèìéóôéêþí äéáêïðôþí (dip switches).

Ãéá ðáñÜäåéãìá, ãéá íá ñõèìßóåôå ôéò ðáñáðÜíù ðáñáìÝôñïõò óå Ýíá åîùôåñéêü modem U.S. Robotics® Sportster® 14,400, èá Ýðñåðå íá óôåßëåôå ôéò ðáñáêÜôù åíôïëÝò óôï modem:

```
ATZ
AT&C1&D2&H1&I0&R2&W
```

Ìðïñåßôå ìå ôçí åõêáéñßá íá ñõèìßóåôå êáé Üëëïõò ðáñáìÝôñïõò ôïõ modem, üðùò ãéá ôï áí èá ÷ñçóéìïðïéåßôáé ôï ðñùôüêïëëï V.42bis Þ óõìðßåóç MNP5.

Ôï åîùôåñéêü modem U.S. Robotics Sportster 14,400 äéáèÝôåé åðßóçò êáé êÜðïéïõò ñõèìéóôéêïýò äéáêüðôåò ðïõ ðñÝðåé íá ñõèìéóôïýí. Ãéá Üëëá modem, ßóùò ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áõôÝò ôéò ñõèìßóåéò ùò áíáöïñÜ:

- Äéáêüðôçò 1: ¶íù ÈÝóç — ÊáíïíéêÞ ëåéôïõñãßá DTR

- Äéáêüðôçò 2: N/A (Êùäéêüò ÁðïôåëÝóìáôïò ùò Êåßìåíï/Êùäéêüò ÁðïôåëÝóìáôïò ùò Áñéèìüò)
- Äéáêüðôçò 3: ¶íù èÝóç — ×ùñßò Êùäéêü ÁðïôåëÝóìáôïò
- Äéáêüðôçò 4: ÊÜôù èÝóç — ×ùñßò echo êáé offline åíôïëÝò
- Äéáêüðôçò 5: ¶íù èÝóç — Áõôüìáôç ÁðÜíôçóç
- Äéáêüðôçò 6: ¶íù èÝóç — ÖõóéïëïãéêÞ Áíß÷íåõóç ÖÝñïíôïò ÓÞìáôïò
- Äéáêüðôçò 7: ¶íù èÝóç — Öüñôùóç Ðñïåðéëïãþí áðü NVRAM (ìç-ðôçôéêÞ ìíÞìç)
- Äéáêüðôçò 8: N/A (Ýîõðíïò/Êïõôüò Ôñüðïò Ëåéôïõñãßáò)

Èá ðñÝðåé íá áðåíåñãïðïéÞóåôå Þ íá áðïìïíþóåôå ôïõò êùäéêïýò áðïôåëåóìÜôùí óôï modem, ãéá íá áðïöýãåôå ðñïâëÞìáôá ðïõ ìðïñïýí íá äçìéïõñãçèïýí áí ç `getty` áðü ëÜèïò óôåßëåé ðñïôñïðÞ `login:` óôï modem åíþ áõôü âñßóêåôáé óå êáôÜóôáóç åíôïëþí. Óôçí ðåñßðôùóç áõôÞ, ôï modem ìðïñåß íá áíáðáñÜãåé îáíÜ ôçí åíôïëÞ (echo) Þ íá óôåßëåé êÜðïéï êùäéêü áðïôåëÝóìáôïò. Áõôü ìðïñåß íá Ý÷åé ùò áðïôÝëåóìá ìéá ìáêñü÷ñïíç êáé ÷áæÞ óõíïìéëßá ìåôáîý ôïõ modem êáé ôçò `getty`.

27.4.5.1 Ñõèìßóåéò ãéá ÊëåéäùìÝíç Ôá÷ýôçôá

Ãéá ëåéôïõñãßá óå êëåéäùìÝíç ôá÷ýôçôá, èá ÷ñåéáóôåß íá ñõèìßóåôå ôï modem íá äéáôçñåß óôáèåñÞ ôá÷ýôçôá õðïëïãéóôÞ — modem, Üó÷åôá ìå ôçí ôá÷ýôçôá åðéêïéíùíßáò ôçò åðéëïãéêÞò óýíäåóçò. Óå Ýíá åîùôåñéêü modem U.S. Robotics Sportster 14,400, ïé åíôïëÝò áõôÝò èá êëåéäþóïõí ôçí åðéêïéíùíßá õðïëïãéóôÞ — modem óôçí ßäéá ôá÷ýôçôá ðïõ Ýãéíå ç ëÞøç ôùí åíôïëþí:

```
ATZ
AT&B1&W
```

27.4.5.2 Ñõèìßóåéò ãéá ÌåôáâëçôÞ Ôá÷ýôçôá

Ãéá ëåéôïõñãßá óå ìåôáâëçôÞ ôá÷ýôçôá, èá ÷ñåéáóôåß íá ñõèìßóåôå ôï modem óáò íá ðñïóáñìüæåé ôçí ôá÷ýôçôá ôçò óåéñéáêÞò èýñáò ôïõ þóôå íá ôáéñéÜæåé ìå áõôÞ ôçò åéóåñ÷üìåíçò êëÞóçò. Óå Ýíá åîùôåñéêü modem U.S. Robotics Sportster 14,400, ïé åíôïëÝò áõôÝò èá êëåéäþóïõí ôçí ôá÷ýôçôá ìåôáöïñÜò äåäïìÝíùí ìå äéüñèùóç ëáèþí ôïõ modem óôçí ôá÷ýôçôá ðïõ ÷ñçóéìïðïéÞèçêå ãéá ôçí áðïóôïëÞ ôùí åíôïëþí, áëëÜ èá åðéôñÝøïõí óôçí ôá÷ýôçôá ôçò óåéñéáêÞò èýñáò íá ìåôáâÜëëåôáé ãéá óõíäÝóåéò ðïõ äåí Ý÷ïõí äéüñèùóç ëáèþí:

```
ATZ
AT&B2&W
```

27.4.5.3 ¸ëåã÷ïò ôùí Ñõèìßóåùí ôïõ Modem

Ôá ðåñéóóüôåñá modem õøçëÞò ôá÷ýôçôáò, ðáñÝ÷ïõí åíôïëÝò ìå ôéò ïðïßåò ìðïñåßôå íá ðáñáêïëïõèÞóåôå ôéò ôñÝ÷ïõóåò ðáñáìÝôñïõò ëåéôïõñãßáò ôïõò ìå ó÷åôéêÜ êáôáíïçôü ôñüðï. Óôï åîùôåñéêü modem U.S. Robotics Sportster 14,400, ç åíôïëÞ `ATI5` äåß÷íåé ôéò ñõèìßóåéò ðïõ åßíáé áðïèçêåõìÝíåò óôçí ìç-ðôçôéêÞ RAM ôïõ modem. Ãéá íá äåßôå ôéò ðñáãìáôéêÝò ðáñáìÝôñïõò ëåéôïõñãßáò ôïõ modem (üðùò áõôÝò åðçñåÜæïíôáé áðü ôéò èÝóåéò ôùí ñõèìéóôéêþí äéáêïðôþí ôïõ), ÷ñçóéìïðïéÞóôå ôéò åíôïëÝò `ATZ` êáé ìåôÜ `ATI4`.

Áí äéáèÝôåôå modem Üëëçò åôáéñßáò, åëÝãîôå ôéò ïäçãßåò ÷ñÞóçò ôïõ ãéá íá äåßôå ðùò ìðïñåßôå íá åëÝãîåôå ìå óéãïõñéÜ ôéò ðáñáìÝôñïõò ñýèìéóçò ôïõ.

27.4.6 Áíôéìåôþðéóç ÐñïâëçìÜôùí

ÐáñáêÜôù èá âñåßôå ìåñéêÜ âÞìáôá ðïõ ìðïñåßôå íá áêïëïõèÞóåôå ãéá íá åëÝãîåôå ôç ëåéôïõñãßá ôïõ modem óôï óýóôçìá óáò.

27.4.6.1 ÅëÝã÷ïíôáò ôï Óýóôçìá óáò

ÓõíäÝóôå ôï modem óôï FreeBSD óýóôçìá óáò, åêêéíÞóôå ôï, êáé áí ôï modem óáò äéáèÝôåé öùôåéíÝò åíäåßîåéò êáôÜóôáóçò, ðáñáêïëïõèÞóôå ôéò ãéá íá äåßôå áí åíåñãïðïéåßôáé ç Ýíäåéîç DTR üôáí åìöáíßæåôáé ç ðñïôñïðÞ `login:` óôçí êïíóüëá ôïõ óõóôÞìáôïò. Áí ç Ýíäåéîç áõôÞ åßíáé åíåñãÞ, óçìáßíåé üôé ôï FreeBSD Ý÷åé îåêéíÞóåé ìéá äéåñãáóßá `getty` óôçí áíôßóôïé÷ç èýñá åðéêïéíùíßáò êáé áíáìÝíåé ôï modem íá áðáíôÞóåé ìéá êëÞóç.

Áí äåí åíåñãïðïéåßôáé ç Ýíäåéîç DTR, åéóÝëèåôå óôï óýóôçìá ìÝóù ôçò êïíóüëáò, êáé äþóôå ôçí åíôïëÞ `ps ax` ãéá íá äåßôå áí ôï FreeBSD ðñïóðáèåß íá åêôåëÝóåé äéåñãáóßá `getty` óôç óùóôÞ èýñá. ÁíÜìåóá óôéò äéåñãáóßåò, èá äåßôå ãñáììÝò üðùò ôéò ðáñáêÜôù:

```
114 ??  I      0:00.10 /usr/libexec/getty V19200 ttyu0
115 ??  I      0:00.10 /usr/libexec/getty V19200 ttyu1
```

Áí äåßôå êÜôé äéáöïñåôéêü, üðùò ôï ðáñáêÜôù:

```
114 d0  I      0:00.10 /usr/libexec/getty V19200 ttyu0
```

êáé ôï modem äåí Ý÷åé áðáíôÞóåé áêüìá êáìßá êëÞóç, óçìáßíåé üôé ç `getty` Ý÷åé ïëïêëçñþóåé ôï Üíïéãìá ôçò óåéñéáêÞò èýñáò. Áõôü ðéèáíüí óçìáßíåé üôé õðÜñ÷åé ðñüâëçìá ìå ôçí êáëùäßùóç, Þ üôé ôï modem äåí åßíáé óùóôÜ ñõèìéóìÝíï, êáèþò ç `getty` äåí èá ðñÝðåé íá ìðïñåß íá áíïßîåé ôç èýñá ðñéí åíåñãïðïéçèåß ôï óÞìá CD (carrier detect, áíß÷íåõóç öÝñïíôïò) áðü ôï modem.

Áí äåí âëÝðåôå êÜðïéåò äéåñãáóßåò `getty` íá ðåñéìÝíïõí íá áíïßîïõí ôçí åðéèõìçôÞ `ttyuN`, åëÝãîôå îáíÜ ôéò êáôá÷ùñßóåéò óáò óôï `/etc/ttys` ãéá ôõ÷üí ëÜèç. ÅëÝãîôå åðßóçò ôï áñ÷åßï êáôáãñáöÞò `/var/log/messages` ãéá íá äåßôå áí õðÜñ÷ïõí êÜðïéá ìçíýìáôá áðü ôçí `init` Þ ôçí `getty` ó÷åôéêÜ ìå ôá ðñïâëÞìáôá. Áí õðÜñ÷ïõí ìçíýìáôá, åëÝãîôå îáíÜ ôá áñ÷åßá ñõèìßóåùí `/etc/ttys` êáé `/etc/gettytab`, üðùò êáé ôá åéäéêÜ áñ÷åßá óõóêåõþí `/dev/ttyuN` ãéá ðéèáíÜ ëÜèç, åëëåßðïíôá êáôá÷ùñßóåéò, Þ ìç-ýðáñîç ôùí åéäéêþí áñ÷åßùí óõóêåõþí.

27.4.6.2 ÐñïóðáèÞóôå íá ÅêôåëÝóåôå Óýíäåóç Åéóüäïõ

ÄïêéìÜóôå íá åéóÝëèåôå óôï óýóôçìá óáò ìÝóù áðïìáêñõóìÝíçò óýíäåóçò. Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå 8 bits, 1 stop bit êáé åðéêïéíùíßá ÷ùñßò éóïôéìßá óôï áðïìáêñõóìÝíï óýóôçìá. Áí äå ëÜâåôå Üìåóá ôçí ðñïôñïðÞ åéóüäïõ, Þ áí ëáìâÜíåôå óêïõðßäéá, äïêéìÜóôå íá ðéÝæåôå **Enter** ìå ñõèìü ðåñßðïõ ìéá öïñÜ ôï äåõôåñüëåðôï. Áí áêüìá äåí ëáìâÜíåôå ôçí ðñïôñïðÞ `login:`, äïêéìÜóôå ìåôÜ áðü ëßãï íá óôåßëåôå Ýíá `BREAK`. Áí êÜíåôå êëÞóç áðü Ýíá modem õøçëÞò ôá÷ýôçôáò, äïêéìÜóôå îáíÜ, áöïý êëåéäþóåôå ôçí ôá÷ýôçôá åðéêïéíùíßáò ôïðéêÜ (ìÝóù ð.÷. ôçò `AT&B1` óå Ýíá U.S. Robotics Sportster modem).

Áí äåí ìðïñåßôå áêüìá íá ëÜâåôå ðñïôñïðÞ `login:`, åëÝãîôå îáíÜ êáé îáíÜ ôï áñ÷åßï `/etc/gettytab`.

- Ôï üíïìá ôçò áñ÷éêÞò éêáíüôçôáò ðïõ êáèïñßæåôáé óôï áñ÷åßï `/etc/ttys` ãéá ôç ãñáììÞ ðñÝðåé íá ôáéñéÜæåé ìå ôï üíïìá ôçò éêáíüôçôáò óôï `/etc/gettytab`
- ÊÜèå êáôá÷þñéóç `nx=` ôáéñéÜæåé ìå ôï üíïìá ìéáò áíôßóôïé÷çò éêáíüôçôáò óôï `gettytab`
- ÊÜèå êáôá÷þñéóç `tc=` ôáéñéÜæåé ìå ôï üíïìá ìéáò áíôßóôïé÷çò éêáíüôçôáò óôï `gettytab`

Áí êÜíåôå êëÞóç áëëÜ ôï modem óôï FreeBSD óýóôçìá äåí áðáíôÜåé, âåâáéùèåßôå üôé ôï modem åßíáé ñõèìéóìÝíï íá áðáíôÜåé ôçí ôçëåöùíéêÞ ãñáììÞ üôáí åíåñãïðïéåßôáé ôï óÞìá DTR. Áí ôï modem öáßíåôáé íá åßíáé ñõèìéóìÝíï óùóôÜ, åðáëçèåýóôå üôé ç ãñáììÞ DTR åßíáé åíåñãÞ åëÝã÷ïíôáò ôéò öùôåéíÝò åíäåßîåéò ôïõ modem (áí õðÜñ÷ïõí).

Áí Ý÷åôå åëÝãîåé ôá ðÜíôá ðïëëÝò öïñÝò, êáé áêüìá äåí öáßíåôáé íá âñßóêåôå ôç ëýóç, êÜíôå Ýíá äéÜëåéììá êáé ðñïóðáèÞóôå îáíÜ áñãüôåñá. Áí áêüìá äåí ëåéôïõñãåß, ßóùò åßíáé êáéñüò íá óôåßëåôå Ýíá ìÞíõìá óôçí çëåêôñïíéêÞ ëßóôá ãåíéêþí åñùôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions) ðåñéãñÜöïíôáò ôï ðñüâëçìá óáò êáé ôï modem óáò, êáé ïé êáëïß Üíèñùðïé ðïõ ðáñáêïëïõèïýí ôçí ëßóôá èá ðñïóðáèÞóïõí íá óáò âïçèÞóïõí.

27.5 Õðçñåóßá ÅðéëïãéêÞò Óýíäåóçò

Ðñïåéäïðïßçóç: Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ôùí óåéñéáêþí èõñþí ìåôïíïìÜóôçêáí áðü `/dev/cuadN` óå `/dev/cuauN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ðáñáêÜôù ôåêìçñßùóç óýìöùíá ìå ôéò ðáñáðÜíù áëëáãÝò.

ÐáñáêÜôù èá âñåßôå êÜðïéåò óõìâïõëÝò ãéá íá ìðïñÝóåôå íá óõíäÝóåôå ôïí õðïëïãéóôÞ óáò ìÝóù modem óå êÜðïéï Üëëï õðïëïãéóôÞ. Ìå ôïí ôñüðï áõôü, ìðïñåßôå íá äçìéïõñãÞóåôå óýíäåóç ôåñìáôéêïý ðñïò Ýíá áðïìáêñõóìÝíï õðïëïãéóôÞ.

Ç õðçñåóßá áõôÞ ÷ñçóéìåýåé åðßóçò ãéá íá óõíäåèåßôå óå ìéá BBS.

Áõôü ôï åßäïò óýíäåóçò ìðïñåß íá öáíåß åîáéñåôéêÜ ÷ñÞóéìï ãéá íá ðÜñåôå êÜðïéï áñ÷åßï áðü ôï Internet áí Ý÷åôå ðñüâëçìá óýíäåóçò ìÝóù PPP. Áí èÝëåôå íá ðÜñåôå êÜôé ìÝóù FTP êáé äåí ìðïñåßôå íá óõíäåèåßôå ìÝóù PPP, óõíäåèåßôå ìÝóù ôåñìáôéêïý óå Ýíá Üëëï õðïëïãéóôÞ, êáé êáôåâÜóôå óå áõôüí ôï áñ÷åßï ìÝóù FTP. ¸ðåéôá, ÷ñçóéìïðïéÞóôå ôï ðñùôüêïëëï zmodem ãéá íá ôï ìåôáöÝñåôå óôïí õðïëïãéóôÞ óáò.

27.5.1 Ôï ôýðïõ Hayes Modem ìïõ äåí Õðïóôçñßæåôáé, Ôé Ìðïñþ íá ÊÜíù;

Óôçí ðñáãìáôéêüôçôá, ç óåëßäá manual ôçò `tip` äåí åßíáé åíçìåñùìÝíç. ÕðÜñ÷åé Þäç êáôÜëëçëï ãåíéêü ðñüãñáììá êëÞóçò ãéá modems ôçò Hayes. Áðëþò ÷ñçóéìïðïéÞóôå ôçí êáôá÷þñéóç `at=hayes` óôï áñ÷åßï `/etc/remote`.

Ôï ðñüãñáììá ïäÞãçóçò Hayes äåí åßíáé áñêåôÜ Ýîõðíï þóôå íá áíáãíùñßæåé êÜðïéá áðü ôá ðñï÷ùñçìÝíá ÷áñáêôçñéóôéêÜ ôùí íåþôåñùí modems. Ìðïñåß íá ìðåñäåõôåß áðü ìçíýìáôá üðùò ôá `BUSY`, `NO DIALTONE`, Þ `CONNECT 115200`. Èá ðñÝðåé íá áðåíåñãïðïéÞóåôå áõôÜ ôá ìçíýìáôá üôáí ÷ñçóéìïðïéåßôáé ôçí `tip` (óôÝëíïíôáò ôçí åíôïëÞ `ATX0&W`).

Åðßóçò, ôï ìÝãéóôï ÷ñïíéêü äéÜóôçìá ôï ïðïßï ðåñéìÝíåé ç `tip` åßíáé 60 äåõôåñüëåðôá. Ôï modem óáò èá ðñÝðåé íá Ý÷åé ìéêñüôåñï ÷ñïíéêü ðåñéèþñéï, áëëéþò ç tip èá íïìßæåé üôé õðÜñ÷åé ðñüâëçìá åðéêïéíùíßáò. ÄïêéìÜóôå ôçí åíôïëÞ `ATS7=45&W`.

27.5.2 Ðùò Õðïôßèåôáé ¼ôé èá Óôåßëù ÁõôÝò ôéò ÁÔ ÅíôïëÝò;

Äçìéïõñãßóôå áõôü ðïõ ïíïìÜæåôáé “áðåõèåßáò” êáôá÷þñçóç óôï áñ÷åßï `/etc/remote`. Ãéá ðáñÜäåéãìá, áí ôï modem óáò åßíáé óõíäåìÝíï óôçí ðñþôç óåéñéáêÞ èýñá, `/dev/cuau0`, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ:

```
cuau0:dv=/dev/cuau0:br#19200:pa=none
```

Óôçí éêáíüôçôá br, ÷ñçóéìïðïéÞóôå ôïí õøçëüôåñï ñõèìü bps ðïõ õðïóôçñßæåé ôï modem óáò. ¸ðåéôá, ðëçêôñïëïãÞóôå `tip cuau0` êáé èá óõíäåèåßôå ìå ôï modem óáò

^{1} ÷ñçóéìïðïéÞóôå ôçí `cu` ùò `root`, äßíïíôáò ôçí áêüëïõèç åíôïëÞ:

```
# cu -lline -sspeed
```

Ôï *`line`* åßíáé ç óåéñéáêÞ èýñá (ð.÷. `/dev/cuau0`) êáé ôï *`speed`* åßíáé ç ôá÷ýôçôá (ð.÷. `57600`). ¼ôáí ôåëåéþóåôå ìå ôéò åíôïëÝò ÁÔ, ãñÜøôå `~.` ãéá íá ôåñìáôßóåôå ôç óýíäåóç.

27.5.3 Ôï Óýìâïëï @ ôçò Éêáíüôçôáò pn Äåí Ëåéôïõñãåß!

Ôï óýìâïëï `@` ôçò éêáíüôçôáò ôçëåöùíéêïý áñéèìïý (pn, phone number) ïäçãåß ôçí tip íá äéáâÜóåé ôï áñ÷åßï `/etc/phones` ãéá Ýíá ôçëåöùíéêü áñéèìü. ÁëëÜ ôï óýìâïëï `@` åßíáé åðßóçò Ýíáò åéäéêüò ÷áñáêôÞñáò óå áñ÷åßá éêáíïôÞôùí üðùò ôï `/etc/remote`. Èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôçí áíÜðïäç êÜèåôï ãéá íá äçëþóåôå üôé äåí åðéèõìåßôå íá Ý÷åé åðßäñáóç åéäéêïý ÷áñáêôÞñá:

```
pn=\@
```

27.5.4 Ðùò Ìðïñþ íá ÊáëÝóù ¸íá Ôçëåöùíéêü Áñéèìü Áðü ôçí ÃñáììÞ Åíôïëþí;

ÂÜëôå ìéá “ãåíéêÞ” êáôá÷þñéóç óôï áñ÷åßï `/etc/remote`. Ãéá ðáñÜäåéãìá:

```
tip115200|Dial any phone number at 115200 bps:\
        :dv=/dev/cuau0:br#115200:at=hayes:pa=none:du:
tip57600|Dial any phone number at 57600 bps:\
        :dv=/dev/cuau0:br#57600:at=hayes:pa=none:du:
```

¸ðåéôá ìðïñåßôå íá äßíåôå åíôïëÝò üðùò:

```
# tip -115200 5551234
```

Áí ðñïôéìÜôå ôçí `cu` áíôß ãéá ôçí `tip`, ÷ñçóéìïðïéÞóôå ìéá ãåíéêÞ êáôá÷þñéóç ãéá ôçí `cu`:

```
cu115200|Use cu to dial any number at 115200bps:\
        :dv=/dev/cuau1:br#57600:at=hayes:pa=none:du:
```

êáé ðëçêôñïëïãÞóôå:

```
# cu 5551234 -s 115200
```

27.5.5 ÐñÝðåé íá Ðëçêôñïëïãþ ôï Ñõèìü bps ÊÜèå ÖïñÜ ðïõ ôï ÊÜíù Áõôü;

Èá ðñÝðåé íá ðñïóèÝóåôå ìéá êáôá÷þñéóç `tip1200` Þ `cu1200`, áëëÜ ìðïñåßôå íá âÜëåôå ôçí äéêÞ óáò åðéèõìçôÞ ôéìÞ óôçí éêáíüôçôá br. Ç åíôïëÞ `tip` èåùñåß üôé ôá 1200 bps åßíáé ìéá êáëÞ ðñïåðéëïãÞ, êáé ãéá ôï ëüãï áõôü øÜ÷íåé íá âñåé ìéá êáôá÷þñéóç `tip1200`. Äåí ÷ñåéÜæåôáé ùóôüóï íá ÷ñçóéìïðïéÞóåôå ôá÷ýôçôá 1200 bps.

27.5.6 ¸÷ù Ðñüóâáóç óå ¸íá Áñéèìü Õðïëïãéóôþí ÌÝóù Åíüò ÅîõðçñåôçôÞ Ôåñìáôéêþí

Áíôß íá ðåñéìÝíåôå ìÝ÷ñé íá óõíäåèåßôå êáé íá ðëçêôñïëïãåßôå `CONNECT` *`host`* êÜèå öïñÜ, ÷ñçóéìïðïéÞóôå ôçí éêáíüôçôá `cm` ôïõ tip. Ãéá ðáñÜäåéãìá, äåßôå ôéò ðáñáêÜôù êáôá÷ùñßóåéò óôï `/etc/remote`:

```
pain|pain.deep13.com|Forrester’s machine:\
        :cm=CONNECT pain\n:tc=deep13:
muffin|muffin.deep13.com|Frank’s machine:\
        :cm=CONNECT muffin\n:tc=deep13:
deep13:Gizmonics Institute terminal server:\
        :dv=/dev/cuau2:br#38400:at=hayes:du:pa=none:pn=5551234:
```

Ôï ðáñáðÜíù, èá óáò åðéôñÝøåé íá ãñÜöåôå `tip pain` Þ `tip muffin` ãéá íá óõíäÝåóôå óôïõò õðïëïãéóôÝò `pain` Þ `muffin`, êáé `tip deep13` ãéá íá óõíäÝåóôå óôïí åîõðçñåôçôÞ ôåñìáôéêþí.

27.5.7 Ìðïñåß ç Tip íá ÄïêéìÜóåé Ðåñéóóüôåñåò Áðü Ìéá ÃñáììÝò ãéá êÜèå Óýíäåóç;

Áõôü ôï ðñüâëçìá óõíÞèùò åìöáíßæåôáé óå Ýíá ðáíåðéóôÞìéï ðïõ Ý÷åé áñêåôÝò ãñáììÝò ãéá modem, áëëÜ êáé ÷éëéÜäåò öïéôçôÝò ðïõ ðñïóðáèïýí íá ôéò ÷ñçóéìïðïéÞóïõí.

ÄçìéïõñãÞóôå ìéá êáôá÷þñéóç ãéá ôï ðáíåðéóôÞìéï óáò óôï `/etc/remote` êáé ÷ñçóéìïðïéÞóôå ôï `@` óôçí éêáíüôçôá `pn`:

```
big-university:\
        :pn=\@:tc=dialout
dialout:\
        :dv=/dev/cuau3:br#9600:at=courier:du:pa=none:
```

¸ðåéôá, äçìéïõñãÞóôå ìéá ëßóôá ìå ôïõò áñéèìïýò ôçëåöþíùí ôïõ ðáíåðéóôçìßïõ óôï `/etc/phones`:

```
big-university 5551111
big-university 5551112
big-university 5551113
big-university 5551114
```

Ç `tip` èá äïêéìÜóåé êÜèå ìßá, ìå ôç óåéñÜ ðïõ åìöáíßæïíôáé, êáé èá óôáìáôÞóåé. Áí èÝëåôå íá óõíå÷ßæåé ôçí ðñïóðÜèåéá, åêôåëÝóôå ôçí `tip` ìÝóá óå Ýíá âñü÷ï while.

27.5.8 Ãéáôß ÐñÝðåé íá ÐéÝóù Ctrl+P Äýï ÖïñÝò ãéá íá Óôåßëù ôï Óõíäõáóìü Ctrl+P Ìéá ÖïñÜ;

Ï óõíäõáóìüò ðëÞêôñùí **Ctrl**+**P** áðïôåëåß ôïí ðñïåðéëåãìÝíï ÷áñáêôÞñá “åîáíáãêáóìïý (force)”, êáé ÷ñçóéìïðïéåßôáé ãéá íá êáôáëÜâåé ç `tip` üôé ï åðüìåíïò ÷áñáêôÞñáò èá ðñÝðåé íá ÷ñçóéìïðïéçèåß üðùò åßíáé. Ìðïñåßôå íá èÝóåôå ôïí ÷áñáêôÞñá åîáíáãêáóìïý óå ïðïéïäÞðïôå Üëëï ÷áñáêôÞñá, ÷ñçóéìïðïéþíôáò ôçí áêïëïõèßá äéáöõãÞò `~s`, ç ïðïßá óçìáßíåé “ñýèìéóå ìéá ìåôáâëçôÞ”.

ÐëçêôñïëïãÞóôå `~sforce=`*`single-char`* êáé óõíå÷ßóôå ìå Ýíá ÷áñáêôÞñá íÝáò ãñáììÞò. Ôï *`single-char`* åßíáé ïðïéïóäÞðïôå ìüíïò ÷áñáêôÞñáò. Áí áöÞóåôå êåíü ôï *`single-char`*, ï ÷áñáêôÞñáò åîáíáãêáóìïý èá åßíáé ï nul, ôïí ïðïßï ìðïñåßôå íá ðëçêôñïëïãÞóåôå ÷ñçóéìïðïéþíôáò ôï óõíäõáóìü ðëÞêôñùí **Ctrl**+**2** Þ **Ctrl**+**Space**. Ìéá áñêåôÜ êáëÞ ôéìÞ ãéá ôï *`single-char`* åßíáé ôï **Shift**+**Ctrl**+**6**, ðïõ ÷ñçóéìïðïéåßôáé ìüíï óå êÜðïéïõò åîõðçñåôçôÝò ôåñìáôéêþí.

Ìðïñåßôå íá ïñßóåôå ôï ÷áñáêôÞñá åîáíáãêáóìïý óå üðïéïí åóåßò åðéèõìåßôå, ìå ôçí áêüëïõèç êáôá÷þñéóç óôï áñ÷åßï `$HOME/.tiprc`:

```
force=single-char
```

27.5.9 ÎáöíéêÜ ¼ôé ÃñÜöù Åìöáíßæåôáé ìå Êåöáëáßá ÃñÜììáôá!!

ÌÜëëïí Ý÷åôå ðéÝóåé **Ctrl**+**A**, ðïõ åßíáé ï “÷áñáêôÞñáò áíýøùóçò” ôçò `tip`, êáé åßíáé ó÷åäéáóìÝíïò åéäéêÜ ãéá üóïõò Ý÷ïõí ðñüâëçìá ìå ôï ðëÞêôñï **CAPS LOCK**. ×ñçóéìïðïéÞóôå ôçí åíôïëÞ `~s` ðïõ äåßîáìå ðáñáðÜíù, ãéá íá èÝóåôå ìéá ëïãéêÞ ôéìÞ óôç ìåôáâëçôÞ `raisechar`. Óôçí ðñáãìáôéêüôçôá, ìðïñåßôå íá èÝóåôå ôçí ßäéá ôéìÞ ìå ôïí ÷áñáêôÞñá åîáíáãêáóìïý, áí äåí óêïðåýåôå ðïôÝ íá ÷ñçóéìïðïéÞóåôå êÜðïéá áðü áõôÝò ôéò äõíáôüôçôåò.

ÐáñáêÜôù öáßíåôáé Ýíá õðüäåéãìá áñ÷åßïõ `.tiprc`, ôï ïðïßï åßíáé ôÝëåéï ãéá ÷ñÞóôåò ôïõ **Emacs** ðïõ ÷ñåéÜæåôáé íá ðëçêôñïëïãïýí óõ÷íÜ **Ctrl**+**2** êáé **Ctrl**+**A**:

```
force=^^
raisechar=^^
```

Ï ÷áñáêôÞñáò `^^` åßíáé ï **Shift**+**Ctrl**+**6**.

27.5.10 Ðùò Ìðïñþ íá ÌåôáöÝñù Áñ÷åßá ìå ôçí `tip`;

Áí åðéêïéíùíåßôå ìå Üëëï UNIX óýóôçìá, ìðïñåßôå íá óôåßëåôå êáé íá ëÜâåôå áñ÷åßá ìå ôéò åíôïëÝò `~p` (put) êáé `~t` (take). Ïé åíôïëÝò áõôÝò åêôåëïýí ôéò `cat` êáé `echo` óôï áðïìáêñõóìÝíï óýóôçìá ãéá íá ëáìâÜíïõí êáé íá óôÝëíïõí áñ÷åßá. Ç óýíôáîç ôïõò åßíáé:

`~p` ôïðéêü-áñ÷åßï [áðïìáêñõóìÝíï-áñ÷åßï]

`~t` áðïìáêñõóìÝíï-áñ÷åßï [ôïðéêü-áñ÷åßï]

Ïé ðáñáðÜíù åíôïëÝò äåí äéáèÝôïõí Ýëåã÷ï ëáèþí. Èá åßíáé êáëýôåñï íá ÷ñçóéìïðïéÞóåôå êÜðïéï Üëëï ðñùôüêïëëï, üðùò ôï zmodem.

27.5.11 Ðùò Ìðïñþ íá ÅêôåëÝóù ôï zmodem ìå ôçí `tip`;

Ãéá íá ëÜâåôå áñ÷åßá, îåêéíÞóôå ôï ðñüãñáììá áðïóôïëÞò óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ. ¸ðåéôá ðëçêôñïëïãÞóôå `~C rz` ãéá íá îåêéíÞóåôå ôçí ôïðéêÞ ëÞøç.

Ãéá íá óôåßëåôå áñ÷åßá, îåêéíÞóôå ôï ðñüãñáììá ëÞøçò óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ. ¸ðåéôá ðëçêôñïëïãÞóôå `~C sz files` ãéá íá óôåßëåôå ôá áñ÷åßá óôï áðïìáêñõóìÝíï óýóôçìá.

27.6 Ñýèìéóç ôçò ÓåéñéáêÞò Êïíóüëáò

Óõíåéóöïñá ôïõ Kazutaka YOKOTA. Âáóéóìݒíï óå Ýíá êåßìåíï ôïõ Bill Paul.

Ðñïåéäïðïßçóç: Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá áñ÷åßá óõóêåõþí ôùí óåéñéáêþí èõñþí ìåôïíïìÜóôçêáí áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôçí ðáñáêÜôù ôåêìçñßùóç óýìöùíá ìå ôéò ðáñáðÜíù áëëáãÝò.

27.6.1 ÅéóáãùãÞ

Ôï FreeBSD Ý÷åé ôçí éêáíüôçôá íá åêêéíÞóåé óå Ýíá óýóôçìá ôï ïðïßï ùò êïíóüëá äéáèÝôåé Ýíá “êïõôü” ôåñìáôéêü óõíäåìÝíï óå ìéá óåéñéáêÞ èýñá. ÁõôÞ ç ñýèìéóç åßíáé ÷ñÞóéìç óå äýï êáôçãïñßåò áíèñþðùí: äéá÷åéñéóôÝò óõóôçìÜôùí ðïõ åðéèõìïýí íá åãêáôáóôÞóïõí FreeBSD óå ìç÷áíÞìáôá ôá ïðïßá äåí äéáèÝôïõí ðëçêôñïëüãéï Þ ïèüíç, êáé ðñïãñáììáôéóôÝò ðïõ åðéèõìïýí íá åêóöáëìáôþóïõí ôïí ðõñÞíá Þ ïäçãïýò óõóêåõþí.

¼ðùò ðåñéãñÜöåôáé óôï ÊåöÜëáéï 13, ôï FreeBSD ÷ñçóéìïðïéåß óýóôçìá åêêßíçóçò ôñéþí óôáäßùí. Ôá ðñþôá äýï óôÜäéá åßíáé óôïí êþäéêá ôïõ boot block, ï ïðïßïò áðïèçêåýåôáé óôçí áñ÷Þ ôçò êáôÜôìçóçò (slice) ôïõ äßóêïõ åêêßíçóçò ôïõ FreeBSD. Ôï boot block êáôüðéí öïñôþíåé êáé åêôåëåß ôïí öïñôùôÞ åêêßíçóçò (`/boot/loader`) ùò êþäéêá ôïõ ôñßôïõ óôáäßïõ.

Ãéá íá åíåñãïðïéÞóåôå ôçí óåéñéáêÞ êïíóüëá, èá ðñÝðåé íá ñõèìßóåôå ôïí êþäéêá ôïõ boot block, ôï öïñôùôÞ åêêßíçóçò, êáé ôïí ðõñÞíá.

27.6.2 Ñýèìéóç ÓåéñéáêÞò Êïíóüëáò (Óýíôïìç ¸êäïóç)

Ç åíüôçôá áõôÞ õðïèÝôåé üôé ÷ñçóéìïðïéåßôå ôéò ðñïåðéëåãìÝíåò ñõèìßóåéò, êáé èÝëåôå áðëþò ìéá ãñÞãïñç åðéóêüðçóç ôçò äéáäéêáóßáò ñýèìéóçò ôçò óåéñéáêÞò êïíóüëáò.

1. ÓõíäÝóôå ôï óåéñéáêü êáëþäéï óôçí `COM1` êáé óôï ôåñìáôéêü.
2. Ãéá íá äåßôå üëá ôá ìçíýìáôá åêêßíçóçò óôçí óåéñéáêÞ êïíóüëá, äþóôå ôçí ðáñáêÜôù åíôïëÞ ùò õðåñ÷ñÞóôçò:

   ```
   # echo 'console="comconsole"' >> /boot/loader.conf
   ```
3. Åðåîåñãáóôåßôå ôï `/etc/ttys` êáé áëëÜîôå ôï `off` óå on êáé ôï `dialup` óå `vt100` ãéá ôçí êáôá÷þñéóç `ttyu0`. ÄéáöïñåôéêÜ, äåí èá ÷ñåéÜæåôáé êùäéêüò ðñüóâáóçò ãéá ôç óýíäåóç ìÝóù ôçò óåéñéáêÞò êïíóüëáò, ôï ïðïßï áðïôåëåß ðéèáíü êåíü áóöáëåßáò.
4. ÅðáíåêêéíÞóôå ôï óýóôçìá ãéá íá äåßôå áí ßó÷õóáí ïé áëëáãÝò.

Áí ÷ñåéÜæåóôå äéáöïñåôéêÝò ñõèìßóåéò, èá âñåßôå ëåðôïìÝñåéåò ãéá ôçí ñýèìéóç óôï ÔìÞìá 27.6.3.

27.6.3 Ñýèìéóç ÓåéñéáêÞò Êïíóüëáò

1. ÐñïåôïéìÜóôå Ýíá óåéñéáêü êáëþäéï.

   Èá ÷ñåéáóôåßôå åßôå Ýíá êáëþäéï ôýðïõ null-modem, åßôå Ýíá ôõðïðïéçìÝíï óåéñéáêü êáëþäéï êáé Ýíá ðñïóáñìïãÝá null-modem. Äåßôå ôï ÔìÞìá 27.2.2 ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôá åßäç ôùí óåéñéáêþí êáëùäßùí.
2. ÁðïóõíäÝóôå ôï ðëçêôñïëüãéï óáò.

Ôá ðåñéóóüôåñá PC øÜ÷íïõí ãéá ôï ðëçêôñïëüãéï êáôÜ ôçí äéÜñêåéá ôùí äéáãíùóôéêþí åêêßíçóçò (POST, Power On Self Test), êáé èá áíáöÝñïõí óöÜëìá áí ôï ðëçêôñïëüãéï äåí åßíáé óõíäåìÝíï. ÌåñéêÜ ìç÷áíÞìáôá ðáñáðïíéïýíôáé ç÷çñÜ ãéá ôçí Ýëëåéøç ðëçêôñïëïãßïõ, êáé äåí óõíå÷ßæïõí ôçí åêêßíçóç ìÝ÷ñé íá ôï óõíäÝóåôå.

Áí ï õðïëïãéóôÞò óáò ðáñáðïíéÝôáé ãéá ôï ëÜèïò, áëëÜ îåêéíÜ Ýôóé êáé áëëéþò, äåí ÷ñåéÜæåôáé íá êÜíåôå ôßðïôá éäéáßôåñï ãéá áõôü. (ÌåñéêÜ ìç÷áíÞìáôá ìå BIOS ôçò Phoenix, ëÝíå áðëþò `Keyboard Failed` êáé óõíå÷ßæïõí ôçí åêêßíçóç êáíïíéêÜ.)

Áí ï õðïëïãéóôÞò óáò áñíåßôáé íá åêêéíÞóåé ÷ùñßò ðëçêôñïëüãéï, èá ðñÝðåé íá ñõèìßóåôå ôï BIOS þóôå íá áãíïåß ôï ëÜèïò (áí ãßíåôáé). Óõìâïõëåõôåßôå ôï åã÷åéñßäéï ôçò ìçôñéêÞò óáò ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå áõôÞ ôç äéáäéêáóßá.

Õðüäåéîç: Ñõèìßóôå ôï ðëçêôñïëüãéï óå “Not installed” óôï BIOS. Ç ñýèìéóç áõôÞ áðëþò áðïôñÝðåé ôï BIOS áðü ôï íá áíé÷íåýåé ôï ðëçêôñïëüãéï óôçí åêêßíçóç, êáé äåí ðñüêåéôáé íá óáò åìðïäßóåé íá ôï ÷ñçóéìïðïéÞóåôå êáíïíéêÜ. Ìðïñåßôå íá áöÞóåôå ôï ðëçêôñïëüãéï óõíäåìÝíï áêüìá êáé üôáí Ý÷åôå åíåñãïðïéÞóåé ôç ñýèìéóç “Not installed”. Áí äåí õðÜñ÷åé ç ðáñáðÜíù ñýèìéóç óôï BIOS, øÜîôå ãéá ôçí åðéëïãÞ “Halt on Error”. ÁëëÜîôå ôç óå “All but Keyboard” Þ áêüìá êáé óå “No Errors”, êáé èá Ý÷åôå ôï ßäéï áðïôÝëåóìá.

Óçìåßùóç: Áí ôï óýóôçìá óáò äéáèÝôåé ðïíôßêé ôýðïõ PS/2®, ðéèáíüí íá ðñÝðåé íá ôï áðïóõíäÝóåôå êáé áõôü. Ôá ðïíôßêéá ôýðïõ PS/2 Ý÷ïõí êÜðïéá êõêëþìáôá êïéíÜ ìå ôï ðëçêôñïëüãéï, ãåãïíüò ðïõ ìðïñåß íá ðñïêáëÝóåé óýã÷õóç óôï ðñüãñáììá áíß÷íåõóçò ôïõ ðëçêôñïëïãßïõ. ÊÜðïéá óõóôÞìáôá, üðùò ôï Gateway 2000 Pentium 90 MHz ìå AMI BIOS, óõìðåñéöÝñïíôáé ìå áõôü ôïí ôñüðï. Óå ãåíéêÝò ãñáììÝò, áõôü äåí åßíáé ðñüâëçìá êáèþò ôï ðïíôßêé Ýôóé êáé áëëéþò äåí åßíáé ÷ñÞóéìï ÷ùñßò ôï ðëçêôñïëüãéï.

3. ÓõíäÝóôå Ýíá êïõôü ôåñìáôéêïý óôçí `COM1` (`sio0`).

   Áí äåí Ý÷åôå êïõôü ôåñìáôéêïý, ìðïñåßôå íá óõíäÝóåôå Ýíá ðáëéü PC/XT ìå Ýíá ðñüãñáììá ãéá modem, Þ íá ÷ñçóéìïðïéÞóåôå ôç óåéñéáêÞ èýñá óå Ýíá Üëëï ìç÷Üíçìá UNIX. Áí äåí Ý÷åôå óåéñéáêÞ èýñá `COM1` (`sio0`), áãïñÜóôå ìéá. Ôç äåäïìÝíç óôéãìÞ äåí õðÜñ÷åé ôñüðïò íá åðéëÝîåôå Üëëç èýñá åêôüò áðü ôçí `COM1`, ÷ùñßò íá åðáíáìåôáãëùôôßóåôå ôá boot blocks. Áí ÷ñçóéìïðïéåßôå Þäç ôçí `COM1` ãéá êÜðïéá Üëëç óõóêåõÞ, èá ðñÝðåé íá ôçí áöáéñÝóåôå ðñïóùñéíÜ, êáé íá åãêáôáóôÞóåôå íÝï boot block êáé ðõñÞíá, ìüëéò óõíäåèåßôå óôï FreeBSD. (ÕðïèÝôïõìå üôé ç `COM1` èá åßíáé Ýôóé êáé áëëéþò äéáèÝóéìç óå Ýíá åîõðçñåôçôÞ áñ÷åßùí/õðïëïãéóôþí/ôåñìáôéêþí. Áí ðñáãìáôéêÜ ÷ñåéÜæåóôå ôçí `COM1` ãéá êÜôé Üëëï (êáé äåí ìðïñåßôå áõôü ôï êÜôé Üëëï íá ôï ìåôáêéíÞóåôå óôçí `COM2` (`sio1`)), ìÜëëïí äåí èá Ýðñåðå íá áó÷ïëçèåßôå êáèüëïõ ìå üëï áõôü ôï èÝìá).

4. Âåâáéùèåßôå üôé ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò Ý÷åé ôéò êáôÜëëçëåò åðéëïãÝò (flags) ãéá ôçí `COM1` (`sio0`).

   Ïé ó÷åôéêÝò åðéëïãÝò åßíáé:

   `0x10`

   Åíåñãïðïéåß ôçí õðïóôÞñéîç êïíóüëáò ãéá áõôÞ ôç èýñá. Áí äåí ôåèåß áõôÞ ç åðéëïãÞ, ôá õðüëïéðá flags ãéá ôçí êïíóüëá äåí ëáìâÜíïíôáé õðüøéí. Ôç äåäïìÝíç óôéãìÞ, ç õðïóôÞñéîç êïíóüëáò ìðïñåß íá åßíáé åíåñãïðïéçìÝíç ìüíï óå ìéá èýñá. Ç ðñþôç ðïõ êáèïñßæåôáé óôï áñ÷åßï ñõèìßóåùí, åßíáé êáé áõôÞ ðïõ èá ðñïôéìçèåß. Áðü ìüíç ôçò, ç åðéëïãÞ áõôÞ äåí èá åíåñãïðïéÞóåé ôçí êïíóüëá óôç óõãêåêñéìÝíç óåéñéáêÞ èýñá. Èá ðñÝðåé íá èÝóåôå ôï ðáñáêÜôù flag Þ íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-h` ðïõ ðåñéãñÜöåôáé ðáñáêÜôù, ìáæß ìå áõôü ôï flag.

`0x20`

ÅîáíáãêÜæåé ôç óõãêåêñéìÝíç èýñá íá ãßíåé ç êïíóüëá (åêôüò áí õðÜñ÷åé Üëëç êïíóüëá õøçëüôåñçò ðñïôåñáéüôçôáò) Üó÷åôá ìå ôçí åðéëïãÞ `-h` ðïõ ðåñéãñÜöåôáé ðáñáêÜôù. Èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï flag `0x20` ìáæß ìå ôï flag `0x10`.

`0x40`

Ðáñáêñáôåß ôç óõãêåêñéìÝíç èýñá (óå óõíäõáóìü ìå ôçí `0x10`) êÜíïíôáò ôçí ìç äéáèÝóéìç ãéá êáíïíéêÞ ðñüóâáóç. Äåí èá ðñÝðåé íá èÝóåôå áõôÞ ôçí åðéëïãÞ óôç óåéñéáêÞ èýñá ðïõ óêïðåýåôå íá ÷ñçóéìïðïéÞóåôå ùò óåéñéáêÞ êïíóüëá. Ç ìüíç ÷ñÞóç áõôïý ôïõ flag, åßíáé íá êáèïñßóåôå üôé ç èýñá èá ÷ñçóéìïðïéçèåß ãéá áðïìáêñõóìÝíç åêóöáëìÜôùóç ôïõ ðõñÞíá (kernel debugging). Äåßôå Ôï Âéâëßï ôïõ Ðñïãñáììáôéóôþ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/developers-handbook/index.html) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôçí áðïìáêñõóìÝíç åêóöáëìÜôùóç.

ÐáñÜäåéãìá:

```
device sio0 flags 0x10
```

Äåßôå ôç óåëßäá manual sio(4) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Áí äåí Ý÷ïõí êáèïñéóôåß flags, èá ðñÝðåé íá åêôåëÝóåôå ôï UserConfig (óå äéáöïñåôéêÞ êïíóüëá) Þ íá åðáíáìåôáãëùôôßóåôå ôïí ðõñÞíá.

5. Äçìéïõñãßóôå ôï áñ÷åßï `boot.config` óôïí ñéæéêü êáôÜëïãï ôçò êáôÜôìçóçò `a` ôïõ äßóêïõ åêêßíçóçò.

Ôï áñ÷åßï áõôü èá êáèïäçãÞóåé ôïí êþäéêá ôïõ boot block ó÷åôéêÜ ìå ôï ðùò èÝëåôå íá åêêéíÞóåé ôï óýóôçìá. Ãéá íá åíåñãïðïéÞóåôå ôçí óåéñéáêÞ êïíóüëá, èá ÷ñåéáóôåßôå ìßá Þ ðåñéóóüôåñåò áðü ôéò ðáñáêÜôù åðéëïãÝò—áí èÝëåôå íá ðñïóäéïñßóåôå ðïëëáðëÝò åðéëïãÝò, èá ðñÝðåé íá ôéò ðåñéëÜâåôå üëåò óôçí ßäéá ãñáììÞ.

`-h`

ÅíáëëÜóóåé ìåôáîý ôçò åóùôåñéêÞò êáé ôçò óåéñéáêÞò êïíóüëáò. Ãéá ðáñÜäåéãìá, áí îåêéíÞóåôå áðü ôçí åóùôåñéêÞ êïíóüëá (ïèüíç), ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-h` ãéá íá êáèïäçãÞóåôå ôï öïñôùôÞ åêêßíçóçò êáé ôïí ðõñÞíá íá ÷ñçóéìïðïéÞóïõí ôç óåéñéáêÞ èýñá ùò óõóêåõÞ êïíóüëáò. ÅíáëëáêôéêÜ, áí åêêéíÞóåôå ìÝóù ôçò óåéñéáêÞò èýñáò, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-h` ãéá íá êáèïäçãÞóåôå ôï öïñôùôÞ åêêßíçóçò êáé ôïí ðõñÞíá íá ÷ñçóéìïðïéÞóïõí ôçí êáíïíéêÞ êïíóüëá áíôß ãéá ôç óåéñéáêÞ.

`-D`

ÅíáëëÜóóåé ìåôáîý ôçò áðëÞò êáé ôçò äéðëÞò êïíóüëáò. Óôçí ñýèìéóç áðëÞò êïíóüëáò, èá ÷ñçóéìïðïéçèåß åßôå ç åóùôåñéêÞ êïíóüëá (áðåéêüíéóç óå ïèüíç) åßôå ç óåéñéáêÞ èýñá, áíÜëïãá ìå ôï ðùò Ý÷åé ôåèåß ç åðéëïãÞ `-h` ðïõ åîåôÜóáìå ðáñáðÜíù. Óå ðåñßðôùóç äéðëÞò êïíóüëáò, èá åíåñãïðïéçèïýí ôáõôü÷ñïíá üôïí ç åóùôåñéêÞ üóï êáé ç óåéñéáêÞ êïíóüëá, Üó÷åôá áðü ôç ñýèìéóç ôçò åðéëïãÞò `-h`. Óçìåéþóôå ùóôüóï üôé ç ñýèìéóç äéðëÞò êïíóüëáò ìðïñåß íá åíåñãïðïéçèåß ìüíï êáôÜ ôçí åêêßíçóç, üóï åêôåëåßôáé ôï boot block. Ìüëéò äïèåß ï Ýëåã÷ïò óôï öïñôùôÞ åêêßíçóçò, ç ìïíáäéêÞ êïíóüëá ðïõ ðáñáìÝíåé åßíáé áõôÞ ðïõ êáèïñßæåôáé áðü ôçí åðéëïãÞ `-h`.

`-P`

Åíåñãïðïéåß ôçí áíß÷íåõóç ðëçêôñïëïãßïõ ôïõ boot block. Áí äåí âñåèåß ðëçêôñïëüãéï, åíåñãïðïéïýíôáé áõôüìáôá ïé åðéëïãÝò `-D` êáé `-h`.

Óçìåßùóç: Ëüãù ðåñéïñéóìþí ÷þñïõ óôçí ôñÝ÷ïõóá Ýêäïóç ôùí boot blocks, ç åðéëïãÞ `-P` ìðïñåß íá áíé÷íåýóåé ìüíï åêôåôáìÝíá (extended) ðëçêôñïëüãéá. Ðëçêôñïëüãéá ìå ëéãüôåñá áðü 101 ðëÞêôñá (êáé ÷ùñßò ôá ðëÞêôñá **F11** êáé **F12**) ßóùò íá ìçí áíé÷íåõèïýí. Åîáéôßáò áõôïý ôïõ ðåñéïñéóìïý, åßíáé ðéèáíü íá ìçí áíé÷íåõèïýí êáé êÜðïéá ðëçêôñïëüãéá öïñçôþí õðïëïãéóôþí. Áí óõìâáßíåé áõôü óôï óýóôçìá óáò, èá ðñÝðåé íá óôáìáôÞóåôå íá ÷ñçóéìïðïéåßôå ôçí åðéëïãÞ `-P`. Äõóôõ÷þò, äåí õðÜñ÷åé êÜðïéïò ôñüðïò íá ðáñáêÜìøåôå áõôü ôï ðñüâëçìá.

×ñçóéìïðïéÞóôå åßôå ôçí åðéëïãÞ `-P` ãéá íá åðéëÝîåôå ôçí êïíóüëá áõôüìáôá, Þ ôçí åðéëïãÞ `-h` ãéá íá åíåñãïðïéÞóåôå ôç óåéñéáêÞ êïíóüëá.

Ìðïñåßôå åðßóçò íá ðåñéëÜâåôå êáé Üëëåò åðéëïãÝò ðïõ ðåñéãñÜöïíôáé óôç óåëßäá manual ôïõ boot(8).

¼ëåò ïé åðéëïãÝò åêôüò ôçò `-P`, èá ðåñÜóïõí óôï öïñôùôÞ åêêßíçóçò (`/boot/loader`). Ï öïñôùôÞò åêêßíçóçò èá êáèïñßóåé áí ç êïíóüëá èá äçìéïõñãçèåß óôçí ïèüíç Þ óôç óåéñéáêÞ èýñá, áöïý åîåôÜóåé ìüíï ôçí åðéëïãÞ `-h`. Áõôü óçìáßíåé üôé áí êáèïñßóåôå ôçí åðéëïãÞ `-D` áëëÜ ü÷é ôçí åðéëïãÞ `-h` óôï `/boot.config`, èá ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí óåéñéáêÞ èýñá ùò êïíóüëá ìüíï êáôÜ ôçí åêôÝëåóç ôïõ boot block. Ï öïñôùôÞò åêêßíçóçò üìùò èá ÷ñçóéìïðïéÞóåé ôçí åóùôåñéêÞ êïíóüëá (ïèüíç).

6. ÅêêéíÞóôå ôï ìç÷Üíçìá.

   ¼ôáí îåêéíÞóåôå ôï FreeBSD ìç÷Üíçìá, ôá boot blocks èá äåßîïõí ôá ðåñéå÷üìåíá ôïõ `/boot.config` óôçí êïíóüëá. Ãéá ðáñÜäåéãìá:

   ```
   /boot.config: -P
   Keyboard: no
   ```

   Ç äåýôåñç ãñáììÞ èá åìöáíéóôåß ìüíï áí âÜëåôå ôçí åðéëïãÞ `-P` óôï `/boot.config`, êáé äåß÷íåé áí õðÜñ÷åé Þ ü÷é óõíäåìÝíï ðëçêôñïëüãéï. Ôá ìçíýìáôá áõôÜ êáôåõèýíïíôáé óôçí óåéñéáêÞ Þ óôçí åóùôåñéêÞ êïíóüëá, Þ áêüìá êáé óôéò äýï, áíÜëïãá ìå ôçí åðéëïãÞ ðïõ Ý÷åé ãßíåé óôï `/boot.config`.

ÅðéëïãÝò	Ôï ìÞíõìá åìöáíßæåôáé óôçí
êáìßá	åóùôåñéêÞ êïíóüëá
`-h`	óåéñéáêÞ êïíóüëá
`-D`	åóùôåñéêÞ êáé óåéñéáêÞ êïíóüëá
`-Dh`	óåéñéáêÞ êáé åóùôåñéêÞ êïíóüëá
`-P`, ðëçêôñïëüãéï óõíäåìÝíï	åóùôåñéêÞ êïíóüëá
`-P`, ÷ùñßò ðëçêôñïëüãéï	óåéñéáêÞ êïíóüëá

   ÌåôÜ ôá ðáñáðÜíù ìçíýìáôá, èá õðÜñîåé ìéá ìéêñÞ ðáýóç ðñéí ôá boot blocks óõíå÷ßóïõí öïñôþíïíôáò ôï öïñôùôÞ åêêßíçóçò, êáé ðñéí åìöáíéóôïýí ðåñéóóüôåñá ìçíýìáôá óôçí êïíóüëá. Õðü êáíïíéêÝò óõíèÞêåò, äåí ÷ñåéÜæåôáé íá äéáêüøåôå ôá boot blocks, áëëÜ ßóùò èÝëåôå íá ôï êÜíåôå áõôü ãéá íá âåâáéùèåßôå üôé üëá åßíáé ñõèìéóìÝíá óùóôÜ.

   ÐéÝóôå ïðïéïäÞðïôå ðëÞêôñï åêôüò áðü ôï **Enter** óôçí êïíóüëá ãéá íá äéáêüøåôå ôç äéáäéêáóßá åêêßíçóçò. Ôá boot blocks èá óáò ñùôÞóïõí ãéá ðåñéóóüôåñåò ðëçñïöïñßåò. Èá ðñÝðåé íá äåßôå êÜôé üðùò ôï ðáñáêÜôù:

   ```
   >> FreeBSD/i386 BOOT
   Default: 0:ad(0,a)/boot/loader
   boot:
   ```

   Åðáëçèåýóôå üôé ôï ðáñáðÜíù ìÞíõìá åìöáíßæåôáé åßôå óôç óåéñéáêÞ êïíóüëá, Þ óôçí åóùôåñéêÞ êïíóüëá Þ êáé óôéò äýï, áíÜëïãá ìå ôéò åðéëïãÝò ðïõ Ý÷åôå âÜëåé óôï áñ÷åßï `/boot.config`. Áí ôï ìÞíõìá åìöáíßæåôáé óôçí óùóôÞ êïíóüëá, ðéÝóôå **Enter** ãéá íá óõíå÷ßóåôå ìå ôç äéáäéêáóßá åêêßíçóçò.

Áí åðéèõìåßôå óåéñéáêÞ êïíóüëá, áëëÜ äåí âëÝðåôå ôçí ðñïôñïðÞ óå áõôÞí, õðÜñ÷åé êÜðïéï ëÜèïò óôéò ñõèìßóåéò. Óôï ìåôáîý, ãñÜøôå `-h` êáé ðéÝóôå **Enter** Þ **Return** (áí ãßíåôáé) ãéá íá ðåßôå óôï boot block (êáé Ýðåéôá óôï öïñôùôÞ åêêßíçóçò êáé ôïí ðõñÞíá) íá åðéëÝîåé ôç óåéñéáêÞ èýñá ãéá ôçí êïíóüëá. Ìüëéò ôï óýóôçìá îåêéíÞóåé, êïéôÜîôå îáíÜ ôéò ñõèìßóåéò ãéá íá âñåßôå ðïõ åßíáé ôï ëÜèïò.

ÌåôÜ ôç öüñôùóç ôïõ öïñôùôÞ åêêßíçóçò, âñßóêåóôå óôï ôñßôï óôÜäéï ôçò äéáäéêáóßáò åêêßíçóçò êáé Ý÷åôå áêüìá ôç äõíáôüôçôá íá åðéëÝîåôå ìåôáîý ôçò åóùôåñéêÞò êáé óåéñéáêÞò êïíóüëáò, èÝôïíôáò ôéò êáôÜëëçëåò ìåôáâëçôÝò ðåñéâÜëëïíôïò óôï öïñôùôÞ åêêßíçóçò. Äåßôå ôï ÔìÞìá 27.6.6.

27.6.4 Ðåñßëçøç

Åäþ èá âñåßôå ìéá ðåñßëçøç ôùí äéÜöïñùí åðéëïãþí ðïõ ðáñïõóéÜóôçêáí óå áõôÞ ôçí åíüôçôá, êáé ôçí êïíóüëá ðïõ åðéëÝ÷èçêå ôåëéêÜ.

27.6.4.1 1ç Ðåñßðôùóç: ¸÷åôå ÈÝóåé ôï Flag 0x10 ãéá ôç Èýñá `sio0`

```
device sio0 flags 0x10
```

ÅðéëïãÝò óôï /boot.config	Êïíóüëá êáôÜ ôç äéÜñêåéá ôùí boot blocks	Êïíóüëá êáôÜ ôç äéÜñêåéá ôïõ öïñôùôÞ åêêßíçóçò	Êïíóüëá óôïí ðõñÞíá
êáìßá	åóùôåñéêÞ	åóùôåñéêÞ	åóùôåñéêÞ
`-h`	óåéñéáêÞ	óåéñéáêÞ	óåéñéáêÞ
`-D`	óåéñéáêÞ êáé åóùôåñéêÞ	åóùôåñéêÞ	åóùôåñéêÞ
`-Dh`	óåéñéáêÞ êáé åóùôåñéêÞ	óåéñéáêÞ	óåéñéáêÞ
`-P`, ðëçêôñïëüãéï óõíäåìÝíï	åóùôåñéêÞ	åóùôåñéêÞ	åóùôåñéêÞ
`-P`, ÷ùñßò ðëçêôñïëüãéï	óåéñéáêÞ êáé åóùôåñéêÞ	óåéñéáêÞ	óåéñéáêÞ

27.6.4.2 2ç Ðåñßðôùóç: ¸÷åôå ÈÝóåé ôï Flag 0x30 ãéá ôçí Èýñá `sio0`

```
device sio0 flags 0x30
```

ÅðéëïãÝò óôï /boot.config	Êïíóüëá êáôÜ ôç äéÜñêåéá ôùí boot blocks	Êïíóüëá êáôÜ ôç äéÜñêåéá ôïõ öïñôùôÞ åêêßíçóçò	Êïíóüëá óôïí ðõñÞíá
êáìßá	åóùôåñéêÞ	åóùôåñéêÞ	óåéñéáêÞ
`-h`	óåéñéáêÞ	óåéñéáêÞ	óåéñéáêÞ
`-D`	óåéñéáêÞ êáé åóùôåñéêÞ	åóùôåñéêÞ	óåéñéáêÞ
`-Dh`	óåéñéáêÞ êáé åóùôåñéêÞ	óåéñéáêÞ	óåéñéáêÞ
`-P`, ðëçêôñïëüãéï óõíäåìÝíï	åóùôåñéêÞ	åóùôåñéêÞ	óåéñéáêÞ
`-P`, ÷ùñßò ðëçêôñïëüãéï	óåéñéáêÞ êáé åóùôåñéêÞ	óåéñéáêÞ	óåéñéáêÞ

27.6.5 ÓõìâïõëÝò ãéá ôçí ÓåéñéáêÞ Êïíóüëá

27.6.5.1 Ñýèìéóç Ìåãáëýôåñçò Ôá÷ýôçôáò ãéá ôç ÓåéñéáêÞ Èýñá

Ïé ðñïåðéëåãìÝíåò ñõèìßóåéò ôçò óåéñéáêÞò èýñáò åßíáé: 9600 baud, 8 bits, ÷ùñßò éóïôéìßá (parity), 1 stop bit. Áí èÝëåôå íá áëëÜîåôå ôçí ðñïåðéëåãìÝíç ôá÷ýôçôá ôçò êïíóüëáò, Ý÷åôå ôéò ðáñáêÜôù åðéëïãÝò:

- Åðáíáìåôáãëùôôßóôå ôá boot blocks èÝôïíôáò ôç ìåôáâëçôÞ `BOOT_COMCONSOLE_SPEED` ãéá íá ïñßóåôå ôçí íÝá ôá÷ýôçôá êïíóüëáò. Äåßôå ôï ÔìÞìá 27.6.5.2 ãéá ëåðôïìåñåßò ïäçãßåò ó÷åôéêÜ ìå ôç ìåôáãëþôôéóç êáé åãêáôÜóôáóç íÝùí boot blocks.

  Áí ç åíåñãïðïßçóç ôçò óåéñéáêÞò êïíóüëáò äåí ãßíåôáé ìÝóù ôçò åðéëïãÞò `-h`, Þ áí ç óåéñéáêÞ êïíóüëá ðïõ ÷ñçóéìïðïéåßôáé áðü ôïí ðõñÞíá åßíáé äéáöïñåôéêÞ áðü áõôÞ ðïõ ÷ñçóéìïðïéåßôáé áðü ôá boot blocks, èá ðñÝðåé åðßóçò íá ðñïóèÝóåôå ôçí ðáñáêÜôù åðéëïãÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá, êáé íá ìåôáãëùôôßóåôå Ýíá íÝï ðõñÞíá:

  ```
  options CONSPEED=19200
  ```

- Óôéò åðéëïãÝò åêêßíçóçò ôïõ ðõñÞíá, ÷ñçóéìïðïéÞóôå ôï `-S`. Ìðïñåßôå åðßóçò íá ðñïóèÝóåôå ôçí åðéëïãÞ `-S` óôï `/boot.config`. Ç óåëßäá manual boot(8) ðåñéÝ÷åé ìéá ëßóôá ôùí õðïóôçñéæüìåíùí åðéëïãþí, êáé ðåñéãñÜöåé ðùò íá ôéò ðñïóèÝóåôå óôï áñ÷åßï `/boot.config`.

- ÅíåñãïðïéÞóôå ôçí åðéëïãÞ `comconsole_speed` óôï áñ÷åßï `/boot/loader.conf`.

  Ãéá íá ëåéôïõñãÞóåé áõôÞ ç åðéëïãÞ, èá ðñÝðåé åðßóçò íá èÝóåôå ôéìÝò ãéá ôéò åðéëïãÝò `console`, `boot_serial`, êáé `boot_multicons` óôï ßäéï áñ÷åßï, ôï `/boot/loader.conf`. ÐáñáêÜôù öáßíåôáé Ýíá ðáñÜäåéãìá ÷ñÞóçò ôïõ `comconsole_speed` ãéá áëëáãÞ ôá÷ýôçôá ôçò óåéñéáêÞò êïíóüëáò:

  ```
  boot_multicons="YES"
  boot_serial="YES"
  comconsole_speed="115200"
  console="comconsole,vidconsole"
  ```

27.6.5.2 ×ñçóéìïðïéþíôáò ÓåéñéáêÞ Èýñá Åêôüò ôçò `sio0` ãéá ôçí Êïíóüëá.

Èá ðñÝðåé íá åðáíáìåôáãëùôôßóåôå êÜðïéá ðñïãñÜììáôá ãéá íá ÷ñçóéìïðïéÞóåôå ùò êïíóüëá ìéá óåéñéáêÞ èýñá åêôüò ôçò `sio0`. Áí ãéá ïðïéïäÞðïôå ëüãï èÝëåôå íá ÷ñçóéìïðïéÞóåôå Üëëç óåéñéáêÞ èýñá, èá ðñÝðåé íá åðáíáìåôáãëùôôßóåôå ôá boot blocks, ôï öïñôùôÞ åêêßíçóçò êáé ôïí ðõñÞíá, ìå ôïí ôñüðï ðïõ öáßíåôáé ðáñáêÜôù.

1. ÁíáêôÞóôå ôïí ðçãáßï êþäéêá ôïõ ðõñÞíá. (Äåßôå ôï ÊåöÜëáéï 25)
2. Åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/make.conf` êáé èÝóôå ôçí åðéëïãÞ `BOOT_COMCONSOLE_PORT` óôç äéåýèõíóç ôçò èýñáò ðïõ èÝëåôå íá ÷ñçóéìïðïéÞóåôå (0x3F8, 0x2F8, 0x3E8 or 0x2E8). Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ìüíï ôéò èýñåò `sio0` ùò `sio3` (`COM1` ùò `COM4`). ÊÜñôåò ðïëëáðëþí èõñþí, äåí ðñüêåéôáé íá ëåéôïõñãÞóïõí. Äåí ÷ñåéÜæåôáé íá ñõèìßóåôå ôçí ôéìÞ ôïõ interrupt.
3. ÄçìéïõñãÞóôå Ýíá áñ÷åßï ñýèìéóçò ðñïóáñìïóìÝíïõ ðõñÞíá, êáé ðñïóèÝóôå ôá êáôÜëëçëá flags ãéá ôç óåéñéáêÞ èýñá ðïõ åðéèõìåßôå íá ÷ñçóéìïðïéÞóåôå. Ãéá ðáñÜäåéãìá, áí èÝëåôå ç `sio1` (`COM2`) íá ãßíåé ç êïíóüëá:

   ```
   device sio1 flags 0x10
   ```

   Þ

   ```
   device sio1 flags 0x30
   ```

Äåí èá ðñÝðåé íá èÝóåôå flags êïíóüëáò ãéá ôéò Üëëåò óåéñéáêÝò èýñåò.

4. Ìåôáãëùôôßóôå êáé åãêáôáóôÞóôå îáíÜ ôá boot blocks êáé ôïí öïñôùôÞ åêêßíçóçò:

   ```
   # cd /sys/boot
   # make clean
   # make
   # make install
   ```

5. Åðáíáìåôáãëùôôßóôå êáé åãêáôáóôÞóôå ôïí ðõñÞíá.
6. ÃñÜøôå ôá boot blocks óôïí äßóêï åêêßíçóçò ÷ñçóéìïðïéþíôáò ôçí bsdlabel(8) êáé åêêéíÞóôå ìå ôï íÝï ðõñÞíá.

27.6.5.3 Åßóïäïò óôïí DDB Debugger ÌÝóù ôçò ÓåéñéáêÞò ÃñáììÞò

Áí èÝëåôå íá åéóÝëèåôå óôïí debugger ôïõ ðõñÞíá áðü ôçí óåéñéáêÞ êïíóüëá (êÜôé ðïõ åßíáé ÷ñÞóéìï ãéá íá åêôåëÝóåôå äéáãíùóôéêÜ áðü áðïìáêñõóìÝíç ôïðïèåóßá, áëëÜ åðßóçò êáé åðéêßíäõíï áí óôåßëåôå êáôÜ ëÜèïò BREAK ìÝóù ôçò óåéñéáêÞò èýñáò!) èá ðñÝðåé íá ðåñéëÜâåôå ôçí ðáñáêÜôù åðéëïãÞ óôïí ðõñÞíá óáò:

```
options BREAK_TO_DEBUGGER
options DDB
```

27.6.5.4 ÐñïôñïðÞ Åéóüäïõ óôçí ÓåéñéáêÞ Êïíóüëá

Áí êáé áõôü äåí åßíáé áðáñáßôçôï, ßóùò íá èÝëåôå íá Ý÷åôå ðñïôñïðÞ åéóüäïõ (*login*) ìÝóù ôçò óåéñéáêÞò ãñáììÞò, ôþñá ðïõ ìðïñåßôå ðëÝïí íá äåßôå ôá ìçíýìáôá åêêßíçóçò êáé íá åéóÝëèåôå óôï debugger ôïõ ðõñÞíá ìÝóù ôçò óåéñéáêÞò êïíóüëáò. Ç äéáäéêáóßá ðåñéãñÜöåôáé ðáñáêÜôù.

Ìå êÜðïéï óõíôÜêôç êåéìÝíïõ, áíïßîôå ôï áñ÷åßï `/etc/ttys` êáé âñåßôå ôéò ãñáììÝò:

```
ttyu0 "/usr/libexec/getty std.9600" unknown off secure
ttyu1 "/usr/libexec/getty std.9600" unknown off secure
ttyu2 "/usr/libexec/getty std.9600" unknown off secure
ttyu3 "/usr/libexec/getty std.9600" unknown off secure
```

Ïé êáôá÷ùñßóåéò áðü `ttyu0` ùò `ttyu3` áíôéóôïé÷ïýí óôéò `COM1` ùò `COM4`. ÁëëÜîôå ôï `off` óå `on` ãéá ôçí èýñá ðïõ åðéèõìåßôå. Áí Ý÷åôå áëëÜîåé ôçí ôá÷ýôçôá ôçò óåéñéáêÞò èýñáò, èá ÷ñåéáóôåß íá áëëÜîåôå ôï `std.9600` þóôå íá ôáéñéÜæåé ìå ôçí ôñÝ÷ïõóá ñýèìéóç, ð.÷. `std.19200`.

ÌÜëëïí èá èÝëåôå íá áëëÜîåôå êáé ôïí ôýðï ôïõ ôåñìáôéêïý, áðü `unknown` óôïí ðñáãìáôéêü ôýðïõ ôïõ óåéñéáêïý óáò ôåñìáôéêïý.

Áöïý áëëÜîåôå ôéò ñõèìßóåéò, èá ðñÝðåé íá åêôåëÝóåôå ôçí åíôïëÞ `kill -HUP 1` þóôå íá åíåñãïðïéçèïýí.

27.6.6 ÁëëáãÞ Êïíóüëáò ìÝóù ôïõ ÖïñôùôÞ Åêêßíçóçò

Óå ðñïçãïýìåíåò åíüôçôåò, ðåñéãñÜøáìå ðùò íá ñõèìßóåôå ôçí óåéñéáêÞ êïíóüëá áëëÜæïíôáò ôéò ñõèìßóåéò ôïõ boot block. Óôçí åíüôçôá áõôÞ, äåß÷íïõìå ðùò ìðïñåßôå íá êáèïñßóåôå ôçí êïíóüëá äßíïíôáò êÜðïéåò åíôïëÝò êáé ìåôáâëçôÝò ðåñéâÜëëïíôïò óôïí öïñôùôÞ åêêßíçóçò. Êáèþò ï öïñôùôÞò åêêßíçóçò êáëåßôáé áðü ôï ôñßôï óôÜäéï ôçò äéáäéêáóßáò åêêßíçóçò, êáé ìåôÜ ôï boot block, ïé ñõèìßóåéò ôïõ öïñôùôÞ åêêßíçóçò õðåñéó÷ýïõí óå ó÷Ýóç ìå áõôÝò ôïõ boot block.

27.6.6.1 Ñýèìéóç ôçò ÓåéñéáêÞò Êïíóüëáò

Ìðïñåßôå åýêïëá íá êáèïñßóåôå üôé èá ÷ñçóéìïðïéçèåß ç óåéñéáêÞ êïíóüëá óôïí öïñôùôÞ åêêßíçóçò êáé óôïí ðõñÞíá ðïõ èá öïñôùèåß, ãñÜöïíôáò áðëþò ìéá ãñáììÞ óôï `/boot/loader.conf`:

```
console="comconsole"
```

Ç ñýèìéóç áõôÞ èá åíåñãïðïéçèåß, Üó÷åôá ìå ôï boot block ðïõ óõæçôÞóáìå óôçí ðñïçãïýìåíç åíüôçôá.

Åßíáé êáëýôåñá ç ãñáììÞ áõôÞ íá åßíáé ç ðñþôç óôï áñ÷åßï `/boot/loader.conf`, þóôå íá âëÝðåôå ôá áñ÷éêÜ ìçíýìáôá åêêßíçóçò óôç óåéñéáêÞ êïíóüëá.

Ìå ôïí ßäéï ôñüðï, ìðïñåßôå íá êáèïñßóåôå ôçí åóùôåñéêÞ êïíóüëá ùò:

```
console="vidconsole"
```

Áí äåí êáèïñßóåôå ôç ìåôáâëçôÞ ðåñéâÜëëïíôïò `console`, ï öïñôùôÞò åêêßíçóçò (êáé Ýðåéôá ï ðõñÞíáò) èá ÷ñçóéìïðïéÞóïõí ïðïéáäÞðïôå êïíóüëá Ý÷åôå êáèïñßóåé óôï boot block ìå ôçí åðéëïãÞ `-h`.

Ìðïñåßôå íá êáèïñßóåôå ôçí êïíóüëá óôï `/boot/loader.conf.local` Þ óôï `/boot/loader.conf`.

Äåßôå ôï loader.conf(5) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

> **Óçìåßùóç:** Ôç äåäïìÝíç óôéãìÞ, ï öïñôùôÞò åêêßíçóçò äåí Ý÷åé åðéëïãÞ áíôßóôïé÷ç ìå ôçí `-P` ôïõ boot block, êáé äåí õðÜñ÷åé êÜðïéïò ôñüðïò íá ãßíåé áõôüìáôç åðéëïãÞ ìåôáîý åóùôåñéêÞò êáé óåéñéáêÞò êïíóüëáò áíÜëïãá ìå ôçí ðáñïõóßá ðëçêôñïëïãßïõ.

27.6.6.2 ×ñÞóç ÓåéñéáêÞò Èýñáò Åêôüò ôçò `sio0` ãéá ôçí Êïíóüëá

Èá ðñÝðåé íá åðáíáìåôáãëùôôßóåôå ôï öïñôùôÞ åêêßíçóçò þóôå íá ÷ñçóéìïðïéåß ìéá óåéñéáêÞ èýñá äéáöïñåôéêÞ áðü ôçí `sio0` ãéá ôç óåéñéáêÞ êïíóüëá. Áêïëïõèåßóôå ôç äéáäéêáóßá ðïõ ðåñéãñÜöåôáé óôï ÔìÞìá 27.6.5.2.

27.6.7 ÐéèáíÝò Ðáãßäåò

Ç ãåíéêÞ éäÝá åßíáé íá åðéôñÝðåôáé óå üðïéïí ôï åðéèõìåß, íá äçìéïõñãÞóåé åîåéäéêåõìÝíïõò åîõðçñåôçôÝò ðïõ äåí áðáéôïýí êÜñôåò ãñáöéêþí êáé ðëçêôñïëüãéá. Äõóôõ÷þò, áí êáé ôá ðåñéóóüôåñá óõóôÞìáôá èá óáò åðéôñÝøïõí íá åêêéíÞóåôå ÷ùñßò ðëçêôñïëüãéï, õðÜñ÷ïõí áñêåôÜ ðïõ äåí óáò åðéôñÝðïõí íá åêêéíÞóåôå ÷ùñßò êÜñôá ãñáöéêþí. Ôá ìç÷áíÞìáôá ìå BIOS ôçò AMI ìðïñïýí íá ñõèìéóôïýí ìå áõôü ôïí ôñüðï, áðëþò áëëÜæïíôáò ôçí åðéëïãÞ “graphics adapter” óôéò ñõèìßóåéò ôïõ CMOS óå “Not installed.”

Ôá ðåñéóóüôåñá ìç÷áíÞìáôá ùóôüóï äåí õðïóôçñßæïõí áõôÞ ôçí åðéëïãÞ, êáé èá áñíçèïýí íá åêêéíÞóïõí áí äåí âñåèåß êÜñôá ãñáöéêþí. Óôá ìç÷áíÞìáôá áõôÜ èá ðñÝðåé íá áöÞóåôå ìéá óôïé÷åéþäç (áêüìá êáé ìïíü÷ñùìç) êÜñôá ãñáöéêþí, áí êáé äåí åßíáé áðáñáßôçôï íá óõíäÝóåôå êáé ïèüíç. Ìðïñåßôå åðßóçò íá äïêéìÜóåôå íá åãêáôáóôÞóåôå BIOS ôçò AMI.

ÊåöÜëáéï 28 PPP êáé SLIP

ÁíáäïìÞèçêå, áíáäéïñãáíþèçêå, êáé áíáíåþèçêå áðü ôïí Jim Mock.

28.1 Óýíïøç

Ôï FreeBSD äéáèÝôåé ðëÞèïò ôñüðùí ãéá ôç óýíäåóç åíüò õðïëïãéóôÞ ìå Ýíá Üëëï. Ãéá íá åðéôý÷åôå óýíäåóç ìÝóù modem óôï Internet Þ óå Ýíá Üëëï äßêôõï, Þ ãéá íá åðéôñÝøåôå óå Üëëïõò íá óõíäåèïýí ìÝóù ôïõ óõóôÞìáôïò óáò, áðáéôåßôáé ç ÷ñÞóç PPP Þ SLIP. Ôï êåöÜëáéï áõôü ðåñéãñÜöåé ëåðôïìåñþò ôïí ôñüðï ñýèìéóçò ôùí ðáñáðÜíù õðçñåóéþí ãéá ÷ñÞóç ìÝóù modem.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá ñõèìßóåôå ôï PPP ÷ñÞóôç (User PPP).
- Ðùò íá ñõèìßóåôå ôï PPP ðõñÞíá (Kernel PPP, ìüíï ãéá FreeBSD 7.X).
- Ðùò íá ñõèìßóåôå ôï PPPoE (PPP ìÝóù Ethernet).
- Ðùò íá ñõèìßóåôå ôï PPPoA (PPP ìÝóù ATM).
- Ðùò íá ñõèìßóåôå Ýíá ðåëÜôç êáé åîõðçñåôçôÞ SLIP (ìüíï ãéá FreeBSD 7.X).

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá åßóôå åîïéêåéùìÝíïò ìå ôç âáóéêÞ ïñïëïãßá ôùí äéêôýùí.
- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò êáé ôï óêïðü ôùí åðéëïãéêþí óõíäÝóåùí êáé ôïõ PPP êáé/Þ SLIP.

Ìðïñåß íá áíáñùôéÝóôå ðïéá åßíáé ç âáóéêÞ äéáöïñÜ ìåôáîý ôïõ PPP ÷ñÞóôç êáé ôïõ PPP ðõñÞíá. Ç áðÜíôçóç åßíáé áðëÞ: ôï PPP ÷ñÞóôç åðåîåñãÜæåôáé ôá äåäïìÝíá åéóüäïõ êáé åîüäïõ ìÝóù ðñïãñáììÜôùí ÷ñÞóôç (userland) áíôß äéáìÝóïõ ôïõ ðõñÞíá ôïõ ëåéôïõñãéêïý. Áõôü ðñïêáëåß êÜðïéåò åðéâáñýíóåéò ëüãù ôçò áíôéãñáöÞò äåäïìÝíùí ìåôáîý ôïõ ðõñÞíá êáé ôçò öéëïîåíßáò ÷ñÞóôç, áëëÜ åðéôñÝðåé êáôÜ ðïëý ðéï ðëïýóéá (áðü Üðïøç äõíáôïôÞôùí) õëïðïßçóç ôïõ PPP ðñùôïêüëëïõ. Ôï PPP ÷ñÞóôç ÷ñçóéìïðïéåß ôç óõóêåõÞ `tun` ãéá ôçí åðéêïéíùíßá ìå ôïí Ýîù êüóìï, åíþ ôï PPP ðõñÞíá ÷ñçóéìïðïéåß ôçí óõóêåõÞ `ppp`.

> **Óçìåßùóç:** Óå üëï ôï êåöÜëáéï, ôï PPP ÷ñÞóôç èá áíáöÝñåôáé áðëÜ ùò **ppp** åêôüò êáé áí ÷ñåéÜæåôáé íá ãßíåé äéÜêñéóç óå ó÷Ýóç ìå Üëëï ëïãéóìéêü PPP üðùò ôï **pppd** (ìüíï ãéá ôï FreeBSD 7.X). Åêôüò áí áíáöÝñåôáé äéáöïñåôéêÜ, üëåò ïé åíôïëÝò ðïõ åîçãïýíôáé óôï êåöÜëáéï áõôü èá ðñÝðåé íá åêôåëïýíôáé ùò `root`.

28.2 ×ñçóéìïðïéþíôáò ôï PPP ×ñÞóôç

Åíçìåñþèçêå êáé âåëôéþèçêå áðü ôïí Tom Rhodes. Áñ÷éêÞ óõíåéóöïñÜ ôïõ Brian Somers. Ìå ôç âïÞèåéá ôùí Nik Clayton, Dirk Frömberg, êáé Peter Childs.

> **Ðñïåéäïðïßçóç:** Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôá ïíüìáôá óõóêåõþí ãéá ôéò óåéñéáêÝò èýñåò ìåôïíïìÜóôçêáí áðü `/dev/cuad`*N* óå `/dev/cuau`*N* êáé áðü `/dev/ttyd`*N* óå `/dev/ttyu`*N*. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá

÷ñåéáóôåß íá ðñïóáñìüóïõí ôéò ðáñáêÜôù ïäçãßåò óýìöùíá ìå áõôÝò ôéò áëëáãÝò.

28.2.1 PPP ×ñÞóç

28.2.1.1 ÐñïûðïèÝóåéò

Ôï êåßìåíï áõôü ðñïûðïèÝôåé üôé Ý÷åôå ôá ðáñáêÜôù:

- Ëïãáñéáóìü óå êÜðïéï Ðáñï÷Ýá Õðçñåóéþí Internet (ISP) óôïí ïðïßï óõíäÝåóôå ÷ñçóéìïðïéþíôáò PPP.
- ¸íá modem Þ Üëëç óõóêåõÞ óõíäåìÝíç óôï óýóôçìá óáò, êáé ñõèìéóìÝíç óùóôÜ þóôå íá óáò åðéôñÝðåé íá óõíäåèåßôå óôïí ISP óáò.
- Ôïõò áñéèìïýò êëÞóçò ãéá ôïí ISP óáò.
- Ôï üíïìá ÷ñÞóôç (login) êáé ôïí êùäéêü óáò (password). Åßôå êáíïíéêü üíïìá êáé êùäéêü (ôýðïõ UNIX) Þ Ýíá æåýãïò ïíüìáôïò / êùäéêïý ôýðïõ PAP Þ CHAP.
- Ôéò IP äéåõèýíóåéò åíüò Þ ðåñéóóüôåñùí äéáêïìéóôþí ïíïìÜôùí (DNS). ÖõóéïëïãéêÜ, ï ISP óáò èá óáò äþóåé äýï ôÝôïéåò äéåõèýíóåéò. Áí äåí Ý÷åôå ôïõëÜ÷éóôïí ìßá, ìðïñåßôå íá åíåñãïðïéÞóåôå ôçí åíôïëÞ `enable dns` óôï `ppp.conf` êáé ôï **ppp** èá ñõèìßóåé ôïõò äéáêïìéóôÝò ïíïìÜôùí ãéá óáò. Ôï ÷áñáêôçñéóôéêü áõôü åîáñôÜôáé áðü ôçí õðïóôÞñéîç ôçò äéáðñáãìÜôåõóçò DNS áðü ôïí ISP óáò.

Ï ISP óáò åíäå÷ïìÝíùò íá óáò äþóåé êáé ôéò ðáñáêÜôù ðëçñïöïñßåò, áëëÜ äåí åßíáé åíôåëþò áðáñáßôçôåò:

- Ôç äéåýèõíóç IP ãéá ôçí ðýëç (gateway) ôïõ ISP óáò. Ç ðýëç åßíáé ôï ìç÷Üíçìá ìÝóù ôïõ ïðïßïõ óõíäÝåóôå, êáé èá áðïôåëÝóåé ôçí *ðñïåðéëåãìÝíç äéáäñïìÞ* (default route) ãéá ôï ìç÷Üíçìá óáò. Áí äåí Ý÷åôå áõôÞ ôçí ðëçñïöïñßá, èá ÷ñçóéìïðïéçèåß ìéá åéêïíéêÞ, êáé üôáí óõíäåèåßôå èá ëÜâåôå ôçí êáíïíéêÞ äéåýèõíóç áðü ôïí äéáêïìéóôÞ PPP ôïõ ISP óáò.

  ÁõôÞ ç äéåýèõíóç IP áíáöÝñåôáé ùò `HISADDR` áðü ôï **ppp**.
- Ôç ìÜóêá äéêôýïõ (netmask) ðïõ ðñÝðåé íá ÷ñçóéìïðïéÞóåôå. Áí ï ISP óáò äå óáò ôçí ðáñÝ÷åé, ìðïñåßôå ìå áóöÜëåéá íá ÷ñçóéìïðïéÞóåôå ôçí ôéìÞ `255.255.255.255`.
- Áí ï ISP óáò ðáñÝ÷åé óôáôéêÞ äéåýèõíóç êáé üíïìá õðïëïãéóôÞ (hostname) ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áõôÜ. ÄéáöïñåôéêÜ, èá áöÞóïõìå ôïí áðïìáêñõóìÝíï õðïëïãéóôÞ íá äþóåé üðïéá äéåýèõíóç IP èåùñåß êáôÜëëçëç.

Áí óáò ëåßðïõí êÜðïéåò áðü ôéò áðáéôïýìåíåò ðëçñïöïñßåò, åðéêïéíùíÞóôå ìå ôïí ISP óáò.

> **Óçìåßùóç:** Óå ïëüêëçñç ôçí ðáñïýóá åíüôçôá, ðïëëÜ áðü ôá ðáñáäåßãìáôá ðïõ äåß÷íïõí ôá ðåñéå÷üìåíá ôùí áñ÷åßùí ñõèìßóåùí, åßíáé áñéèìçìÝíá áíÜ ãñáììÞ. Ïé áñéèìïß áõôïß åîõðçñåôïýí óôçí ðáñïõóßáóç êáé ôç óõæÞôçóç ôïõ êÜèå ðáñáäåßãìáôïò, êáé äåí ðñÝðåé íá ãñáöïýí ìÝóá óôï ðñáãìáôéêü áñ÷åßï. Åßíáé åðßóçò óçìáíôéêü íá ôçñåßôå ç óùóôÞ óôïß÷éóç óå êÜèå áñ÷åßï, ìå ôç ÷ñÞóç óôçëïèåôþí (tabs) êáé êåíþí äéáóôçìÜôùí.

28.2.1.2 Áõôüìáôç Ñýèìéóç PPP

Ôüóï ôï ppp üóï êáé ôï pppd (ç õëïðïßçóç ôïõ PPP óå åðßðåäï ðõñÞíá, ìüíï óôï FreeBSD 7.X) ÷ñçóéìïðïéïýí ôá áñ÷åßá ñõèìßóåùí óôïí êáôÜëïãï `/etc/ppp`. Ìðïñåßôå íá âñåßôå ðáñáäåßãìáôá ãéá ôï ppp ÷ñÞóçò óôïí êáôÜëïãï `/usr/share/examples/ppp/`.

H ñýèìéóç ôïõ ppp áðáéôåß ôçí ôñïðïðïßçóç åíüò áñéèìïý áðü áñ÷åßá, áíÜëïãá ìå ôéò áðáéôÞóåéò óáò. Ôï ôé èá âÜëåôå óå áõôÜ, åîáñôÜôáé óå êÜðïéï âáèìü áðü ôï áí ï ISP óáò áðïäßäåé óôáôéêÝò äéåõèýíóåéò IP (äçë. óáò ðáñÝ÷åé ìéá äéåýèõíóç IP ç ïðïßá äåí áëëÜæåé) Þ äõíáìéêÝò (äçë. ç IP äéåýèõíóç óáò áëëÜæåé êÜèå öïñÜ ðïõ óõíäÝåóôå óôïí ISP óáò).

28.2.1.2.1 PPP êáé ÓôáôéêÝò Äéåõèýíóåéò IP

Èá ÷ñåéáóôåß íá ôñïðïðïéÞóåôå ôï áñ÷åßï ñõèìßóåùí `/etc/ppp/ppp.conf`. Èá ðñÝðåé íá ìïéÜæåé ìå áõôü ðïõ öáßíåôáé ðáñáêÜôù:

> **Óçìåßùóç:** Ïé ãñáììÝò ðïõ ôåëåéþíïõí ìå : îåêéíïýí óôçí ðñþôç óôÞëç (áñ÷Þ ôçò ãñáììÞò) — üëåò ïé Üëëåò ãñáììÝò èá ðñÝðåé íá óôïé÷éóôïýí ìå ôïí ôñüðï ðïõ öáßíåôáé, ìå ôç ÷ñÞóç êåíþí Þ óôçëïèåôþí.

```
1     default:
2       set log Phase Chat LCP IPCP CCP tun command
3       ident user-ppp VERSION (built COMPILATIONDATE)
4       set device /dev/cuau0
5       set speed 115200
6       set dial "ABORT BUSY ABORT NO\\sCARRIER TIMEOUT 5 \
7                 \"\" AT OK-AT-OK ATE1Q0 OK \\dATDT\\T TIMEOUT 40 CONNECT"
8       set timeout 180
9       enable dns
10
11    provider:
12      set phone "(123) 456 7890"
13      set authname foo
14      set authkey bar
15      set login "TIMEOUT 10 \"\" \"\" gin:--gin: \\U word: \\P col: ppp"
16      set timeout 300
17      set ifaddr x.x.x.x y.y.y.y 255.255.255.255 0.0.0.0
18      add default HISADDR
```

ÃñáììÞ 1:

Áíáãíùñßæåé ôçí ðñïåðéëåãìÝíç êáôá÷þñéóç. Ïé åíôïëÝò óå áõôÞ ôçí êáôá÷þñéóç åêôåëïýíôáé áõôüìáôá, üôáí åêôåëåßôå ôï ppp.

ÃñáììÞ 2:

Åíåñãïðïéåß ôçí êáôáãñáöÞ (logging) ôùí ðáñáìÝôñùí. ¼ôáí ïé ñõèìßóåéò ðïõ Ý÷ïõí ãßíåé ëåéôïõñãïýí éêáíïðïéçôéêÜ, ç ãñáììÞ áõôÞ èá ðñÝðåé íá ìéêñýíåé óôçí ðáñáêÜôù:

```
set log phase tun
```

ãéá íá áðïöåõ÷èïýí ìåãÜëá ìåãÝèç óôá áñ÷åßá êáôáãñáöÞò.

ÃñáììÞ 3:

ËÝåé óôï PPP ðùò íá áíáöÝñåé ðëçñïöïñßåò ãéá ôïí åáõôü ôïõ óôçí Üëëç ìåñéÜ ôçò óýíäåóçò. Ç äéáäéêáóßá áõôÞ ãßíåôáé áí ôï PPP Ý÷åé ðñüâëçìá óôçí äéáðñáãìÜôåõóç êáé ïëïêëÞñùóç ôçò óýíäåóçò, ðáñÝ÷ïíôáò ìå áõôü ôïí ôñüðï ðëçñïöïñßåò óôïí áðïìáêñõóìÝíï äéá÷åéñéóôÞ. Ïé ðëçñïöïñßåò áõôÝò ìðïñåß íá åßíáé ÷ñÞóéìåò óôçí åðßëõóç ôïõ ðñïâëÞìáôïò.

ÃñáììÞ 4:

Áíáãíùñßæåé ôç óõóêåõÞ óôçí ïðïßá åßíáé óõíäåìÝíï ôï modem. Ç óõóêåõÞ `COM1` åßíáé ç `/dev/cuau0` êáé ç `COM2` åßíáé ç `/dev/cuau1`.

ÃñáììÞ 5:

Êáèïñßæåé ôçí ôá÷ýôçôá ìå ôçí ïðïßá åðéèõìåßôå íá óõíäåèåßôå. Áí äåí ëåéôïõñãåß ç ôéìÞ 115200 (ç ïðïßá ðñÝðåé íá ëåéôïõñãåß ìå êÜèå ó÷åôéêÜ óýã÷ñïíï modem), äïêéìÜóôå ìå 38400.

ÃñáììÝò 6 & 7:

Ôï áëöáñéèìçôéêü ðïõ èá ÷ñçóéìïðïéçèåß ãéá ôçí êëÞóç. Ôï PPP ÷ñÞóôç ÷ñçóéìïðïéåß óýíôáîç expect-send ðáñüìïéá ìå áõôÞ ðïõ ÷ñçóéìïðïéåß ôï ðñüãñáììá chat(8). Äåßôå ôç óåëßäá manual ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò äõíáôüôçôåò áõôÞò ôçò ãëþóóáò.

Óçìåéþóôå üôé áõôÞ ç åíôïëÞ óõíå÷ßæåé óôçí åðüìåíç ãñáììÞ ãéá ëüãïõò áíáãíùóéìüôçôáò. Áõôü ìðïñåß íá ãßíåé óå êÜèå åíôïëÞ ôïõ `ppp.conf`, åöüóïí ôï `\` åßíáé ï ôåëåõôáßïò ÷áñáêôÞñáò ôçò ãñáììÞò.

ÃñáììÞ 8:

Êáèïñßæåé ôï ÷ñüíï ôåñìáôéóìïý ëüãù áäñÜíåéáò ôçò óýíäåóçò. Ôá 180 äåõôåñüëåðôá åßíáé ç ðñïåðéëåãìÝíç ôéìÞ, Ýôóé ç ãñáììÞ áõôÞ åßíáé åäþ êáèáñÜ äéáêïóìçôéêÞ.

ÃñáììÞ 9:

ËÝåé óôï PPP íá ñùôÞóåé ôçí Üëëç ðëåõñÜ ãéá íá åðéâåâáéþóåé ôéò ñõèìßóåéò ôïõ resolver. Áí åêôåëåßôå ôïðéêü äéáêïìéóôÞ ïíïìÜôùí (DNS), èá ðñÝðåé íá ìåôáôñÝøåôå áõôÞ ôç ãñáììÞ óå ó÷üëéï Þ íá ôçí áöáéñÝóåôå.

ÃñáììÞ 10:

ÊåíÞ ãñáììÞ þóôå ç áíÜãíùóç ôïõ áñ÷åßïõ íá åßíáé ðéï åýêïëç. Ïé êåíÝò ãñáììÝò áãíïïýíôáé áðü ôï PPP.

ÃñáììÞ 11:

Áíáãíùñßæåé ôçí êáôá÷þñéóç åíüò ðáñï÷Ýá ìå ôï üíïìá “provider”. Ìðïñåßôå åäþ íá ÷ñçóéìïðïéÞóåôå ôï üíïìá ôïõ ISP óáò, þóôå áñãüôåñá íá îåêéíÜôå ôç óýíäåóç óáò ìå ôçí åðéëïãÞ `load ISP`.

ÃñáììÞ 12:

ÈÝôåé ôïí áñéèìü êëÞóçò ãéá áõôü ôïí ðáñï÷Ýá. Ìðïñåßôå íá êáèïñßóåôå ðïëëáðëïýò áñéèìïýò êëÞóçò ÷ñçóéìïðïéþíôáò Üíù-êÜôù ôåëåßá (`:`) Þ ôïí ÷áñáêôÞñá (`|`) ùò äéá÷ùñéóôéêü. Ç äéáöïñÜ ìåôáîý ôùí äýï äéá÷ùñéóôéêþí ðåñéãñÜöåôáé óôï ppp(8). ÐåñéëçðôéêÜ, áí èÝëåôå íá äïêéìÜæïíôáé êõêëéêÜ üëïé ïé áñéèìïß, ÷ñçóéìïðïéÞóôå ôçí Üíù-êÜôù ôåëåßá. Áí èÝëåôå íá ãßíåôáé ðÜíôïôå áðüðåéñá êëÞóçò ôïõ ðñþôïõ áñéèìïý êáé ïé õðüëïéðïé íá äïêéìÜæïíôáé ìüíï áí ï ðñþôïò áðïôý÷åé, ÷ñçóéìïðïéÞóôå ôï ÷áñáêôÞñá ðáñï÷Ýôåõóçò. Íá ãñÜöåôå ðÜíôïôå üëï ôï óýíïëï ôùí ôçëåöùíéêþí áñéèìþí ìå ôïí ôñüðï ðïõ öáßíåôáé.

Áí ï áñéèìüò ôçëåöþíïõ ðåñéÝ÷åé êåíÜ, èá ðñÝðåé íá ôïí ðåñéêëåßóåôå óå åéóáãùãéêÜ ("). Ç ðáñÜëåéøç ôïõò, áí êáé åßíáé áðëü óöÜëìá, ìðïñåß íá ðñïêáëÝóåé ðñïâëÞìáôá ðïõ äåí ìðïñïýí íá åíôïðéóôïýí åýêïëá.

ÃñáììÝò 13 & 14:

Áíáãíùñßæåé ôï üíïìá ÷ñÞóôç êáé ôïí êùäéêü ôïõ. ¼ôáí óõíäÝåóôå ÷ñçóéìïðïéþíôáò ðñïôñïðÞ ôýðïõ UNIX, ïé ôéìÝò áõôÝò áíáöÝñïíôáé áðü ôçí åíôïëÞ `set login` ÷ñçóéìïðïéþíôáò ôéò ìåôáâëçôÝò \U êáé \P. ¼ôáí óõíäÝåóôå ìå ÷ñÞóç PAP Þ CHAP, ïé ôéìÝò áõôÝò ÷ñçóéìïðïéïýíôáé ôçí þñá ôçò ðéóôïðïßçóçò ôáõôüôçôáò ôïõ ÷ñÞóôç.

ÃñáììÞ 15:

Áí ÷ñçóéìïðïéåßôå PPP Þ CHAP, äåí èá õðÜñ÷åé óôï óçìåßï áõôü ðñïôñïðÞ åéóüäïõ (login), êáé èá ðñÝðåé íá ìåôáôñÝøåôå ôç ãñáììÞ áõôÞ óå ó÷üëéï Þ íá ôçí áöáéñÝóåôå. Äåßôå ôçí Ðéóôïðïßçóç PAP êáé CHAP ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Ôï áëöáñéèìçôéêü åéóüäïõ ÷ñçóéìïðïéåß óýíôáîç ðáñüìïéá ìå ôï chat(8), üðùò óõìâáßíåé êáé ìå ôï áëöáñéèìçôéêü êëÞóçò. Óôï ðáñÜäåéãìá ìáò, ôï áëöáñéèìçôéêü ÷ñçóéìïðïéåßôáé ãéá ìéá õðçñåóßá ôçò ïðïßáò ç óõíåäñßá åéóüäïõ ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
J. Random Provider
login: foo
password: bar
protocol: ppp
```

Èá ÷ñåéáóôåß íá áëëÜîåôå áõôü ôï script áíÜëïãá ìå ôéò áíÜãêåò óáò. ¼ôáí ãñÜöåôå áõôü ôï script ôçí ðñþôç öïñÜ, âåâáéùèåßôå üôé Ý÷åôå åíåñãïðïéÞóåé ôï áñ÷åßï êáôáãñáöÞò ãéá ôï “chat” þóôå íá ìðïñåßôå íá ðñïóäéïñßóåôå áí ç äéáäéêáóßá áíáãíþñéóçò ðñï÷ùñÜåé óùóôÜ.

ÃñáììÞ 16:

ÈÝôåé ôï ÷ñüíï áäñÜíåéáò (óå äåõôåñüëåðôá) ãéá ôç óýíäåóç. Åäþ, ç óýíäåóç èá êëåßóåé áõôüìáôá áí äåí õðÜñ÷åé êßíçóç ãéá 300 äåõôåñüëåðôá. Áí äåí èÝëåôå íá ãßíåôáé ðïôÝ ôåñìáôéóìüò ôçò óýíäåóçò ëüãù áäñÜíåéáò, èÝóôå áõôÞ ôç ôéìÞ óå ìçäÝí, Þ ÷ñçóéìïðïéÞóôå ôçí åðéëïãÞ `-ddial` óôç ãñáììÞ åíôïëÞò.

ÃñáììÞ 17:

ÈÝôåé ôç äéåýèõíóç ôçò äéåðáöÞò. Ôï áëöáñéèìçôéêü `x.x.x.x` èá ðñÝðåé íá áíôéêáôáóôáèåß ìå ôç äéåýèõíóç IP ðïõ óáò Ý÷åé áðïäïèåß áðü ôïí ðáñï÷Ýá óáò. Ôï áëöáñéèìçôéêü `y.y.y.y` èá ðñÝðåé íá áíôéêáôáóôáèåß ìå ôçí äéåýèõíóç IP ðïõ Ý÷åé êáèïñßóåé ï ISP óáò ùò ðýëç (gateway, ôï ìç÷Üíçìá óôï ïðïßï óõíäÝåóôå). Áí ï ISP óáò äåí óáò Ý÷åé äþóåé äéåýèõíóç ðýëçò, ÷ñçóéìïðïéÞóôå ôçí `10.0.0.2/0`. Áí ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ìéá IP äéåýèõíóç ðïõ Ý÷åôå “ìáíôÝøåé”, âåâáéùèåßôå üôé Ý÷åôå äçìéïõñãÞóåé ìéá êáôá÷þñéóç óôï `/etc/ppp/ppp.linkup` óýìöùíá ìå ôéò ïäçãßåò ãéá ôï PPP êáé ÄõíáìéêÝò IP Äéåõèýíóåéò. Áí ðáñáëåßøåôå áõôÞ ôç ãñáììÞ, ôï `ppp` äåí èá ìðïñåß íá åêôåëåóôåß óå êáôÜóôáóç `-auto`.

ÃñáììÞ 18:

ÐñïóèÝóôå ìéá ðñïåðéëåãìÝíç äéáäñïìÞ (default route) ðñïò ôï ìç÷Üíçìá ðýëçò (gateway) ôïõ ISP óáò. Ç åéäéêÞ ëÝîç `HISADDR` áíôéêáèßóôáôáé ìå ôçí äéåýèõíóç ðýëçò ðïõ êáèïñßæåôáé óôç ãñáììÞ 17. Åßíáé óçìáíôéêü ç ãñáììÞ áõôÞ íá åìöáíßæåôáé ìåôÜ ôçí ãñáììÞ 17, äéáöïñåôéêÜ ôï `HISADDR` äåí èá Ý÷åé áêüìá ëÜâåé áñ÷éêÞ ôéìÞ.

Áí äåí åðéèõìåßôå íá åêôåëÝóåôå ôï ppp óå êáôÜóôáóç `-auto`, èá ðñÝðåé íá ìåôáêéíÞóåôå áõôÞ ôç ãñáììÞ óôï áñ÷åßï `ppp.linkup`.

Äåí åßíáé áðáñáßôçôï íá ðñïóèÝóåôå êáôá÷þñéóç óôï áñ÷åßï `ppp.linkup` üôáí Ý÷åôå óôáôéêÞ äéåýèõíóç IP êáé åêôåëåßôå ôï ppp óå êáôÜóôáóç `-auto`. Óôçí ðåñßðôùóç áõôÞ, ïé êáôá÷ùñßóåéò óáò óôïí ðßíáêá äñïìïëüãçóçò åßíáé óùóôÝò ðñéí êáí óõíäåèåßôå. ºóùò ùóôüóï íá èÝëåôå íá äçìéïõñãÞóåôå ìéá êáôá÷þñéóç ãéá íá åêôåëÝóåôå êÜðïéá ðñïãñÜììáôá ìåôÜ ôçí áðïêáôÜóôáóç ôçò óýíäåóçò. Èá ôï åîçãÞóïõìå áõôü áñãüôåñá óå Ýíá ðáñÜäåéãìá ìå ôï sendmail.

Ìðïñåßôå íá âñåßôå ðáñáäåßãìáôá áñ÷åßùí ñõèìßóåùí óôïí êáôÜëïãï `usr/share/examples/ppp/`.

28.2.1.2.2 PPP êáé ÄõíáìéêÝò Äéåõèýíóåéò IP

Áí ï ðáñï÷Ýáò óáò äåí äßíåé óôáôéêÝò äéåõèýíóåéò, ôï `ppp` ìðïñåß íá ñõèìéóôåß íá äéáðñáãìáôåõôåß ôçí ôïðéêÞ êáé ôçí áðïìáêñõóìÝíç äéåýèõíóç. Áõôü ãßíåôáé “ìáíôåýïíôáò” ìéá äéåýèõíóç IP, êáé åðéôñÝðïíôáò óôï `ppp` íá ôçí èÝóåé Ýðåéôá óùóôÜ, ÷ñçóéìïðïéþíôáò ôï ðñùôüêïëëï IPCP (IP Configuration Protocol) ìåôÜ ôç óýíäåóç. Ôï áñ÷åßï ñõèìßóåùí `ppp.conf` åßíáé ôï ßäéï üðùò êáé óôï PPP êáé ÓôáôéêÝò Äéåõèýíóåéò IP, ìå ôçí ðáñáêÜôù ìüíï áëëáãÞ:

```
17      set ifaddr 10.0.0.1/0 10.0.0.2/0 255.255.255.255 0.0.0.0
```

¼ðùò êáé ðñïçãïõìÝíùò, äåí ðñÝðåé íá ðåñéëÜâåôå ôïí áñéèìü ãñáììÞò. Áðáéôåßôáé åóï÷Þ åíüò ôïõëÜ÷éóôïí êåíïý äéáóôÞìáôïò.

ÃñáììÞ 17:

> Ï áñéèìüò ìåôÜ ôï ÷áñáêôÞñá `/` åßíáé ôï ðëÞèïò ôùí bits ôçò äéåýèõíóçò ãéá ôï ïðïßï èá åðéìåßíåé ôï ppp. ºóùò èÝëåôå íá ÷ñçóéìïðïéÞóåôå áñéèìïýò IP ðéï êáôÜëëçëïõò ãéá ôçí ðåñßóôáóç, áëëÜ ôï ðáñÜäåéãìá ðïõ äßíïõìå ðáñáðÜíù èá ëåéôïõñãÞóåé ðÜíôá.
>
> Ôï ôåëåõôáßï üñéóìá (ôï `0.0.0.0`) ëÝåé óôï PPP íá áñ÷ßóåé ôéò äéáðñáãìáôåýóåéò ìå ôçí äéåýèõíóç `0.0.0.0` áíôß ãéá ôçí `10.0.0.1`. Áõôü åßíáé áðáñáßôçôï óå ïñéóìÝíïõò ISP. Ìç ÷ñçóéìïðïéÞóåôå ôï `0.0.0.0` ùò ðñþôï üñéóìá óôçí `set ifaddr`, êáèþò èá åìðïäßóåé ôçí PPP íá ñõèìßóåé ôçí áñ÷éêÞ äéáäñïìÞ óôçí êáôÜóôáóç `-auto` .

Áí äåí ÷ñçóéìïðïéåßôå ôçí åðéëïãÞ `-auto`, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå ìéá êáôá÷þñéóç óôï áñ÷åßï `/etc/ppp/ppp.linkup`. Ôï áñ÷åßï `ppp.linkup` ÷ñçóéìïðïéåßôáé ìåôÜ ôçí áðïêáôÜóôáóç ôçò óýíäåóçò. Óôï óçìåßï áõôü, ôï `ppp` èá Ý÷åé Þäç áðïäþóåé äéåýèõíóç óôçí äéåðáöÞ êáé èá åßíáé ðëÝïí äõíáôüí íá ðñïóèÝóåôå ôéò êáôá÷ùñßóåéò óôïí ðßíáêá äñïìïëüãçóçò:

```
1     provider:
2      add default HISADDR
```

ÃñáììÞ 1:

> Ìå ôçí áðïêáôÜóôáóç ôçò óýíäåóçò, ôï `ppp` èá øÜîåé ãéá ìéá êáôá÷þñéóç óôï `ppp.linkup` óýìöùíá ìå ôïõò ðáñáêÜôù êáíüíåò: Áñ÷éêÜ èá ðñïóðáèÞóåé íá ôáéñéÜîåé ôçí ðñþôç åôéêÝôá ðïõ Ý÷åé ÷ñçóéìïðïéçèåß óôï áñ÷åßï `ppp.conf`. Áí áõôü áðïôý÷åé, èá øÜîåé ãéá ìéá êáôá÷þñéóç ãéá ôçí äéåýèõíóç IP ôçò ðýëçò. Ç êáôá÷þñéóç áõôÞ åßíáé ìéá åôéêÝôá ìïñöÞò IP äéåýèõíóçò, ìå ôÝóóåñéò ïêôÜäåò. Áí äåí Ý÷åé áêüìá âñåèåß ç óùóôÞ êáôá÷þñéóç, èá ãßíåé áíß÷íåõóç ãéá ôçí êáôá÷þñéóç `MYADDR`.

ÃñáììÞ 2:

> Ç ãñáììÞ áõôÞ ëÝåé óôï `ppp` íá ðñïóèÝóåé ìéá ðñïåðéëåãìÝíç äéáäñïìÞ ç ïðïßá íá äåß÷íåé óôï `HISADDR`. Ôï `HISADDR` èá áíôéêáôáóôáèåß ìå ôç äéåýèõíóç IP ôçò ðýëçò üðùò áõôÞ áðïäüèçêå ìÝóù ôïõ ðñùôïêüëëïõ IPCP.

Äåßôå ôçí êáôá÷þñéóç `pmdemand` óôá áñ÷åßá `/usr/share/examples/ppp/ppp.conf.sample` êáé `/usr/share/examples/ppp/ppp.linkup.sample` ãéá Ýíá ðéï ëåðôïìåñÝò ðáñÜäåéãìá.

28.2.1.2.3 ËÞøç Åéóåñ÷üìåíùí ÊëÞóåùí

¼ôáí ñõèìßæåôå ôï **ppp** íá ëáìâÜíåé åéóåñ÷üìåíåò êëÞóåéò óå Ýíá ìç÷Üíçìá ðïõ óõíäÝåôáé óå Ýíá ôïðéêü äßêôõï (LAN), èá ðñÝðåé íá áðïöáóßóåôå áí èÝëåôå íá ðñïùèïýíôáé ðáêÝôá ðñïò áõôü. Áí íáé, èá ðñÝðåé íá áðïäþóåôå óôï ìç÷Üíçìá ìéá äéåýèõíóç IP ç ïðïßá íá áíÞêåé óôï ßäéï õðïäßêôõï ìå ôï LAN, êáé íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `enable proxy` óôï áñ÷åßï `/etc/ppp/ppp.conf`. Èá ðñÝðåé åðßóçò íá åðéâåâáéþóåôå üôé ôï áñ÷åßï `/etc/rc.conf` ðåñéÝ÷åé ôá ðáñáêÜôù:

```
gateway_enable="YES"
```

28.2.1.2.4 Ðïéï getty;

Ç åíüôçôá Õðçñåóßá Åéóüäïõ ìÝóù Åðéëïãéêþò Óýíäåóçò (dial in) ðáñÝ÷åé ìéá êáëÞ ðåñéãñáöÞ ó÷åôéêÜ ìå ôçí åíåñãïðïßçóç õðçñåóéþí åðéëïãéêþí êëÞóåùí ÷ñçóéìïðïéþíôáò ôçí getty(8).

Ìéá åíáëëáêôéêÞ óôçí `getty` åßíáé ç mgetty (http://mgetty.greenie.net/) (áðü ôï ðáêÝôï `comms/mgetty+sendfax`), ìéá ðéï Ýîõðíç Ýêäïóç ôçò `getty`, ç ïðïßá Ý÷åé ó÷åäéáóôåß ãéá íá ëáìâÜíåé õðüøéí ôéò åðéëïãéêÝò ãñáììÝò.

Ôá ðëåïíåêôÞìáôá ôçò `mgetty` åßíáé üôé *åðéêïéíùíåß* åíåñãÜ ìå ôá modem, ôï ïðïßï óçìáßíåé üôé áí ç èýñá åßíáé áðåíåñãïðïéçìÝíç óôï `/etc/ttys`, ôï modem óáò äåí èá áðáíôÞóåé óôçí êëÞóç.

ÌåôáãåíÝóôåñåò åêäüóåéò ôçò `mgetty` (áðü ôçí 0.99beta êáé ìåôÜ) õðïóôçñßæïõí åðßóçò áõôüìáôç áíß÷íåõóç PPP streams, åðéôñÝðïíôáò óôïõò ðåëÜôåò óáò ðñüóâáóç óôïí åîõðçñåôçôÞ ÷ùñßò ÷ñÞóç scripts.

ÄéáâÜóôå ôçí åíüôçôá Mgetty êáé AutoPPP ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí `mgetty`.

*28.2.1.2.5 ¶äåéåò ãéá ôï **PPP***

Õðïóéïëïãéêü, ç åêôÝëåóç ôçò åíôïëÞò `ppp` ðñÝðåé íá ãßíåôáé ùò ÷ñÞóôçò `root`. Áí ùóôüóï èÝëåôå íá åðéôñÝøåôå ôçí åêôÝëåóç ôïõ `ppp` óå êáôÜóôáóç åîõðçñåôçôÞ ùò êáíïíéêüò ÷ñÞóôçò (ìå ôïí ôñüðï ðïõ ðåñéãñÜöåôáé ðáñáêÜôù) èá ðñÝðåé íá äþóåôå óå áõôü ôï ÷ñÞóôç ôá êáôÜëëçëá äéêáéþìáôá ãéá íá åêôåëåß ôï `ppp`, ðñïóèÝôïíôáò ôïí óôçí ïìÜäá `network` óôï áñ÷åßï `/etc/group`.

Èá ðñÝðåé åðßóçò íá ôïõò äþóåôå ðñüóâáóç óå Ýíá Þ ðåñéóóüôåñá ôìÞìáôá ôïõ áñ÷åßïõ ñõèìßóåùí, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ `allow`:

```
allow users fred mary
```

Áí ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ áõôÞ óôï ôìÞìá `default`, èá äþóåôå óå áõôïýò ôïõò ÷ñÞóôåò ðñüóâáóç óå üëåò ôéò ñõèìßóåéò.

28.2.1.2.6 Êåëýöç PPP ãéá ×ñÞóôåò ìå ÄõíáìéêÜ IP

ÄçìéïõñãÞóôå Ýíá áñ÷åßï ìå ôï üíïìá `/etc/ppp/ppp-shell` ôï ïðïßï íá ðåñéÝ÷åé ôá ðáñáêÜôù:

```
#!/bin/sh
IDENT=‘echo $0 | sed -e ’s/^.*-\(.*\)$/\1/’‘
CALLEDAS="$IDENT"
```

```
TTY=‘tty‘

if [ x$IDENT = xdialup ]; then
        IDENT=‘basename $TTY‘
fi

echo "PPP for $CALLEDAS on $TTY"
echo "Starting PPP for $IDENT"

exec /usr/sbin/ppp -direct $IDENT
```

Ôï script áõôü èá ðñÝðåé íá ãßíåé åêôåëÝóéìï. ÄçìéïõñãÞóôå ôþñá Ýíá óõìâïëéêü äåóìü ðïõ íá ïíïìÜæåôáé `ppp-dialup` ÷ñçóéìïðïéþíôáò ôéò ðáñáêÜôù åíôïëÝò:

```
# ln -s ppp-shell /etc/ppp/ppp-dialup
```

Èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå áõôü ôï script ùò ôï *êÝëõöïò* ãéá üëïõò ôïõò dialup ÷ñÞóôåò. Åäþ öáßíåôáé Ýíá ðáñÜäåéãìá ôïõ `/etc/passwd` ãéá Ýíá ÷ñÞóôç dialup ìå üíïìá `pchilds` (èõìçèåßôå üôé äåí ðñÝðåé íá ôñïðïðïéåßôå Üìåóá ôï áñ÷åßï ôùí êùäéêþí, áëëÜ ìÝóù ôçò åíôïëÞò vipw(8)).

```
pchilds:*:1011:300:Peter Childs PPP:/home/ppp:/etc/ppp/ppp-dialup
```

ÄçìéïõñãÞóôå Ýíá êáôÜëïãï `/home/ppp` ðñïóâÜóéìï ãéá áíÜãíùóç áðü üëïõò, ï ïðïßïò èá ðåñéÝ÷åé ôá ðáñáêÜôù êåíÜ áñ÷åßá:

```
-r--r--r--   1 root     wheel           0 May 27 02:23 .hushlogin
-r--r--r--   1 root     wheel           0 May 27 02:22 .rhosts
```

ôá ïðïßá åìðïäßæïõí ôçí åìöÜíéóç ôïõ ìçíýìáôïò áðü ôï áñ÷åßï `/etc/motd`.

28.2.1.2.7 Êåëýöç PPP ãéá ×ñÞóôåò ìå Óôáôéêü IP

ÄçìéïõñãÞóôå ôï áñ÷åßï `ppp-shell` üðùò öáßíåôáé ðáñáðÜíù, êáé ãéá êÜèå ëïãáñéáóìü ìå óôáôéêü IP, äçìéïõñãÞóôå Ýíá óõìâïëéêü äåóìü ðñïò ôï `ppp-shell`.

Ãéá ðáñÜäåéãìá, áí Ý÷åôå ôñåéò ðåëÜôåò dialup, ôïõò `fred`, `sam`, êáé `mary`, óôïõò ïðïßïõò åêôåëåßôå äñïìïëüãçóç /24 CIDR, èá ðñÝðåé íá ãñÜøåôå ôá ðáñáêÜôù:

```
# ln -s /etc/ppp/ppp-shell /etc/ppp/ppp-fred
# ln -s /etc/ppp/ppp-shell /etc/ppp/ppp-sam
# ln -s /etc/ppp/ppp-shell /etc/ppp/ppp-mary
```

Ãéá êÜèå ëïãáñéáóìü ÷ñÞóôç dialup, èá ðñÝðåé íá ñõèìßóåôå ôï êÝëõöïò óôï óõìâïëéêü äåóìü ðïõ äçìéïõñãÞèçêå ðáñáðÜíù (ãéá ðáñÜäåéãìá ï óõìâïëéêüò äåóìüò ãéá ôï êÝëõöïò ôïõ ÷ñÞóôç `mary` èá ðñÝðåé íá åßíáé ï `/etc/ppp/ppp-mary`).

28.2.1.2.8 Ñýèìéóç ôïõ `ppp.conf` ãéá ×ñÞóôåò ìå Äõíáìéêü IP

Ôï áñ÷åßï `/etc/ppp/ppp.conf` èá ðñÝðåé íá ðåñéÝ÷åé êÜôé áíôßóôïé÷ï ìå ôï ðáñáêÜôù:

```
default:
  set debug phase lcp chat
  set timeout 0

ttyu0:
  set ifaddr 203.14.100.1 203.14.100.20 255.255.255.255
  enable proxy

ttyu1:
  set ifaddr 203.14.100.1 203.14.100.21 255.255.255.255
  enable proxy
```

> **Óçìåßùóç:** Ç óôïß÷éóç åßíáé óçìáíôéêÞ.

Ãéá êÜèå óõíåäñßá, öïñôþíåôáé ç åíüôçôá `default:`. Ãéá êÜèå ãñáììÞ dialup ðïõ åíåñãïðïéåßôáé óôï `/etc/ttys`, èá ðñÝðåé íá äçìéïõñãÞóåôå ìéá êáôá÷þñéóç üìïéá ìå áõôÞ ðïõ öáßíåôáé ðáñáðÜíù ãéá ôï `ttyu0:`. ÊÜèå ãñáììÞ èá ðñÝðåé íá ðáßñíåé ìéá ìïíáäéêÞ äéåýèõíóç IP áðü ôï áðüèåìá ôùí IP äéåõèýíóåùí ðïõ ðñïïñßæïíôáé ãéá ôïõò äõíáìéêïýò ÷ñÞóôåò.

28.2.1.2.9 Ñýèìéóç ôïõ `ppp.conf` ãéá ×ñÞóôåò ìå Óôáôéêü IP

Åêôüò áðü ôá ðåñéå÷üìåíá ôïõ õðïäåßãìáôïò `/usr/share/examples/ppp/ppp.conf` èá ðñÝðåé íá ðñïóèÝóåôå ìéá åíüôçôá ãéá êáèÝíá áðü ôïõò ÷ñÞóôåò dialup óôïõò ïðïßïõò Ý÷åé áðïäïèåß óôáôéêü IP. Èá óõíå÷ßóïõìå ìå ôï ðáñÜäåéãìá ìáò ìå ôïõò ÷ñÞóôåò `fred`, `sam`, êáé `mary`.

```
fred:
  set ifaddr 203.14.100.1 203.14.101.1 255.255.255.255

sam:
  set ifaddr 203.14.100.1 203.14.102.1 255.255.255.255

mary:
  set ifaddr 203.14.100.1 203.14.103.1 255.255.255.255
```

Ôï áñ÷åßï `/etc/ppp/ppp.linkup` èá ðñÝðåé åðßóçò íá ðåñéÝ÷åé ðëçñïöïñßåò äñïìïëüãçóçò ãéá êÜèå ÷ñÞóôç ìå óôáôéêü IP (áí áðáéôåßôáé). Ç ðáñáêÜôù ãñáììÞ èá ðñïóèÝóåé ìéá äéáäñïìÞ ðñïò ôç äéåýèõíóç äéêôýïõ `203.14.101.0/24` ìÝóù ôçò óýíäåóçò ppp ôïõ ðåëÜôç.

```
fred:
  add 203.14.101.0 netmask 255.255.255.0 HISADDR

sam:
  add 203.14.102.0 netmask 255.255.255.0 HISADDR

mary:
  add 203.14.103.0 netmask 255.255.255.0 HISADDR
```

28.2.1.2.10 `mgetty` êáé AutoPPP

Ôï port `comms/mgetty+sendfax`, Ýñ÷åôáé ìå ðñïåðéëåãìÝíç ôçí åðéëïãÞ `AUTO_PPP`, åðéôñÝðïíôáò Ýôóé óôçí `mgetty` íá áíé÷íåýåé ôçí öÜóç LCP ôùí óõíäÝóåùí PPP êáé íá åêôåëåß áõôüìáôá Ýíá êÝëõöïò ppp. Ùóôüóï, êáèþò ìå áõôü ôïí ôñüðï äåí åíåñãïðïéåßôáé ç ðñïåðéëåãìÝíç áêïëïõèßá ïíüìáôïò ÷ñÞóôç êáé êùäéêïý, åßíáé áðáñáßôçôï íá ãßíåôáé ðéóôïðïßçóç ôùí ÷ñçóôþí ìå ôç ÷ñÞóç PAP Þ CHAP.

Ç åíüôçôá áõôÞ ðñïûðïèÝôåé üôé ï ÷ñÞóôçò Ý÷åé ñõèìßóåé, ìåôáãëùôôßóåé êáé åãêáôáóôÞóåé ìå åðéôõ÷ßá ôï port `comms/mgetty+sendfax` óôï óýóôçìá ôïõ.

Âåâáéùèåßôå üôé ôï áñ÷åßï óáò `/usr/local/etc/mgetty+sendfax/login.config` ðåñéÝ÷åé ôá ðáñáêÜôù:

```
/AutoPPP/ -     -                         /etc/ppp/ppp-pap-dialup
```

Áõôü èá ðåé óôçí `mgetty` íá åêôåëÝóåé ôï script `ppp-pap-dialup` ãéá ôéò PPP óõíäÝóåéò ðïõ áíé÷íåýèçêáí.

ÄçìéïõñãÞóôå Ýíá áñ÷åßï ìå ôï üíïìá `/etc/ppp/ppp-pap-dialup` ôï ïðïßï èá ðåñéÝ÷åé ôá áêüëïõèá (ôï áñ÷åßï èá ðñÝðåé íá åßíáé åêôåëÝóéìï):

```
#!/bin/sh
exec /usr/sbin/ppp -direct pap$IDENT
```

Ãéá êÜèå ãñáììÞ dialup ðïõ åßíáé åíåñãïðïéçìÝíç óôï `/etc/ttys`, äçìéïõñãÞóôå ìéá áíôßóôïé÷ç êáôá÷þñéóç óôï áñ÷åßï `/etc/ppp/ppp.conf`. Ç êáôá÷þñéóç áõôÞ ìðïñåß íá óõíõðÜñ÷åé ÷ùñßò ðñüâëçìá ìå áõôÝò ðïõ ïñßóáìå ðáñáðÜíù.

```
pap:
  enable pap
  set ifaddr 203.14.100.1 203.14.100.20-203.14.100.40
  enable proxy
```

ÊÜèå ÷ñÞóôçò ðïõ åéóÝñ÷åôáé ìå áõôü ôïí ôñüðï, èá ðñÝðåé íá äéáèÝôåé üíïìá ÷ñÞóôç/êùäéêü óôï áñ÷åßï `/etc/ppp/ppp.secret`. ÅíáëëáêôéêÜ, ìðïñåßôå íá ðñïóèÝóåôå ôçí ðáñáêÜôù åðéëïãÞ þóôå íá ãßíåôáé ðéóôïðïßçóç ôùí ÷ñçóôþí ìÝóù PAP ìå âÜóç ôá óôïé÷åßá ôïõ áñ÷åßïõ `/etc/passwd`.

```
enable passwdauth
```

Áí èÝëåôå íá áðïäþóåôå óôáôéêü IP óå êÜðïéïõò ÷ñÞóôåò, ìðïñåßôå íá êáèïñßóåôå ôçí äéåýèõíóç ùò ôñßôï üñéóìá óôï áñ÷åßï `/etc/ppp/ppp.secret`. Ãéá ðáñáäåßãìáôá, äåßôå ôï áñ÷åßï `/usr/share/examples/ppp/ppp.secret.sample`.

28.2.1.2.11 ÅðåêôÜóåéò MS

Åßíáé äõíáôüí íá ñõèìßóåôå ôï PPP þóôå íá ðáñÝ÷åé äéåõèýíóåéò DNS êáé NetBIOS êáôÜ áðáßôçóç.

Ãéá íá åíåñãïðïéÞóåôå áõôÝò ôéò åðåêôÜóåéò ìå ôçí Ýêäïóç 1.x ôïõ PPP, èá ðñÝðåé íá ðñïóèÝóåôå ôéò ðáñáêÜôù ãñáììÝò óôï ó÷åôéêü ôìÞìá ôïõ `/etc/ppp/ppp.conf`.

```
enable msext
set ns 203.14.100.1 203.14.100.2
set nbns 203.14.100.5
```

Ãéá ôï PPP áðü ôçí Ýêäïóç 2 êáé ðÜíù:

```
accept dns
set dns 203.14.100.1 203.14.100.2
set nbns 203.14.100.5
```

Ôï ðáñáðÜíù èá åíçìåñþóåé ôïõò ðåëÜôåò ãéá ôïí êýñéï êáé äåõôåñåýïíôá åîõðçñåôçôÞ DNS, êáé ãéá ôïí åîõðçñåôçôÞ ïíïìÜôùí NetBIOS.

Áðü ôçí Ýêäïóç 2 êáé ðÜíù, áí ðáñáëåéöèåß ç ãñáììÞ `set dns`, ôï PPP èá ÷ñçóéìïðïéÞóåé ôéò ãñáììÝò ðïõ èá âñåé óôï `/etc/resolv.conf`.

28.2.1.2.12 Ðéóôïðïßçóç PAP êáé CHAP

ÊÜðïéïé ISP ñõèìßæïõí ôá óõóôÞìáôá ôïõò ìå ôÝôïéï ôñüðï, þóôå ôï êïììÜôé ôçò óýíäåóçò ðïõ áó÷ïëåßôáé ìå ôçí ðéóôïðïßçóç ôïõ ÷ñÞóôç íá ãßíåôáé ìÝóù ôùí ìç÷áíéóìþí PAP Þ CHAP. Áí óõìâáßíåé áõôü óôç äéêÞ óáò ðåñßðôùóç, ï ISP óáò äåí èá óáò óôåßëåé ðñïôñïðÞ login üôáí óõíäåèåßôå, áëëÜ èá áñ÷ßóåé áðåõèåßáò ôç ìåôÜäïóç PPP.

Ôï PAP åßíáé ëéãüôåñï áóöáëÝò áðü ôï CHAP, áëëÜ ç áóöÜëåéá åäþ äåí åßíáé ôüóï óðïõäáßï èÝìá, êáèþò ïé êùäéêïß (áí êáé óôÝëíïíôáé ùò êáíïíéêü êåßìåíï) ìåôáäßäïíôáé ìüíï ìÝóù óåéñéáêÞò ãñáììÞò. ¸óé äåí õðÜñ÷åé ðñáãìáôéêÞ äõíáôüôçôá ôùí crackers íá “êñõöáêïýóïõí”.

×ñçóéìïðïéþíôáò ùò áíáöïñÜ ôéò åíüôçôåò PPP êáé ÓôáôéêÝò Äéåõèýíóåéò IP Þ PPP êáé ÄõíáìéêÝò Äéåõèýíóåéò IP, èá ðñÝðåé íá ãßíïõí ïé ðáñáêÜôù áëëáãÝò:

```
13      set authname MyUserName
14      set authkey MyPassword
15      set login
```

ÃñáììÞ 13:

> Ç ãñáììÞ áõôÞ êáèïñßæåé ôï üíïìá ÷ñÞóôç ãéá ôá PAP/CHAP. Èá ÷ñåéáóôåß íá åéóÜãåôå ôçí óùóôÞ ôéìÞ ãéá ôï *`MyUserName`*.

ÃñáììÞ 14:

> Ç ãñáììÞ áõôÞ êáèïñßæåé ôïí êùäéêü ãéá ôá PAP/CHAP. Èá ÷ñåéáóôåß íá åéóÜãåôå ôçí óùóôÞ ôéìÞ ãéá ôï *`MyPassword`*. ºóùò èÝëåôå íá ðñïóèÝóåôå ìéá áêüìá ãñáììÞ, üðùò ôçí ðáñáêÜôù:
>
> ```
> 16      accept PAP
> ```
>
> Þ
>
> ```
> 16      accept CHAP
> ```
>
> ãéá íá åßíáé öáíåñÞ ç ðñüèåóç óáò, ùóôüóï ôüóï ôï PAP üóï êáé ôï CHAP ãßíïíôáé äåêôÜ áðü ðñïåðéëïãÞ.

ÃñáììÞ 15:

> Ï ISP óáò äåí èá áðáéôåß öõóéïëïãéêÜ íá åéóÝëèåôå óôïí åîõðçñåôçôÞ áí ÷ñçóéìïðïéåßôå PAP Þ CHAP. Ãéá ôï ëüãï áõôü, èá ðñÝðåé íá áðåíåñãïðïéÞóåôå ôï áëöáñéèìçôéêü “set login”.

28.2.1.2.13 ÁëëÜæïíôáò ¶ìåóá ôéò Ñõèìßóåéò ôïõ ppp

Åßíáé äõíáôüí íá åðéêïéíùíÞóåôå ìå ôï ðñüãñáììá ppp êáèþò åêôåëåßôáé óôïí ðáñáóêÞíéï, áëëÜ ìüíï áí Ý÷åôå ñõèìßóåé ìéá êáôÜëëçëç äéáãíùóôéêÞ èýñá ãéá áõôü ôï óêïðü. Ãéá íá ôï êÜíåôå áõôü, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôéò ñõèìßóåéò óáò:

```
set server /var/run/ppp-tun%d DiagnosticPassword 0177
```

Áõôü ïäçãåß ôï PPP íá “áêïýåé” óôï êáèïñéóìÝíï UNIX socket ôïõ ôïìÝá, êáé íá ñùôÜåé ôïõò ðåëÜôåò ãéá ôïí êùäéêü ðïõ Ý÷åé êáèïñéóôåß ðñéí åðéôñÝøåé ôçí ðñüóâáóç. Ôï `%d` óôï üíïìá, áíôéêáèßóôáôáé ìå ôïí áñéèìü ôçò óõóêåõÞò `tun` ðïõ ÷ñçóéìïðïéåßôáé.

Áðü ôç óôéãìÞ ðïõ ñõèìéóôåß ôï socket, ôï ðñüãñáììá pppctl(8) ìðïñåß íá ÷ñçóéìïðïéçèåß óå scripts ìå ôá ïðïßá åðéèõìåßôå íá äéá÷åéñéóôåßôå ôï ðñüãñáììá ppp ôï ïðïßï åêôåëåßôáé Þäç.

28.2.1.3 ×ñçóéìïðïéþíôáò ôç Äõíáôüôçôá ÌåôÜöñáóçò Äéåõèýíóåùí (NAT) ôïõ PPP

Ôï PPP Ý÷åé ôçí éêáíüôçôá íá ÷ñçóéìïðïéÞóåé äéêü ôïõ åóùôåñéêü NAT, ÷ùñßò íá áðáéôïýíôáé ïé éêáíüôçôåò áíáêáôåýèõíóçò ôïõ ðõñÞíá. Ìðïñåßôå íá åíåñãïðïéÞóåôå áõôÞ ôç ëåéôïõñãßá ìå ôçí áêüëïõèç ãñáììÞ óôï `/etc/ppp/ppp.conf`:

```
nat enable yes
```

Åíáëëáêôéêü, ôï NAT ôïõ PPP ìðïñåß íá åíåñãïðïéçèåß ìå ôçí åðéëïãÞ `-nat` óôçí ãñáììÞ åíôïëþí. Ìðïñåßôå áêüìá íá âÜëåôå ôçí åðéëïãÞ `ppp_nat` óôï áñ÷åßï `/etc/rc.conf`. Ç åðéëïãÞ áõôÞ åßíáé åíåñãïðïéçìÝíç áðü ðñïåðéëïãÞ.

Áí ÷ñçóéìïðïéÞóåôå áõôü ôï ÷áñáêôçñéóôéêü, ìÜëëïí èá âñåßôå ÷ñÞóéìåò êáé ôéò ðáñáêÜôù åðéëïãÝò ãéá ôï `/etc/ppp/ppp.conf`, ìå ôéò ïðïßåò åíåñãïðïéåßôáé ç ðñïþèçóç åéóåñ÷üìåíùí óõíäÝóåùí:

```
nat port tcp 10.0.0.2:ftp ftp
nat port tcp 10.0.0.2:http http
```

Þ áí äåí åìðéóôåýåóôå êáèüëïõ ôï åîùôåñéêü äßêôõï:

```
nat deny_incoming yes
```

28.2.1.4 ÔåëéêÝò Ñõèìßóåéò ÓõóôÞìáôïò

¸÷åôå ðëÝïí ñõèìßóåé ôï ppp, áëëÜ õðÜñ÷ïõí ìåñéêÜ áêüìá ðñÜãìáôá ðïõ ðñÝðåé íá êÜíåôå ðñéí íá åßíáé Ýôïéìï ãéá ëåéôïõñãßá. ¼ëá ðåñéëáìâÜíïõí ôçí åðåîåñãáóßá ôïõ áñ÷åßïõ `/etc/rc.conf`.

Îåêéíþíôáò áðü ôçí áñ÷Þ ôïõ áñ÷åßïõ áõôïý, âåâáéùèåßôå üôé åßíáé ïñéóìÝíç ç ãñáììÞ `hostname=`, ð.÷.:

```
hostname="foo.example.com"
```

Áí ï ISP óáò ðáñÝ÷åé óôáôéêÞ IP äéåýèõíóç êáé üíïìá, åßíáé ìÜëëïí êáëýôåñï íá ÷ñçóéìïðïéÞóåôå áõôü ôï üíïìá ùò üíïìá ãéá ôï ìç÷Üíçìá óáò.

ØÜîôå ãéá ôç ìåôáâëçôÞ `network_interfaces`. Áí èÝëåôå íá ñõèìßóåôå ôï óýóôçìá óáò íá êáëåß ôïí ISP óáò êáôÜ áðáßôçóç, âåâáéùèåßôå üôé õðÜñ÷åé óôç ëßóôá ç óõóêåõÞ `tun0`, äéáöïñåôéêÜ áöáéñÝóôå ôçí.

```
network_interfaces="lo0 tun0"
```

```
ifconfig_tun0=
```

> **Óçìåßùóç:** Ç ìåôáâëçôÞ `ifconfig_tun0` èá ðñÝðåé íá åßíáé Üäåéá, êáé èá ðñÝðåé íá äçìéïõñãçèåß Ýíá áñ÷åßï ìå üíïìá `/etc/start_if.tun0`. Ôï áñ÷åßï áõôü èá ðñÝðåé íá ðåñéÝ÷åé ôçí ðáñáêÜôù ãñáììÞ:
>
> ```
> ppp -auto mysystem
> ```
>
> Ôï script áõôü åêôåëåßôáé êáôÜ ôç äéÜñêåéá ñýèìéóçò ôïõ äéêôýïõ, îåêéíþíôáò Ýôóé ôï äáßìïíá ppp óå êáôÜóôáóç áõôüìáôçò ëåéôïõñãßáò. Áí äéáèÝôåôå êÜðïéï ôïðéêü äßêôõï (LAN) ãéá ôï ïðïßï ôï ìç÷Üíçìá áõôü Ý÷åé ôï ñüëï ôçò ðýëçò, ßóùò íá èÝëåôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-alias`. Äåßôå ôç óåëßäá manual ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Âåâáéùèåßôå üôé ç ìåôáâëçôÞ ãéá ôï ðñüãñáììá router Ý÷åé ôåèåß óôï `NO` ìÝóù ôçò åðüìåíçò ãñáììÞò óôï `/etc/rc.conf`:

```
router_enable="NO"
```

Åßíáé óçìáíôéêü íá ìçí îåêéíÞóåé ï äáßìïíáò `routed`, ï ïðïßïò óõíÞèùò äéáãñÜöåé ôéò ðñïåðéëåãìÝíåò ôéìÝò ôïõ ðßíáêá äñïìïëüãçóçò ðïõ äçìéïõñãïýíôáé áðü ôï `ppp`.

Åßíáé ìÜëëïí êáëÞ éäÝá íá åîáóöáëßóåôå üôé ç ãñáììÞ `sendmail_flags` äåí ðåñéëáìâÜíåé ôçí åðéëïãÞ `-q`, äéáöïñåôéêÜ ôï `sendmail` èá ðñïóðáèåß êÜèå ôüóï íá êÜíåé áíáæÞôçóç ôïõ äéêôýïõ, ìå ðéèáíü áðïôÝëåóìá ôï ìç÷Üíçìá óáò íá åêôåëåß ôçëåöùíéêÞ óýíäåóç (dial out). Ìðïñåßôå íá äïêéìÜóåôå:

```
sendmail_flags="-bd"
```

Ôï ìåéïíÝêôçìá ôïõ ðáñáðÜíù, åßíáé üôé ðñÝðåé íá åîáíáãêÜóåôå ôï `sendmail` íá åðáíåîåôÜóåé ôçí ïõñÜ ôùí ìçíõìÜôùí, êÜèå öïñÜ ðïõ áðïêáèßóôáôáé ç óýíäåóç ppp, ãñÜöïíôáò:

```
# /usr/sbin/sendmail -q
```

ºóùò èÝëåôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `!bg` óôï `ppp.linkup` ãéá íá ãßíåôáé ôï ðáñáðÜíù áõôüìáôá:

```
provider:
  delete ALL
  add 0 0 HISADDR
  !bg sendmail -bd -q30m
```

Áí áõôü äåí óáò áñÝóåé, åßíáé äõíáôüí íá ñõèìßóåôå Ýíá “dfilter” ôï ïðïßï íá áðïêüðôåé ôçí êßíçóç SMTP. Äåßôå ôá õðïäåßãìáôá ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Ôï ìüíï ðïõ ìÝíåé åßíáé íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá. ÌåôÜ ôçí åðáíåêêßíçóç, ìðïñåßôå åßôå íá ãñÜøåôå:

```
# ppp
```

êáé Ýðåéôá `dial provider` ãéá íá îåêéíÞóåôå ôç óõíåäñßá PPP, Þ áí èÝëåôå ôï ppp íá áðïêáèéóôÜ ôéò óõíåäñßåò áõôüìáôá êÜèå öïñÜ ðïõ õðÜñ÷åé êßíçóç ðñïò ôï åîùôåñéêü äßêôõï (êáé äåí Ý÷åôå äçìéïõñãÞóåé ôï script `start_if.tun0`) ìðïñåßôå íá ãñÜøåôå:

```
# ppp -auto provider
```

28.2.1.5 Ðåñßëçøç

Ãéá íá áíáêåöáëáéþóïõìå, ôá ðáñáêÜôù âÞìáôá åßíáé áðáñáßôçôá üôáí åãêáèéóôÜôå ôï ppp ãéá ðñþôç öïñÜ:

Áðü ôç ìåñéÜ ôïõ ìç÷áíÞìáôïò-ðåëÜôç:

1. Âåâáéùèåßôå üôé ðåñéëáìâÜíåôáé óôïí ðõñÞíá óáò ç óõóêåõÞ `tun`.
2. Âåâáéùèåßôå üôé õðÜñ÷åé ôï áñ÷åßï ôçò óõóêåõÞò `tunN` óôïí êáôÜëïãï `/dev`.
3. ÄçìéïõñãÞóôå ìéá êáôá÷þñéóç óôï áñ÷åßï `/etc/ppp/ppp.conf`. Ôï ðáñÜäåéãìá ãéá ôï pmdemand èá ðñÝðåé íá åßíáé åðáñêÝò ãéá ôïõò ðåñéóóüôåñïõò ISPs.
4. Áí Ý÷åôå äõíáìéêÞ äéåýèõíóç IP, äçìéïõñãÞóôå ìéá êáôá÷þñéóç óôï `/etc/ppp/ppp.linkup`.
5. Åíçìåñþóôå ôï áñ÷åßï `/etc/rc.conf`.
6. ÄçìéïõñãÞóôå ôï script `start_if.tun0` áí ÷ñåéÜæåóôå êëÞóç êáôÜ áðáßôçóç.

Áðü ôç ìåñéÜ ôïõ åîõðçñåôçôÞ:

1. Âåâáéùèåßôå üôé ðåñéëáìâÜíåôáé óôïí ðõñÞíá óáò ç óõóêåõÞ `tun`.
2. Âåâáéùèåßôå üôé õðÜñ÷åé ôï áñ÷åßï ôçò óõóêåõÞò `tunN` óôïí êáôÜëïãï `/dev`.
3. ÄçìéïõñãÞóôå ìéá êáôá÷þñéóç óôï `/etc/passwd` (÷ñçóéìïðïéþíôáò ôï ðñüãñáììá vipw(8)).
4. ÄçìéïõñãÞóôå Ýíá áñ÷åßï profile óôïí ðñïóùðéêü êáôÜëïãï ôïõ ÷ñÞóôç, ôï ïðïßï íá åêôåëåß ôçí åíôïëÞ `ppp -direct direct-server` Þ êÜðïéá áíôßóôïé÷ç.
5. ÄçìéïõñãÞóôå ìéá êáôá÷þñéóç óôï `/etc/ppp/ppp.conf`. Ôï ðáñÜäåéãìá ãéá ôï `direct-server` èá ðñÝðåé íá åßíáé åðáñêÝò.
6. ÄçìéïõñãÞóôå ìéá êáôá÷þñéóç óôï `/etc/ppp/ppp.linkup`.
7. Åíçìåñþóôå ôï áñ÷åßï `/etc/rc.conf`.

28.3 ×ñçóéìïðïéþíôáò ôï PPP ôïõ ÐõñÞíá

ÊÜðïéá ôìÞìáôá ðñïÝñ÷ïíôáé áðü áñ÷éêÞ óõíåéóöïñÜ ôùí Gennady B. Sorokopud êáé Robert Huff.

Ðñïåéäïðïßçóç: Ç åíüôçôá áõôÞ åßíáé Ýãêõñç êáé ìðïñåß íá åöáñìïóôåß ìüíï óå óõóôÞìáôá FreeBSD 7.X.

28.3.1 Ñõèìßæïíôáò ôï PPP ôïõ ÐõñÞíá

Ðñéí îåêéíÞóåôå íá ñõèìßæåôå ôï PPP óôï ìç÷Üíçìá óáò, âåâáéùèåßôå üôé ôï `pppd` âñßóêåôáé óôïí êáôÜëïãï `/usr/sbin` êáé üôé õðÜñ÷åé ï êáôÜëïãïò `/etc/ppp`.

Ôï `pppd` Ý÷åé äýï êáôáóôÜóåéò ëåéôïõñãßáò:

1. Ùò ðåëÜôçò (“client”) — üôáí èÝëåôå íá óõíäÝóåôå ôï ìç÷Üíçìá óáò ìå ôïí Ýîù êüóìï ìÝóù óåéñéáêÞò óýíäåóçò óýíäåóçò Þ ãñáììÞò modem.
2. Ùò åîõðçñåôçôÞò (“server”) — ôï ìç÷Üíçìá óáò åßíáé óõíäåìÝíï óôï äßêôõï êáé ÷ñçóéìïðïéåßôáé ãéá íá óõíäÝóåé Üëëïõò õðïëïãéóôÝò, ÷ñçóéìïðïéþíôáò ôï PPP.

Êáé óôéò äýï ðåñéðôþóåéò èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå Ýíá áñ÷åßï åðéëïãþí (`/etc/ppp/options` Þ `~/.ppprc` áí óôï ìç÷Üíçìá óáò õðÜñ÷ïõí ðåñéóóüôåñïé áðü Ýíáò ÷ñÞóôåò ðïõ ÷ñçóéìïðïéïýí ôï PPP).

Èá ÷ñåéáóôåßôå åðßóçò êáé êÜðïéï ëïãéóìéêü ãéá ÷ñÞóç ìå modem êáé óåéñéáêÝò óõíäÝóåéò (êáôÜ ðñïôßìçóç ôï `comms/kermit`), þóôå íá ìðïñåßôå íá êáëÝóåôå êáé íá áðïêáôáóôÞóåôå ôç óýíäåóç ìå ôïí áðïìáêñõóìÝíï åîõðçñåôçôÞ.

28.3.2 ×ñçóéìïðïéþíôáò ôï pppd ùò ÐåëÜôçò

ÂáóéóìÝíï óå ðëçñïöïñßåò ðïõ ðáñåß÷å ï Trev Roydhouse.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï `/etc/ppp/options` ðïõ öáßíåôáé ðáñáêÜôù, ãéá íá óõíäåèåßôå óå ìéá ãñáììÞ PPP åíüò åîõðçñåôçôÞ ôåñìáôéêþí (terminal server) ôçò Cisco.

```
crtscts         # enable hardware flow control
modem           # modem control line
noipdefault     # remote PPP server must supply your IP address
                # if the remote host does not send your IP during IPCP
                # negotiation, remove this option
passive         # wait for LCP packets
domain ppp.foo.com      # put your domain name here

:remote_ip    # put the IP of remote PPP host here
                # it will be used to route packets via PPP link
                # if you didn’t specified the noipdefault option
                # change this line to local_ip:remote_ip

defaultroute    # put this if you want that PPP server will be your
                # default router
```

Ãéá íá óõíäåèåßôå:

1. ÊáëÝóôå ôïí áðïìáêñõóìÝíï åîõðçñåôçôÞ ÷ñçóéìïðïéþíôáò ôï **Kermit** (Þ êÜðïéï Üëëï ðñüãñáììá ãéá modem) êáé åéóÜãåôå ôï üíïìá ÷ñÞóôç êáé ôïí êùäéêü óáò (Þ üôé Üëëï ÷ñåéÜæåôáé ãéá íá åíåñãïðïéÞóåôå ôï PPP óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ).
2. Âãåßôå áðü ôï **Kermit** (÷ùñßò íá êëåßóåôå ôç ãñáììÞ).
3. ÐëçêôñïëïãÞóôå ôá ðáñáêÜôù:

   ```
   # /usr/sbin/pppd /dev/tty01 19200
   ```

   Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôï óùóôü üíïìá óõóêåõÞò êáé ôçí êáôÜëëçëç ôá÷ýôçôá.

Ï õðïëïãéóôÞò óáò åßíáé ôþñá óõíäåìÝíïò ìÝóù PPP. Áí ç óýíäåóç áðïôý÷åé, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `debug` óôï áñ÷åßï `/etc/ppp/options` êáé íá åëÝãîåôå ôá ìçíýìáôá óôçí êïíóüëá ãéá íá áíé÷íåýóåôå ôï ðñüâëçìá.

Ôï ðáñáêÜôù script `/etc/ppp/pppup` áõôïìáôïðïéåß êáé ôá 3 óôÜäéá:

```
#!/bin/sh
```

```
pgrep -l pppd
pid=‘pgrep pppd‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing pppd, PID=’ ${pid}
        kill ${pid}
fi
pgrep -l kermit
pid=‘pgrep kermit‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing kermit, PID=’ ${pid}
        kill -9 ${pid}
fi

ifconfig ppp0 down
ifconfig ppp0 delete

kermit -y /etc/ppp/kermit.dial
pppd /dev/tty01 19200
```

Ôï áñ÷åßï `/etc/ppp/kermit.dial` åßíáé Ýíá script ãéá ôï **Kermit** ôï ïðïßï êÜíåé ôçí êëÞóç êáé ôçí ðéóôïðïßçóç ôïõ ÷ñÞóôç óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ (óôï ôÝëïò áõôïý ôïõ åããñÜöïõ, èá âñåßôå Ýíá ðáñÜäåéãìá ãéá Ýíá ôÝôïéï script).

×ñçóéìïðïéÞóôå ôï ðáñáêÜôù script `/etc/ppp/pppdown` ãéá íá áðïóõíäÝóåôå ôçí ãñáììÞ PPP:

```
#!/bin/sh
pid=‘pgrep pppd‘
if [ X${pid} != "X" ] ; then
        echo ’killing pppd, PID=’ ${pid}
        kill -TERM ${pid}
fi

pgrep -l kermit
pid=‘pgrep kermit‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing kermit, PID=’ ${pid}
        kill -9 ${pid}
fi

/sbin/ifconfig ppp0 down
/sbin/ifconfig ppp0 delete
kermit -y /etc/ppp/kermit.hup
/etc/ppp/ppptest
```

ÅëÝãîôå áí åêôåëåßôáé áêüìá ôï `pppd`, åêôåëþíôáò ôï `/usr/etc/ppp/ppptest`, ôï ïðïßï èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#!/bin/sh
pid=‘pgrep pppd‘
if [ X${pid} != "X" ] ; then
        echo ’pppd running: PID=’ ${pid-NONE}
else
        echo ’No pppd running.’
fi
set -x
```

```
netstat -n -I ppp0
ifconfig ppp0
```

Ãéá íá êëåßóåôå ôçí ãñáììÞ, åêôåëÝóôå ôï `/etc/ppp/kermit.hup`, ôï ïðïßï èá ðñÝðåé íá ðåñéÝ÷åé:

```
set line /dev/tty01     ; put your modem device here
set speed 19200
set file type binary
set file names literal
set win 8
set rec pack 1024
set send pack 1024
set block 3
set term bytesize 8
set command bytesize 8
set flow none

pau 1
out +++
inp 5 OK
out ATH0\13
echo \13
exit
```

Ìéá åíáëëáêôéêÞ ìÝèïäïò ðïõ ÷ñçóéìïðïéåß ôï `chat` áíôß ãéá ôï `kermit`:

Ôá ðáñáêÜôù äýï áñ÷åßá åðáñêïýí ãéá ôç äçìéïõñãßá ìéáò óýíäåóçò pppd.

`/etc/ppp/options`:

```
/dev/cuad1 115200

crtscts         # enable hardware flow control
modem           # modem control line
connect "/usr/bin/chat -f /etc/ppp/login.chat.script"
noipdefault     # remote PPP serve must supply your IP address
                # if the remote host doesn't send your IP during
                # IPCP negotiation, remove this option
passive         # wait for LCP packets
domain your.domain# put your domain name here

:               # put the IP of remote PPP host here
                # it will be used to route packets via PPP link
                # if you didn't specified the noipdefault option
                # change this line to local_ip:remote_ip

defaultroute    # put this if you want that PPP server will be
                # your default router
```

`/etc/ppp/login.chat.script`:

> **Óçìåßùóç:** Ôï ðáñáêÜôù èá ðñÝðåé íá ãñáöåß óå ìéá ìüíï ãñáììÞ.

```
ABORT BUSY ABORT ’NO CARRIER’ "" AT OK ATDTphone.number
  CONNECT "" TIMEOUT 10 ogin:-\\r-ogin: login-id
  TIMEOUT 5 sword: password
```

Ìüëéò ôñïðïðïéÞóåôå êáé åãêáôáóôÞóåôå óùóôÜ ôá ðáñáðÜíù áñ÷åßá, ôï ìüíï ðïõ ÷ñåéÜæåôáé íá êÜíåôå åßíáé íá åêôåëÝóåôå ôçí åíôïëÞ `pppd`, ìå ôïí ôñüðï ðïõ öáßíåôáé ðáñáêÜôù:

```
# pppd
```

28.3.3 ×ñçóéìïðïéþíôáò ôï pppd ùò ÅîõðçñåôçôÞ

Ôï `/etc/ppp/options` èá ðñÝðåé íá ðåñéÝ÷åé êÜôé áíôßóôïé÷ï ìå ôï ðáñáêÜôù:

```
crtscts                             # Hardware flow control
netmask 255.255.255.0               # netmask (not required)
192.114.208.20:192.114.208.165      # IP’s of local and remote hosts
                                    # local ip must be different from one
                                    # you assigned to the Ethernet (or other)
                                    # interface on your machine.
                                    # remote IP is IP address that will be
                                    # assigned to the remote machine
domain ppp.foo.com                  # your domain
passive                             # wait for LCP
modem                               # modem line
```

Ôï script `/etc/ppp/pppserv` ðïõ öáßíåôáé ðáñáêÜôù, èá ðåé óôï **pppd** íá ëåéôïõñãÞóåé ùò åîõðçñåôçôÞò:

```
#!/bin/sh
pgrep -l pppd
pid=‘pgrep pppd‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing pppd, PID=’ ${pid}
        kill ${pid}
fi
pgrep -l kermit
pid=‘pgrep kermit‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing kermit, PID=’ ${pid}
        kill -9 ${pid}
fi

# reset ppp interface
ifconfig ppp0 down
ifconfig ppp0 delete

# enable autoanswer mode
kermit -y /etc/ppp/kermit.ans

# run ppp
pppd /dev/tty01 19200
```

×ñçóéìïðïéÞóôå ôï ðáñáêÜôù script `/etc/ppp/pppservdown` ãéá íá óôáìáôÞóåôå ôïí åîõðçñåôçôÞ:

```
#!/bin/sh
pgrep -l pppd
pid=‘pgrep pppd‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing pppd, PID=’ ${pid}
        kill ${pid}
fi
pgrep -l kermit
pid=‘pgrep kermit‘
if [ "X${pid}" != "X" ] ; then
        echo ’killing kermit, PID=’ ${pid}
        kill -9 ${pid}
fi
ifconfig ppp0 down
ifconfig ppp0 delete

kermit -y /etc/ppp/kermit.noans
```

Ôï ðáñáêÜôù script ãéá ôï **Kermit** (`/etc/ppp/kermit.ans`) ìðïñåß íá åíåñãïðïéåß êáé íá áðåíåñãïðïéåß ôçí ëåéôïõñãßá áõôüìáôçò áðÜíôçóçò óôï modem óáò.

```
set line /dev/tty01
set speed 19200
set file type binary
set file names literal
set win 8
set rec pack 1024
set send pack 1024
set block 3
set term bytesize 8
set command bytesize 8
set flow none

pau 1
out +++
inp 5 OK
out ATH0\13
inp 5 OK
echo \13
out ATS0=1\13   ; change this to out ATS0=0\13 if you want to disable
                ; autoanswer mode
inp 5 OK
echo \13
exit
```

Óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ, ÷ñçóéìïðïéåßôáé ôï script `/etc/ppp/kermit.dial` ãéá êëÞóç êáé ðéóôïðïßçóç ôïõ ÷ñÞóôç. Èá ðñÝðåé íá ôï ôñïðïðïéÞóåôå óýìöùíá ìå ôéò áíÜãêåò óáò. ÂÜëôå ôï üíïìá ÷ñÞóôç êáé ôïí êùäéêü óáò óå áõôü ôï script. Èá ÷ñåéáóôåß åðßóçò íá áëëÜîåôå ôçí ãñáììÞ ãéá ôçí åßóïäï (input) áíÜëïãá ìå ôéò áðáíôÞóåéò ðïõ äßíåé ôï modem óáò êáé ï áðïìáêñõóìÝíïò õðïëïãéóôÞò.

```
;
; put the com line attached to the modem here:
;
```

```
set line /dev/tty01
;
; put the modem speed here:
;
set speed 19200
set file type binary            ; full 8 bit file xfer
set file names literal
set win 8
set rec pack 1024
set send pack 1024
set block 3
set term bytesize 8
set command bytesize 8
set flow none
set modem hayes
set dial hangup off
set carrier auto                ; Then SET CARRIER if necessary,
set dial display on             ; Then SET DIAL if necessary,
set input echo on
set input timeout proceed
set input case ignore
def \%x 0                       ; login prompt counter
goto slhup

:slcmd                          ; put the modem in command mode
echo Put the modem in command mode.
clear                           ; Clear unread characters from input buffer
pause 1
output +++                      ; hayes escape sequence
input 1 OK\13\10                ; wait for OK
if success goto slhup
output \13
pause 1
output at\13
input 1 OK\13\10
if fail goto slcmd              ; if modem doesn't answer OK, try again

:slhup                          ; hang up the phone
clear                           ; Clear unread characters from input buffer
pause 1
echo Hanging up the phone.
output ath0\13                  ; hayes command for on hook
input 2 OK\13\10
if fail goto slcmd              ; if no OK answer, put modem in command mode

:sldial                         ; dial the number
pause 1
echo Dialing.
output atdt9,550311\13\10               ; put phone number here
assign \%x 0                    ; zero the time counter

:look
clear                           ; Clear unread characters from input buffer
```

```
increment \%x                   ; Count the seconds
input 1 {CONNECT }
if success goto sllogin
reinput 1 {NO CARRIER\13\10}
if success goto sldial
reinput 1 {NO DIALTONE\13\10}
if success goto slnodial
reinput 1 {\255}
if success goto slhup
reinput 1 {\127}
if success goto slhup
if < \%x 60 goto look
else goto slhup

:sllogin                        ; login
assign \%x 0                    ; zero the time counter
pause 1
echo Looking for login prompt.

:slloop
increment \%x                   ; Count the seconds
clear                           ; Clear unread characters from input buffer
output \13
;
; put your expected login prompt here:
;
input 1 {Username: }
if success goto sluid
reinput 1 {\255}
if success goto slhup
reinput 1 {\127}
if success goto slhup
if < \%x 10 goto slloop         ; try 10 times to get a login prompt
else goto slhup                 ; hang up and start again if 10 failures

:sluid
;
; put your userid here:
;
output ppp-login\13
input 1 {Password: }
;
; put your password here:
;
output ppp-password\13
input 1 {Entering SLIP mode.}
echo
quit

:slnodial
echo \7No dialtone.  Check the telephone line!\7
exit 1
```

```
; local variables:
; mode: csh
; comment-start: "; "
; comment-start-skip: "; "
; end:
```

28.4 Áíôéìåôþðéóç ÐñïâëçìÜôùí óå ÓõíäÝóåéò PPP

ÓõíåéóöïñÜ ôïõ Tom Rhodes.

> **Ðñïåéäïðïßçóç:** Áðü ôï FreeBSD 8.0 êáé ìåôÜ, ôï ðñüãñáììá ïäÞãçóçò sio(4) áíôéêáôáóôÜèçêå áðü ôï uart(4). Ôá ïíüìáôá óõóêåõþí ôùí óåéñéáêþí èõñþí Ý÷ïõí áëëÜîåé áðü `/dev/cuadN` óå `/dev/cuauN` êáé áðü `/dev/ttydN` óå `/dev/ttyuN`. Ïé ÷ñÞóôåò ôïõ FreeBSD 7.X èá ðñÝðåé íá ðñïóáñìüóïõí ôéò ðáñáêÜôù ïäçãßåò óýìöùíá ìå áõôÝò ôéò áëëáãÝò.

Ç åíüôçôá áõôÞ êáëýðôåé ìåñéêÜ áðü ôá ðñïâëÞìáôá ðïõ ìðïñåß íá ðáñïõóéáóôïýí üôáí ãßíåôáé ÷ñÞóç ôïõ PPP ìÝóù óýíäåóçò modem. Ãéá ðáñÜäåéãìá, èá ðñÝðåé íá îÝñåôå ìå áêñßâåéá ôá ìçíýìáôá åéóüäïõ ðïõ èá åìöáíßóåé ôï óýóôçìá ôï ïðïßï êáëåßôå. Ìåñéêïß ISP äßíïõí ôçí ðñïôñïðÞ `ssword`, åíþ Üëëïé äßíïõí ôçí `password`. Áí äåí Ý÷åôå ãñÜøåé óùóôÜ ôï script ãéá ôï `ppp`, ç áðüðåéñá åéóüäïõ èá áðïôý÷åé. Ï ðéï óõíçèéóìÝíïò ôñüðïò íá åêóöáëìáôþóåôå ìéá óýíäåóç `ppp`, åßíáé íá óõíäåèåßôå ÷åéñïêßíçôá. Ïé ðëçñïöïñßåò ðïõ åìöáíßæïíôáé ðáñáêÜôù, èá óáò ïäçãÞóïõí âÞìá ðñïò âÞìá óôç ÷åéñïêßíçôç áðïêáôÜóôáóç ôçò óýíäåóçò.

28.4.1 ÅëÝãîôå ôá Áñ÷åßá Óõóêåõþí

Áí ÷ñçóéìïðïéåßôå ðñïóáñìïóìÝíï ðõñÞíá, âåâáéùèåßôå üôé Ý÷åôå ðåñéëÜâåé ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò:

```
device   uart
```

Áí ÷ñçóéìïðïéåßôå ôïí ðõñÞíá `GENERIC`, äåí ÷ñåéÜæåôáé íá êÜíåôå êÜðïéá áëëáãÞ, êáèþò ç óõóêåõÿç `uart` ðåñéëáìâÜíåôáé Þäç óå áõôüí. Áðëþò åëÝãîôå ôá ìçíýìáôá ôçò `dmesg` ãéá ôçí óõóêåõÞ modem, ÷ñçóéìïðïéþíôáò ôçí ðáñáêÜôù åíôïëÞ:

```
# dmesg | grep uart
```

Èá ðñÝðåé íá äåßôå êÜðïéá Ýîïäï ó÷åôéêÞ ìå ôéò óõóêåõÝò `uart`. Ðñüêåéôáé ãéá ôéò èýñåò COM ðïõ ÷ñåéáæüìáóôå. Áí ôï modem óáò ëåéôïõñãåß ùò ôõðïðïéçìÝíç óåéñéáêÞ èýñá, èá ðñÝðåé íá ôï äåßôå íá áíáöÝñåôáé ùò `uart1`, Þ `COM2`. Áí óõìâáßíåé áõôü, äåí ÷ñåéÜæåôáé íá åðáíáìåôáãëùôôßóåôå ôïí ðõñÞíá óáò. Áí ç óåéñéáêÞ èýñá ðïõ áíôéóôïé÷åß óôï modem óáò åßíáé ç `uart1` Þ `COM2` óôï DOS, ç áíôßóôïé÷ç óõóêåõÞ modem èá åßíáé ç `/dev/cuau1`.

28.4.2 ×åéñïêßíçôç Óýíäåóç

Ç ÷åéñïêßíçôç óýíäåóç óôï Internet ìå ÷ñÞóç ôçò `ppp`, åßíáé Ýíáò ãñÞãïñïò êáé åýêïëïò ôñüðïò íá åíôïðßóåôå ôõ÷üí ðñïâëÞìáôá óýíäåóçò, Þ áðëþò íá ðÜñåôå ðëçñïöïñßåò ó÷åôéêÜ ìå ôï ðùò ï ISP óáò áíôéìåôùðßæåé ôéò óõíäÝóåéò ðåëáôþí ppp. Èá îåêéíÞóïõìå ôçí åöáñìïãÞ **PPP** áðü ôçí ãñáììÞ åíôïëþí. Óçìåéþóôå üôé óå üëá ìáò ôá ðáñáäåßãìáôá, èá ÷ñçóéìïðïéïýìå ôï *example* ùò ôï üíïìá ôïõ õðïëïãéóôÞ ðïõ åêôåëåß ôï **PPP**. Ìðïñåßôå íá îåêéíÞóåôå ôï ppp, ãñÜöïíôáò áðëþò ppp:

```
# ppp
```

¸÷ïõìå ôþñá îåêéíÞóåé ôï ppp.

```
ppp ON example> set device /dev/cuau1
```

ÈÝôïõìå ôç óõóêåõÞ modem. Óôï ðáñÜäåéãìá ìáò, åßíáé ç `cuau1`.

```
ppp ON example> set speed 115200
```

ÈÝôïõìå ôçí ôá÷ýôçôá óýíäåóçò, óå áõôÞ ôçí ðåñßðôùóç ÷ñçóéìïðïéïýìå 115,200 kbps.

```
ppp ON example> enable dns
```

ËÝìå óôï ppp íá ñõèìßóåé ôïí resolver êáé ðñïóèÝôïõìå ôéò êáôÜëëçëåò ãñáììÝò ãéá ôï äéáêïìéóôÞ ïíïìÜôùí óôï `/etc/resolv.conf`. Áí ôï ppp äåí ìðïñåß íá êáèïñßóåé ôï üíïìá ôïõ äéáêïìéóôÞ, ìðïñïýìå íá ôï êáèïñßóïõìå ìå ÷åéñïêßíçôï ôñüðï áñãüôåñá.

```
ppp ON example> term
```

ÁëëÜæïõìå óå êáôÜóôáóç “terminal” þóôå íá ìðïñïýìå íá åëÝãîïõìå ôï modem ÷åéñïêßíçôá.

```
deflink: Entering terminal mode on /dev/cuau1
type ’~h’ for help

at
OK
atdt123456789
```

×ñçóéìïðïéïýìå ôï `at` ãéá íá áñ÷éêïðïéÞóïõìå ôï modem, êáé Ýðåéôá ÷ñçóéìïðïéïýìå ôï `atdt` êáé ôïí áñéèìü ôïõ ISP ãéá íá îåêéíÞóïõìå ôç äéáäéêáóßá ôçò êëÞóçò.

```
CONNECT
```

Åäþ Ý÷ïõìå åðéâåâáßùóç ôçò óýíäåóçò. Áí Ý÷ïõìå ðñïâëÞìáôá óýíäåóçò ôá ïðïßá äåí ó÷åôßæïíôáé ìå ôï õëéêü ìáò, åäþ åßíáé ôï óçìåßï ðïõ ðñÝðåé íá ðñïóðáèÞóïõìå íá ôá åðéëýóïõìå.

```
ISP Login:myusername
```

Ç ðñïôñïðÞ áõôÞ åßíáé ãéá íá äþóïõìå ôï üíïìá ÷ñÞóôç. ×ñçóéìïðïéÞóôå ôï üíïìá ÷ñÞóôç ðïõ óáò Ý÷åé äïèåß áðü ôïí ISP óáò.

```
ISP Pass:mypassword
```

Ç ðñïôñïðÞ áõôÞ åßíáé ãéá ôïí êùäéêü ðñüóâáóçò. ÁðáíôÞóôå ìå ôïí êùäéêü ðïõ óáò Ý÷åé äïèåß áðü ôïí ISP óáò. Ï êùäéêüò áõôüò äåí èá åìöáíéóôåß óôçí ïèüíç óáò, üðùò áêñéâþò óõìâáßíåé êáé ìå ôïí êùäéêü óáò üôáí ôïí ãñÜöåôå óôçí ðñïôñïðÞ åéóüäïõ ôïõ FreeBSD óõóôÞìáôüò óáò.

```
Shell or PPP:ppp
```

ÁíÜëïãá ìå ôïí ISP óáò, ìðïñåß íá ìçí äåßôå êáé êáèüëïõ ôçí ðáñáðÜíù ðñïôñïðÞ. Óôçí ðáñáðÜíù ðåñßðôùóç ìáò ñùôÜåé áí åðéèõìïýìå íá åêôåëÝóïõìå êÜðïéï êÝëõöïò (shell) óôï ìç÷Üíçìá ôïõ ðáñï÷Ýá, Þ áí èÝëïõìå íá åêêéíÞóïõìå ôï ppp. Óôï ðáñÜäåéãìá ìáò åðéëÝîáìå íá ÷ñçóéìïðïéÞóïõìå ppp êáèþò èÝëïõìå íá óõíäåèïýìå óôï Internet.

```
Ppp ON example>
```

ÐáñáôçñÞóôå üôé óôï ðáñÜäåéãìá ôï ðñþôï p åßíáé êåöáëáßï. Áõôü äåß÷íåé üôé Ý÷ïõìå óõíäåèåß åðéôõ÷þò ìå ôïí ISP.

```
PPp ON example>
```

¸÷ïõìå ðéóôïðïéçèåß ìå åðéôõ÷ßá áðü ôïí ISP ìáò, êáé ðåñéìÝíïõìå íá ìáò áðïäïèåß äéåýèõíóç IP.

```
PPP ON example>
```

¸÷åé ðëÝïí êáèïñéóôåß äéåýèõíóç IP, êáé Ý÷ïõìå ïëïêëçñþóåé ôç óýíäåóç ìå åðéôõ÷ßá.

```
PPP ON example>add default HISADDR
```

Åäþ ðñïóèÝôïõìå ôçí ðñïåðéëåãìÝíç äéáäñïìÞ (default route). Ôï âÞìá áõôü åßíáé áðáñáßôçôï ðñéí ìðïñÝóïõìå íá åðéêïéíùíÞóïõìå ìå ôïí Ýîù êüóìï, êáèþò ôç äåäïìÝíç óôéãìÞ ç ìüíç óýíäåóç ðïõ Ý÷ïõìå åßíáé ìå Ýíá õðïëïãéóôÞ áðü ôçí Üëëç ìåñéÜ ôçò ãñáììÞò. Áí ôï ðáñáðÜíù áðïôý÷åé åðåéäÞ õðÜñ÷ïõí Þäç êáèïñéóìÝíåò äéáäñïìÝò, ìðïñåßôå íá âÜëåôå Ýíá èáõìáóôéêü `!` ìðñïóôÜ áðü ôï `add`. ÅíáëëáêôéêÜ, ìðïñåßôå íá êÜíåôå áõôÞ ôç ñýèìéóç ðñéí åðé÷åéñÞóåôå ôç óýíäåóç, êáé èá ãßíåé áõôüìáôá äéáðñáãìÜôåõóç ôçò íÝáò äéáäñïìÞò.

Áí üëá ðÞãáí êáëÜ, èá ðñÝðåé ôþñá íá Ý÷åôå åíåñãÞ óýíäåóç ìå ôï Internet, ôçí ïðïßá ìðïñåßôå íá ìåôáêéíÞóåôå óôï ðáñáóêÞíéï ÷ñçóéìïðïéþíôáò ôï óõíäõáóìü ðëÞêôñùí **CTRL**+**z**. Áí ðáñáôçñÞóåôå ôï `PPP` íá ãßíåôáé îáíÜ `ppp`, ç óýíäåóç Ý÷åé äéáêïðåß. Ìå ôïí ôñüðï áõôü ìðïñåßôå íá ðáñáêïëïõèåßôå ôçí êáôÜóôáóç ôçò óýíäåóçò óáò. Ôá êåöáëáßá P äåß÷íïõí üôé õðÜñ÷åé óýíäåóç ìå ôïí ISP åíþ ôá ìéêñÜ p äåß÷íïõí üôé ãéá êÜðïéï ëüãï ç óýíäåóç Ý÷åé ÷áèåß. Ôï `ppp` Ý÷åé ìüíï áõôÝò ôéò äýï êáôáóôÜóåéò.

28.4.2.1 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Áí Ý÷åôå áðåõèåßáò ãñáììÞ êáé äåí öáßíåôáé íá ìðïñåßôå íá áðïêáôáóôÞóåôå ôç óýíäåóç, áðåíåñãïðïéÞóôå ôïí Ýëåã÷ï ñïÞò ìÝóù õëéêïý (CTS/RTS) ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `set ctsrts off`. Ôï ðáñáðÜíù óõìâáßíåé óõíÞèùò áí åßóôå óõíäåìÝíïò óå êÜðïéï åîõðçñåôçôÞ ôåñìáôéêþí ìå äõíáôüôçôá **PPP**, üðïõ ôï **PPP** óôáìáôÜåé íá áðïêñßíåôáé üôáí ðñïóðáèåß íá ãñÜøåé äåäïìÝíá óôç óýíäåóç óáò. Óôçí ðåñßðôùóç áõôÞ, óõíÞèùò ðåñéìÝíåé ãéá êÜðïéï óÞìá CTS (Clear To Send) ôï ïðïßï äåí Ýñ÷åôáé ðïôÝ. Áí ùóôüóï ÷ñçóéìïðïéÞóåôå áõôÞ ôçí åðéëïãÞ, èá ðñÝðåé åðßóçò íá ÷ñçóéìïðïéÞóåôå êáé ôçí åðéëïãÞ `set accmap` ç ïðïßá åíäå÷ïìÝíùò áðáéôåßôáé ãéá íá áðïìïíùèåß ôï õëéêü ðïõ åîáñôÜôáé áðü ôç ìåôÜäïóç óõãêåêñéìÝíùí ÷áñáêôÞñùí áðü ôç ìéá Üêñç óôçí Üëëç, óõíÞèùò ìÝóù ôïõ XON/XOFF. Äåßôå ôç óåëßäá manual ôïõ ppp(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôÞ ôçí åðéëïãÞ êáé ðùò ìðïñåßôå íá ôçí ÷ñçóéìïðïéÞóåôå.

Áí äéáèÝôåôå Ýíá ðáëáéüôåñï modem, ßóùò ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `set parity even`. Ç ðñïåðéëåãìÝíç ñýèìéóç åßíáé íá ìçí õðÜñ÷åé éóïôéìßá (parity none), áëëÜ óå ðáëéÜ modems (êáé óå êÜðïéïõò ISP) ÷ñçóéìïðïéåßôáé ãéá Ýëåã÷ï ëáèþí (ç ÷ñÞóç ôçò ðñïêáëåß ùóôüóï ìåãÜëç áýîçóç óôç ìåôáêßíçóç äåäïìÝíùí). ºóùò ÷ñåéáóôåßôå áõôÞ ôçí åðéëïãÞ, áí ï ISP óáò åßíáé ç Compuserve.

Ôï **PPP** ßóùò íá ìçí åðáíÝëèåé óôçí êáôÜóôáóç åíôïëþí, ôï ïðïßï åßíáé óõíÞèùò óöÜëìá äéáðñáãìÜôåõóçò, êáèþò ï ISP ðåñéìÝíåé áðü ôç äéêÞ óáò ìåñéÜ íá îåêéíÞóåé ôç äéáðñáãìÜôåõóç. Óôï óçìåßï áõôü, ç ÷ñÞóç ôçò åíôïëÞò `~p` èá åîáíáãêÜóåé ôï ppp íá áñ÷ßóåé íá óôÝëíåé ôéò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ñýèìéóç.

Áí äåí ðÜñåôå ðïôÝ ðñïôñïðÞ åéóüäïõ, ôï ðéèáíüôåñï åßíáé íá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ðéóôïðïßçóç PAP Þ CHAP áíôß ãéá ôçí ôýðïõ UNIX ðéóôïðïßçóç ðïõ ðåñéãñÜøáìå óôï ðáñáðÜíù ðáñÜäåéãìá. Ãéá íá ÷ñçóéìïðïéÞóåôå PAP Þ CHAP áðëþò ðñïóèÝóôå ôéò ðáñáêÜôù åðéëïãÝò óôçí åöáñìïãÞ **PPP** ðñéí âñåèåßôå óå êáôÜóôáóç ôåñìáôéêïý:

```
ppp ON example> set authname myusername
```

Èá ðñÝðåé íá áíôéêáôáóôÞóåôå ôï *myusername* ìå ôï üíïìá ÷ñÞóôç ðïõ óáò Ý÷åé äïèåß áðü ôïí ISP óáò.

```
ppp ON example> set authkey mypassword
```

Èá ðñÝðåé íá áíôéêáôáóôÞóåôå ôï *mypassword* ìå ôïí êùäéêü ÷ñÞóôç ðïõ óáò Ý÷åé äïèåß áðü ôïí ISP óáò.

Áí óõíäÝåóôå êáíïíéêÜ, áëëÜ äåí öáßíåôáé íá ìðïñåßôå íá åðéêïéíùíÞóåôå ìå êáìéÜ äéåýèõíóç, ðñïóðáèÞóôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ ping(8) ìå ìéá äéåýèõíóç IP ãéá íá äåßôå áí èá ëÜâåôå áðÜíôçóç. Áí âëÝðåôå áðþëåéá ðáêÝôùí 100%, ôï ðéï ðéèáíü åßíáé üôé äåí Ý÷åôå êáèïñßóåé êÜðïéá ðñïåðéëåãìÝíç äéáäñïìÞ. ÅëÝãîôå îáíÜ üôé Ý÷åôå ñõèìßóåé ôçí åðéëïãÞ `add default HISADDR` êáôÜ ôç äéÜñêåéá ôçò óýíäåóçò. Áí ìðïñåßôå íá åðéêïéíùíÞóåôå ìå ìéá áðïìáêñõóìÝíç äéåýèõíóç IP, ôï ðéèáíüôåñï åßíáé üôé äåí Ý÷åôå âÜëåé ôç äéåýèõíóç êÜðïéïõ äéáêïìéóôÞ ïíïìÜôùí óôï áñ÷åßï `/etc/resolv.conf`. Ôï áñ÷åßï áõôü èá ðñÝðåé íá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
domain example.com
nameserver x.x.x.x
nameserver y.y.y.y
```

¼ðïõ ôá *x.x.x.x* êáé *y.y.y.y* èá ðñÝðåé íá áíôéêáôáóôáèïýí ìå ôéò äéåõèýíóåéò IP ôùí äéáêïìéóôþí DNS ôïõ ISP óáò. Åíäå÷ïìÝíùò ïé ðëçñïöïñßåò áõôÝò íá óáò Ý÷ïõí äïèåß êáôÜ ôçí åããñáöÞ óáò óôçí õðçñåóßá. Áí ü÷é, èá ìðïñÝóåôå íá ôéò âñåßôå åýêïëá ìå Ýíá ôçëåöþíçìá óôïí ISP óáò.

Ìðïñåßôå åðßóçò íá åíåñãïðïéÞóåôå ôçí êáôáãñáöÞ óõìâÜíôùí ãéá ôçí **PPP** óýíäåóç óáò, ìÝóù ôïõ syslog(3). Áðëþò ðñïóèÝóôå:

```
!ppp
*.*     /var/log/ppp.log
```

óôï `/etc/syslog.conf`. Ôéò ðåñéóóüôåñåò öïñÝò, áõôÞ ç ëåéôïõñãßá õðÜñ÷åé Þäç.

28.5 ×ñçóéìïðïéþíôáò PPP ìÝóù Ethernet (PPPoE)

ÓõíåéóöïñÜ (áðü http://node.to/freebsd/how-tos/how-to-freebsd-pppoe.html) ôïõ Jim Mock.

Ç åíüôçôá áõôÞ ðåñéãñÜöåé ðùò íá ñõèìßóåôå ìéá óýíäåóç PPP ìÝóù Ethernet (PPPoE).

28.5.1 Ñýèìéóç ôïõ ÐõñÞíá

Äåí áðáéôåßôáé ðëÝïí åéäéêÞ ñýèìéóç ôïõ ðõñÞíá ãéá ôç ëåéôïõñãßá PPPoE. Áí ï ðõñÞíáò óáò äåí ðåñéëáìâÜíåé ôçí áðáñáßôçôç õðïóôÞñéîç netgraph, ôï **ppp** èá ôçí öïñôþóåé áõôüìáôá ùò Üñèñùìá.

28.5.2 Ñýèìéóç ôïõ `ppp.conf`

ÐáñáêÜôù öáßíåôáé Ýíá õðüäåéãìá áñ÷åßïõ `ppp.conf`:

```
default:
  set log Phase tun command # you can add more detailed logging if you wish
  set ifaddr 10.0.0.1/0 10.0.0.2/0

name_of_service_provider:
  set device PPPoE:xl1 # replace xl1 with your Ethernet device
  set authname YOURLOGINNAME
  set authkey YOURPASSWORD
  set dial
  set login
  add default HISADDR
```

28.5.3 ÅêôÝëåóç ôïõ ppp

Ùò ÷ñÞóôçò `root`, ìðïñåßôå íá åêôåëÝóåôå:

```
# ppp -ddial name_of_service_provider
```

28.5.4 Åêêßíçóç ôïõ ppp êáôÜ ôçí Åêêßíçóç

ÐñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï áñ÷åßï `/etc/rc.conf`:

```
ppp_enable="YES"
ppp_mode="ddial"
ppp_nat="YES"   # if you want to enable nat for your local network, otherwise NO
ppp_profile="name_of_service_provider"
```

28.5.5 ×ñÞóç ìéáò ÅôéêÝôáò Õðçñåóßáò PPPoE

ÌåñéêÝò öïñÝò èá ÷ñåéáóôåß íá ÷ñçóéìïðïéÞóåôå ìéá åôéêÝôá õðçñåóßáò (service tag) ãéá ôçí áðïêáôÜóôáóç ôçò óýíäåóçò óáò. Ïé åôéêÝôåò õðçñåóéþí ÷ñçóéìïðïéïýíôáé ãéá ôïí äéá÷ùñéóìü ìåôáîý äéáöïñåôéêþí åîõðçñåôçôþí PPPoE ðïõ âñßóêïíôáé óôï ßäéï äßêôõï.

Ç ôåêìçñßùóç ðïõ óáò Ý÷åé äþóåé ï ISP óáò, èá ðñÝðåé íá Ý÷åé ôéò áðáéôïýìåíåò ðëçñïöïñßåò ãéá ôçí åôéêÝôá õðçñåóßáò ðïõ ÷ñåéÜæåóôå. Áí äåí ìðïñåßôå íá ôçí âñåßôå, ñùôÞóôå ôçí åîõðçñÝôçóç ðåëáôþí ôïõ ISP óáò.

Ùò ôåëåõôáßá ëýóç, èá ìðïñïýóáôå íá äïêéìÜóåôå ôçí ìÝèïäï ðïõ óõíßóôáôáé óôï ðñüãñáììá Roaring Penguin PPPoE (http://www.roaringpenguin.com/pppoe/) ôï ïðïßï ìðïñåßôå íá âñåßôå óôçí ÓõëëïãÞ ôùí Ports. Íá Ý÷åôå õðüøç óáò, üôé áõôü ìðïñåß íá áðïðñïãñáììáôßóåé êáé íá á÷ñçóôåýóåé ôï modem óáò, Ýôóé óêåöôåßôå ôï êáëÜ ðñéí ôï êÜíåôå. Áðëþò åãêáôáóôÞóôå ôï ðñüãñáììá ðïõ äßíåé ï ðáñï÷Ýáò óáò ìáæß ìå ôï modem. ¸ðåéôá, åéóÝëèåôå óôï ìåíïý System ôïõ ðñïãñÜììáôïò. Åêåß èá ðñÝðåé íá åßíáé ôï üíïìá ôïõ ðñïößë óáò. ÓõíÞèùò ãñÜöåé *ISP*.

Ôï üíïìá ôïõ ðñïößë (åôéêÝôá õðçñåóßáò) èá ÷ñçóéìïðïéçèåß óôçí êáôá÷þñéóç ãéá ôçí ñýèìéóç ôïõ PPPoE óôï áñ÷åßï `ppp.conf`, ùò ôï ôìÞìá ðïõ äçëþíåé ôïí ðáñï÷Ýá óôçí åíôïëÞ `set device` (äåßôå ôç óåëßäá manual ôïõ ppp(8) ãéá ðëÞñåéò ëåðôïìÝñåéåò). èá äåß÷íåé üðùò ôï ðáñáêÜôù:

```
set device PPPoE:xl1:ISP
```

Ìçí îå÷Üóåôå íá áëëÜîåôå ôï `xl1` ìå ôç óùóôÞ óõóêåõÞ ðïõ áíôéóôïé÷åß óôçí êÜñôá Ethernet ðïõ ÷ñçóéìïðïéåßôå.

Ìçí îå÷Üóåôå íá áëëÜîåôå ôï `ISP` ìå ôï ðñïößë ðïõ âñÞêáôå ðáñáðÜíù.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå:

- Öèçíüôåñåò ÅõñõæùíéêÝò ÓõíäÝóåéò ìÝóù FreeBSD óå ÃåñìáíéêÞ DSL (http://renaud.waldura.com/doc/freebsd/pppoe/) áðü ôïí Renaud Waldura.
- Nutzung von T-DSL und T-Online mit FreeBSD (http://www.ruhr.de/home/nathan/FreeBSD/tdsl-freebsd.html) áðü ôïí Udo Erdelhoff (óôá ÃåñìáíéêÜ).

28.5.6 Ôï PPPoE óå Modem 3Com® HomeConnect® ADSL Dual Link

Áõôü ôï modem äåí áêïëïõèåß ôï RFC 2516 (http://www.faqs.org/rfcs/rfc2516.html) (*Ìéá ìÝèïäïò ãéá ìåôÜäïóç PPP ìÝóù Ethernet (PPPoE)*, ãñáììÝíï áðü ôïõò L. Mamakos, K. Lidl, J. Evarts, D. Carrel, D. Simone, êáé R. Wheeler). Áíôßèåôá, ÷ñçóéìïðïéåß äéáöïñåôéêïýò ôýðïõò êùäéêþí ðáêÝôùí ãéá ôá ðëáßóéá Ethernet. Ðáñáêáëïýìå íá åêöñÜóåôå ôá ðáñÜðïíá óáò óôçí 3Com (http://www.3com.com/) áí íïìßæåôå üôé èá ðñÝðåé íá óõììïñöùèåß ìå ôéò ðñïäéáãñáöÝò ôïõ PPPoE.

Ãéá íá ìðïñåß ôï FreeBSD íá åðéêïéíùíåß ìå áõôÞ ôç óõóêåõÞ, èá ðñÝðåé íá ôåèåß Ýíá êáôÜëëçëï sysctl. Áõôü ìðïñåß íá ãßíåôáé áõôüìáôá êáôÜ ôçí åêêßíçóç, ìå ôçí åíçìÝñùóç ôïõ áñ÷åßïõ `/etc/sysctl.conf`:

```
net.graph.nonstandard_pppoe=1
```

Þ ìðïñåß íá ãßíåé Üìåóá ìå ôçí åíôïëÞ:

```
# sysctl net.graph.nonstandard_pppoe=1
```

Äõóôõ÷þò, åðåéäÞ ðñüêåéôáé ãéá ìéá ñýèìéóç ðïõ åðçñåÜæåé ïëüêëçñï ôï óýóôçìá, äåí åßíáé äõíáôüí íá åðéêïéíùíåßôå ôáõôü÷ñïíá ìå Ýíá êáíïíéêü ðåëÜôç Þ åîõðçñåôçôÞ PPPoE êáé ìå Ýíá ADSL modem 3Com HomeConnect®.

28.6 ×ñçóéìïðïéþíôáò PPP ìÝóù ATM (PPPoA)

[1] åíüôçôá ðïõ áêïëïõèåß, ðåñéãñÜöåé ðùò íá ñõèìßóåôå ôï PPP ãéá ëåéôïõñãßá ìÝóù ATM (PPPoA). Ôï PPPoA åßíáé ìéá äçìïöéëÞò åðéëïãÞ óôïõò ðáñï÷åßò õðçñåóéþí DSL óôçí Åõñþðç.

28.6.1 ×ñçóéìïðïéþíôáò PPPoA ìå ôï Alcatel SpeedTouch™ USB

Ç õðïóôÞñéîç PPPooA ãéá áõôÞ ôç óõóêåõÞ, ðáñÝ÷åôáé ùò port óôï FreeBSD, êáèþò ôï firmware ôçò óõóêåõÞò äéáíÝìåôáé õðü ôçí Üäåéá Alcatel’s license agreement (http://www.speedtouchdsl.com/disclaimer_lx.htm) êáé äåí ìðïñåß íá äéáíåìçèåß åëåýèåñá ìå ôï âáóéêü óýóôçìá ôïõ FreeBSD.

Ãéá íá åãêáôáóôÞóåôå ôï ëïãéóìéêü, áðëÜ ÷ñçóéìïðïéÞóôå ôçí ÓõëëïãÞ ôùí Ports. Åãêáôáóôçóôå ôï port `net/pppoa` êáé áêïëïõèÞóôå ôéò ïäçãßåò ðïõ ðåñéëáìâÜíïíôáé óå áõôü.

¼ðùò ðïëëÝò óõóêåõÝò USB, ôï Alcatel SpeedTouch™ ÷ñåéÜæåôáé íá êáôåâÜóåé ôï firmware ôïõ áðü ôïí õðïëïãéóôÞ óôï ïðïßï åßíáé óõíäåìÝíï, ðñïêåéìÝíïõ íá ëåéôïõñãÞóåé óùóôÜ. Ç äéáäéêáóßá áõôÞ ìðïñåß íá áõôïìáôïðïéçèåß óôï FreeBSD, þóôå ç ìåôáöïñÜ íá ãßíåôáé êÜèå öïñÜ ðïõ óõíäÝåôáé ç óõóêåõÞ óôç èýñá USB. Ìðïñåßôå íá ðñïóèÝóåôå ôéò ðáñáêÜôù ðëçñïöïñßåò óôï áñ÷åßï `/etc/usbd.conf` ãéá íá åíåñãïðïéÞóåôå ôçí áõôüìáôç ìåôáöïñÜ ôïõ firmware. Èá ðñÝðåé íá åðåîåñãáóôåßôå áõôü ôï áñ÷åßï ùò ÷ñÞóôçò `root`.

```
device "Alcatel SpeedTouch USB"
    devname "ugen[0-9]+"
    vendor 0x06b9
    product 0x4061
    attach "/usr/local/sbin/modem_run -f /usr/local/libdata/mgmt.o"
```

Ãéá íá åíåñãïðïéÞóåôå ôï **usbd**, ôï äáßìïíá USB, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï `/etc/rc.conf`:

```
usbd_enable="YES"
```

Ìðïñåß åðßóçò íá ñõèìßóåôå ôï **ppp** þóôå íá åêôåëåß áõôüìáôá êëÞóç êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò. Ãéá íá ãßíåé áõôü, ðñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/rc.conf`. Èá ðñÝðåé êáé ðÜëé íá åêôåëÝóåôå ôç äéáäéêáóßá áõôÞ ùò `root`.

```
ppp_enable="YES"
ppp_mode="ddial"
ppp_profile="adsl"
```

Ãéá íá ëåéôïõñãÞóåé óùóôÜ ôï ðáñáðÜíù, èá ðñÝðåé íá Ý÷åôå ÷ñçóéìïðïéÞóåé ôï õðüäåéãìá ôïõ áñ÷åßïõ `ppp.conf` ôï ïðïßï ðáñÝ÷åôáé ìå ôï port `net/pppoa`.

28.6.2 ×ñçóéìïðïéþíôáò ôï mpd

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï **mpd** ãéá íá óõíäåèåßôå óå Ýíá ðëÞèïò õðçñåóéþí, êáé åéäéêüôåñá õðçñåóßåò PPTP. Ìðïñåßôå íá âñåßôå ôï **mpd** óôçí ÓõëëïãÞ ôùí Ports, óôï `net/mpd`. ÐïëëÜ ADSL modem áðáéôïýí ôç äçìéïõñãßá åíüò PPTP ôïýíåë ìåôáîý ôïõ modem êáé ôïõ õðïëïãéóôÞ. ¸íá ôÝôïéï modem åßíáé ôï Alcatel SpeedTouch Home.

Ðñþôá ðñÝðåé íá åãêáôáóôÞóåôå ôï port, êáé ìåôÜ ìðïñåßôå íá ñõèìßóåôå ôï **mpd** þóôå íá êáëýðôåé ôéò áðáéôÞóåéò óáò êáé ôéò ñõèìßóåéò ôïõ ðáñï÷Ýá óáò. Ôï port åãêáèéóôÜ êÜðïéá ðáñáäåßãìáôá áñ÷åßùí ñõèìßóåùí óôïí êáôÜëïãï *`PREFIX`*`/etc/mpd/`. Ôá áñ÷åßá áõôÜ ðåñéÝ÷ïõí áñêåôÜ êáëÞ ôåêìçñßùóç ôùí ñõèìßóåùí. Óçìåéþóôå åäþ, üôé ôï *`PREFIX`* åßíáé ï êáôÜëïãïò óôïí ïðïßï åãêáèßóôáíôáé ôá ports, êáé áðü ðñïåðéëïãÞ åßíáé ï `/usr/local/`. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ port, èá âñåßôå Ýíá ðëÞñç ïäçãü ãéá ôç ñýèìéóç ôïõ **mpd** óå ìïñöÞ HTML. Ç ôåêìçñßùóç åãêáèßóôáôáé óôïí êáôÜëïãï *`PREFIX`*`/share/doc/mpd/`. ÐáñáêÜôù öáßíåôáé Ýíá õðüäåéãìá ñõèìßóåùí ãéá óýíäåóç óå ìéá õðçñåóßá ADSL ìÝóù ôïõ **mpd**. Ïé ñõèìßóåéò ÷ùñßæïíôáé óå äýï áñ÷åßá, ðñþôá äåß÷íïõìå ôï `mpd.conf`:

```
default:
    load adsl

adsl:
    new -i ng0 adsl adsl
    set bundle authname username ❶
    set bundle password password ❷
    set bundle disable multilink

    set link no pap acfcomp protocomp
    set link disable chap
    set link accept chap
    set link keep-alive 30 10
    set ipcp no vjcomp
    set ipcp ranges 0.0.0.0/0 0.0.0.0/0

    set iface route default
    set iface disable on-demand
    set iface enable proxy-arp
    set iface idle 0

    open
```

❶ Ôï üíïìá ÷ñÞóôç ìå ôï ïðïßï ãßíåôáé ç ðéóôïðïßçóç óôïí ISP óáò.

❷ Ï êùäéêüò ìå ôïí ïðïßï ãßíåôáé ç ðéóôïðïßçóç óôïí ISP óáò.

Ôï áñ÷åßï `mpd.links` ðåñéÝ÷åé ðëçñïöïñßåò ó÷åôéêÜ ìå ôç óýíäåóç Þ ôéò óõíäÝóåéò ðïõ èá ðñáãìáôïðïéçèïýí. Ãéá ðáñÜäåéãìá, ôï `mpd.links` ðïõ óõíïäåýåé ôï ðáñáðÜíù ðáñÜäåéãìá, öáßíåôáé ðáñáêÜôù:

```
adsl:
    set link type pptp
    set pptp mode active
    set pptp enable originate outcall
    set pptp self 10.0.0.1 ❶
    set pptp peer 10.0.0.138 ❷
```

❶ Ç äéåýèõíóç IP ôïõ FreeBSD õðïëïãéóôÞ óáò, óôïí ïðïßï èá ÷ñçóéìïðïéÞóåôå ôï **mpd**.

❷ Ç äéåýèõíóç IP ôïõ ADSL modem óáò. Ãéá ôï Alcatel SpeedTouch Home, ç äéåýèõíóç áõôÞ åßíáé áðü ðñïåðéëïãÞ ç `10.0.0.138`.

Åßíáé äõíáôüí íá áñ÷éêïðïéÞóåôå ôç óýíäåóç åýêïëá, äßíïíôáò ôçí ðáñáêÜôù åíôïëÞ ùò `root`:

```
# mpd -b adsl
```

Ìðïñåßôå íá äåßôå ôçí êáôÜóôáóç ôçò óýíäåóçò ìå ôçí ðáñáêÜôù åíôïëÞ:

```
% ifconfig ng0
ng0: flags=88d1<UP,POINTOPOINT,RUNNING,NOARP,SIMPLEX,MULTICAST> mtu 1500
     inet 216.136.204.117 --> 204.152.186.171 netmask 0xffffffff
```

Ôï **mpd** áðïôåëåß ôïí óõíéóôþìåíï ôñüðï óýíäåóçò ôïõ FreeBSD ìå ìéá õðçñåóßá ADSL.

28.6.3 ×ñçóéìïðïéþíôáò ôï pptpclient

Ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôï FreeBSD ãéá íá óõíäåèåßôå óå Üëëåò õðçñåóßåò PPPoA ÷ñçóéìïðïéþíôáò ôï `net/pptpclient`.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôï `net/pptpclient` ãéá íá óõíäåèåßôå óå ìéá õðçñåóßá DSL, åãêáôáóôÞóôå ôï port Þ ôï ðáêÝôï, êáé åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/ppp/ppp.conf`. Èá ÷ñåéáóôåß íá åßóôå `root` ãéá íá êÜíåôå êáé ôéò äýï ðáñáðÜíù äéáäéêáóßåò. ÐáñáêÜôù öáßíåôáé Ýíá ðáñÜäåéãìá ìéáò åíüôçôáò ôïõ `ppp.conf`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò åðéëïãÝò ôïõ `ppp.conf`, äåßôå ôç óåëßäá manual ôïõ **ppp**, ppp(8).

```
adsl:
```

```
set log phase chat lcp ipcp ccp tun command
set timeout 0
enable dns
set authname username ❶
set authkey password ❷
set ifaddr 0 0
add default HISADDR
```

❶ Ôï üíïìá ÷ñÞóôç ãéá ôïí ëïãáñéáóìü óáò óôïí ðáñï÷Ýá DSL.

❷ Ï êùäéêüò ãéá ôïí ëïãáñéáóìü óáò.

> **Ðñïåéäïðïßçóç:** Êáèþò èá ðñÝðåé íá ãñÜøåôå ôïí êùäéêü óáò ìïñöÞ áðëïý êåéìÝíïõ óôï áñ÷åßï `ppp.conf`, èá ðñÝðåé íá âåâáéùèåßôå üôé êáíÝíáò Üëëïò äåí èá ìðïñåß íá äéáâÜóåé ôá ðåñéå÷üìåíá áõôïý ôïõ áñ÷åßïõ. Ìå ôéò ðáñáêÜôù åíôïëÝò, ìðïñåßôå íá åîáóöáëßóåôå üôé ôï áñ÷åßï èá ìðïñåß íá äéáâáóôåß ìüíï ìÝóá áðü ôïí ëïãáñéáóìü ôïõ `root`. Äåßôå ôéò óåëßäåò manual ôùí chmod(1) êáé chown(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.
>
> ```
> # chown root:wheel /etc/ppp/ppp.conf
> # chmod 600 /etc/ppp/ppp.conf
> ```

Áõôü èá áíïßîåé Ýíá ôïýíåë ãéá ìéá óõíåäñßá PPP ìå ôïí DSL äñïìïëïãçôÞ óáò. Ôá DSL modem ôýðïõ ethernet Ý÷ïõí ìéá ðñïêáèïñéóìÝíç äéåýèõíóç IP óôï ôïðéêü óáò äßêôõï, óôçí ïðïßá ìðïñåßôå íá óõíäåèåßôå. Óôçí ðåñßðôùóç ôïõ Alcatel SpeedTouch Home, ç äéåýèõíóç áõôÞ åßíáé `10.0.0.138`. Ç ôåêìçñßùóç ðïõ äéáèÝôåé ï äñïìïëïãçôÞò óáò, èá áíáöÝñåé ðïéá äéåýèõíóç ÷ñçóéìïðïéåß ç óõóêåõÞ óáò. Ãéá íá áíïßîåôå ôï ôïýíåë êáé íá îåêéíÞóåôå ìéá óõíåäñßá PPP, åêôåëÝóôå ôçí áêüëïõèç åíôïëÞ:

```
# pptp address adsl
```

> **Õðüäåéîç:** Åßíáé êáëÞ éäÝá íá ðñïóèÝóåôå Ýíá “&” óôï ôÝëïò ôçò ðñïçãïýìåíçò åíôïëÞò, äéáöïñåôéêÜ ôï **pptp** äåí èá óáò åðéóôñÝøåé ôïí Ýëåã÷ï (ðñïôñïðÞ) ôïõ ôåñìáôéêïý óáò.

Èá äçìéïõñãçèåß ìéá óõóêåõÞ `tun` (åéêïíéêü ôïýíåë) ãéá ôçí áëëçëåðßäñáóç ìåôáîý ôùí äéåñãáóéþí **pptp** êáé **ppp**. Ìüëéò åðéóôñÝøåé ç ðñïôñïðÞ óôï ôåñìáôéêü óáò, Þ ôï **pptp** åðéâåâáéþóåé ôç óýíäåóç, ìðïñåßôå íá åîåôÜóåôå ôï ôïýíåë ìå ôïí ôñüðï ðïõ öáßíåôáé ðáñáêÜôù:

```
% ifconfig tun0
tun0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
        inet 216.136.204.21 --> 204.152.186.171 netmask 0xffffff00
        Opened by PID 918
```

Áí äåí ìðïñÝóåôå íá óõíäåèåßôå, åëÝãîôå ôéò ñõèìßóåéò ôïõ äñïìïëïãçôÞ óáò, ïé ïðïßåò óõíÞèùò åßíáé ðñïóâÜóéìåò ìÝóù **telnet** Þ ìÝóù êÜðïéïõ öõëëïìåôñçôÞ. Áí áêüìá äåí ìðïñåßôå íá óõíäåèåßôå, èá ðñÝðåé íá åîåôÜóåôå ôçí Ýîïäï ôçò åíôïëÞò `pptp` êáé ôá ðåñéå÷üìåíá ôïõ áñ÷åßïõ êáôáãñáöÞò ôïõ **ppp**, `/var/log/ppp.log` ãéá ðéèáíÜ óôïé÷åßá.

28.7 ×ñçóéìïðïéþíôáò ôï SLIP

Áñ÷éêÞ óõíåéóöïñÜ ôïõ Satoshi Asami. Ìå ôç âïÞèåéá ôùí Guy Helmer êáé Piero Serini.

Ðñïåéäïðïßçóç: Ç åíüôçôá áõôÞ åöáñìüæåôáé êáé åßíáé Ýãêõñç ìüíï óå óõóôÞìáôá FreeBSD 7.X.

28.7.1 Ñõèìßæïíôáò Ýíá ÐåëÜôç SLIP

ÐáñáêÜôù ðáñïõóéÜæïõìå Ýíá ôñüðï íá ñõèìßóåôå Ýíá ìç÷Üíçìá FreeBSD ùò ðåëÜôç SLIP óå Ýíá äßêôõï ìå óôáôéêÝò äéåõèýíóåéò. Ãéá ìç÷áíÞìáôá ôá ïðïßá ëáìâÜíïõí üíïìá äõíáìéêÜ (ç äéåýèõíóç ôïõò áëëÜæåé êÜèå öïñÜ ðïõ óõíäÝïíôáé), ðéèáíüí íá ÷ñåéáóôåß íá êÜíåôå êÜðïéåò ðéï ðïëýðëïêåò ñõèìßóåéò.

Áñ÷éêÜ, èá ðñÝðåé íá êáèïñßóåôå óå ðïéá óåéñéáêÞ èýñá åßíáé óõíäåìÝíï ôï modem óáò. Áñêåôïß ÷ñÞóôåò äçìéïõñãïýí Ýíá óõìâïëéêü äåóìü ð.÷. `/dev/modem`, ôï ïðïßï äåß÷íåé óôçí ðñáãìáôéêÞ óõóêåõÞ `/dev/cuadN`. Áõôü óáò åðéôñÝðåé íá óõíå÷ßóåôå íá ÷ñçóéìïðïéåßôå ôï ßäéï üíïìá óõóêåõÞò, áêüìá êáé áí ìåôáêéíÞóåôå ôï modem óå äéáöïñåôéêÞ èýñá. Åßíáé ìÜëëïí Üâïëï íá ðñÝðåé íá áëëÜîåôå ðëÞèïò áñ÷åßùí óôï `/etc` êáèþò êáé ôá áñ÷åßá `.kermrc` óå üëï ôï óýóôçìá!

Óçìåßùóç: Ôï `/dev/cuad0` åßíáé ç `COM1`, ôï `/dev/cuad1` åßíáé ç `COM2`, ê.ï.ê.

Âåâáéùèåßôå üôé ôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò ðåñéÝ÷åé ôá ðáñáêÜôù:

```
device   sl
```

Ôï ðáñáðÜíù ðåñéëáìâÜíåôáé óôïí ðõñÞíá `GENERIC`, êáé áí äåí ôï Ý÷åôå äéáãñÜøåé, äåí èá Ý÷åôå ðñüâëçìá.

28.7.1.1 Ñõèìßóåéò ðïõ èá ×ñåéáóôåß íá ÊÜíåôå Ìüíï Ìéá ÖïñÜ

1. ÐñïóèÝóôå ôï ìç÷Üíçìá óáò, ôçí ðýëç (gateway) êáé ôïõò äéáêïìéóôÝò ïíïìÜôùí (nameservers) óôï áñ÷åßï `/etc/hosts`. Óôï ðáñÜäåéãìá ìáò, ôï áñ÷åßï áõôü ìïéÜæåé ìå ôï ðáñáêÜôù:

   ```
   127.0.0.1               localhost loghost
   136.152.64.181          water.CS.Example.EDU water.CS water
   136.152.64.1            inr-3.CS.Example.EDU inr-3 slip-gateway
   128.32.136.9            ns1.Example.EDU ns1
   128.32.136.12           ns2.Example.EDU ns2
   ```

2. Âåâáéùèåßôå üôé ç åíüôçôá `files` âñßóêåôáé ðñéí ôï `dns` óôçí åíüôçôá `hosts:` ôïõ áñ÷åßïõ `/etc/nsswitch.conf`. Áí äåí õðÜñ÷ïõí áõôÝò ïé ðáñÜìåôñïé, ìðïñåß íá åìöáíéóôïýí ðáñÜîåíá óõìðôþìáôá.

3. Ôñïðïðïéåßóôå ôï áñ÷åßï `/etc/rc.conf`.

   1. Ïñßóôå ôï üíïìá ôïõ õðïëïãéóôÞ óáò, ôñïðïðïéþíôáò ôç ãñáììÞ ðïõ ãñÜöåé:

      ```
      hostname="myname.my.domain"
      ```

      Èá ðñÝðåé åäþ íá ôïðïèåôÞóåôå ôï ðëÞñåò üíïìá ôïõ õðïëïãéóôÞ óáò.

   2. Ïñßóôå ôïí ðñïåðéëåãìÝíï äñïìïëïãçôÞ, áëëÜæïíôáò ôç ãñáììÞ:

      ```
      defaultrouter="NO"
      ```

óå:

```
defaultrouter="slip-gateway"
```

4. ÄçìéïõñãÞóôå Ýíá áñ÷åßï `/etc/resolv.conf` ôï ïðïßï èá ðåñéÝ÷åé:

   ```
   domain CS.Example.EDU
   nameserver 128.32.136.9
   nameserver 128.32.136.12
   ```

   ¼ðùò ìðïñåßôå íá äåßôå, ôï ðáñáðÜíù ïñßæåé ôïõò äéáêïìéóôÝò DNS. ÖõóéêÜ, ôá ðñáãìáôéêÜ ïíüìáôá êáé ïé äéåõèýíóåéò ôùí ôïìÝùí åîáñôþíôáé áðü ôï ðåñéâÜëëïí óáò.

5. Ñõèìßóôå êùäéêü ðñüóâáóçò ãéá ôïõò ÷ñÞóôåò `root` êáé `toor` (êáèþò êáé ãéá üóïõò Üëëïõò ëïãáñéáóìïýò äåí Ý÷ïõí êùäéêü).

6. ÅðáíåêêéíÞóôå ôï ìç÷Üíçìá óáò, êáé âåâáéùèåßôå üôé Ý÷åé ôåèåß óùóôÜ ôï üíïìá ôïõ õðïëïãéóôÞ.

28.7.1.2 Äçìéïõñãþíôáò ìéá Óýíäåóç SLIP

1. ÌåôÜ ôçí êëÞóç, ãñÜøôå ôçí åíôïëÞ `slip` óôçí ðñïôñïðÞ, ãñÜøôå ôï üíïìá ôïõ ìç÷áíÞìáôïò óáò êáé ôïí êùäéêü. Ôï ôé áêñéâþò ÷ñåéÜæåôáé íá ãñÜøåôå, åîáñôÜôáé áðü ôï ðåñéâÜëëïí óáò. Áí ÷ñçóéìïðïéåßôå ôï **Kermit**, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå Ýíá script üðùò ôï áêüëïõèï:

   ```
   # kermit setup
   set modem hayes
   set line /dev/modem
   set speed 115200
   set parity none
   set flow rts/cts
   set terminal bytesize 8
   set file type binary
   # The next macro will dial up and login
   define slip dial 643-9600, input 10 =>, if failure stop, -
   output slip\x0d, input 10 Username:, if failure stop, -
   output silvia\x0d, input 10 Password:, if failure stop, -
   output ***\x0d, echo \x0aCONNECTED\x0a
   ```

   ÖõóéêÜ, èá ðñÝðåé íá áëëÜîåôå ôï üíïìá ÷ñÞóôç êáé ôïí êùäéêü þóôå íá ôáéñéÜæïõí ìå ôá äéêÜ óáò. ÌåôÜ áðü áõôü, ìðïñåßôå áðëþò íá ðëçêôñïëïãÞóåôå `slip` óôçí ðñïôñïðÞ óýíäåóçò ôïõ **Kermit**.

   > **Óçìåßùóç:** Ç ýðáñîç ôïõ êùäéêïý óáò óå ìïñöÞ áðëïý êåéìÝíïõ óå ïðïéïäÞðïôå óçìåßï åíüò óõóôÞìáôïò áñ÷åßùí, åßíáé ãåíéêÜ *êáêÞ* éäÝá. Ðñï÷ùñÞóôå ìå äéêÞ óáò åõèýíç.

2. ÁöÞóôå ôï **Kermit** åêåß (ìðïñåßôå íá ôï óôåßëåôå óôï ðáñáóêÞíéï ÷ñçóéìïðïéþíôáò ôá ðëÞêôñá **Ctrl-z**) êáé ùò `root`, ãñÜøôå:

   ```
   # slattach -h -c -s 115200 /dev/modem
   ```

   Áí ìðïñåßôå íá êÜíåôå `ping` óå õðïëïãéóôÝò óôçí Üëëç ìåñéÜ ôïõ äñïìïëïãçôÞ, åßóôå óõíäåìÝíïé! Áí áõôü äåí äïõëåýåé, äïêéìÜóôå ôçí åðéëïãÞ `-a` áíôß ãéá ôçí `-c` ùò üñéóìá óôçí `slattach`.

28.7.1.3 Ðùò íá Ôåñìáôßóåôå ôçí Óýíäåóç

ÊÜíôå ôá áêüëïõèá:

```
# kill -INT ‘cat /var/run/slattach.modem.pid‘
```

ãéá íá ôåñìáôßóåôå ôï `slattach`. Èõìçèåßôå üôé ðñÝðåé íá åßóôå `root` ãéá íá åêôåëÝóåôå ôï ðáñáðÜíù. ¸ðåéôá åðáíÝëèåôå óôï `kermit` (åêôåëþíôáò ôçí `fg` áí ôï åß÷áôå óôåßëåé óôï ðáñáóêÞíéï) êáé ôåñìáôßóôå ôï (ðéÝæïíôáò **q**).

Ç óåëßäá manual ôïõ slattach(8) áíáöÝñåé üôé ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `ifconfig sl0 down` ãéá íá äéáêüøåôå ôç óýíäåóç, áëëÜ áõôü äåí öáßíåôáé íá Ý÷åé êáíÝíá áðïôÝëåóìá. (To `ifconfig sl0` áíáöÝñåé ôï ßäéï ðñÜãìá.)

ÌåñéêÝò öïñÝò, ôï modem óáò ìðïñåß íá áñíçèåß íá êëåßóåé ôç ãñáììÞ. Óôéò ðåñéðôþóåéò áõôÝò, îåêéíÞóôå îáíÜ ôï `kermit` êáé ôåñìáôßóôå ôï îáíÜ. Ôç äåýôåñç öïñÜ óõíÞèùò ðåôõ÷áßíåé.

28.7.1.4 Áíôéìåôþðéóç ÐñïâëçìÜôùí

Áí ôï ðáñáðÜíù äåí ëåéôïõñãÞóåé, ñùôÞóôå óôç ëßóôá freebsd-net (http://lists.FreeBSD.org/mailman/listinfo/freebsd-net). ÌåñéêÜ áðü ôá óõíçèéóìÝíá ðñïâëÞìáôá ôá ïðïßá Ý÷ïõìå ìÝ÷ñé óôéãìÞò áíôéìåôùðßóåé:

- Íá ìçí Ý÷åé ÷ñçóéìïðïéçèåß ç åðéëïãÞ `-c` Þ `-a` óôçí `slattach` (Áõôü êáíïíéêÜ äåí åßíáé êñßóéìï óöÜëìá, áëëÜ ìåñéêïß ÷ñÞóôåò áíÝöåñáí üôé áõôü Ýëõóå ôá ðñïâëÞìáôá ôïõò.)
- ×ñÞóç ôïõ `s10` áíôß ãéá `sl0` (ç äéáöïñÜ ìðïñåß íá åßíáé ðïëý ìéêñÞ óå ìåñéêÝò ãñáììáôïóåéñÝò).
- ÄïêéìÜóôå ôçí åíôïëÞ `ifconfig sl0` ãéá íá äåßôå ôçí êáôÜóôáóç ôçò äéåðáöÞò. Ãéá ðáñÜäåéãìá, ìðïñåß íá äåßôå ôï ðáñáêÜôù:

  ```
  # ifconfig sl0
  sl0: flags=10<POINTOPOINT>
          inet 136.152.64.181 --> 136.152.64.1 netmask ffffff00
  ```

- Áí ç åíôïëÞ ping(8) äßíåé ìçíýìáôá `no route to host`, ßóùò õðÜñ÷åé ðñüâëçìá ìå ôïí ðßíáêá äñïìïëüãçóçò óáò. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `netstat -r` ãéá íá äåßôå ôçí ôñÝ÷ïõóá äñïìïëüãçóç:

  ```
  # netstat -r
  Routing tables
  Destination      Gateway            Flags     Refs     Use  IfaceMTU    Rtt    Netmasks:

  (root node)
  (root node)

  Route Tree for Protocol Family inet:
  (root node) =>
  default          inr-3.Example.EDU  UG          8    224515 sl0 -      -
  localhost.Exampl localhost.Example. UH          5     42127 lo0 -       0.438
  inr-3.Example.ED water.CS.Example.E UH          1         0 sl0 -      -
  water.CS.Example localhost.Example. UGH        34  47641234 lo0 -       0.438
  (root node)
  ```

  Ôá ðáñáðÜíù ðáñáäåßãìáôá åßíáé áðü Ýíá ó÷åôéêÜ áðáó÷ïëçìÝíï óýóôçìá. Ïé áñéèìïß èá äéáöÝñïõí óôï óýóôçìá óáò, áíÜëïãá ìå ôç äñáóôçñéüôçôá ôïõ äéêôýïõ.

28.7.2 Ñõèìßæïíôáò ¸íá ÅîõðçñåôçôÞ SLIP

Ôï êåßìåíï áõôü ðáñÝ÷åé êÜðïéåò õðïäåßîåéò ãéá ôç ñýèìéóç åíüò FreeBSD óõóôÞìáôïò ùò åîõðçñåôçôÞ SLIP. ÔõðéêÜ áõôü óçìáßíåé üôé ôï óýóôçìá óáò èá ñõèìéóôåß íá îåêéíÜ áõôüìáôá ôéò óõíäÝóåéò ìåôÜ ôçí åßóïäï áðïìáêñõóìÝíùí ðåëáôþí SLIP.

28.7.2.1 ÐñïûðïèÝóåéò

Ç åíüôçôá áõôÞ åßíáé éäéáßôåñá ôå÷íéêÞò öýóåùò, êáé ãéá ôï ëüãï áõôü áðáéôåßôáé íá Ý÷åôå ôéò áíôßóôïé÷åò ãíþóåéò ãéá íá ôçí êáôáíïÞóåôå. ÕðïèÝôïõìå üôé Ý÷åôå ìéá åîïéêåßùóç ìå ôï ðñùôüêïëëï TCP/IP êáé åéäéêüôåñá ìå ôç äéåõèõíóéïäüôçóç êüìâùí, ôéò ìÜóêåò äéêôýùí, ôá õðïäßêôõá, ôç äñïìïëüãçóç êáé ôá ðñùôüêïëëá äñïìïëüãçóçò üðùò ôï RIP. Ç ñýèìéóç ôùí õðçñåóéþí SLIP óå Ýíá åîõðçñåôçôÞ åðéëïãéêþí óõíäÝóåùí áðáéôåß ãíþóç áõôþí ôùí åííïéþí, êáé áí äåí åßóôå åîïéêåéùìÝíïò ìå áõôÝò, óáò ðáñáêáëïýìå íá äéáâÜóåôå åßôå ôï *TCP/IP Network Administration* ôïõ Craig Hunt (åêäüóåéò O’Reilly & Associates, Inc, Áñéèìüò ISBN 0-937175-82-X) Þ êÜðïéï áðü ôá âéâëßá ôïõ Douglas Comer ó÷åôéêÜ ìå ôï ðñùôüêïëëï TCP/IP.

ÅðéðëÝïí, õðïèÝôïõìå üôé Þäç Ý÷åôå ñõèìßóåé ôï modem óáò êáé Ý÷åôå ôñïðïðïéÞóåé ôá êáôÜëëçëá áñ÷åßá ñõèìßóåùí ôïõ óõóôÞìáôïò þóôå íá åðéôñÝðåôáé ç åßóïäïò óôï óýóôçìá ìÝóù ôùí modem. Áí äåí Ý÷åôå áêüìá ðñïåôïéìÜóåé ôï óýóôçìá ãéá áõôü, ðáñáêáëïýìå äåßôå ôï ÔìÞìá 27.4 ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôç ñýèìéóç ôùí åðéëïãéêþí óõíäÝóåùí. Åíäå÷ïìÝíùò íá èÝëåôå åðßóçò íá äåßôå ôéò óåëßäåò manual ôçò sio(4) ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôï ðñüãñáììá ïäÞãçóçò ôçò óåéñéáêÞò èýñáò, ôá ttys(5), gettytab(5), getty(8), êáé init(8) ãéá ðëçñïöïñßåò ðïõ ó÷åôßæïíôáé ìå ôç ñýèìéóç ôïõ óõóôÞìáôïò þóôå íá äÝ÷åôáé åßóïäï ÷ñçóôþí ìÝóù modem, êáé ßóùò êáé ôç stty(1) ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ðáñáìÝôñïõò óåéñéáêþí èõñþí (üðùò ôçí `clocal` ãéá óåéñéáêÝò äéåðáöÝò ðïõ åßíáé áðåõèåßáò óõíäåìÝíåò).

28.7.2.2 ÃñÞãïñç Åðéóêüðçóç

ÔõðéêÜ, Ýíáò åîõðçñåôçôÞò SLIP ðïõ ÷ñçóéìïðïéåß FreeBSD ëåéôïõñãåß ìå ôïí åîÞò ôñüðï: Ýíáò ÷ñÞóôçò SLIP êáëåß ôïí åîõðçñåôçôÞ SLIP, êáé åéóÝñ÷åôáé óôï óýóôçìá ìÝóù åíüò åéäéêïý áíáãíùñéóôéêïý åéóüäïõ ãéá ôï SLIP. Ôï êÝëõöïò ôïõ ÷ñÞóôç åßíáé ôï `/usr/sbin/sliplogin`. Ôï ðñüãñáììá `sliplogin` äéáâÜæåé ôï áñ÷åßï `/etc/sliphome/slip.hosts` ãéá íá âñåé ìéá ãñáììÞ ðïõ íá ôáéñéÜæåé ìå ôïí ÷ñÞóôç, êáé áí õðÜñ÷åé, óõíäÝåé ôçí óåéñéáêÞ ãñáììÞ óå ìéá äéáèÝóéìç äéåðáöÞ SLIP êáé Ýðåéôá åêôåëåß ôï script ôïõ êåëýöïõò `/etc/sliphome/slip.login` ãéá íá ñõèìßóåé ôç äéåðáöÞ SLIP.

28.7.2.2.1 ¸íá ÐáñÜäåéãìá Åéóüäïõ óå Åîõðçñåôçôü SLIP

Ãéá ðáñÜäåéãìá, ãéá Ýíá ÷ñÞóôç SLIP ìå ID `Shelmerg`, ç áíôßóôïé÷ç êáôá÷þñéóç óôï `/etc/master.passwd` èá Ýìïéáæå ìå ôçí ðáñáêÜôù:

```
Shelmerg:password:1964:89::0:0:Guy Helmer - SLIP:/usr/users/Shelmerg:/usr/sbin/sliplogin
```

¼ôáí åéóÝëèåé ï `Shelmerg`, ôï `sliplogin` èá øÜîåé ôï `/etc/sliphome/slip.hosts` ãéá ìéá ãñáììÞ ìå ID ÷ñÞóôç ðïõ íá ôáéñéÜæåé. Ãéá ðáñÜäåéãìá, ìðïñåß íá õðÜñ÷åé ìéá ãñáììÞ óôï `/etc/sliphome/slip.hosts` ðïõ íá ãñÜöåé:

```
Shelmerg        dc-slip sl-helmer       0xfffffc00                autocomp
```

Ôï `sliplogin` èá âñåé ôç ãñáììÞ áõôÞ, èá óõíäÝóåé ôç óåéñéáêÞ ãñáììÞ óôçí åðüìåíç äéáèÝóéìç äéåðáöÞ SLIP, êáé Ýðåéôá èá åêôåëÝóåé ôï `/etc/sliphome/slip.login` üðùò öáßíåôáé ðáñáêÜôù:

```
/etc/sliphome/slip.login 0 19200 Shelmerg dc-slip sl-helmer 0xfffffc00 autocomp
```

Áí ëéá ðÜíå êáëÜ, ôï `/etc/sliphome/slip.login` èá åêôåëÝóåé ìéá åíôïëÞ `ifconfig` ãéá ôç äéåðáöÞ SLIP óôçí ïðïßá Ý÷åé óõíäåèåß ç `sliplogin` (ç äéåðáöÞ 0 óôï ðáñáðÜíù ðáñÜäåéãìá, ç ðñþôç ðáñÜìåôñïò ôçò ëßóôáò ðïõ äßíåôáé óôï `slip.login`) þóôå íá ñõèìéóôïýí ç ôïðéêÞ äéåýèõíóç IP (`dc-slip`), ç áðïìáêñõóìÝíç äéåýèõíóç IP (`sl-helmer`), ç ìÜóêá äéêôýïõ ãéá ôç äéåðáöÞ SLIP (`0xfffffc00`), êáé ïðïéåóäÞðïôå ðñüóèåôåò åðéëïãÝò (`autocomp`). Áí êÜôé ðÜåé óôñáâÜ, èá ìðïñÝóåôå íá ôï åíôïðßóåôå áðü ôá áñ÷åßá êáôáãñáöÞò ôçò `sliplogin`. Ç `sliplogin` êáôáãñÜöåé ôá ìçíýìáôá ÷ñçóéìïðïéþíôáò ôï äáßìïíá **syslogd** ï ïðïßïò óõíÞèùò ÷ñçóéìïðïéåß ôï áñ÷åßï `/var/log/messages` (äåßôå ôéò óåëßäåò âïÞèåéáò ãéá ôá syslogd(8) êáé syslog.conf(5) êáé åíäå÷ïìÝíùò åëÝãîôå ôï `/etc/syslog.conf` ãéá íá äåßôå ôçí ôïðïèåóßá êáé ôï áñ÷åßï ðïõ ÷ñçóéìïðïéåß ôï **syslogd** ãéá ôçí êáôáãñáöÞ).

28.7.2.3 Ñýèìéóç ôïõ ÐõñÞíá

Ï ðñïåðéëåãìÝíïò ðõñÞíáò ôïõ FreeBSD (ï `GENERIC`) äéáèÝôåé åíóùìáôùìÝíç õðïóôÞñéîç SLIP (sl(4)). Óôçí ðåñßðôùóç ðïõ èÝëåôå íá äçìéïõñãÞóåôå ðñïóáñìïóìÝíï ðõñÞíá, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá óáò:

```
device   sl
```

Ôï FreeBSD, áðü ðñïåðéëïãÞ, äåí ðñïùèåß ðáêÝôá. Áí èÝëåôå ï åîõðçñåôçôÞò óáò íá åíåñãåß ùò äñïìïëïãçôÞò, èá ðñÝðåé íá åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/rc.conf` êáé íá áëëÜîåôå ôç ñýèìéóç ôçò ìåôáâëçôÞò `gateway_enable` óå `YES`. Ìå ôïí ôñüðï áõôü, èá åßíáé óßãïõñï üôé ç ðñïéëïãÞ ôçò äñïìïëüãçóçò èá äéáôçñçèåß ìåôÜ áðü ìéá åðáíåêêßíçóç.

Èá ðñÝðåé Ýðåéôá íá åðáíåêêéíÞóåôå ãéá íá åíåñãïðïéçèïýí ïé íÝåò ñõèìßóåéò.

Ãéá íá åöáñìüóåôå áõôÝò ôéò ñõèìßóåéò Üìåóá, ìðïñåßôå íá åêôåëÝóåôå ôçí ðáñáêÜôù åíôïëÞ ùò `root`:

```
# /etc/rc.d/routing start
```

Ðáñáêáëïýìå äåßôå ôï ÊåöÜëáéï 9 ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí ñýèìéóç ôïõ ðõñÞíá ôïõ FreeBSD.

28.7.2.4 Ñýèìéóç ôïõ Sliplogin

¼ðùò áíáöÝñèçêå êáé ðñéí, õðÜñ÷ïõí ôñßá áñ÷åßá óôïí êáôÜëïãï `/etc/sliphome` ôá ïðïßá ÷ñçóéìïðïéïýíôáé óôç ñýèìéóç ôïõ `/usr/sbin/sliplogin` (äåßôå êáé ôç óåëßäá manual ôïõ sliplogin(8)): ôï `slip.hosts`, ôï ïðïßï ïñßæåé ôïõò ÷ñÞóôåò SLIP êáé ôéò áíôßóôïé÷åò IP äéåõèýíóåéò ôïõò, ôï `slip.login` ôï ïðïßï óõíÞèùò ñõèìßæåé áðëÜ ôçí äéåðáöÞ SLIP, êáé ðñïáéñåôéêÜ ôï `slip.logout`, ôï ïðïßï áíáéñåß ôéò áëëáãÝò ôïõ `slip.login` üôáí ôåñìáôßóåé ç óåéñéáêÞ óýíäåóç.

28.7.2.4.1 Ñýèìéóç ôïõ `slip.hosts`

Ôï `/etc/sliphome/slip.hosts` ðåñéÝ÷åé ãñáììÝò ìå ôÝóóåñá ðåäßá ðïõ ÷ùñßæïíôáé ìåôáîý ôïõò ìå êåíÜ äéáóôÞìáôá:

- Ôï áíáãíùñéóôéêü åéóüäïõ ôïõ ÷ñÞóôç SLIP
- Ôçí ôïðéêÞ äéåýèõíóç (ôïðéêÞ ùò ðñïò ôïí åîõðçñåôçôÞ SLIP) ôçò äéáóýíäåóçò SLIP
- Ôçí áðïìáêñõóìÝíç äéåýèõíóç ôçò äéáóýíäåóçò SLIP
- Ôç ìÜóêá ôïõ äéêôýïõ

Ç ôïðéêÞ êáé ç áðïìáêñõóìÝíç äéåýèõíóç, ìðïñåß íá åßíáé ïíüìáôá õðïëïãéóôþí (ôá ïðïßá íá ìåôáôñÝðïíôáé óå äéåõèýíóåéò IP ìÝóù ôïõ `/etc/hosts` Þ ìÝóù ôïõ DNS, áíÜëïãá ìå ôéò êáôá÷ùñßóåéò ðïõ õðÜñ÷ïõí óôï áñ÷åßï `/etc/nsswitch.conf`), êáé ç ìÜóêá äéêôýïõ ìðïñåß íá åßíáé Ýíá üíïìá ôï ïðïßï íá ìðïñåß íá äéåõêñéíéóôåß ìÝóù áíáæÞôçóçò óôï `/etc/networks`. Óå Ýíá äïêéìáóôéêü óýóôçìá, ôï `/etc/sliphome/slip.hosts` ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#
# login local-addr      remote-addr     mask            opt1    opt2
#                                               (normal,compress,noicmp)
#
Shelmerg  dc-slip       sl-helmerg      0xfffffc00      autocomp
```

Óôï ôÝëïò ôçò ãñáììÞò, âñßóêïíôáé ìéá Þ ðåñéóóüôåñåò áðü ôéò ðáñáêÜôù åðéëïãÝò:

- `normal` — ÷ùñßò óõìðßåóç ôùí åðéêåöáëßäùí
- `compress` — ìå óõìðßåóç ôùí åðéêåöáëßäùí
- `autocomp` — ìå óõìðßåóç ôùí åðéêåöáëßäùí, áí åðéôñÝðåôáé áðü ôïí áðïìáêñõóìÝíï õðïëïãéóôÞ
- `noicmp` — áðåíåñãïðïßçóç ôùí ðáêÝôùí ICMP (ìå ôïí ôñüðï áõôü ôá ðáêÝôá “ping” èá áðïññßðôïíôáé áíôß íá êáôáíáëþíïõí ôï åýñïò æþíçò ôçò óýíäåóçò óáò)

Ïé åðéëïãÝò ðïõ Ý÷åôå ãéá ôéò ôïðéêÝò êáé áðïìáêñõóìÝíåò äéåõèýíóåéò ôùí SLIP óõíäÝóåùí óáò, åîáñôþíôáé áðü ôï áí ðñüêåéôáé íá áöéåñþóåôå Ýíá õðïäßêôõï TCP/IP Þ áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå “proxy ARP” óôï SLIP åîõðçñåôçôÞ óáò (äåí åßíáé “ðñáãìáôéêü” proxy ARP, áëëÜ óôçí åíüôçôá áõôÞ ðåñéãñÜöåôáé ìå áõôü ôïí üñï). Áí äåí åßóôå óßãïõñïò ðïéá ìÝèïäï íá åðéëÝîåôå Þ ðùò íá áðïäßäåôå äéåõèýíóåéò IP, ðáñáêáëïýìå áíáôñÝîôå óôá âéâëßá ôïõ TCP/IP ðïõ áíáöÝñïíôáé óôéò ÐñïûðïèÝóåéò SLIP (ÔìÞìá 28.7.2.1) Þ/êáé óõìâïõëåõèåßôå ôï äéá÷åéñéóôÞ äéêôýïõ óáò.

Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå îå÷ùñéóôü õðïäßêôõï ãéá ôïõò SLIP ðåëÜôåò óáò, èá ÷ñåéáóôåß íá äéáèÝóåôå ôïí áñéèìü õðïäéêôýïõ áðü ôçí äéåýèõíóç IP ðïõ óáò Ý÷åé áðïäïèåß êáé íá áðïäþóåôå óôïõò ðåëÜôåò SLIP äéåõèýíóåéò ðïõ áíÞêïõí óå áõôü ôï õðïäßêôõï. ¸ðåéôá, èá ÷ñåéáóôåß ìÜëëïí íá êáèïñßóåôå ìéá óôáôéêÞ äéáäñïìÞ óôï õðïäßêôõï SLIP ìÝóù ôïõ åîõðçñåôçôÞ SLIP óôïí êïíôéíüôåñï óáò äñïìïëïãçôÞ IP.

ÄéáöïñåôéêÜ, áí ÷ñçóéìïðïéÞóåôå ôç ìÝèïäï “proxy ARP”, èá ÷ñåéáóôåß íá áðïäþóåôå óôïõò SLIP ðåëÜôåò óáò äéåõèýíóåéò IP ðïõ áíÞêïõí óôï õðïäßêôõï Ethernet óôï ïðïßï áíÞêåé ï åîõðçñåôçôÞò SLIP, êáé èá ÷ñåéáóôåß åðßóçò íá ñõèìßóåôå ôá scripts `/etc/sliphome/slip.login` êáé `/etc/sliphome/slip.logout` íá ÷ñçóéìïðïéïýí ôï arp(8) ãéá íá ÷åéñßæïíôáé ôéò êáôá÷ùñßóåéò “proxy ARP” óôïí ðßíáêá ARP ôïõ åîõðçñåôçôÞ SLIP.

28.7.2.4.2 Ñýèìéóç ôïõ `slip.login`

¸íá ôõðéêü `/etc/sliphome/slip.login` ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#!/bin/sh -
#
#       @(#)slip.login  5.1 (Berkeley) 7/1/90

#
# generic login file for a slip line.  sliplogin invokes this with
# the parameters:
#      1        2         3        4          5         6     7-n
#   slipunit ttyspeed loginname local-addr remote-addr mask opt-args
```

```
#
/sbin/ifconfig sl$1 inet $4 $5 netmask $6
```

Ôï áñ÷åßï `slip.login` åêôåëåß áðëþò ôï `ifconfig` ãéá ôçí êáôÜëëçëç äéåðáöÞ SLIP, ìå ôéò ôïðéêÝò êáé áðïìáêñõóìÝíåò äéåõèýíóåéò êáé ôç ìÜóêá äéêôýïõ ôçò äéåðáöÞò áõôÞò.

Áí Ý÷åôå áðïöáóßóåé íá ÷ñçóéìïðïéÞóåôå ôçí ìÝèïäï “proxy ARP” (áíôß íá ÷ñçóéìïðïéÞóåôå äéáöïñåôéêü õðïäßêôõï ãéá ôïõò ðåëÜôåò SLIP), ôï áñ÷åßï `/etc/sliphome/slip.login` èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#!/bin/sh -
#
#       @(#)slip.login  5.1 (Berkeley) 7/1/90

#
# generic login file for a slip line.  sliplogin invokes this with
# the parameters:
#      1        2         3        4          5         6     7-n
#   slipunit ttyspeed loginname local-addr remote-addr mask opt-args
#
/sbin/ifconfig sl$1 inet $4 $5 netmask $6
# Answer ARP requests for the SLIP client with our Ethernet addr
/usr/sbin/arp -s $5 00:11:22:33:44:55 pub
```

Ç ðñüóèåôç ãñáììÞ óå áõôü ôï `slip.login`, ç `arp -s $5 00:11:22:33:44:55 pub`, äçìéïõñãåß ìéá êáôá÷þñéóç ARP óôïí ðßíáêá ARP ôïõ åîõðçñåôçôÞ SLIP. ÁõôÞ ç êáôá÷þñéóç ARP êÜíåé ôïí åîõðçñåôçôÞ SLIP íá áðáíôÜ ìå ôçí äéåýèõíóç Ethernet MAC üôáí êÜðïéïò Üëëïò êüìâïò IP óôï Ethernet åðéèõìåß íá åðéêïéíùíÞóåé ìå ôçí äéåýèõíóç IP ôïõ ðåëÜôç SLIP.

¼ôáí ÷ñçóéìïðïéåßôå ôï ðáñáðÜíù ðáñÜäåéãìá, âåâáéùèåßôå üôé Ý÷åôå áíôéêáôáóôÞóåé ôçí äéåýèõíóç MAC ôïõ Ethernet (`00:11:22:33:44:55`) ìå ôçí áíôßóôïé÷ç ôçò äéêÞò óáò êÜñôáò Ethernet, äéáöïñåôéêÜ ôï “proxy ARP” óßãïõñá äåí èá ëåéôïõñãÞóåé! Ìðïñåßôå íá áíáêáëýøåôå ôç äéåýèõíóç MAC ôïõ äéêïý óáò åîõðçñåôçôÞ SLIP êïéôÜæïíôáò ôá áðïôåëÝóìáôá ôçò åíôïëÞò `netstat -i`. Ç äåýôåñç ãñáììÞ ôçò åîüäïõ èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
ed0   1500  <Link>0.2.c1.28.5f.4a         191923        0   129457     0   116
```

Áõôü äåß÷íåé üôé óôï óõãêåêñéìÝíï óýóôçìá ç äéåýèõíóç MAC ôïõ Ethernet åßíáé `00:02:c1:28:5f:4a`. Ïé ôåëåßåò óôçí äéåýèõíóç ðïõ äåß÷íåé ç `netstat -i` ðñÝðåé íá áíôéêáôáóôáèïýí ìå Üíù-êÜôù ôåëåßåò, êáé êÜèå ìïíü äåêáåîáäéêü øçößï ðñÝðåé íá ìåôáôñáðåß óå äéðëü ðñïóèÝôïíôáò Ýíá ìçäåíéêü. Ç äéåýèõíóç ìåôáôñÝðåôáé ìå áõôü ôïí ôñüðï óå ìéá ìïñöÞ ðïõ ìðïñåß íá ÷ñçóéìïðïéÞóåé ç arp(8). Äåßôå ôç óåëßäá manual ôçò arp(8) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ÷ñÞóç ôçò åíôïëÞò áõôÞò.

> **Óçìåßùóç:** ¼ôáí äçìéïõñãåßôå ôï `/etc/sliphome/slip.login` êáé ôï `/etc/sliphome/slip.logout`, èá ðñÝðåé íá èÝóåôå ôï bit “åêôÝëåóçò” (ð.÷. `chmod 755 /etc/sliphome/slip.login /etc/sliphome/slip.logout`), äéáöïñåôéêÜ ç `sliplogin` äåí èá ìðïñåß íá ôá åêôåëÝóåé.

28.7.2.4.3 Ñýèìéóç ôïõ `slip.logout`

Ôï `/etc/sliphome/slip.logout` äåí åßíáé áðüëõôá áðáñáßôçôï (åêôüò áí ðñüêåéôáé íá õëïðïéÞóåôå “proxy ARP”), áëëÜ áí óêïðåýåôå íá ôï äçìéïõñãÞóåôå, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ùò õðüäåéãìá ôï ðáñáêÜôù áðëü ðáñÜäåéãìá:

```
#!/bin/sh -
#
#       slip.logout

#
# logout file for a slip line.  sliplogin invokes this with
# the parameters:
#      1        2         3        4          5         6     7-n
#   slipunit ttyspeed loginname local-addr remote-addr mask opt-args
#
/sbin/ifconfig sl$1 down
```

Áí ÷ñçóéìïðïéåßôå “proxy ARP”, èá èÝëåôå ôï `/etc/sliphome/slip.logout` íá äéáãñÜöåé ôçí êáôá÷þñéóç ARP ôïõ ðåëÜôç SLIP:

```
#!/bin/sh -
#
#       @(#)slip.logout

#
# logout file for a slip line.  sliplogin invokes this with
# the parameters:
#      1        2         3        4          5         6     7-n
#   slipunit ttyspeed loginname local-addr remote-addr mask opt-args
#
/sbin/ifconfig sl$1 down
# Quit answering ARP requests for the SLIP client
/usr/sbin/arp -d $5
```

Ç `arp -d $5` äéáãñÜöåé ôçí êáôá÷þñéóç ARP ðïõ ðñïóôÝèçêå ìå ôçí åêôÝëåóç ôïõ `slip.login` ôïõ “proxy ARP”, êáôÜ ôçí åßóïäï ôïõ ðåëÜôç SLIP.

ÐñÝðåé íá ôï åðáíáëÜâïõìå Üëëç ìéá öïñÜ: Âåâáéùèåßôå üôé ôï `/etc/sliphome/slip.logout` Ý÷åé ïñéóôåß ùò åêôåëÝóéìï ìåôÜ ôçí äçìéïõñãßá ôïõ (ð.÷., `chmod 755 /etc/sliphome/slip.logout`).

28.7.2.5 ÐáñÜãïíôåò ðïõ ÐñÝðåé íá ËÜâåôå Õðüøç óáò óôç Äñïìïëüãçóç

Áí äåí ÷ñçóéìïðïéåßôå ôçí ìÝèïäï “proxy ARP” ãéá íá äñïìïëïãåßôå ðáêÝôá ìåôáîý ôùí ðåëáôþí SLIP êáé ôïõ õðüëïéðïõ äéêôýïõ óáò (êáé åíäå÷ïìÝíùò êáé ôïõ Internet), èá ðñÝðåé ìÜëëïí íá ðñïóèÝóåôå óôáôéêÝò äéáäñïìÝò ðñïò ôïí ðëçóéÝóôåñï óáò ðñïåðéëåãìÝíï äñïìïëïãçôÞ ãéá íá äñïìïëïãåßôå ôï õðïäßêôõï ôùí SLIP ðåëáôþí óáò äéáìÝóïõ ôïõ åîõðçñåôçôÞ SLIP.

28.7.2.5.1 ÓôáôéêÝò ÄéáäñïìÝò

Ç ðñïóèÞêç óôáôéêþí äéáäñïìþí ðñïò ôïõò ðëçóéÝóôåñïõò óáò ðñïåðéëåãìÝíïõò äñïìïëïãçôÝò, ìðïñåß íá åßíáé ðñïâëçìáôéêÞ (Þ êáé áäýíáôç áí äåí Ý÷åôå ôá êáôÜëëçëá äéêáéþìáôá ðñüóâáóçò). Áí ç åôáéñßá óáò äéáèÝôåé äßêôõï ìå ðïëëáðëïýò äñïìïëïãçôÝò, êÜðïéá ìïíôÝëá (ð.÷. áðü ôçí Cisco êáé ôçí Proteon), åêôüò üôé ðñÝðåé íá ñõèìéóôïýí ìå ôçí óôáôéêÞ äéáäñïìÞ ðñïò ôï õðïäßêôõï SLIP, ðñÝðåé åðßóçò íá ñõèìéóôïýí ìå ôéò óôáôéêÝò äéáäñïìÝò ðïõ èá áíáöÝñïõí óôïõò Üëëïõò äñïìïëïãçôÝò. Èá ÷ñåéáóôåß íá ðåéñáìáôéóôåßôå êáé íá äïêéìÜóåôå äéÜöïñåò ñõèìßóåéò ãéá íá äïõëÝøåé ç äñïìïëüãçóç ìÝóù óôáôéêþí äéáäñïìþí.

ÊåöÜëáéï 29 Çëåêôñïíéêü Ôá÷õäñïìåßï

Áñ÷éêÞ óõíåéóöïñÜ áðü ôïí Bill Lloyd. ÃñÜöôçêå îáíÜ áðü ôïí Jim Mock.

29.1 Óýíïøç

Ôï “çëåêôñïíéêü ôá÷õäñïìåßï”, åõñýôåñá ãíùóôü ùò email, åßíáé óôéò ìÝñåò ìáò ìéá áðü ôéò ðëÝïí äéáäåäïìÝíåò ìïñöÝò åðéêïéíùíßáò. Ôï êåöÜëáéï áõôü ðáñÝ÷åé ìéá âáóéêÞ åéóáãùãÞ óôç ëåéôïõñãßá åíüò äéáêïìéóôÞ email óôï FreeBSD, êáèþò êáé ìéá åéóáãùãÞ óôç äéáäéêáóßá áðïóôïëÞò êáé ëÞøçò email óôï FreeBSD. Ùóôüóï ç áíáöïñÜ áõôÞ äåí ðñÝðåé íá èåùñçèåß ðëÞñçò, êáèþò õðÜñ÷ïõí áêüìá áñêåôïß ðáñÜãïíôåò ðïõ ðñÝðåé íá ëçöèïýí õðüøéí êáé Ý÷ïõí åäþ ðáñáëåéöèåß. Ãéá ðéï ðëÞñç áíÜëõóç ôïõ èÝìáôïò, ï áíáãíþóôçò ðáñáðÝìðåôáé óôá ðïëëÜ åîáéñåôéêÜ âéâëßá ðïõ áíáöÝñïíôáé óôï ÐáñÜñôçìá B.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôï ëïãéóìéêü ðïõ ÷ñçóéìïðïéåßôáé óôçí áðïóôïëÞ êáé ëÞøç çëåêôñïíéêïý ôá÷õäñïìåßïõ.
- Ðïõ âñßóêïíôáé ôá âáóéêÜ áñ÷åßá ñõèìßóåùí ôïõ **sendmail** óôï FreeBSD.
- Ôç äéáöïñÜ ìåôáîý áðïìáêñõóìÝíùí êáé ôïðéêþí èõñßäùí ôá÷õäñïìåßïõ (mailboxes).
- Ðùò íá åìðïäßóåôå áíåðéèýìçôïõò spammers áðü ôï íá ÷ñçóéìïðïéÞóïõí ôïí äéêü óáò åîõðçñåôçôÞ email ùò áíáìåôáäüôç.
- Ðùò íá åãêáôáóôÞóåôå êáé íá ñõèìßóåôå Ýíá åíáëëáêôéêü Áíôéðñüóùðï ÌåôáöïñÜò Ôá÷õäñïìåßïõ (Mail Transfer Agent) óôï óýóôçìá óáò, áíôéêáèéóôþíôáò Ýôóé ôï **sendmail**.
- Ðùò íá áíôéìåôùðßóåôå óõíçèéóìÝíá ðñïâëÞìáôá óôïí äéáêïìéóôÞ ôá÷õäñïìåßïõ.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôï SMTP ìå ôï UUCP.
- Ðùò íá ñõèìßóåôå ôï óýóôçìá óáò ìüíï ãéá áðïóôïëÞ email.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôï email ìÝóù åðéëïãéêÞò (dialup) óýíäåóçò.
- Ðùò íá ñõèìßóåôå ðéóôïðïßçóç áõèåíôéêüôçôáò óôï SMTP ãéá ðñüóèåôç áóöÜëåéá.
- Ðùò íá åãêáôáóôÞóåôå êáé íá ÷ñçóéìïðïéÞóåôå ìéá åöáñìïãÞ áðïóôïëÞò êáé ëÞøçò email ãéá ÷ñÞóôåò, üðùò ôï **mutt**.
- Ðùò íá êáôåâÜóåôå ôï email óáò áðü Ýíá áðïìáêñõóìÝíï äéáêïìéóôÞ POP Þ IMAP.
- Ðùò íá åöáñìüóåôåößëôñá êáé êáíüíåò óôçí åéóåñ÷üìåíç áëëçëïãñáößá óáò, ìå áõôüìáôï ôñüðï.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá ñõèìßóåôå óùóôÜ ôç óýíäåóç ôïõ äéêôýïõ óáò (ÊåöÜëáéï 32).
- Íá ñõèìßóåôå óùóôÜ ôéò ðëçñïöïñßåò DNS ãéá ôïí äéáêïìéóôÞ áëëçëïãñáößáò óáò (ÊåöÜëáéï 30).
- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

29.2 ×ñçóéìïðïéþíôáò ôï Çëåêôñïíéêü Ôá÷õäñïìåßï

Óå êÜèå áíôáëëáãÞ çëåêôñïíéêïý ôá÷õäñïìåßïõ, óõíåñãÜæïíôáé ðÝíôå âáóéêÜ ôìÞìáôá: Ôï ðñüãñáììá ÷ñÞóôç, ï äáßìïíáò ìåôáöïñÜò, ôï DNS, ìéá áðïìáêñõóìÝíç Þ ôïðéêÞ èõñßäá ôá÷õäñïìåßïõ (mailbox) êáé öõóéêÜ ï õðïëïãéóôÞò ðïõ äéá÷åéñßæåôáé ôï email (mailhost).

29.2.1 Ôï Ðñüãñáììá ×ñÞóôç

Ç êáôçãïñßá áõôÞ ðåñéëáìâÜíåé ðñïãñÜììáôá üðùò ôá **mutt**, **alpine**, **elm**, êáé `mail`, êáèþò êáé ðñïãñÜììáôá ðïõ äéáèÝôïõí GUI üðùò åßíáé ôá **balsa**, **xfmail** (ãéá íá äþóïõìå ìåñéêÜ ðáñáäåßãìáôá) êáé êÜðïéá ðéï “åîåëéãìÝíá” üðùò åßíáé ïé öõëëïìåôñçôÝò ãéá ôï WWW. Ôá ðñïãñÜììáôá áõôÜ, áðëþò ìåôáâéâÜæïõí ôéò óõíáëëáãÝò ôá÷õäñïìåßïõ óôïí ôïðéêü “mailhost”, åßôå êáëþíôáò êÜðïéïí áðü ôïõò äáßìïíåò ôïõ åîõðçñåôçôÞ ðïõ åßíáé äéáèÝóéìïé, Þ ðáñáäßäïíôáò ôéò áðåõèåßáò ìÝóù TCP.

29.2.2 Äáßìïíáò ÅîõðçñåôçôÞ Mailhost

Ôï FreeBSD Ýñ÷åôáé ìå ôï **sendmail** åãêáôåóôçìÝíï áðü ðñïåðéëïãÞ, áëëÜ õðïóôçñßæåé åðßóçò êáé ìåãÜëï áñéèìü áðü Üëëïõò äáßìïíåò ôá÷õäñïìåßïõ, ðåñéëáìâáíïìÝíùí êáé ôùí:

- **exim**
- **postfix**
- **qmail**

Ï äáßìïíáò Ý÷åé óõíÞèùò äýï ëåéôïõñãßåò—åßíáé õðåýèõíïò ãéá ôç ëÞøç åéóåñ÷üìåíïõ mail, üðùò åðßóçò êáé ôçí ðáñÜäïóç ôïõ åîåñ÷üìåíïõ mail. ¼ìùò, *äåí åßíáé* õðåýèõíïò ãéá ôç óõëëïãÞ ôïõ mail ìå ôç ÷ñÞóç ðñùôïêüëëùí üðùò ôá POP Þ IMAP ãéá ôçí áíÜãíùóç ôïõ ôá÷õäñïìåßïõ óáò, ïýôå åðéôñÝðåé ôç óýíäåóç óôéò ôïðéêÝò èõñßäåò ôýðïõ `mbox` Þ Maildir. Ðéèáíüí íá ÷ñåéáóôåßôå êÜðïéï åðéðñüóèåôï äáßìïíá ãéá áõôü ôï óêïðü.

> **Ðñïåéäïðïßçóç:** Ðáëéüôåñåò åêäüóåéò ôïõ **sendmail** Ý÷ïõí êÜðïéá óïâáñÜ ðñïâëÞìáôá áóöáëåßáò, ìÝóù ôùí ïðïßùí ìðïñåß êÜðïéïò åéóâïëÝáò íá áðïêôÞóåé ôïðéêÞ Þ áðïìáêñõóìÝíç ðñüóâáóç óôï ìç÷Üíçìá óáò. Ãéá íá áðïöýãåôå ðñïâëÞìáôá ôÝôïéïõ åßäïõò, âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå êÜðïéá ðñüóöáôç Ýêäïóç. ÅíáëëáêôéêÜ, ìðïñåßôå íá åãêáôáóôÞóåôå êÜðïéï Üëëï MTA áðü ôçí ÓõëëïãÞ ôùí Ports ôïõ FreeBSD.

29.2.3 Email êáé DNS

Ôï Óýóôçìá Ïíïìáóßáò Ðåñéï÷þí (DNS) êáé ï äáßìïíáò ôïõ, ï `named`, Ý÷ïõí óçìáíôéêü ñüëï óôçí ðáñÜäïóç ôïõ email. Ãéá ôçí ðáñÜäïóç ôïõ email áðü ôï Ýíá site óå Ýíá Üëëï, ï äáßìïíáò ôïõ åîõðçñåôçôÞ èá øÜîåé ãéá ôï áðïìáêñõóìÝíï site óôï DNS, ãéá íá êáèïñßóåé ðïéïò õðïëïãéóôÞò ëáìâÜíåé ôï email ãéá ôïí óõãêåêñéìÝíï ðñïïñéóìü. Ç äéáäéêáóßá áõôÞ óõìâáßíåé åðßóçò üôáí ï äéêüò óáò åîõðçñåôçôÞò ëáìâÜíåé email áðü êÜðïéï áðïìáêñõóìÝíï õðïëïãéóôÞ.

Ôï DNS åßíáé õðåýèõíï ãéá ôçí áíôéóôïß÷éóç ïíïìÜôùí õðïëïãéóôþí óå äéåõèýíóåéò IP, üðùò êáé ãéá ôçí áðïèÞêåõóç ðëçñïöïñéþí ðïõ ó÷åôßæïíôáé ìå ôçí ðáñÜäïóç çëåêôñïíéêïý ôá÷õäñïìåßïõ, üðùò ïé åããñáöÝò MX. Ç åããñáöÞ MX (Mail Exchanger) áíáãíùñßæåé ðïéïò õðïëïãéóôÞò (Þ õðïëïãéóôÝò) èá åßíáé õðåýèõíïò ãéá ôç ëÞøç ôá÷õäñïìåßïõ åíüò óõãêåêñéìÝíïõ ôïìÝá (domain). Áí äåí Ý÷åôå åããñáöÞ MX ãéá ôïí õðïëïãéóôÞ Þ ôïí ôïìÝá óáò, ôï email èá ðáñáäåßãìáôá áðåõèåßáò óôïí õðïëïãéóôÞ óáò, ìå ôçí ðñïûðüèåóç üôé Ý÷åôå åããñáöÞ ôýðïõ A ðïõ íá äåß÷íåé óôïí õðïëïãéóôÞ óáò Þ óôçí IP äéåýèõíóç ôïõ.

Ìðïñåßôå íá äåßôå ôéò åããñáöÝò MX ãéá ïðïéïäÞðïôå ôïìÝá, ÷ñçóéìïðïéþíôáò ôçí åíôïëÞ host(1), üðùò öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá:

```
% host -t mx FreeBSD.org
FreeBSD.org mail is handled (pri=10) by mx1.FreeBSD.org
```

29.2.4 ËáìâÜíïíôáò Mail

Ï mailhost åßíáé õðåýèõíïò ãéá ôçí ëÞøç mail ðïõ ðñïïñßæåôáé ãéá ôïí ôïìÝá óáò. Èá óõëëÝîåé üëï ôï mail ðïõ Ýñ÷åôáé ðñïò ôïí ôïìÝá, êáé èá ôï áðïèçêåýóåé åßôå óôï `mbox` (ôçí ðñïåðéëåãìÝíç ìÝèïäï ãéá áðïèÞêåõóç mail) Þ óå ìïñöÞ Maildir, áíÜëïãá ìå ôéò ñõèìßóåéò ðïõ Ý÷åôå êÜíåé. Áðü ôç óôéãìÞ ðïõ ôï mail Ý÷åé áðïèçêåõèåß, ìðïñåßôå åßôå íá ôï äéáâÜóåôå ôïðéêÜ, ÷ñçóéìïðïéþíôáò åöáñìïãÝò üðùò ôï mail(1) Þ ôï **mutt**, Þ íá ôï äåßôå ìÝóù áðïìáêñõóìÝíçò óýíäåóçò, ÷ñçóéìïðïéþíôáò êÜðïéï ðñùôüêïëëï üðùò ôï POP Þ ôï IMAP. Áõôü óçìáßíåé üôé áí åðéèõìåßôå íá äéáâÜæåôå ôï mail óáò ìüíï ôïðéêÜ, äåí ÷ñåéÜæåôáé íá åãêáôáóôÞóåôå åîõðçñåôçôÞ POP Þ IMAP.

29.2.4.1 Ðñüóâáóç óå ÁðïìáêñõóìÝíåò Èõñßäåò ìÝóù POP êáé IMAP

Ãéá íá Ý÷åôå áðïìáêñõóìÝíç ðñüóâáóç óôéò èõñßäåò ôá÷õäñïìåßïõ, åßíáé áðáñáßôçôï íá Ý÷åôå ðñüóâáóç óå Ýíá åîõðçñåôçôÞ POP Þ IMAP. Ôá ðñùôüêïëëá áõôÜ, åðéôñÝðïõí óôïõò ÷ñÞóôåò íá óõíäÝïíôáé óôéò èõñßäåò ôïõò áðü áðüóôáóç, ìå ìåãÜëç åõêïëßá. Êáé ôá äýï ðñùôüêïëëá (POP êáé IMAP) åðéôñÝðïõí óôïõò ÷ñÞóôåò áðïìáêñõóìÝíç ðñüóâáóç óôéò èõñßäåò ôïõò, áëëÜ ôï IMAP ðñïóöÝñåé áñêåôÜ ðëåïíåêôÞìáôá, ìåñéêÜ áðü ôá ïðïßá öáßíïíôáé ðáñáêÜôù:

- Ôï IMAP ìðïñåß íá áðïèçêåýóåé ìçíýìáôá óå Ýíá áðïìáêñõóìÝíï åîõðçñåôçôÞ, üðùò åðßóçò êáé íá ôá áíáêôÞóåé.
- Ôï IMAP õðïóôçñßæåé ôáõôü÷ñïíåò åíçìåñþóåéò.
- Ôï IMAP ìðïñåß íá öáíåß åîáéñåôéêÜ ÷ñÞóéìï óå óõíäÝóåéò ÷áìçëÞò ôá÷ýôçôáò, êáèþò åðéôñÝðåé óôïõò ÷ñÞóôåò íá êáôåâÜóïõí ôç äïìÞ ôùí ìçíõìÜôùí, ÷ùñßò íá êáôåâÜóïõí ôï ðåñéå÷üìåíï ôïõò. Ìðïñåß åðßóçò íá åêôåëÝóåé åñãáóßåò üðùò åýñåóç ìçíõìÜôùí áðåõèåßáò óôïí åîõðçñåôçôÞ, åëá÷éóôïðïéþíôáò ìå áõôü ôïí ôñüðï ôç ìåôáöïñÜ äåäïìÝíùí ìåôáîý ôùí ðåëáôþí êáé ôùí åîõðçñåôçôþí.

Ãéá íá åãêáôáóôÞóåôå Ýíá åîõðçñåôçôÞ POP Þ IMAP èá ðñÝðåé íá áêïëïõèÞóåôå ôá åðüìåíá âÞìáôá:

1. ÅðéëÝîôå Ýíá åîõðçñåôçôÞ IMAP Þ POP ðïõ íá åîõðçñåôåß ôéò áíÜãêåò óáò. Ïé ðáñáêÜôù åîõðçñåôçôÝò POP êáé IMAP åßíáé áñêåôÜ äéáäåäïìÝíïé êáé áðïôåëïýí êáëÜ ðáñáäåßãìáôá:
   - **qpopper**
   - **teapop**
   - **imap-uw**
   - **courier-imap**
   - **dovecot**
2. ÅãêáôáóôÞóôå ôï äáßìïíá POP Þ IMAP ôçò åðéëïãÞò óáò, áðü ôçí ÓõëëïãÞ ôùí Ports.
3. Áí ÷ñåéÜæåôáé, ôñïðïðïéÞóôå ôï áñ÷åßï `/etc/inetd.conf` ãéá íá öïñôþóåôå ôïí åîõðçñåôçôÞ POP Þ IMAP.

Ðñïåéäïðïßçóç: Èá ðñÝðåé íá óçìåéþóïõìå üôé ôüóï ôï POP üóï êáé ôï IMAP ìåôáäßäïõí ðëçñïöïñßåò üðùò ôï üíïìá ÷ñÞóôç êáé ôïí êùäéêü óå ìïñöÞ áðëïý êåéìÝíïõ. Áõôü óçìáßíåé üôé áí èÝëåôå íá áóöáëßóåôå ôç ìåôÜäïóç ðëçñïöïñéþí ìÝóù áõôþí ôùí ðñùôïêüëëùí, èá ðñÝðåé íá ðåñÜóåôå áõôÝò ôéò óõíäÝóåéò ìÝóù ôïõ ssh(1) (tunneling) Þ íá ÷ñçóéìïðïéÞóåôå SSL. Ç äéáäéêáóßá tunneling ðåñéãñÜöåôáé ìå ëåðôïìÝñåéá óôï ÔìÞìá 15.11.8 êáé ôï SSL óôï ÔìÞìá 15.9.

29.2.4.2 Ðñüóâáóç óå ÔïðéêÝò Èõñßäåò Ôá÷õäñïìåßïõ

Ìðïñåßôå íá Ý÷åôå ôïðéêÞ ðñüóâáóç óôéò èõñßäåò ôá÷õäñïìåßïõ ÷ñçóéìïðïéþíôáò áðåõèåßáò êÜðïéï ðñüãñáììá áðïóôïëÞò/ëÞøçò (MUA) óôïí åîõðçñåôçôÞ ðïõ åßíáé áðïèçêåõìÝíåò. ÊáôÜëëçëåò åöáñìïãÝò ãéá áõôü ôï óêïðü åßíáé ð.÷. ôï **mutt** Þ ôï mail(1).

29.2.5 Ï ÅîõðçñåôçôÞò Mail

ÅîõðçñåôçôÞò mail èåùñåßôáé ï õðïëïãéóôÞò ï ïðïßïò åßíáé õðåýèõíïò ãéá ôçí ðáñÜäïóç êáé ëÞøç mail ãéá ôïí õðïëïãéóôÞ óáò, êáé åíäå÷ïìÝíùò ãéá ôï äßêôõï óáò.

29.3 Ñýèìéóç ôïõ sendmail

ÓõíåéóöïñÜ ôïõ Christopher Shumway.

Ôï sendmail(8) åßíáé ï ðñïåðéëåãìÝíïò Áíôéðñüóùðïò ÌåôáöïñÜò Ôá÷õäñïìåßïõ (Mail Transfer Agent, MTA) óôï FreeBSD. ÄïõëåéÜ ôïõ åßíáé íá äÝ÷åôáé ôï email áðü ôïõò Áíôéðñïóþðïõò Email ×ñÞóôç (Mail User Agents, MUA) êáé íá ôï ðáñáäßäåé óôï êáôÜëëçëï mailer ðïõ ïñßæåôáé óôï áñ÷åßï ñõèìßóåùí ôïõ. Ôï **sendmail** ìðïñåß åðßóçò íá äå÷èåß óõíäÝóåéò äéêôýïõ êáé íá ðáñáäþóåé ôï mail óå ôïðéêÝò èõñßäåò Þ êáé óå êÜðïéï Üëëï ðñüãñáììá.

Ôï **sendmail** ÷ñçóéìïðïéåß ôá áêüëïõèá áñ÷åßá ñõèìßóåùí:

¼íïìá Áñ÷åßïõ	Ëåéôïõñãßá
`/etc/mail/access`	Ç âÜóç äåäïìÝíùí ðñüóâáóçò ôïõ **sendmail**.
`/etc/mail/aliases`	Ðáñùíýìéá (aliases) ãéá ôéò èõñßäåò (Mailboxes)
`/etc/mail/local-host-names`	Ëßóôá ôùí õðïëïãéóôþí ãéá ôïõò ïðïßïõò ôï **sendmail** äÝ÷åôáé mail
`/etc/mail/mailer.conf`	Ñõèìßóåéò ôïõ ðñïãñÜììáôïò mailer
`/etc/mail/mailertable`	Ðßíáêáò ðáñáäüóåùí ôïõ mailer
`/etc/mail/sendmail.cf`	Ôï êåíôñéêü áñ÷åßï ñõèìßóåùí ôïõ **sendmail**
`/etc/mail/virtusertable`	Ðßíáêáò åéêïíéêþí ÷ñçóôþí êáé ðåñéï÷þí (domains)

29.3.1 `/etc/mail/access`

Ç âÜóç äåäïìÝíùí ðñüóâáóçò êáèïñßæåé ðïéïé õðïëïãéóôÝò Þ äéåõèýíóåéò IP Ý÷ïõí ðñüóâáóç óôïí ôïðéêü åîõðçñåôçôÞ mail êáé ôé åßäïõò ðñüóâáóçò Ý÷ïõí. Ç êáôá÷þñçóç åíüò õðïëïãéóôÞ ìðïñåß íá Ý÷åé ôéò åðéëïãÝò `OK`, `REJECT`, `RELAY` Þ áðëÜ íá ìåôáâéâÜæåé ôïí Ýëåã÷ï óôç ñïõôßíá äéá÷åßñéóçò ëáèþí ôïõ **sendmail** ìå êÜðïéï óõãêåêñéìÝíï óöÜëìá. Ïé õðïëïãéóôÝò ðïõ åßíáé êáôá÷ùñçìÝíïé ìå ôçí åðéëïãÞ `OK`, ç ïðïßá åßíáé êáé ç ðñïåðéëåãìÝíç, åðéôñÝðåôáé íá óôÝëíïõí email óå áõôü ôïí õðïëïãéóôÞ, åöüóïí ï ôåëéêüò ðñïïñéóìüò ôïõ ìçíýìáôïò åßíáé ôï ôïðéêü ìç÷Üíçìá. Ïé õðïëïãéóôÝò ðïõ åßíáé êáôá÷ùñçìÝíïé ìå ôçí åðéëïãÞ `REJECT` áðïññßðôïíôáé ãéá ïðïéáäÞðïôå åðéêïéíùíßá Ý÷åé íá êÜíåé ìå ìåôÜäïóç mail. Ïé õðïëïãéóôÝò ðïõ åßíáé êáôá÷ùñçìÝíïé ìå ôçí åðéëïãÞ `RELAY`, Ý÷ïõí ôç äõíáôüôçôá íá óôÝëíïõí mail ðñïò ïðïéáäÞðïôå êáôåýèõíóç ìÝóù ôïõ óõãêåêñéìÝíïõ åîõðçñåôçôÞ.

ÐáñÜäåéãìá 29-1. Ñýèìéóç ôçò ÂÜóçò ÄåäïìÝíùí Ðñüóâáóçò ôïõ sendmail

```
cyberspammer.com                550 We do not accept mail from spammers
FREE.STEALTH.MAILER@            550 We do not accept mail from spammers
another.source.of.spam          REJECT
okay.cyberspammer.com           OK
128.32                          RELAY
```

Óå áõôü ôï ðáñÜäåéãìá Ý÷ïõìå ðÝíôå êáôá÷ùñÞóåéò. Ïé äéåõèýíóåéò ðïõ ôáéñéÜæïõí óôçí áñéóôåñÞ ðëåõñÜ ôïõ ðßíáêá, åðçñåÜæïíôáé áðü ôç åíÝñãåéá ðïõ ôáéñéÜæåé óôç äåîéÜ ðëåõñÜ. Ôá ðñþôá äýï ðáñáäåßãìáôá, åðéóôñÝöïõí Ýíá êùäéêü óöÜëìáôïò óôç ñïõôßíá äéá÷åßñéóçò ëáèþí ôïõ **sendmail**. Ôï ìÞíõìá åêôõðþíåôáé óôïí áðïìáêñõóìÝíï õðïëïãéóôÞ, üôáí ôï mail ðïõ ëáìâÜíåôáé áíÞêåé óå êÜðïéá áðü ôéò êáôçãïñßåò ôçò áñéóôåñÞò ðëåõñÜò ôïõ ðßíáêá. Ç åðüìåíç êáôá÷þñçóç áðïññßðôåé ôçí ðáñáëáâÞ mail áðü Ýíá óõãêåêñéìÝíï õðïëïãéóôÞ óôï Internet, ôïí `another.source.of.spam`. Ç åðüìåíç êáôá÷þñçóç êÜíåé äåêôÝò ôéò óõíäÝóåéò mail áðü ôïí õðïëïãéóôÞ `okay.cyberspammer.com`, ôï üíïìá ôïõ ïðïßïõ ðñïóäéïñßæåôáé áêñéâÝóôåñá óå ó÷Ýóç ìå ôç ãñáììÞ `cyberspammer.com` ðïõ åßäáìå ðáñáðÜíù. ÃñáììÝò ðïõ êáèïñßæïõí ïíüìáôá ìå ìåãáëýôåñç áêñßâåéá, Ý÷ïõí ðñïôåñáéüôçôá óå ó÷Ýóç ìå ðéï áóáöåßò. Ç ôåëåõôáßá êáôá÷þñçóç åðéôñÝðåé ôçí áíáìåôÜäïóç (relaying) çëåêôñïíéêïý ôá÷õäñïìåßïõ áðü õðïëïãéóôÝò ìå äéåõèýíóåéò IP ðïõ îåêéíÜíå ìå `128.32`. Ïé õðïëïãéóôÝò áõôïß, ìðïñïýí íá óôåßëïõí mail ìÝóù ôïõ óõãêåêñéìÝíïõ åîõðçñåôçôÞ, ôï ïðïßï íá êáôåõèýíåôáé óå Üëëïõò åîõðçñåôçôÝò ôá÷õäñïìåßïõ.

Óå ðåñßðôùóç áíáíÝùóçò áõôïý ôïõ áñ÷åßïõ, èá ðñÝðåé íá åêôåëÝóåôå ôçí åíôïëÞ `make` óôïí êáôÜëïãï `/etc/mail/` ãéá íá áíáíåþóåôå ôç âÜóç äåäïìÝíùí.

29.3.2 `/etc/mail/aliases`

Ç âÜóç äåäïìÝíùí ôùí ðáñùíõìßùí (aliases), ðåñéÝ÷åé ìéá ëßóôá áðü åéêïíéêÝò èõñßäåò ôá÷õäñïìåßïõ ðïõ åðåêôåßíïíôáé óå Üëëïõò ÷ñÞóôåò, áñ÷åßá Þ êáé Üëëá ðáñùíýìéá. ÌåñéêÜ ðáñáäåßãìáôá ÷ñÞóçò ôïõ `/etc/mail/aliases` öáßíïíôáé ðáñáêÜôù:

ÐáñÜäåéãìá 29-2. Ðáñùíýìéá Mail

```
root: localuser
ftp-bugs: joe,eric,paul
bit.bucket:  /dev/null
procmail: "|/usr/local/bin/procmail"
```

Ç ìïñöÞ ôïõ áñ÷åßïõ åßíáé áðëÞ. Ôï üíïìá ôçò èõñßäáò âñßóêåôáé óôçí áñéóôåñÞ ðëåõñÜ ôçò Üíù-êÜôù ôåëåßáò, êáé åðåêôåßíåôáé óôïí ðñïïñéóìü ðïõ âñßóêåôáé óôç äåîéÜ ðëåõñÜ. Ôï ðñþôï ðáñÜäåéãìá, áðëþò ïñßæåé üôé ç èõñßäá ôïõ ÷ñÞóôç `root` èá åßíáé óôçí ðñáãìáôéêüôçôá ç èõñßäá `localuser`. Ãéá ôçí èõñßäá áõôÞ, ãßíåôáé îáíÜ áíáæÞôçóç óôç âÜóç äåäïìÝíùí ôùí ðáñùíõìéþí. Áí äåí âñåèåß Üëëï üíïìá ðïõ íá ôáéñéÜæåé, ôï ìÞíõìá èá ðáñáäïèåß óôïí ôïðéêü ÷ñÞóôç `localuser`. Ôï åðüìåíï ðáñÜäåéãìá äåß÷íåé ìéá ëßóôá ôá÷õäñïìåßïõ. Ôá ìçíýìáôá ðïõ áðåõèýíïíôáé óôç èõñßäá `ftp-bugs`, êáôåõèýíïíôáé óå ôñåéò ôïðéêÝò èõñßäåò, ôéò `joe`, `eric` êáé `paul`. Óçìåéþóôå üôé åßíáé äõíáôüí íá êáèïñéóôåß ìéá áðïìáêñõóìÝíç èõñßäá ÷ñçóéìïðïéþíôáò ôç ìïñöÞ <`user@example.com`>. Ôï åðüìåíï ðáñÜäåéãìá, äåß÷íåé ðùò ìðïñåß íá ãßíåé åããñáöÞ ôïõ mail óå Ýíá áñ÷åßï, óôç óõãêåêñéìÝíç ðåñßðôùóç ôï `/dev/null`. Ôï ôåëåõôáßï ðáñÜäåéãìá, äåß÷íåé ðùò ãßíåôáé ç áðïóôïëÞ mail ðñïò Ýíá ðñüãñáììá. Óôï ðáñÜäåéãìá áõôü, ôï ìÞíõìá ãñÜöåôáé óôçí ôõðïðïéçìÝíç åßóïäï (standard input) ôïõ ðñïãñÜììáôïò `/usr/local/bin/procmail` ÷ñçóéìïðïéþíôáò Ýíá UNIX pipe.

ÊÜèå öïñÜ ðïõ ãßíåôáé åíçìÝñùóç áõôïý ôïõ áñ÷åßïõ, èá ðñÝðåé íá åêôåëåßôå ôçí åíôïëÞ `make` óôïí êáôÜëïãï `/etc/mail/`, þóôå íá åíçìåñùèåß ç âÜóç äåäïìÝíùí.

29.3.3 `/etc/mail/local-host-names`

Ðñüêåéôáé ãéá ìéá ëßóôá áðü ïíüìáôá õðïëïãéóôþí, ôçí ïðïßá ôï sendmail(8) èá äÝ÷åôáé ùò ïíüìáôá ãéá ôï ôïðéêü ìç÷Üíçìá. ÔïðïèåôÞóôå óå áõôÞí ôá ïíüìáôá ôùí õðïëïãéóôþí Þ ôùí ôïìÝùí ãéá ôïõò ïðïßïõò èÝëåôå ôï **sendmail** íá ëáìâÜíåé mail. Ãéá ðáñÜäåéãìá, áí ï óõãêåêñéìÝíïò åîõðçñåôçôÞò mail ðñüêåéôáé íá ëáìâÜíåé mail ãéá ôïí ôïìÝá `example.com` êáé ãéá ôïí õðïëïãéóôÞ `mail.example.com`, ôï áñ÷åßï `local-host-names` èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
example.com
mail.example.com
```

ÊÜèå öïñÜ ðïõ åíçìåñþíåôáé áõôü ôï áñ÷åßï, èá ðñÝðåé íá ãßíåôáé åðáíåêêßíçóç ôïõ sendmail(8) ãéá íá äéáâÜóåé ôéò áëëáãÝò.

29.3.4 `/etc/mail/sendmail.cf`

Ôï `sendmail.cf` åßíáé ôï êåíôñéêü áñ÷åßï ñõèìßóåùí ôïõ **sendmail**. Ôï áñ÷åßï áõôü ñõèìßæåé ôç óõíïëéêÞ óõìðåñéöïñÜ ôïõ **sendmail**, ðïõ ðåñéëáìâÜíåé ìåôáîý Üëëùí ôçí åðáíåããñáöÞ äéåõèýíóåùí êáé ôçí áðïóôïëÞ ìçíõìÜôùí áðüññéøçò ðñïò áðïìáêñõóìÝíïõò åîõðçñåôçôÝò mail. Êáèþò ôï áñ÷åßï áõôü ðåñéÝ÷åé ôüóï äéáöïñåôéêÝò ñõèìßóåéò, åßíáé öõóéêü íá åßíáé áñêåôÜ ðïëýðëïêï êáé ïé ëåðôïìÝñåéåò ôïõ åßíáé Ýîù áðü ôï óêïðü áõôÞò ôçò åíüôçôáò. Åõôõ÷þò, áõôü ôï áñ÷åßï óðÜíéá ÷ñåéÜæåôáé íá áëëá÷èåß óå ôõðéêïýò åîõðçñåôçôÝò mail.

Ôï âáóéêü áñ÷åßï ñõèìßóåùí ôïõ **sendmail** ìðïñåß íá ðáñá÷èåß ìå ôç âïÞèåéá ìáêñïåíôïëþí ôýðïõ m4(1) ðïõ êáèïñßæïõí ôç óõìðåñéöïñÜ êáé ôá ÷áñáêôçñéóôéêÜ ôïõ **sendmail**. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, ðáñáêáëïýìå äéáâÜóôå ôï `/usr/src/contrib/sendmail/cf/README`.

Ãéá íá éó÷ýóïõí ïé áëëáãÝò ðïõ êÜíåôå óå áõôü ôï áñ÷åßï, èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï **sendmail**.

29.3.5 `/etc/mail/virtusertable`

Ôï áñ÷åßï `virtusertable` áíôéóôïé÷åß äéåõèýíóåéò mail åéêïíéêþí ôïìÝùí óå ðñáãìáôéêÝò èõñßäåò ôá÷õäñïìåßïõ. Ïé èõñßäåò áõôÝò ìðïñåß íá åßíáé ôïðéêÝò, áðïìáêñõóìÝíåò, ðáñùíýìéá ðïõ Ý÷ïõí ïñéóôåß óôï `/etc/mail/aliases`, Þ áñ÷åßá.

ÐáñÜäåéãìá 29-3. ÐáñÜäåéãìá Áíôéóôïß÷çóçò Mail Åéêïíéêïý ÔïìÝá

```
root@example.com                root
postmaster@example.com          postmaster@noc.example.net
@example.com                    joe
```

Óôï ðáñáðÜíù ðáñÜäåéãìá, Ý÷ïõìå ìéá áíôéóôïß÷çóç ãéá ôïí ôïìÝá `example.com`. Ç åðåîåñãáóßá áõôïý ôïõ áñ÷åßïõ ãßíåôáé áðü ðÜíù ðñïò ôá êÜôù, êáé óôáìáôÜåé óôçí åýñåóç ôïõ ðñþôïõ ïíüìáôïò ðïõ ôáéñéÜæåé. Ç ðñþôç ãñáììÞ ôïõ ðáñáäåßãìáôïò, áíôéóôïé÷åß ôï <`root@example.com`> óôçí ôïðéêÞ èõñßäá `root`. Ç åðüìåíç êáôá÷þñçóç áíôéóôïé÷åß ôï <`postmaster@example.com`> óôç èõñßäá `postmaster` óôïí õðïëïãéóôÞ `noc.example.net`. ÔÝëïò, áí äåí âñåèåß êáìéÜ áíôéóôïß÷çóç ãéá ôïí ôïìÝá `example.com`, èá åöáñìïóôåß ç ôåëåõôáßá áíôéóôïß÷çóç, ç ïðïßá ôáéñéÜæåé ìå ïðïéïäÞðïôå mail óôáëèåß ðñïò ôïí ôïìÝá `example.com`. Óôçí ðåñßðôùóç áõôÞ, ôï ìÞíõìá èá ðáñáäïèåß óôçí ôïðéêÞ èõñßäá `joe`.

29.4 ÁëëÜæïíôáò ôïí Áíôéðñüóùðï ÌåôáöïñÜò Ôá÷õäñïìåßïõ (MTA)

ÃñÜöçêå áðü ôïí Andrew Boothman. Ïé ðëçñïöïñßåò ðïõ ðñïÝñ÷ïíôáé áðü e-mails Ý÷ïõí ãñáöåß áðü ôïí Gregory Neil Shapiro.

¼ðùò Ý÷ïõìå Þäç áíáöÝñåé, ôï FreeBSD Ýñ÷åôáé ìå ôï **sendmail** ðñïåãêáôåóôçìÝíï ùò Áíôéðñüóùðï ÌåôáöïñÜò Ôá÷õäñïìåßïõ (Mail Transfer Agent, MTA). Ôï ðñüãñáììá áõôü åßíáé áðü ðñïåðéëïãÞ õðåýèõíï ãéá ôçí åéóåñ÷üìåíç êáé åîåñ÷üìåíç áëëçëïãñáößá.

ÕðÜñ÷åé ùóôüóï ðëçèþñá ëüãùí ãéá ôïõò ïðïßïõò êÜðïéïé äéá÷åéñéóôÝò åðéëÝãïõí íá áëëÜîïõí ôï MTA ôïõ óõóôÞìáôïò ôïõò. Ïé ëüãïé áõôïß êõìáßíïíôáé áðü ôï üôé áðëÜ èÝëïõí íá äïêéìÜóïõí êÜðïéï Üëëï MTA, ùò êáé ôï üôé ÷ñåéÜæïíôáé êÜðïéï éäéáßôåñï ÷áñáêôçñéóôéêü Þ äõíáôüôçôá ðïõ õðÜñ÷åé óå êÜðïéï Üëëï mailer. Åõôõ÷þò, ôï FreeBSD êÜíåé åýêïëç ôçí áëëáãÞ ôïõ áíôéðñïóþðïõ.

29.4.1 ÅãêáôáóôÞóôå ÍÝï MTA

ÕðÜñ÷ïõí áñêåôïß MTA ãéá íá åðéëÝîåôå. ¸íá êáëü óçìåßï åêêßíçóçò åßíáé ç ÓõëëïãÞ ôùí Ports ôïõ FreeBSD üðïõ êáé èá ìðïñÝóåôå íá âñåßôå áñêåôïýò. ÖõóéêÜ åßóôå åëåýèåñïé íá åðéëÝîåôå üðïéï MTA èÝëåôå áðü ïðïõäÞðïôå, üóï ôïõëÜ÷éóôïí ìðïñåßôå íá ôï êÜíåôå íá åêôåëåßôå óôï FreeBSD.

ÎåêéíÞóôå åãêáèéóôþíôáò ôï íÝï óáò MTA. ÌåôÜ ôçí åãêáôÜóôáóç, èá Ý÷åôå ôçí åõêáéñßá íá áðïöáóßóåôå áí ðñáãìáôéêÜ êáëýðôåé ôéò áíÜãêåò óáò, êáèþò êáé íá ïëïêëçñþóåôå ôéò ñõèìßóåéò ôïõ ðñéí ìåôáöÝñåôå ôç äéá÷åßñéóç mail ôïõ óõóôÞìáôïò áðü ôï **sendmail** óôï íÝï óáò ðñüãñáììá. ÊáôÜ ôçí åãêáôÜóôáóç, âåâáéùèåßôå üôé ôï íÝï óáò ëïãéóìéêü äåí èá ðñïóðáèÞóåé íá åãêáôáóôáèåß ðÜíù óôá õðÜñ÷ïíôá åêôåëÝóéìá ôïõ óõóôÞìáôïò, üðùò ôï `/usr/bin/sendmail`. ÄéáöïñåôéêÜ, èá Ý÷åôå ïõóéáóôéêÜ âÜëåé ôï íÝï óáò ëïãéóìéêü mail óå ÷ñÞóç, ðñéí ðñïëÜâåôå êáëÜ-êáëÜ íá ôï ñõèìßóåôå.

Ðáñáêáëïýìå íá äéáâÜóåôå ôçí ôåêìçñßùóç ôïõ MTA ðïõ åðéëÝîáôå, ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ñýèìéóç ôïõ.

29.4.2 ÁðåíåñãïðïéÞóôå ôï sendmail

> **Ðñïåéäïðïßçóç:** Áí áðåíåñãïðïéÞóåôå ôç äõíáôüôçôá áðïóôïëÞò (åîåñ÷üìåíá) ôïõ **sendmail**, åßíáé óçìáíôéêü íá ôçí áíôéêáôáóôÞóåôå ìå Ýíá åíáëëáêôéêü óýóôçìá ðáñÜäïóçò mail. Áí åðéëÝîåôå íá ìçí êÜíåôå ôï ðáñáðÜíù, ôá ìçíýìáôá ôïõ óõóôÞìáôïò, üðùò áõôÜ ðïõ ðáñÜãïíôáé áðü ôï periodic(8), äåí èá ìðïñïýí íá ðáñáäïèïýí ìÝóù email, üðùò åßíáé ôï áíáìåíüìåíï. ÐïëëÜ ôìÞìáôá ôïõ óõóôÞìáôïò óáò áíáìÝíïõí üôé õðÜñ÷åé óå ëåéôïõñãßá Ýíá óýóôçìá óõìâáôü ìå ôï **sendmail**. Áí ïé åöáñìïãÝò óõíå÷ßæïõí íá ÷ñçóéìïðïéïýí ôá åêôåëÝóéìá ôïõ **sendmail** ðñïóðáèþíôáò íá óôåßëïõí email ìåôÜ ôçí áðåíåñãïðïßçóç ôïõ, ôï mail ðéèáíþò èá âñåèåß óå ìéá áíåíåñãÞ ïõñÜ ôïõ **sendmail** êáé äåí èá ðáñáäïèåß ðïôÝ.

Ãéá íá áðåíåñãïðïéÞóåôå åíôåëþò ôï **sendmail**, óõìðåñéëáìâáíïìÝíçò êáé ôçò õðçñåóßáò åîåñ÷üìåíùí ìçíõìÜôùí, ÷ñçóéìïðïéÞóôå:

```
sendmail_enable="NO"
sendmail_submit_enable="NO"
sendmail_outbound_enable="NO"
sendmail_msp_queue_enable="NO"
```

óôï `/etc/rc.conf`.

Áí èÝëåôå íá áðåíåñãïðïéÞóåôå ìüíï ôçí õðçñåóßá åéóåñ÷ïìÝíùí ôïõ **sendmail** èá ðñÝðåé íá èÝóåôå:

```
sendmail_enable="NO"
```

óôï `/etc/rc.conf`. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôéò åðéëïãÝò åêêßíçóçò ôïõ **sendmail**, äéáôßèåíôáé áðü ôçí áíôßóôïé÷ç óåëßäá manual, rc.sendmail(8).

29.4.3 Åêêßíçóç ôïõ ÍÝïõ óáò MTA êáôÜ ôçí Åêêßíçóç

Ôï íÝï óáò MTA èá îåêéíÜåé êáôÜ ôçí åêêßíçóç, áí ðñïóèÝóåôå ìéá êáôÜëëçëç ãñáììÞ óôï áñ÷åßï `/etc/rc.conf`. Äåßôå ôï ðáñáêÜôù ðáñÜäåéãìá ãéá ôï **postfix**:

```
# echo 'postfix_enable="YES"' >> /etc/rc.conf
```

Ôï MTA èá îåêéíÜåé ðëÝïí êáôÜ ôçí åêêßíçóç.

29.4.4 Áíôéêáèéóôþíôáò ôï sendmail áðü ÐñïåðéëåãìÝíï Mailer ÓõóôÞìáôïò

Ôï **sendmail** åßíáé ôüóï ãíùóôü ùò óôÜíôáñ ëïãéóìéêü óôá óõóôÞìáôá UNIX, þóôå ðïëëÜ Üëëá ðñïãñÜììáôá èåùñïýí üôé åßíáé Þäç åãêáôåóôçìÝíï êáé ñõèìéóìÝíï. Ãéá ôï ëüãï áõôü, ðïëëÜ åíáëëáêôéêÜ MTA ðáñÝ÷ïõí äéêÝò ôïõò óõìâáôÝò õëïðïéÞóåéò ôïõ **sendmail**. Ïé õëïðïéÞóåéò áõôÝò ðáñÝ÷ïõí ðáñüìïéï óýíïëï åíôïëþí, êáé ìðïñïýí Ýôóé íá ÷ñçóéìïðïéçèïýí þóôå íá áíôéêáôáóôÞóïõí “áðåõèåßáò” ôï **sendmail**.

Ãéá ôï ëüãï áõôü, áí ÷ñçóéìïðïéåßôå êÜðïéï åíáëëáêôéêü mailer, èá èÝëåôå íá åîáóöáëßóåôå üôé Üëëá ðñïãñÜììáôá ðïõ ðñïóðáèïýí íá åêôåëÝóïõí ôá ôõðéêÜ åêôåëÝóéìá ôïõ **sendmail** üðùò ôï `/usr/bin/sendmail`, èá åêôåëÝóïõí óôçí ðñáãìáôéêüôçôá ôïí åðéëåãìÝíï óáò mailer. Åõôõ÷þò, ôï FreeBSD ðáñÝ÷åé Ýíá óýóôçìá ðïõ êáëåßôå mailwrapper(8) êáé ôï ïðïßï áíáëáìâÜíåé áõôÞ ôç äïõëåéÜ ãéá óáò.

¼ôáí ôï **sendmail** ëåéôïõñãåß üðùò Ý÷åé åãêáôáóôáèåß áñ÷éêÜ, èá âñåßôå êÜôé üðùò ôï ðáñáêÜôù óôï `/etc/mail/mailer.conf`:

```
sendmail         /usr/libexec/sendmail/sendmail
send-mail       /usr/libexec/sendmail/sendmail
mailq           /usr/libexec/sendmail/sendmail
newaliases      /usr/libexec/sendmail/sendmail
hoststat        /usr/libexec/sendmail/sendmail
purgestat       /usr/libexec/sendmail/sendmail
```

Áõôü óçìáßíåé üôé üôáí åêôåëåßôáé êÜðïéá áðü áõôÝò ôéò óõíçèéóìÝíåò åíôïëÝò (üðùò ôï ßäéï ôï `sendmail`), ôï óýóôçìá óôçí ðñáãìáôéêüôçôá åêôåëåß Ýíá áíôßãñáöï ôïõ mailwrapper ðïõ ïíïìÜæåôáé `sendmail`, êáé ôï ïðïßï åëÝã÷åé ôï `mailer.conf` êáé åêôåëåß ôï `/usr/libexec/sendmail/sendmail` áíôß áõôïý. Ôï óýóôçìá áõôü äéåõêïëýíåé éäéáßôåñá ôçí áëëáãÞ ôùí åêôåëÝóéìùí ðïõ åêôåëïýíôáé óôçí ðñáãìáôéêüôçôá üôáí ãßíåôáé êëÞóç ôùí ðñïåðéëåãìÝíùí ëåéôïõñãéþí ôïõ `sendmail`.

¸ôóé, áí èÝëåôå íá åêôåëåßôáé ôï `/usr/local/supermailer/bin/sendmail-compat` áíôß ãéá ôï **sendmail**, èá ìðïñïýóáôå íá áëëÜîåôå ôï `/etc/mail/mailer.conf` þóôå íá ãñÜöåé:

```
sendmail         /usr/local/supermailer/bin/sendmail-compat
send-mail       /usr/local/supermailer/bin/sendmail-compat
mailq           /usr/local/supermailer/bin/mailq-compat
newaliases      /usr/local/supermailer/bin/newaliases-compat
hoststat        /usr/local/supermailer/bin/hoststat-compat
purgestat       /usr/local/supermailer/bin/purgestat-compat
```

29.4.5 Ïëïêëçñþíïíôáò

Ìüëéò Ý÷åôå ñõèìßóåé ôá ðÜíôá üðùò åðéèõìåßôå, ìðïñåßôå åßôå íá êÜíåôå kill ôéò äéåñãáóßåò ôïõ **sendmail** ðïõ äåí ÷ñåéÜæåóôå ðëÝïí êáé íá åêêéíÞóåôå ôéò áíôßóôïé÷åò ôïõ íÝïõ óáò ëïãéóìéêïý, Þ áðëþò íá êÜíåôå åðáíåêêßíçóç. Ç åðáíåêêßíçóç èá óáò äþóåé åðßóçò ôçí åõêáéñßá íá âåâáéùèåßôå üôé ôï óýóôçìá óáò Ý÷åé ñõèìéóôåß óùóôÜ, þóôå ôï íÝï óáò MTA íá îåêéíÜåé áõôüìáôá óå êÜèå åêêßíçóç.

29.5 Áíôéìåôþðéóç ÐñïâëçìÜôùí

1. Ãéáôß ðñÝðåé íá ÷ñçóéìïðïéþ ôï ðëÞñåò üíïìá (FQDN) ãéá õðïëïãéóôÝò ðïõ âñßóêïíôáé óôïí ôïìÝá ìïõ;

Ôï ðéï ðéèáíü åßíáé íá äéáðéóôþóåôå üôé ï õðïëïãéóôÞò âñßóêåôáé óôçí ðñáãìáôéêüôçôá óå äéáöïñåôéêü ôïìÝá. Ãéá ðáñÜäåéãìá, áí âñßóêåóôå óôï `foo.bar.edu` êáé èÝëåôå íá åðéêïéíùíÞóåôå ìå Ýíá õðïëïãéóôÞ ìå ôï üíïìá `mumble` óôïí ôïìÝá `bar.edu`, èá ðñÝðåé íá áíáöåñèåßôå óå áõôüí ìå ôï ðëÞñåò ôïõ üíïìá, `mumble.bar.edu`, áíôß ãéá áðëþò `mumble`.

ÐáñáäïóéáêÜ, áõôü åðéôñåðüôáí áðü ôïõò DNS resolvers ôïõ BIND. Ùóôüóï, ç ôñÝ÷ïõóá Ýêäïóç ôïõ **BIND** ðïõ ðåñéëáìâÜíåôáé óôï FreeBSD, äåí ðáñÝ÷åé ðëÝïí óõíôïìåýóåéò ãéá ìç-ðëÞñç ïíüìáôá ôïìÝùí, åêôüò ãéá ôïí ôïìÝá óôïí ïðïßï âñßóêåóôå. ¸ôóé, Ýíáò õðïëïãéóôÞò ìå ìç-ðëÞñåò üíïìá `mumble` èá ðñÝðåé íá âñåèåß ùò `mumble.foo.bar.edu`, Þ èá ãßíåé áíáæÞôçóç ãéá áõôüí óôï ñéæéêü ôïìÝá.

Ç óõìðåñéöïñÜ áõôÞ åßíáé äéáöïñåôéêÞ áðü ôçí ðñïçãïýìåíç, üðïõ ç áíáæÞôçóç óõíå÷éæüôáí êáé óôï `mumble.bar.edu`, êáé ôï `mumble.edu`. Ñßîôå ìéá ìáôéÜ óôï RFC 1535 ãéá ôï ëüãï ðïõ ôï ðáñáðÜíù èåùñåßôå êáêÞ ðñáêôéêÞ, Þ áêüìá êáé êåíü áóöáëåßáò.

¸íáò ôñüðïò ãéá íá ðáñáêÜìøåôå ôï ðñüâëçìá åßíáé íá ðñïóèÝóåôå ôç ãñáììÞ:

```
search foo.bar.edu bar.edu
```

áíôß ãéá ôçí ðñïçãïýìåíç:

```
domain foo.bar.edu
```

óôï áñ÷åßï `/etc/resolv.conf`. Âåâáéùèåßôå ùóôüóï üôé ç óåéñÜ áíáæÞôçóçò äåí ðçãáßíåé ðÝñá áðü ôï “üñéï ìåôáîý ôïðéêÞò êáé äçìüóéáò äéá÷åßñéóçò”, üðùò ôï áðïêáëåß ôï RFC 1535.

2. Ôï **sendmail** äßíåé ôï ìÞíõìá `mail loops back to myself` (ôï mail åðéóôñÝöåé óôïí åáõôü ìïõ)

Ç áðÜíôçóç óå áõôü, õðÜñ÷åé óôï FAQ ôïõ **sendmail** üðùò öáßíåôáé ðáñáêÜôù:

```
ËáìâÜíù áõôÜ ôá ìçíýìáôá ëÜèïõò:

553 MX list for domain.net points back to relay.domain.net
554 <user@domain.net>... Local configuration error

Ðùò ìðïñþ íá ëýóù ôï ðñüâëçìá;

¸÷åôå æçôÞóåé ôï mail ðñïò Ýíá ôïìÝá (ð.÷. ôï domain.net) íá
ðñïùèåßôáé ðñïò Ýíá óõãêåêñéìÝíï õðïëïãéóôÞ (óôçí ðåñßðôùóç áõôÞ
ôï relay.domain.net) ÷ñçóéìïðïéþíôáò ìéá åããñáöÞ MX, áëëÜ ôï
ìç÷Üíçìá áíáìåôÜäïóçò (relay) äåí áíáãíùñßæåé ôïí åáõôü ôïõ ùò
domain.net.  ÐñïóèÝóôå ôï domain.net óôï /etc/mail/local-host-names
[åßíáé ãíùóôü ùò /etc/sendmail.cw ðñéí ôçí Ýêäïóç 8.10]
(áí ÷ñçóéìïðïéåßôå ôï FEATURE(use_cw_file)), äéáöïñåôéêÜ ðñïóèÝóôå ôï
“Cw domain.net” óôï /etc/mail/sendmail.cf.
```

Ìðïñåßôå íá âñåßôå ôï FAQ ôïõ **sendmail** óôç äéåýèõíóç http://www.sendmail.org/faq/, êáé óõíßóôáôáé íá ôï äéáâÜóåôå áí èÝëåôå íá “ðåéñÜîåôå” ôéò ñõèìßóåéò ôïõ mail óáò.

3. Ðùò ìðïñþ íá åêôåëÝóù åîõðçñåôçôÞ mail óå õðïëïãéóôÞ ðïõ óõíäÝåôáé ìÝóù åðéëïãéêÞò óýíäåóçò PPP;

ÈÝëåôå íá óõíäÝóåôå Ýíá FreeBSD ìç÷Üíçìá óå Ýíá ôïðéêü äßêôõï (LAN) óôï Internet. Ôï FreeBSD ìç÷Üíçìá èá ãßíåé ðýëç ôá÷õäñïìåßïõ ãéá ôï LAN. Ç óýíäåóç PPP äåí åßíáé áðïêëåéóôéêÞ.

ÕðÜñ÷ïõí ôïõëÜ÷éóôïí äýï ôñüðïé ãéá íá ôï êÜíåôå áõôü. Ï Ýíáò åßíáé ìå ôç ÷ñÞóç UUCP.

¸íáò Üëëïò ôñüðïò åßíáé íá âñåßôå Ýíá åîõðçñåôçôÞ Internet ï ïðïßïò Ý÷åé óõíå÷Þ óýíäåóç, íá óáò ðáñÝ÷åé õðçñåóßá äåõôåñåýïíôïò MX ãéá ôïí ôïìÝá óáò. Ãéá ðáñÜäåéãìá, áí ï ôïìÝáò ôçò åôáéñßáò óáò åßíáé `example.com` êáé ï ðáñï÷Ýáò óáò Internet Ý÷åé ïñßóåé ôï `example.net` íá ðáñÝ÷åé õðçñåóßåò äåõôåñåýïíôïò MX ãéá ôïí ôïìÝá óáò:

```
example.com.          MX        10      example.com.
                      MX        20      example.net.
```

Ìüíï Ýíáò õðïëïãéóôÞò ìðïñåß íá êáèïñéóôåß ùò ôåëéêüò ðáñáëÞðôçò (ðñïóèÝóôå ôï `Cw example.com` óôï áñ÷åßï `/etc/mail/sendmail.cf` óôï `example.com`).

¼ôáí ôï ìç÷Üíçìá ðïõ óôÝëíåé ìÝóù ôïõ `sendmail` ðñïóðáèåß íá ðáñáäþóåé ôï mail èá ðñïóðáèÞóåé íá óõíäåèåß óôï äéêü óáò (`example.com`) ìÝóù ôçò óýíäåóçò modem. Ôï ðéï ðéèáíü åßíáé üôé äåí èá ôá êáôáöÝñåé, ãéáôß äåí èá åßóôå óõíäåìÝíïé åêåßíç ôç óôéãìÞ. Ôï **sendmail** èá ôï ðáñáäþóåé áõôüìáôá óôçí õðçñåóßá äåõôåñåýïíôïò MX, ð.÷. ôïí ðáñï÷Ýá óáò Internet (`example.net`). Ôï äåõôåñåýïí MX èá ðñïóðáèåß ðåñéïäéêÜ íá óõíäåèåß óôï ìç÷Üíçìá óáò êáé íá ðáñáäþóåé ôï mail óôïí êýñéï åîõðçñåôçôÞ MX (`example.com`).

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå êÜôé üðùò ôï ðáñáêÜôù ùò script åéóüäïõ:

```
#!/bin/sh
# Put me in /usr/local/bin/pppmyisp
( sleep 60 ; /usr/sbin/sendmail -q ) &
/usr/sbin/ppp -direct pppmyisp
```

Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ÷ùñéóôü script ãéá ôçí åßóïäï êÜðïéïõ ÷ñÞóôç, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå áíôß ãéá ôï ðáñáðÜíù ôï `sendmail -qRexample.com` óôï script. Áõôü èá åîáíáãêÜóåé ôçí Üìåóç åðåîåñãáóßá üëïõ ôïõ mail óôçí ïõñÜ ãéá ôï `example.com`.

Ðéï ëåðôïìåñÞò ðåñéãñáöÞ ôçò êáôÜóôáóçò öáßíåôáé ðáñáêÜôù:

ÌÞíõìá áðü ôçí çëåêôñïíéêÞ ëßóôá ôïõ FreeBSD ãéá ôïõò ðáñï÷åßò õðçñåóéþí Internet (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isp).

```
> ðáñÝ÷ïõìå äåõôåñåýïí MX ãéá Ýíá ðåëÜôç.  Ï ðåëÜôçò óõíäÝåôáé óôéò
> õðçñåóßåò ìáò áñêåôÝò öïñÝò ôç ìÝñá áõôüìáôá, ãéá íá ëáìâÜíåé ôá email ôïõ
> óôï ðñùôåýïí ôïõ MX (Äåí êáëïýìå ôçí ôïðïèåóßá ôïõ üôáí ëáìâÜíïõìå email
> ãéá ôïí ôïìÝá ôïõ).  Ôï sendmail ìáò óôÝëíåé ôï  mailqueue êÜèå 30 ëåðôÜ.
> Ôç äåäïìÝíç óôéãìÞ èá ðñÝðåé íá ìåßíåé óõíäåìÝíïò ãéá 30 ëåðôÜ,
> ãéá íá åßíáé âÝâáéïò üôé üëï ôï email ôïõ èá Ý÷åé
> ðáñáäïèåß óôïí ðñùôåýïíôá MX.
>
> ÕðÜñ÷åé êÜðïéá åíôïëÞ ðïõ íá åîáíáãêÜóåé ôï sendmail íá óôåßëåé
> üëá ôá mails Üìåóá; Ï ÷ñÞóôçò öõóéêÜ äåí Ý÷åé äéêáéþìáôá
> root óôï ìç÷Üíçìá ìáò.

Óôçí åíüôçôá “privacy flags” ôïõ sendmail.cf, õðÜñ÷åé Ýíáò
ïñéóìüò Opgoaway,restrictqrun

ÁöáéñÝóôå ôï restrictqrun ãéá íá åðéôñÝøåôå óå ìç-root ÷ñÞóôåò íá îåêéíÞóïõí
ôçí åðåîåñãáóßá ôçò ïõñÜò.
Ìðïñåß åðßóçò íá èÝëåôå íá áíáäéáôÜîåôå ôá MX.  Åßìáóôå ôï 1ï MX ãéá áõôïý
ôïõ åßäïõò ôïõò ðåëÜôåò, êáé Ý÷ïõìå ïñßóåé:

# If we are the best MX for a host, try directly instead of generating
# local config error.
OwTrue

Ìå ôïí ôñüðï áõôü, Ýíá áðïìáêñõóìÝíï site èá ðáñáäßäåé áðåõèåßáò óå óáò,
÷ùñßò íá ðñïóðáèåß ôç óýíäåóç ìå ôï ÷ñÞóôç.  ¸ðåéôá ôá óôÝëíåôå óôïí
ðåëÜôç óáò.  Áõôü ëåéôïõñãåß ìüíï ãéá “ìç÷áíÞìáôá”, êáé Ýôóé
÷ñåéÜæåôáé íá âÜëåôå ôïí ðåëÜôç óáò íá ïíïìÜóåé ôï ìç÷Üíçìá ôïõ mail
“customer.com” êáé åðßóçò
“hostname.customer.com” óôï DNS.  Áðëþò ðñïóèÝóôå ìéá åããñáöÞ
ôýðïõ A óôï DNS ãéá ôï “customer.com”.
```

4. Ãéáôß ëáìâÜíù óõíÝ÷åéá ìçíýìáôá ëÜèïõò `Relaying Denied` üôáí óôÝëíù mail áðü Üëëïõò õðïëïãéóôÝò;

Óôéò ðñïåðéëåãìÝíåò åãêáôáóôÜóåéò ôïõ FreeBSD, ôï **sendmail** åßíáé ñõèìéóìÝíï íá óôÝëíåé mail ìüíï áðü ôïí õðïëïãéóôÞ óôïí ïðïßï åêôåëåßôáé. Ãéá ðáñÜäåéãìá, áí õðÜñ÷åé äéáèÝóéìïò äéáêïìéóôÞò POP, ïé ÷ñÞóôåò èá ìðïñïýí íá åëÝã÷ïõí ôï mail ôïõò áðü ôï ó÷ïëåßï, ôï ãñáöåßï, Þ Üëëç áðïìáêñõóìÝíç ôïðïèåóßá, áëëÜ èá åîáêïëïõèïýí íá ìçí ìðïñïýí íá óôåßëïõí ðñïò åîùôåñéêÝò äéåõèýíóåéò. ÔõðéêÜ, ëßãï ìåôÜ áðü ìéá áðüðåéñá áðïóôïëÞò, èá óôáëåß Ýíá email áðü ôïí **MAILER-DAEMON** ìå ôï ìÞíõìá ëÜèïõò `5.7 Relaying Denied`.

ÕðÜñ÷ïõí äéÜöïñïé ôñüðïé ãéá íá îåðåñÜóåôå ôï ðñüâëçìá. Ï ðëÝïí áðëüò åßíáé íá âÜëåôå ôç äéåýèõíóç ôïõ ISP óáò óå Ýíá áñ÷åßï relay-domains, `/etc/mail/relay-domains`. ¸íáò ãñÞãïñïò ôñüðïò ãéá íá ôï êÜíåôå áõôü åßíáé:

```
# echo "your.isp.example.com" > /etc/mail/relay-domains
```

Áöïý äçìéïõñãÞóåôå Þ åðåîåñãáóôåßôå áõôü ôï áñ÷åßï, èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï **sendmail**. Áõôü äïõëåýåé ìéá ÷áñÜ áí åßóôå äéá÷åéñéóôÞò åîõðçñåôçôÞ êáé äåí åðéèõìåßôå íá óôÝëíåôå mail ôïðéêÜ, Þ áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå Ýíá óýóôçìá ôýðïõ point êáé click óå Ýíá Üëëï ìç÷Üíçìá Þ áêüìá êáé óå Üëëï ISP. Åßíáé åðßóçò ðïëý ÷ñÞóéìï áí Ý÷åôå ñõèìßóåé ìüíï Ýíá Þ äýï ëïãáñéáóìïýò mail. Áí èÝëåôå íá ðñïóèÝóåôå ìåãáëýôåñï áñéèìü äéåõèýíóåùí, ìðïñåßôå áðëþò íá áíïßîåôå áõôü ôï áñ÷åßï ìå ôïí åðéèõìçôü óõíôÜêôç êåéìÝíïõ, êáé íá ðñïóèÝóåôå üëïõò ôïõò ôïìåßò, Ýíá óå êÜèå ãñáììÞ:

```
your.isp.example.com
other.isp.example.net
users-isp.example.org
www.example.org
```

Ôþñá, ïðïéáäÞðïôå áðïóôïëÞ mail áðü ôï óýóôçìá óáò áðü ïðïéïäÞðïôå õðïëïãéóôÞ áõôÞò ôçò ëßóôáò (ìå ôçí ðñïûðüèåóÞ ï ÷ñÞóôçò íá Ý÷åé ëïãáñéáóìü óôï óýóôçìá óáò), èá åßíáé åðéôõ÷Þò. Ðñüêåéôáé ãéá Ýíá ðïëý êáëü ôñüðï íá åðéôñÝøåôå óôïõò ÷ñÞóôåò íá óôÝëíïõí mail áðü ôï óýóôçìá óáò ìÝóù áðïìáêñõóìÝíçò óýíäåóçò, ÷ùñßò íá åðéôñÝðåôå óå Üëëïõò íá óôÝëíïõí SPAM ìÝóù ôïõ óõóôÞìáôïò óáò.

29.6 Ðñï÷ùñçìÝíá ÈÝìáôá

Ç áêüëïõèç åíüôçôá êáëýðôåé ðéï ðñï÷ùñçìÝíá èÝìáôá, üðùò ôç ñýèìéóç ôïõ mail êáé ñõèìßóåéò ãéá Ýíá ïëüêëçñï ôïìÝá.

29.6.1 ÂáóéêÝò Ñõèìßóåéò

×ùñßò íá ÷ñåéáóôåß íá êÜíåôå êáìéÜ ñýèìéóç, èá ìðïñåßôå íá óôåßëåôå mail ðñïò åîùôåñéêïýò õðïëïãéóôÝò, áñêåß íá Ý÷åôå ñõèìßóåé ôï `/etc/resolv.conf` Þ íá åêôåëåßôå ôï äéêü óáò åîõðçñåôçôÞ DNS. Áí èÝëåôå íá ðáñáëáìâÜíåôå mail ãéá ôïí õðïëïãéóôÞ óáò óôï äéêü óáò **sendmail** MTA, õðÜñ÷ïõí äýï ìÝèïäïé:

- Ìðïñåßôå íá Ý÷åôå äéêü óáò ôïìÝá êáé äéêü óáò åîõðçñåôçôÞ DNS ãéá ôïí ôïìÝá óáò. Ãéá ðáñÜäåéãìá, `FreeBSD.org`
- Íá ðáñáëáìâÜíåôå mail áðåõèåßáò óôï ìç÷Üíçìá óáò. Áõôü ãßíåôáé áí ôï mail ðáñáäßäåôáé áðåõèåßáò óôïí õðïëïãéóôÞ óáò, ÷ñçóéìïðïéþíôáò ôïí üíïìá ôïõ (ðñÝðåé íá âñßóêåôáé óôï DNS). Ãéá ðáñÜäåéãìá, `example.FreeBSD.org`.

¼ðïéá åðéëïãÞ áðü ôéò ðáñáðÜíù êáé íá êÜíáôå, ãéá íá åßíáé äõíáôÞ ç ðáñáëáâÞ mail áðåõèåßáò óôïí õðïëïãéóôÞ óáò, èá ðñÝðåé íá Ý÷åôå ìüíéìç óôáôéêÞ äéåýèõíóç IP (ü÷é äõíáìéêÞ, üðùò åßíáé ïé ðåñéóóüôåñåò åðéëïãéêÝò óõíäÝóåéò PPP). Áí âñßóêåóôå ðßóù áðü êÜðïéï firewall, èá ðñÝðåé íá åðéôñÝðåé ôç äéáêßíçóç SMTP ðñïò åóÜò. Áí èÝëåôå íá ëáìâÜíåôå mail áðåõèåßáò óôïí õðïëïãéóôÞ óáò, èá ðñÝðåé íá åîáóöáëßóåôå *Ýíá* áðü ôá ðáñáêÜôù:

- Íá âåâáéùèåßôå üôé ç åããñáöÞ MX (ìå ôï ÷áìçëüôåñï áñéèìü) óôï DNS óáò, äåß÷íåé ðñïò ôç äéåýèõíóç IP ôïõ ìç÷áíÞìáôïò óáò.
- Íá âåâáéùèåßôå üôé äåí õðÜñ÷åé êáìéÜ åããñáöÞ MX óôï DNS ãéá ôïí õðïëïãéóôÞ óáò.

¼ðïéï áðü ôá ðáñáðÜíù êáé áí êÜíåôå, èá ìðïñåßôå íá ëáìâÜíåôå mail áðåõèåßáò óôïí õðïëïãéóôÞ óáò.

ÄïêéìÜóôå áõôü:

```
# hostname
example.FreeBSD.org
# host example.FreeBSD.org
example.FreeBSD.org has address 204.216.27.XX
```

Áí âëÝðåôå ôï ðáñáðÜíù, ôï mail ðïõ êáôåõèýíåôáé áðåõèåßáò óôï <`yourlogin@example.FreeBSD.org`> èá ðñÝðåé íá ëáìâÜíåôáé ÷ùñßò ðñïâëÞìáôá (èåùñþíôáò üôé ôï **sendmail** åêôåëåßôå óùóôÜ óôïí õðïëïãéóôÞ `example.FreeBSD.org`).

Áí áíôß ãéá áõôü äåßôå êÜôé óáí ôï ðáñáêÜôù:

```
# host example.FreeBSD.org
example.FreeBSD.org has address 204.216.27.XX
example.FreeBSD.org mail is handled (pri=10) by hub.FreeBSD.org
```

¼ëï ôï mail ðïõ êáôåõèýíåôáé ðñïò ôïí õðïëïãéóôÞ óáò (`example.FreeBSD.org`) èá êáôáëÞîåé íá óõëëÝãåôáé óôï `hub` ìå ôï ßäéï üíïìá ÷ñÞóôç, áíôß íá óôáëåß áðåõèåßáò óôï ìç÷Üíçìá óáò.

Ôéò ðáñáðÜíù ðëçñïöïñßåò, ôéò ÷åéñßæåôáé ï äéêüò óáò åîõðçñåôçôÞò DNS. Ç åããñáöÞ DNS ðïõ ðåñéÝ÷åé ôéò ðëçñïöïñßåò äñïìïëüãçóçò ãéá ôï mail, åßíáé ç *M*ail e*X*change. Áí äåí õðÜñ÷åé åããñáöÞ MX, ôï mail èá ðáñáäßäåôáé áðåõèåßáò óôïí õðïëïãéóôÞ ìÝóù ôçò IP äéåýèõíóçò ôïõ.

Ç êáôá÷þñéóç MX ãéá ôïí `freefall.FreeBSD.org` Ýìïéáæå êÜðïéá óôéãìÞ ìå ôçí ðáñáêÜôù:

```
freefall        MX   30   mail.crl.net
freefall        MX   40   agora.rdrop.com
freefall        MX   10   freefall.FreeBSD.org
freefall        MX   20   who.cdrom.com
```

¼ðùò ìðïñåßôå íá äåßôå, ï `freefall` åß÷å ðïëëÝò êáôá÷ùñÞóåéò MX. Ç êáôá÷þñçóç ìå ôïí ìéêñüôåñï áñéèìü, åßíáé ï õðïëïãéóôÞò ðïõ ëáìâÜíåé ôï mail áðåõèåßáò, áí åßíáé äéáèÝóéìïò. Áí ãéá êÜðïéï ëüãï äåí åßíáé ðñïóâÜóéìïò, ïé Üëëïé (ðïõ ïñéóìÝíåò öïñÝò êáëïýíôáé “backup MXes”) äÝ÷ïíôáé ôá ìçíýìáôá ðñïóùñéíÜ êáé ôá ìåôáâéâÜæïõí óå êÜðïéï õðïëïãéóôÞ ìå ÷áìçëüôåñç áñßèìçóç, ìüëéò ãßíåé äéáèÝóéìïò. ÔåëéêÜ ôá ìçíýìáôá êáôáëÞãïõí óôïí õðïëïãéóôÞ ìå ôï ìéêñüôåñï áñéèìü.

Ïé åíáëëáêôéêÝò ôïðïèåóßåò MX, èá ðñÝðåé íá ÷ñçóéìïðïéïýí äéáöïñåôéêÝò ãñáììÝò ãéá ôç óýíäåóç ôïõò ìå ôï Internet. ÁõôÞ åßíáé ç êáëýôåñç ëýóç. Ï ðáñï÷Ýáò óáò Þ êÜðïéï Üëëï öéëéêü site, äåí èá Ý÷ïõí êáíÝíá ðñüâëçìá íá óáò ðáñÝ÷ïõí áõôÞ ôçí õðçñåóßá.

29.6.2 Mail ãéá ôïí ÔïìÝá Óáò

Ãéá íá äçìéïõñãÞóåôå Ýíá “mailhost” (äçë. Ýíá åîõðçñåôçôÞ mail) èá ðñÝðåé ïðïéïäÞðïôå mail óôÝëíåôáé ðñïò êÜðïéï óôáèìü åñãáóßáò, íá ëáìâÜíåôáé óå áõôüí. ÂáóéêÜ èá èÝëåôå íá “äéåêäéêåßôå” ïðïéïäÞðïôå mail ðïõ êáôåõèýíåôáé ðñïò ïðïéïäÞðïôå üíïìá ìç÷áíÞìáôïò ôïõ ôïìÝá óáò (óôçí ðåñßðôùóç ìáò ôï `*.FreeBSD.org`) êáé íá ôï áíáêáôåõèýíåôå ðñïò ôïí åîõðçñåôçôÞ mail, þóôå ïé ÷ñÞóôåò óáò íá ìðïñïýí íá ëÜâïõí ôï mail ôïõò áðü ôïí êåíôñéêü åîõðçñåôçôÞ.

Ãéá åõêïëßá, èá ðñÝðåé íá Ý÷åôå Ýíá ëïãáñéáóìü ÷ñÞóôç ìå ôï ßäéï *üíïìá ÷ñÞóôç* êáé óôá äýï ìç÷áíÞìáôá. ×ñçóéìïðïéÞóôå ãéá ôï óêïðü áõôü ôçí åíôïëÞ adduser(8).

Ï mailhost ðïõ èá ÷ñçóéìïðïéÞóåôå, ðñÝðåé íá åßíáé ôï êáèïñéóìÝíï ìç÷Üíçìá ãéá ôçí áíôáëëáãÞ ìçíõìÜôùí ãéá êÜèå óôáèìü åñãáóßáò ôïõ äéêôýïõ. Áõôü ãßíåôáé óôéò ñõèìßóåéò DNS ìå ôïí áêüëïõèï ôñüðï:

```
example.FreeBSD.org         A      204.216.27.XX          ; Workstation
                            MX  10 hub.FreeBSD.org           ; Mailhost
```

Ìå ôïí ôñüðï áõôü, ôï mail ðïõ êáôåõèýíåôáé ðñïò êÜðïéï óôáèìü åñãáóßáò èá áíáêáôåõèõíèåß ðñïò ôï mailhost, Üó÷åôá ìå ôï ðïõ äåß÷íåé ç åããñáöÞ ôýðïõ Á. Ôï mail óôÝëíåôáé ðñïò ôïí õðïëïãéóôÞ MX.

Äåí ìðïñåßôå íá êÜíåôå ôï ðáñáðÜíù, áí äåí åêôåëåßôå ôï äéêü óáò åîõðçñåôçôÞ DNS. Áí áõôü äåí óõìâáßíåé, êáé äåí ìðïñåßôå íá ôï áëëÜîåôå, óõíåííïçèåßôå ìå ôïí ðáñï÷Ýá óáò (ISP) Þ ìå üðïéïí óáò ðáñÝ÷åé õðçñåóßåò DNS.

Áí ðáñÝ÷åôå õðçñåóßåò åéêïíéêïý ôá÷õäñïìåßïõ, ïé ðáñáêÜôù ðëçñïöïñßåò èá óáò öáíïýí ÷ñÞóéìåò. Ãéá ôï ðáñÜäåéãìá ìáò, èá õðïèÝóïõìå üôé Ý÷åôå Ýíá ðåëÜôç ìå ôï äéêü ôïõ ôïìÝá, óôçí ðåñßðôùóç ìáò ôï `customer1.org`, êáé èÝëåôå üëï ôï mail ãéá ôï `customer1.org` íá óôÝëíåôáé óôï äéêü óáò mailhost, `mail.myhost.com`. Ç êáôá÷þñéóç óáò óôï DNS èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
customer1.org            MX      10      mail.myhost.com
```

Óçìåéþóôå üôé *äåí ÷ñåéÜæåóôå* åããñáöÞ ôýðïõ Á ãéá ôï `customer1.org` áí èÝëåôå áðëþò íá ÷åéñßæåóôå email ãéá áõôü ôïí ôïìÝá.

> **Óçìåßùóç:** Íá Ý÷åôå õðüøç óáò üôé äåí èá ìðïñåßôå íá êÜíåôå ping ôï `customer1.org` áí äåí õðÜñ÷åé ãéá áõôü åããñáöÞ ôýðïõ Á.

Ôï ôåëåõôáßï ðñÜãìá ðïõ ðñÝðåé íá êÜíåôå, åßíáé íá ïñßóåôå óôï **sendmail** ðïõ åêôåëåßôáé óôï äéêü óáò mailhost, ãéá ðïéïõò ôïìåßò Þ / êáé ìç÷áíÞìáôá èá äÝ÷åôáé mail. ÕðÜñ÷ïõí ìåñéêïß äéáöïñåôéêïß ôñüðïé ãéá íá ãßíåé áõôü. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå Ýíáí áðü ôïõò ðáñáêÜôù:

- ÐñïóèÝóôå ôá ìç÷áíÞìáôá óôï áñ÷åßï `/etc/mail/local-host-names` áí ÷ñçóéìïðïéåßôå ôç äõíáôüôçôá `FEATURE(use_cw_file)`. Áí ÷ñçóéìïðïéåßôå êÜðïéá Ýêäïóç ôïõ **sendmail** ðñéí ôçí 8.10, ôï áñ÷åßï åßíáé ôï `/etc/sendmail.cw`.
- ÐñïóèÝóôå ìéá ãñáììÞ `Cwyour.host.com` óôï áñ÷åßï óáò `/etc/sendmail.cf` Þ óôï áñ÷åßï `/etc/mail/sendmail.cf` áí ÷ñçóéìïðïéåßôå ôçí Ýêäïóç 8.10 ôïõ **sendmail** Þ êÜðïéá ìåôáãåíÝóôåñç.

29.7 SMTP ìå UUCP

Ç ðñïåðéëåãìÝíç ñýèìéóç ôïõ **sendmail** ðïõ Ýñ÷åôáé ìå ôï FreeBSD, ðñïïñßæåôáé ãéá äéêôõáêÝò ôïðïèåóßåò ðïõ åßíáé áðåõèåßáò óõíäåäåìÝíåò óôï Internet. Óå ðåñéðôþóåéò ðïõ åßíáé åðéèõìçôÞ ç áíôáëëáãÞ email ìÝóù UUCP, èá ðñÝðåé íá ÷ñçóéìïðïéçèåß äéáöïñåôéêü áñ÷åßï ñõèìßóåùí ãéá ôï **sendmail**.

Ç ÷åéñïêßíçôç ñýèìéóç ôïõ áñ÷åßïõ `/etc/mail/sendmail.cf` áíÞêåé óôá ðñï÷ùñçìÝíá èÝìáôá. Ç Ýêäïóç 8 ôïõ **sendmail** ðáñÜãåé áñ÷åßá ñõèìßóåùí ìÝóù ôïõ ðñïåðåîåñãáóôÞ m4(1), üðïõ ïé ñõèìßóåéò ãßíïíôáé óå Ýíá áíþôåñï åðßðåäï áöáßñåóçò. Ìðïñåßôå íá âñåßôå ôá áñ÷åßá ñýèìéóçò ôïõm4(1) óôïí êáôÜëïãï `/usr/share/sendmail/cf`. ÄéáâÜóôå ôï `README` óôïí êáôÜëïãï `cf` ãéá ìéá âáóéêÞ åéóáãùãÞ óôéò ñõèìßóåéò ôïõ m4(1).

Ï êáëýôåñïò ôñüðïò ãéá ôçí ðáñÜäïóç mail ìÝóù ôïõ UUCP, åßíáé ìå ôçí ÷ñÞóç ôçò äõíáôüôçôáò `mailertable`. ÐáñÜãåôáé ìå áõôü ôïí ôñüðï ìéá âÜóç äåäïìÝíùí ðïõ ìðïñåß íá ÷ñçóéìïðïéÞóåé ôï **sendmail** ãéá íá ðÜñåé áðïöÜóåéò ó÷åôéêÜ ìå ôçí äñïìïëüãçóç.

Èá ðñÝðåé áñ÷éêÜ íá äçìéïõñãÞóåôå ôï áñ÷åßï `.mc`. Èá âñåßôå ìåñéêÜ ðáñáäåßãìáôá óôïí êáôÜëïãï `/usr/share/sendmail/cf/cf`. ÕðïèÝôïíôáò üôé Ý÷åôå ïíïìÜóåé ôï áñ÷åßï óáò `foo.mc`, ôï ìüíï ðïõ ÷ñåéÜæåôáé íá êÜíåôå ãéá íá ôï ìåôáôñÝøåôå óå Ýíá Ýãêõñï áñ÷åßï `sendmail.cf` åßíáé:

```
# cd /etc/mail
# make foo.cf
# cp foo.cf /etc/mail/sendmail.cf
```

¸íá ôõðéêü áñ÷åßï `.mc` èá äåß÷íåé üðùò ôï ðáñáêÜôù:

```
VERSIONID('Your version number') OSTYPE(bsd4.4)

FEATURE(accept_unresolvable_domains)
FEATURE(nocanonify)
FEATURE(mailertable, 'hash -o /etc/mail/mailertable')

define('UUCP_RELAY', your.uucp.relay)
define('UUCP_MAX_SIZE', 200000)
define('confDONT_PROBE_INTERFACES')

MAILER(local)
MAILER(smtp)
MAILER(uucp)

Cw     your.alias.host.name
Cw     youruucpnodename.UUCP
```

Ïé ãñáììÝò ðïõ ðåñéÝ÷ïõí ôéò äõíáôüôçôåò `accept_unresolvable_domains`, `nocanonify`, and `confDONT_PROBE_INTERFACES` èá áðïôñÝøïõí ôç ÷ñÞóç ôïõ DNS êáôÜ ôçí ðáñÜäïóç ôïõ mail. Ç ïäçãßá `UUCP_RELAY` áðáéôåßôáé ãéá ôçí õðïóôÞñéîç ðáñÜäïóçò ìÝóù ôïõ UUCP. Áðëþò ôïðïèåôÞóôå åêåß Ýíá üíïìá ìç÷áíÞìáôïò óôï Internet ðïõ íá ìðïñåß íá ÷åéñéóôåß äéåõèýíóåéò øåõäï-ôïìÝùí .UUCP. Ôï ðéï ðéèáíü åßíáé íá âÜëåôå åêåß ôïí áíáìåôáäüôç (relay) ãéá mail ðïõ ðáñÝ÷åé ï ISP óáò.

¸÷ïíôáò êÜíåé ôï ðáñáðÜíù, èá ÷ñåéáóôåßôå Ýíá áñ÷åßï `/etc/mail/mailertable`. Áí Ý÷åôå ìüíï ìéá óýíäåóç ìå ôïí Ýîù êüóìï ðïõ ÷ñçóéìïðïéåßôáé ãéá üëá óáò ôá mail, ôï ðáñáêÜôù áñ÷åßï åßíáé åðáñêÝò:

```
#
# makemap hash /etc/mail/mailertable.db < /etc/mail/mailertable
.                             uucp-dom:your.uucp.relay
```

¸íá ðéï ðïëýðëïêï ðáñÜäåéãìá èá ìïéÜæåé ìå ôï ðáñáêÜôù:

```
#
# makemap hash /etc/mail/mailertable.db < /etc/mail/mailertable
#
horus.interface-business.de   uucp-dom:horus
.interface-business.de        uucp-dom:if-bus
interface-business.de         uucp-dom:if-bus
.heep.sax.de                  smtp8:%1
horus.UUCP                    uucp-dom:horus
```

```
if-bus.UUCP                   uucp-dom:if-bus
.                             uucp-dom:
```

Ïé ôñåéò ðñþôåò ãñáììÝò ÷åéñßæïíôáé åéäéêÝò ðåñéðôþóåéò, üðïõ ôï mail ðïõ áðåõèýíåôáé óå êÜðïéï ôïìÝá äåí èá ðñÝðåé íá óôáëèåß óôçí ðñïåðéëåãìÝíç äéáäñïìÞ, áëëÜ áíôßèåôá óå êÜðïéï ãåéôïíéêü UUCP ðñïêåéìÝíïõ íá "óõíôïìåõèåß" ôï ìïíïðÜôé ðáñÜäïóçò. Ç åðüìåíç ãñáììÞ ÷åéñßæåôáé ôï mail ðñïò ôïí ôïðéêü ôïìÝá Ethernet, üðïõ åßíáé äõíáôÞ ç ðáñÜäïóç ìÝóù SMTP. ÔÝëïò, ïé ãåéôïíéêïß UUCP áíáöÝñïíôáé ìå ãñáöÞ øåõäï-ôïìÝùí UUCP þóôå íá åðéôñÝðåôáé óå êÜðïéïí *uucp-neighbor !recipient* íá ðáñáêÜìøåé ôïõò ðñïåðéëåãìÝíïõò êáíüíåò. Ç ôåëåõôáßá ãñáììÞ åßíáé ðÜíôá ìéá ìïíáäéêÞ ôåëåßá, ç ïðïßá ôáéñéÜæåé ìå ïôéäÞðïôå Üëëï, ìå ðáñÜäïóç UUCP óå Ýíá ãåéôïíéêü UUCP ï ïðïßïò åíåñãåß ùò ãåíéêÞ ðýëç mail ðñïò ôïí õðüëïéðï êüóìï. ¼ëá ôá ïíüìáôá õðïëïãéóôþí ðïõ âñßóêïíôáé ìåôÜ ôï `uucp-dom:` èá ðñÝðåé íá åßíáé Ýãêõñïé UUCP ãåßôïíåò, üðùò ìðïñåßôå íá âåâáéþóåôå ÷ñçóéìïðïéþíôáò ôï `uuname`.

Óáò õðåíèõìßæïõìå üôé áõôü ôï áñ÷åßï ðñÝðåé íá ìåôáôñáðåß óå ìéá âÜóç äåäïìÝíùí DBM ðñéí ÷ñçóéìïðïéçèåß. Ìðïñåßôå íá âÜëåôå ôç ãñáììÞ åíôïëþí ðïõ áðáéôåßôáé ãéá íá åðéôåõ÷èåß áõôü ùò ó÷üëéï óôçí áñ÷Þ ôïõ áñ÷åßïõ `mailertable`. ÐñÝðåé ðÜíôïôå íá åêôåëåßôå áõôÞ ôçí åíôïëÞ êÜèå öïñÜ ðïõ áëëÜæåôå ôï áñ÷åßï `mailertable`.

Ìéá ôåëåõôáßá õðüäåéîç: áí äåí åßóôå âÝâáéïé ãéá ôï áí èá ëåéôïõñãÞóåé êÜðïéá óõãêåêñéìÝíç äñïìïëüãçóç mail, èõìçèåßôå ôçí åðéëïãÞ `-bt` ôïõ **sendmail**. ÁõôÞ îåêéíÜåé ôï **sendmail** óå *êáôÜóôáóç äïêéìÞò äéåõèýíóåùí*. Áðëþò ãñÜøôå `3,0`, áêïëïõèïýìåíï áðü ôç äéåýèõíóç ðïõ èÝëåôå íá åëÝãîåôå ãéá äñïìïëüãçóç mail. Ç ôåëåõôáßá ãñáììÞ èá óáò ðåé ôïí åóùôåñéêü áíôéðñüóùðï mail ðïõ ÷ñçóéìïðïéÞèçêå, ôç äéåýèõíóç ðñïïñéóìïý ìå ôçí ïðïßá êëÞèçêå, êáèþò êáé ôçí (ðéèáíþò ìåôáöñáóìÝíç) äéåýèõíóç. Ìðïñåßôå íá âãåßôå áðü áõôÞ ôçí êáôÜóôáóç, ðëçêôñïëïãþíôáò **Ctrl**+**D**.

```
% sendmail -bt
ADDRESS TEST MODE (ruleset 3 NOT automatically invoked)
Enter <ruleset> <address>
> 3,0 foo@example.com
canonify           input: foo @ example . com
...
parse            returns: $# uucp-dom $@ your.uucp.relay $: foo < @ example . com . >
> ^D
```

29.8 Ñýèìéóç ÅîõðçñåôçôÞ Ìüíï ãéá ÁðïóôïëÞ

Óõíåéóöïñ Ü áðü ôïí Bill Moran.

ÕðÜñ÷ïõí ðïëëÝò ðåñéðôþóåéò, ðïõ ìðïñåß íá èÝëåôå ìüíï íá óôÝëíåôå mail ìÝóù êÜðïéïõ áíáìåôáäüôç. ÌåñéêÜ ðáñáäåßãìáôá:

- Ï õðïëïãéóôÞò óáò ÷ñçóéìïðïéåßôáé ùò desktop, áëëÜ èÝëåôå íá ÷ñçóéìïðïéÞóåôå ðñïãñÜììáôá üðùò ôï send-pr(1). Ãéá íá ãßíåé áõôü èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôïí áíáìåôáäüôç mail ðïõ ðáñÝ÷åé ï ISP óáò.
- Ï õðïëïãéóôÞò óáò åßíáé Ýíáò åîõðçñåôçôÞò ðïõ äåí ÷åéñßæåôáé ôï mail ôïðéêÜ, áëëÜ ÷ñåéÜæåôáé íá ôï äþóåé åî' ïëïêëÞñïõ óå êÜðïéï áíáìåôáäüôç ãéá åðåîåñãáóßá.

ÏðïéïäÞðïôå ó÷åäüí MTA åßíáé éêáíü íá êáëýøåé ôïí ðáñáðÜíù ñüëï. Äõóôõ÷þò, ìðïñåß íá åßíáé ðïëý äýóêïëï íá ñõèìßóåôå óùóôÜ Ýíá ðëÞñåò MTA þóôå áðëþò íá óôÝëíåé ôï mail ðñïò áíáìåôÜäïóç. ÐñïãñÜììáôá üðùò ôï **sendmail** êáé ôï **postfix** åßíáé õðåñâïëéêÜ ìåãÜëá ãéá áõôÞ ôç äïõëåéÜ.

Åðéðñüóèåôá, áí ÷ñçóéìïðïéåßôå êÜðïéá óõíçèéóìÝíç õðçñåóßá ðñüóâáóçò óôï Internet, ç óõìöùíßá ìå ôçí åôáéñßá ðáñï÷Þò ìðïñåß íá óáò áðáãïñåýåé íá åêôåëåßôå ôï äéêü óáò "åîõðçñåôçôÞ mail".

Ï åõêïëüôåñïò ôñüðïò ãéá íá åêðëçñþóåôå áõôÝò ôéò áíÜãêåò åßíáé íá åãêáôáóôÞóåôå ôï port `mail/ssmtp` ÅêôåëÝóôå ôéò áêüëïõèåò åíôïëÝò ùò `root`:

```
# cd /usr/ports/mail/ssmtp
# make install replace clean
```

ÌåôÜ ôçí åãêáôÜóôáóç, ôï `mail/ssmtp` ìðïñåß íá ñõèìéóôåß ìå Ýíá áñ÷åßï ôåóóÜñùí ìüëéò ãñáììþí, ôï ïðïßï âñßóêåôáé óôï `/usr/local/etc/ssmtp/ssmtp.conf`:

```
root=yourrealemail@example.com
mailhub=mail.example.com
rewriteDomain=example.com
hostname=_HOSTNAME_
```

Âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôçí ðñáãìáôéêÞ äéåýèõíóç email ãéá ôïí `root`. ÂÜëôå ôïí áíáìåôáäüôç mail ôïõ ISP óáò óôç èÝóç `mail.example.com` (ìåñéêïß ISP ôïí ïíïìÜæïõí “åîõðçñåôçôÞ åîåñ÷üìåíïõ ôá÷õäñïìåßïõ” Þ “åîõðçñåôçôÞ SMTP”).

Âåâáéùèåßôå üôé Ý÷åôå áðåíåñãïðïéÞóåé ðëÞñùò ôï **sendmail**, áêüìá êáé ôçí õðçñåóßá åîåñ÷üìåíùí ìçíõìÜôùí. Äåßôå ôï ÔìÞìá 29.4.2 ãéá ëåðôïìÝñåéåò.

ÕðÜñ÷ïõí êÜðïéåò áêüìá äéáèÝóéìåò åðéëïãÝò óôï `mail/ssmtp`. Äåßôå ôï ðáñÜäåéãìá ôïõ áñ÷åßïõ ñõèìßóåùí óôï `/usr/local/etc/ssmtp` Þ ôç óåëßäá manual ôïõ **ssmtp** ãéá ðåñéóóüôåñá ðáñáäåßãìáôá êáé ðëçñïöïñßåò.

Ñõèìßæïíôáò ôï **ssmtp** ìå áõôü ôïí ôñüðï, èá åßíáé äõíáôÞ ç óùóôÞ ëåéôïõñãßá ïðïéïõäÞðïôå ëïãéóìéêïý óôïí õðïëïãéóôÞ óáò ðïõ ÷ñåéÜæåôáé íá óôåßëåé mail. Åðßóçò äåí ðáñáâéÜæåôáé ìå áõôü ôïí ôñüðï ç Üäåéá ÷ñÞóçò ôïõ ISP óáò êáé äåí ìðïñåß ï õðïëïãéóôÞò óáò íá ðáñáâéáóôåß êáé íá ÷ñçóéìïðïéçèåß ãéá ôçí áðïóôïëÞ áíåðéèýìçôùí ìçíõìÜôùí (spam).

29.9 ×ñçóéìïðïéþíôáò ôï Mail ÌÝóù ÅðéëïãéêÞò (Dialup) Óýíäåóçò

Áí Ý÷åôå óôáôéêÞ äéåýèõíóç IP, äåí èá ÷ñåéáóôåß íá áëëÜîåôå êáìéÜ áðü ôéò ðñïåðéëïãÝò. Ñõèìßóôå ôï üíïìá ôïõ õðïëïãéóôÞ óáò þóôå íá ôáéñéÜæåé ìå áõôü ðïõ óáò Ý÷åé ïñéóôåß ãéá ôï Internet, êáé ôï **sendmail** èá êÜíåé ôá õðüëïéðá.

Áí ëáìâÜíåôå äõíáìéêÞ IP êáé ÷ñçóéìïðïéåßôå åðéëïãéêÞ PPP óýíäåóç ìå ôï Internet, ðéèáíüí äéáèÝôåôå ìéá èõñßäá ôá÷õäñïìåßïõ (mailbox) óôïí åîõðçñåôçôÞ mail ôïõ ðáñï÷Ýá óáò. Áò õðïèÝóïõìå üôé ï ôïìÝáò ôïõ ISP óáò åßíáé `example.net`, êáé üôé ôï üíïìá ÷ñÞóôç óáò åßíáé `user`, ôï ìç÷Üíçìá óáò ëÝãåôáé `bsd.home`, êáé ï ISP óáò, óáò Ý÷åé ðåé üôé ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï `relay.example.net` ùò áíáìåôáäüôç ãéá ôï mail.

Ãéá íá ìðïñÝóåôå íá ëÜâåôå mail áðü ôç èõñßäá óáò, èá ÷ñåéáóôåßôå êÜðïéï áíôéðñüóùðï áíÜëçøçò (retrieval agent). Ôï âïçèçôéêü ðñüãñáììá **fetchmail** åßíáé ìéá êáëÞ åðéëïãÞ, êáèþò õðïóôçñßæåé ðïëëÜ äéáöïñåôéêÜ ðñùôüêïëëá. Ôï ðñüãñáììá áõôü åßíáé äéáèÝóéìï ùò ðáêÝôï Þ áðü ôçí ÓõëëïãÞ ôùí Ports (`mail/fetchmail`). ÓõíÞèùò, ï ISP óáò èá ðáñÝ÷åé ôçí õðçñåóßá POP. Áí ÷ñçóéìïðïéåßôå PPP ÷ñÞóôç, ìðïñåßôå íá êáôåâÜóåôå áõôüìáôá ôï mail óáò ìåôÜ ôçí áðïêáôÜóôáóç ôçò óýíäåóçò óáò, ÷ñçóéìïðïéþíôáò ôçí áêüëïõèç êáôá÷þñéóç óôï `/etc/ppp/ppp.linkup`:

```
MYADDR:
!bg su user -c fetchmail
```

Áí ÷ñçóéìïðïéåßôå ôï **sendmail** (üðùò öáßíåôáé ðáñáêÜôù) ãéá íá ðáñáäþóåôå mail óå ìç-ôïðéêïýò ëïãáñéáóìïýò, ðéèáíüí íá èÝëåôå ôï **sendmail** íá åðåîåñãÜæåôáé ôçí ïõñÜ ôïõ mail áìÝóùò ìåôÜ ôçí áðïêáôÜóôáóç ôçò óýíäåóçò. Ãéá íá ôï êÜíåôå áõôü, âÜëôå ôçí ðáñáêÜôù åíôïëÞ áìÝóùò ìåôÜ ôçí åíôïëÞ `fetchmail` óôï áñ÷åßï `/etc/ppp/ppp.linkup`:

```
  !bg su user -c "sendmail -q"
```

Áò õðïèÝóïõìå üôé õðÜñ÷åé Ýíáò ëïãáñéáóìüò ãéá ôïí `user` óôïí `bsd.home`. Óôïí ðñïóùðéêü êáôÜëïãï ôïõ `user` óôï `bsd.home`, äçìéïõñãÞóôå Ýíá áñ÷åßï `.fetchmailrc`:

```
poll example.net protocol pop3 fetchall pass MySecret
```

Ôï áñ÷åßï áõôü äåí èá ðñÝðåé íá åßíáé áíáãíþóéìï áðü êáíÝíá, åêôüò áðü ôïí `user`, êáèþò ðåñéÝ÷åé ôïí êùäéêü `MySecret`.

Ãéá íá ìðïñåßôå íá óôåßëåôå mail ìå ôç óùóôÞ åðéêåöáëßäá `from:`, èá ðñÝðåé íá ñõèìßóåôå ôï **sendmail** íá ÷ñçóéìïðïéåß ôï <`user@example.net`> áíôß ãéá ôï <`user@bsd.home`>. ºóùò åðßóçò íá èÝëåôå íá ñõèìßóåôå ôï **sendmail** íá óôÝëíåé üëï ôï mail ìÝóù ôïõ `relay.example.net`, þóôå ç ìåôÜäïóç ôïõ mail íá åßíáé ôá÷ýôåñç.

Ôï áêüëïõèï áñ÷åßï `.mc` èá ðñÝðåé íá åßíáé åðáñêÝò:

```
VERSIONID(‘bsd.home.mc version 1.0’)
OSTYPE(bsd4.4)dnl
FEATURE(nouucp)dnl
MAILER(local)dnl
MAILER(smtp)dnl
Cwlocalhost
Cwbsd.home
MASQUERADE_AS(‘example.net’)dnl
FEATURE(allmasquerade)dnl
FEATURE(masquerade_envelope)dnl
FEATURE(nocanonify)dnl
FEATURE(nodns)dnl
define(‘SMART_HOST’, ‘relay.example.net’)
Dmbsd.home
define(‘confDOMAIN_NAME’,‘bsd.home’)dnl
define(‘confDELIVERY_MODE’,‘deferred’)dnl
```

ÄéáâÜóôå ôçí ðñïçãïýìåíç åíüôçôá ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôçí ìåôáôñïðÞ áõôïý ôïõ áñ÷åßïõ `.mc` óå Ýíá áñ÷åßï `sendmail.cf`. Åðßóçò, ìç îå÷Üóåôå íá åðáíåêêéíÞóåôå ôï **sendmail** ìåôÜ ôçí åíçìÝñùóç ôïõ `sendmail.cf`.

29.10 Ðéóôïðïßçóç Áõèåíôéêüôçôáò óôï SMTP

ÃñÜöôçêå áðü ôïí James Gorham.

Ç ÷ñÞóç SMTP ìå ðéóôïðïßçóç áõèåíôéêüôçôáò óôïí åîõðçñåôçôÞ ôá÷õäñïìåßïõ óáò, ìðïñåß íá óáò ðñïóöÝñåé ìéá óåéñÜ áðü ïöÝëç. Ìðïñåß íá ðñïóèÝóåé Ýíá áêüìá åðßðåäï áóöáëåßáò óôï **sendmail**, åíþ Ý÷åé êáé ôï ðëåïíÝêôçìá üôé äßíåé ôç äõíáôüôçôá óôïõò ÷ñÞóôåò öïñçôþí õðïëïãéóôþí (ðïõ óõ÷íÜ óõíäÝïíôáé ìÝóù äéáöïñåôéêþí äéêôýùí) íá ÷ñçóéìïðïéïýí ôïí ßäéï åîõðçñåôçôÞ ôá÷õäñïìåßïõ ÷ùñßò ôçí áíÜãêç åðáíáñýèìéóçò êÜèå öïñÜ ôïõ ðñïãñÜììáôïò áðïóôïëÞò / ëÞøçò ôá÷õäñïìåßïõ.

1. ÅãêáôáóôÞóôå ôï `security/cyrus-sasl2` áðü ôç ÓõëëïãÞ ôùí Ports. Ôï port áõôü õðïóôçñßæåé ìéá óåéñÜ áðü åðéëïãÝò ðïõ ìðïñåßôå íá èÝóåôå êáôÜ ôçí ìåôáãëþôôéóç. Ãéá íá ìðïñÝóåôå íá ÷ñçóéìïðïéÞóåôå ôçí ìÝèïäï áõèåíôéêïðïßçóçò óôï SMTP ðïõ óõæçôÜìå åäþ, âåâáéùèåßôå üôé åßíáé åíåñãïðïéçìÝíç ç åðéëïãÞ `LOGIN`.

2. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ `security/cyrus-sasl2`, ôñïðïðïéÞóôå ôï áñ÷åßï `/usr/local/lib/sasl2/Sendmail.conf` (Þ äçìéïõñãÞóôå ôï áí äåí õðÜñ÷åé) êáé ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ:

   ```
   pwcheck_method: saslauthd
   ```

3. ÅãêáôáóôÞóôå Ýðåéôá ôï `security/cyrus-sasl2-saslauthd`, êáé ðñïóèÝóôå óôï `/etc/rc.conf` ôçí áêüëïõèç ãñáììÞ:

   ```
   saslauthd_enable="YES"
   ```

   ÔÝëïò, îåêéíÞóôå ôï äáßìïíá saslauthd:

   ```
   # /usr/local/etc/rc.d/saslauthd start
   ```

   Ï äáßìïíáò áõôüò äñá ùò åíäéÜìåóïò ãéá ôï **sendmail** þóôå íá ãßíåôáé ðéóôïðïßçóç áõèåíôéêüôçôáò ìÝóù ôçò âÜóçò äåäïìÝíùí êùäéêþí `passwd` ôïõ FreeBSD óõóôÞìáôüò óáò. Ìå áõôü ôïí ôñüðï áðáëëÜóóåóôå áðü ôçí áíÜãêç äçìéïõñãßáò íÝùí óåô áðü ïíüìáôá ÷ñçóôþí êáé êùäéêïýò ãéá êÜèå ÷ñÞóôç ðïõ ÷ñåéÜæåôáé íá ÷ñçóéìïðïéÞóåé ðéóôïðïßçóç óôï SMTP. ×ñçóéìïðïéåßôáé ôï ßäéï üíïìá êáé êùäéêüò, ôüóï ãéá åßóïäï óôï óýóôçìá, üóï êáé ãéá ôï mail.

4. Åðåîåñãáóôåßôå ôþñá ôï `/etc/make.conf` êáé ðñïóèÝóôå ôéò áêüëïõèåò ãñáììÝò:

   ```
   SENDMAIL_CFLAGS=-I/usr/local/include/sasl -DSASL
   SENDMAIL_LDFLAGS=-L/usr/local/lib
   SENDMAIL_LDADD=-lsasl2
   ```

   Ïé ãñáììÝò áõôÝò, ðáñÝ÷ïõí óôï **sendmail** ôéò êáôÜëëçëåò ñõèìßóåéò þóôå íá óõíäåèåß óùóôÜ ìå ôï `cyrus-sasl2` êáôÜ ôç äéÜñêåéá ôçò ìåôáãëþôôéóçò. Âåâáéùèåßôå üôé åßíáé åãêáôåóôçìÝíï ôï ðáêÝôï `cyrus-sasl2` ðñéí îåêéíÞóåôå ôçí åðáíáìåôáãëþôôéóç ôïõ **sendmail**.

5. Åðáíáìåôáãëùôôßóôå ôï **sendmail** åêôåëþíôáò ôéò ðáñáêÜôù åíôïëÝò:

   ```
   # cd /usr/src/lib/libsmutil
   # make cleandir && make obj && make
   # cd /usr/src/lib/libsm
   # make cleandir && make obj && make
   # cd /usr/src/usr.sbin/sendmail
   # make cleandir && make obj && make && make install
   ```

   Ç ìåôáãëþôôéóç ôïõ **sendmail** äåí ðñÝðåé íá ðáñïõóéÜóåé ðñïâëÞìáôá, áí ôï `/usr/src` äåí Ý÷åé áëëÜîåé óå ìåãÜëï âáèìü êáé åöüóïí õðÜñ÷ïõí ïé êïéíü÷ñçóôåò âéâëéïèÞêåò ðïõ áðáéôïýíôáé.

6. ÌåôÜ ôçí ìåôáãëþôôéóç êáé åðáíåãêáôÜóôáóç ôïõ **sendmail**, åðåîåñãáóôåßôå ôï áñ÷åßï `/etc/mail/freebsd.mc` (Þ üðïéï áñ÷åßï ÷ñçóéìïðïéåßôå ùò `.mc`. Ðïëëïß äéá÷åéñéóôÝò åðéëÝãïõí íá ÷ñçóéìïðïéÞóïõí ôçí Ýîïäï ôçò åíôïëÞò hostname(1) ùò üíïìá ãéá ôï áñ÷åßï `.mc` ãéá íá åîáóöáëßóïõí üôé åßíáé ìïíáäéêü). ÐñïóèÝóôå óå áõôü ôéò áêüëïõèåò ãñáììÝò:

   ```
   dnl set SASL options
   TRUST_AUTH_MECH('GSSAPI DIGEST-MD5 CRAM-MD5 LOGIN')dnl
   define('confAUTH_MECHANISMS', 'GSSAPI DIGEST-MD5 CRAM-MD5 LOGIN')dnl
   ```

   Ïé åðéëïãÝò áõôÝò ñõèìßæïõí ôéò äéáöïñåôéêÝò ìåèüäïõò ðïõ Ý÷åé óôç äéÜèåóç ôïõ ôï **sendmail**, ðñïêåéìÝíïõ íá ðéóôïðïéÞóåé ôïõò ÷ñÞóôåò. Áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå êÜðïéá ìÝèïäï äéáöïñåôéêÞ áðü ôï **pwcheck**, äåßôå ôçí ôåêìçñßùóç ðïõ ðåñéëáìâÜíåôáé.

7. ÔÝëïò, åêôåëÝóôå make(1) åíþ âñßóêåóôå óôïí êáôÜëïãï `/etc/mail`. Ìå ôïí ôñüðï áõôü, èá ÷ñçóéìïðïéçèåß ôï íÝï óáò `.mc` áñ÷åßï êáé èá äçìéïõñãçèåß Ýíá áñ÷åßï `.cf` ìå üíïìá `freebsd.cf` (Þ ïôéäÞðïôå üíïìá åß÷áôå äþóåé óôï áñ÷åßï `.mc`). ×ñçóéìïðïéÞóôå Ýðåéôá ôçí åíôïëÞ `make install restart`, ç ïðïßá èá áíôéãñÜøåé ôï

áñ÷åßï óôï `sendmail.cf`, êáé èá åðáíåêêéíÞóåé óùóôÜ ôï **sendmail**. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò ó÷åôéêÜ ìå áõôÞ ôç äéáäéêáóßá, èá ðñÝðåé íá äéáâÜóåôå ôï áñ÷åßï `/etc/mail/Makefile`.

Áí üëá ðÞãáí êáëÜ, èá ðñÝðåé íá ìðïñåßôå íá äþóåôå ôá óôïé÷åßá åéóüäïõ óáò óôï ðñüãñáììá ðïõ ÷ñçóéìïðïéåßôå ãéá áðïóôïëÞ êáé ëÞøç mail, êáé íá óôåßëåôå Ýíá äïêéìáóôéêü ìÞíõìá. Ãéá íá äéåñåõíÞóåôå ðåñéóóüôåñï ôç ëåéôïõñãßá, èÝóôå ôçí åðéëïãÞ `LogLevel` ôïõ **sendmail** óôï 13 êáé ðáñáêïëïõèÞóôå ôï `/var/log/maillog` ãéá ôõ÷üí ëÜèç.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, ðáñáêáëïýìå íá äåßôå ôç óåëßäá ôïõ **sendmail** ðïõ áöïñÜ ôçí ðéóôïðïßçóç áõèåíôéêüôçôáò óôï SMTP (http://www.sendmail.org/~ca/email/auth.html).

29.11 ÐñïãñÜììáôá Ôá÷õäñïìåßïõ ãéá ôïí ×ñÞóôç

ÓõíåéóöïñÜ ôïõ Marc Silver.

¸íá ðñüãñáììá Áíôéðñïóþðïõ Ôá÷õäñïìåßïõ ×ñÞóôç (Mail User Agent, MUA), åßíáé ìéá åöáñìïãÞ ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí áðïóôïëÞ êáé ëÞøç email. ÅðéðëÝïí, êáèþò ôï email “åîåëßóóåôáé” êáé ãßíåôáé ðéï ðïëýðëïêï, ôá MUA ãßíïíôáé üëï êáé éó÷õñüôåñá üóï áöïñÜ ôïí ôñüðï ðïõ áëëçëåðéäñïýí ìå ôï email. Áõôü äßíåé óôïõò ÷ñÞóôåò ðåñéóóüôåñåò ëåéôïõñãßåò êáé åõåëéîßá. To FreeBSD ðåñéÝ÷åé õðïóôÞñéîç ãéá ìåãÜëï áñéèìü áðü ðñïãñÜììáôá ôá÷õäñïìåßïõ, êáé üëá ìðïñïýí íá åãêáôáóôáèïýí ðïëý åýêïëá ìÝóù ôçò ÓõëëïãÞò ôùí Ports ôïõ FreeBSD. Ïé ÷ñÞóôåò ìðïñïýí íá åðéëÝîïõí ìåôáîý ãñáöéêþí ðñïãñáììÜôùí, üðùò ôï **evolution** Þ ôï **balsa**, êáé ðñïãñÜììáôá êïíóüëáò üðùò ôá **mutt**, **alpine** Þ `mail`, Þ áêüìá êáé ôéò äéåðáöÝò web ðïõ ðñïóöÝñïíôáé áðü ìåñéêïýò ìåãÜëïõò ïñãáíéóìïýò.

29.11.1 mail

Ôï mail(1) åßíáé ôï ðñïåðéëåãìÝíï ðñüãñáììá ôá÷õäñïìåßïõ (MUA) in FreeBSD. Ðñüêåéôáé ãéá Ýíá MUA êïíóüëáò, ôï ïðïßï ðñïóöÝñåé üëåò ôéò âáóéêÝò ëåéôïõñãßåò ðïõ áðáéôïýíôáé ãéá ôçí áðïóôïëÞ êáé ëÞøç email óå ìïñöÞ êåéìÝíïõ, áí êáé Ý÷åé ðåñéïñéóìÝíåò äõíáôüôçôåò üóï áöïñÜ óõíçììÝíá áñ÷åßá êáé õðïóôçñßæåé ìüíï ôïðéêÝò èõñßäåò.

Áí êáé ôï `mail` äåí õðïóôçñßæåé åããåíþò ôç ëÞøç email ìÝóù äéáêïìéóôþí POP Þ IMAP, åßíáé äõíáôüí íá êáôåâÜóåôå ôá email óå ìéá ôïðéêÞ èõñßäá (`mbox`) ÷ñçóéìïðïéþíôáò êÜðïéá åöáñìïãÞ üðùò ôï **fetchmail**, ôï ïðïßï èá óõæçôÞóïõìå áñãüôåñá óå áõôü ôï êåöÜëáéï (ÔìÞìá 29.12).

Ãéá ôçí áðïóôïëÞ êáé ëÞøç email, áðëþò åêôåëÝóôå ôçí åíôïëÞ `mail` üðùò öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá:

```
% mail
```

Ôá ðåñéå÷üìåíá ôçò èõñßäáò ôïõ ÷ñÞóôç óôïí êáôÜëïãï `/var/mail` èá äéáâáóôïýí áõôüìáôá áðü ôï ðñüãñáììá `mail`. Áí ç èõñßäá ôá÷õäñïìåßïõ åßíáé Üäåéá, ôï ðñüãñáììá ôåñìáôßæåôáé ìå ôï ìÞíõìá üôé äåí âñÝèçêå áëëçëïãñáößá. ÌåôÜ ôçí áíÜãíùóç ôçò èõñßäáò, îåêéíÜ ç äéåðáöÞ ôçò åöáñìïãÞò êáé åìöáíßæåôáé ìéá ëßóôá ìå ìçíýìáôá. Ôá ìçíýìáôá áñéèìïýíôáé áõôüìáôá, üðùò öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá:

```
Mail version 8.1 6/6/93.  Type ? for help.
"/var/mail/marcs": 3 messages 3 new
>N  1 root@localhost        Mon Mar  8 14:05  14/510   "test"
 N  2 root@localhost        Mon Mar  8 14:05  14/509   "user account"
 N  3 root@localhost        Mon Mar  8 14:05  14/509   "sample"
```

Ôá ìçíýìáôá ìðïñïýí ðëÝïí íá äéáâáóôïýí ìå ôçí åíôïëÞ **t** ôçò åíôïëÞò `mail`, áêïëïõèïýìåíç ìå ôïí áñéèìü ôïõ mail ðïõ èÝëåôå íá åìöáíéóôåß. Óôï ðáñÜäåéãìá áõôü èá äéáâÜóïõìå ôï ðñþôï ìÞíõìá:

```
& t 1
```

```
Message 1:
From root@localhost  Mon Mar  8 14:05:52 2004
X-Original-To: marcs@localhost
Delivered-To: marcs@localhost
To: marcs@localhost
Subject: test
Date: Mon,  8 Mar 2004 14:05:52 +0200 (SAST)
From: root@localhost (Charlie Root)

This is a test message, please reply if you receive it.
```

¼ðùò öáßíåôáé óôï ðáñáðÜíù ðáñÜäåéãìá, ç ÷ñÞóç ôïõ ðëÞêôñïõ **t** èá ðñïêáëÝóåé ôçí åìöÜíéóç ôïõ ìçíýìáôïò ìå ðëÞñåéò åðéêåöáëßäåò. Ãéá íá äåßôå îáíÜ ôç ëßóôá ìå ôá ìçíýìáôá, ÷ñçóéìïðïéÞóôå ôï ðëÞêôñï **h**.

Áí ôï mail áðáéôåß áðÜíôçóç, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `mail` ÷ñçóéìïðïéþíôáò ôéò åíóùìáôùìÝíåò åíôïëÝò **R** Þ **r**. Ôï ðëÞêôñï **R** ïäçãåß ôï `mail` íá áðáíôÞóåé ìüíï óôïí áðïóôïëÝá ôïõ ìçíýìáôïò, åíþ ôï **r** áðáíôÜåé ü÷é ìüíï óôïí áðïóôïëÝá, áëëÜ óå üëïõò ôïõò ðáñáëÞðôåò ôïõ ìçíýìáôïò. Ìðïñåßôå åðßóçò íá ðñïóèÝóåôå ìåôÜ áðü ôéò åíôïëÝò áõôÝò, ôïí áñéèìü ôïõ ìçíýìáôïò óôï ïðïßï èÝëåôå íá áðáíôÞóåôå. Áöïý ôï êÜíåôå áõôü, èá ðñÝðåé íá ãñÜøåôå ôçí áðÜíôçóç óáò êáé íá óçìåéþóåôå ôï ôÝëïò ôçò ãñÜöïíôáò ìéá ìüíï **.** óå ìéá íÝá ãñáììÞ. Ìðïñåßôå íá äåßôå Ýíá ðáñÜäåéãìá ðáñáêÜôù:

```
& R 1
To: root@localhost
Subject: Re: test

Thank you, I did get your email.
.
EOT
```

Ãéá íá óôåßëåôå íÝï mail, èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå ôï ðëÞêôñï **m**, áêïëïõèïýìåíï áðü ôçí äéåýèõíóç ôïõ ðáñáëÞðôç. Ìðïñåßôå íá äþóåôå ðïëëáðëïýò ðáñáëÞðôåò, ÷ùñßæïíôáò ìåôáîý ôïõò ôéò äéåõèýíóåéò ìå **,**. Ìðïñåßôå Ýðåéôá íá âÜëåôå ôï èÝìá ôïõ ìçíýìáôïò êáé íá óõíå÷ßóåôå ìå ôï ðåñéå÷üìåíï. Ôï ôÝëïò ôïõ ìçíýìáôïò êáèïñßæåôáé ãñÜöïíôáò ìéá ìïíáäéêÞ **.** óå ìéá íÝá ãñáììÞ.

```
& mail root@localhost
Subject: I mastered mail

Now I can send and receive email using mail ... :)
.
EOT
```

¼óï âñßóêåóôå ìÝóá óôçí åíôïëÞ `mail`, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ðëÞêôñï **?** ãéá ôçí åìöÜíéóç âïÞèåéáò ïðïéáäÞðïôå óôéãìÞ. Ìðïñåßôå åðßóçò íá óõìâïõëåõôåßôå ôçí óåëßäá manual ôïõ mail(1) ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôçí åíôïëÞ `mail`.

> **Óçìåßùóç:** ¼ðùò áíáöÝñáìå ðñïçãïõìÝíùò, ç åíôïëÞ mail(1) äåí ó÷åäéÜóôçêå áñ÷éêÜ ãéá íá ÷åéñßæåôáé óõíçììÝíá, êáé ãéá ôï ëüãï áõôü ïé äõíáôüôçôåò ôéò óôï óõãêåêñéìÝíï èÝìá åßíáé ìéêñÝò. Íåþôåñá MUA, üðùò ôï **mutt**, ÷åéñßæïíôáé ôá óõíçììÝíá ìå ðïëý ðéï Ýîõðíï ôñüðï. ÁëëÜ áí ðáñ’ üëá áõôÜ åðéèõìåßôå íá ÷ñçóéìïðïéÞóåôå ôçí åíôïëÞ `mail`, ìÜëëïí èá óáò öáíåß ÷ñÞóéìï ôï port `converters/mpack`.

29.11.2 mutt

Ôï **mutt** åßíáé Ýíá ìéêñü, áëëÜ ðïëý éó÷õñü ðñüãñáììá áðïóôïëÞò êáé ëÞøçò mail, ìå åîáéñåôéêÜ ÷áñáêôçñéóôéêÜ ôá ïðïßá ðåñéëáìâÜíïõí:

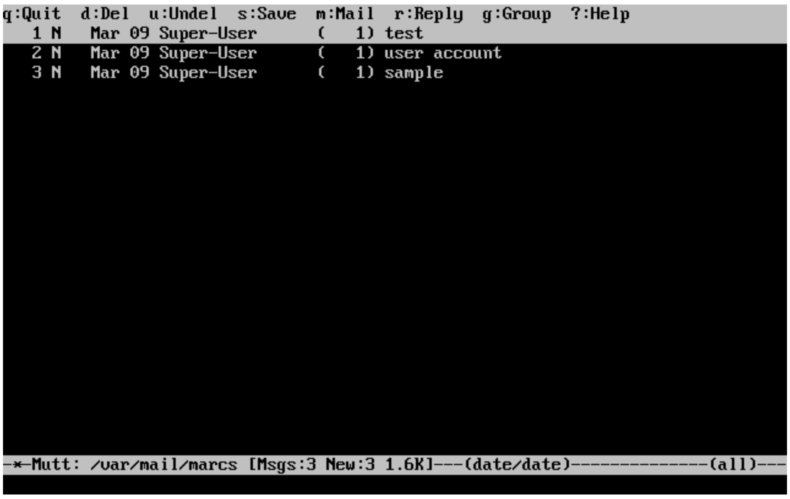
- Ôçí éêáíüôçôá íá äåß÷íåé ìçíýìáôá ìå ôçí ìïñöÞ óõæçôÞóåùí
- ÕðïóôÞñéîç PGP ãéá øçöéáêÞ õðïãñáöÞ êáé êñõðôïãñÜöçóç email
- ÕðïóôÞñéîç MIME
- ÕðïóôÞñéîç Maildir
- ÅîáéñåôéêÝò äõíáôüôçôåò ðáñáìåôñïðïßçóçò

¼ëåò áõôÝò ïé äõíáôüôçôåò, êÜíïõí ôï **mutt** Ýíá áðü ôá ðéï åîåëéãìÝíá äéáèÝóéìá ðñïãñÜììáôá ôá÷õäñïìåßïõ. Äåßôå ôçí ôïðïèåóßá http://www.mutt.org ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï **mutt**.

Ìðïñåßôå íá åãêáôáóôÞóåôå ôç óôáèåñÞ Ýêäïóç ôïõ **mutt** ìÝóù ôïõ port `mail/mutt`, åíþ êáé ç ôñÝ÷ïõóá õðü åîÝëéîç Ýêäïóç åßíáé äéáèÝóéìç ìÝóù ôïõ port `mail/mutt-devel`. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ port, ìðïñåßôå íá åêôåëÝóåôå ôï **mutt**, ìå ôçí áêüëïõèç åíôïëÞ:

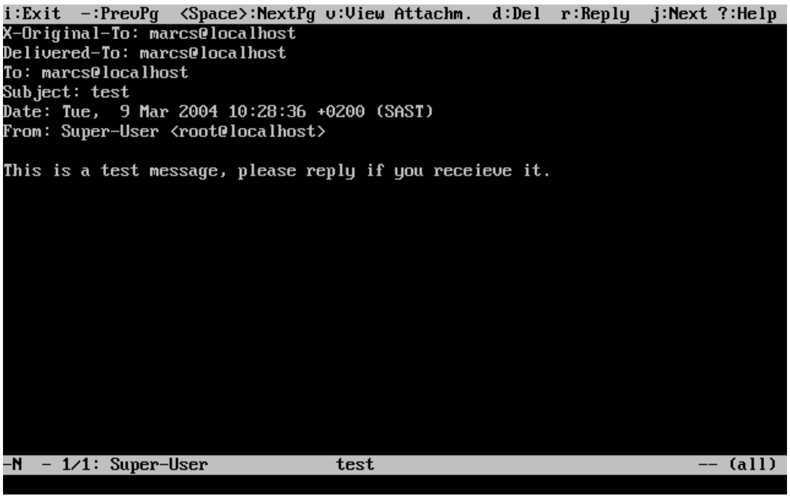
```
% mutt
```

Ôï **mutt** èá äéáâÜóåé áõôüìáôá ôá ðåñéå÷üìåíá ôçò èõñßäáò ôá÷õäñïìåßïõ ÷ñÞóôç óôïí êáôÜëïãï `/var/mail`, êáé èá äåßîåé ôá ðåñéå÷üìåíá ôïõ áí áõôü åßíáé åöéêôü. Áí äåí õðÜñ÷ïõí mails óôç èõñßäá ôïõ ÷ñÞóôç, ôï **mutt** èá åéóÝëèåé óå êáôÜóôáóç áíáìïíÞò åíôïëþí. Ôï ðáñáêÜôù ðáñÜäåéãìá, äåß÷íåé ôï **mutt** íá áðåéêïíßæåé ìéá ëßóôá ìçíõìÜôùí:



```
q:Quit  d:Del  u:Undel  s:Save  m:Mail  r:Reply  g:Group  ?:Help
   1 N   Mar 09 Super-User      (   1) test
   2 N   Mar 09 Super-User      (   1) user account
   3 N   Mar 09 Super-User      (   1) sample
-*-Mutt: /var/mail/marcs [Msgs:3 New:3 1.6K]---(date/date)-------------(all)---
```

Ãéá íá äéáâÜóåôå email, áðëþò åðéëÝîôå ôï ÷ñçóéìïðïéþíôáò ôá âåëÜêéá, êáé ðéÝóôå **Enter**. Ìðïñåßôå íá äåßôå Ýíá ðáñÜäåéãìá áðåéêüíéóçò mail áðü ôï **mutt** ðáñáêÜôù:

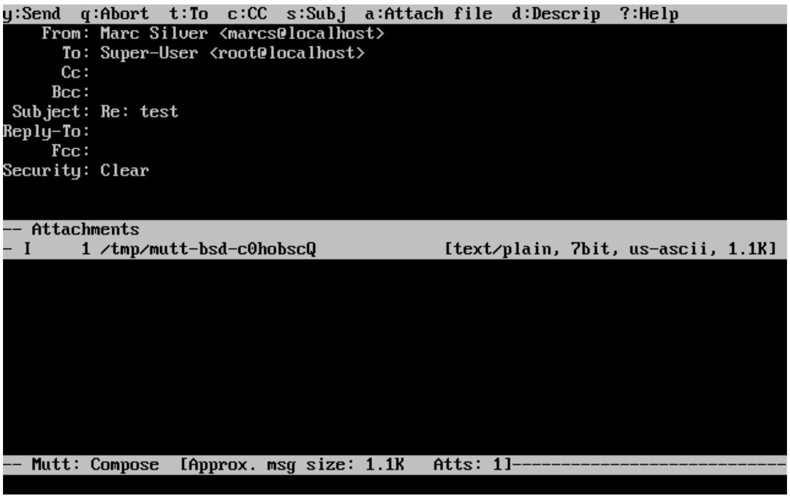


```
i:Exit  -:PrevPg  <Space>:NextPg v:View Attachm.  d:Del  r:Reply  j:Next ?:Help
X-Original-To: marcs@localhost
Delivered-To: marcs@localhost
To: marcs@localhost
Subject: test
Date: Tue,  9 Mar 2004 10:28:36 +0200 (SAST)
From: Super-User <root@localhost>

This is a test message, please reply if you receieve it.











-N  - 1/1: Super-User             test                                  -- (all)
```

¼ðùò êáé ôï mail(1), ôï **mutt**, óáò åðéôñÝðåé íá áðáíôÞóåôå ôüóï óôïí áðïóôïëÝá ôïõ ìçíýìáôïò, üóï êáé óå üëïõò ôïõò ðáñáëÞðôåò. Ãéá íá áðáíôÞóåôå ìüíï óôïí áðïóôïëÝá ôïõ email, ÷ñçóéìïðïéÞóôå ôï ðëÞêôñï **r**. Ãéá íá áðáíôÞóåôå óôçí ïìÜäá ÷ñçóôþí ç ïðïßá ðåñéëáìâÜíåé ôüóï ôïí áñ÷éêü áðïóôïëÝá, üóï êáé ôïõò õðüëïéðïõò ðáñáëÞðôåò ôïõ ìçíýìáôïò, ÷ñçóéìïðïéÞóôå ôï ðëÞêôñï **g**.

> **Óçìåßùóç:** Ôï **mutt** ÷ñçóéìïðïéåß ôï vi(1) ùò óõíôÜêôç êåéìÝíïõ ãéá äçìéïõñãßá êáé áðÜíôçóç óå email. Ç ñýèìéóç áõôÞ ìðïñåß íá áëëá÷èåß áðü ôï ÷ñÞóôç äçìéïõñãþíôáò Þ ôñïðïðïéþíôáò ôï áñ÷åßï `.muttrc` óôïí ðñïóùðéêü ôïõ êáôÜëïãï, êáé èÝôïíôáò ôç ìåôáâëçôÞ `editor`, Þ áëëÜæïíôáò ôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `EDITOR`. Äåßôå ôçí ôïðïèåóßá http://www.mutt.org/ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ñýèìéóç ôïõ **mutt**.

Ãéá íá óõíôÜîåôå Ýíá íÝï ìÞíõìá, ðéÝóôå ôï ðëÞêôñï **m**. Áöïý ãñÜøåôå ôï êáôÜëëçëï èÝìá, ôï **mutt** èá îåêéíÞóåé ôï vi(1) åðéôñÝðïíôáò óáò íá ãñÜøåôå ôï mail. Ìüëéò ïëïêëçñþóåôå, áðïèçêåýóôå êáé ôåñìáôßóôå ôï `vi` êáé ôï **mutt** èá óõíå÷ßóåé, äåß÷íïíôáò óáò ìéá ïèüíç ðåñßëçøçò ôïõ mail ôï ïðïßï ðñüêåéôáé íá óôáëåß. Ãéá íá óôåßëåôå ôï mail, ðéÝóôå ôï ðëÞêôñï **y**. Ìðïñåßôå íá äåßôå ðáñáêÜôù Ýíá ðáñÜäåéãìá ôçò ïèüíçò ðåñßëçøçò:



```
y:Send  q:Abort  t:To  c:CC  s:Subj  a:Attach file  d:Descrip  ?:Help
    From: Marc Silver <marcs@localhost>
      To: Super-User <root@localhost>
      Cc:
     Bcc:
 Subject: Re: test
Reply-To:
     Fcc:
Security: Clear

-- Attachments
- I     1 /tmp/mutt-bsd-c0hobscQ            [text/plain, 7bit, us-ascii, 1.1K]










-- Mutt: Compose  [Approx. msg size: 1.1K   Atts: 1]----------------------------
```

Ôï **mutt** ðåñéÝ÷åé åðßóçò åêôåôáìÝíç âïÞèåéá, óôçí ïðïßá ìðïñåßôå íá Ý÷åôå ðñüóâáóç ó÷åäüí áðü êÜèå óçìåßï ôïõ ìåíïý, ðéÝæïíôáò ôï ðëÞêôñï **?**. Ç ãñáììÞ óôçí êïñõöÞ ôçò ïèüíçò äåß÷íåé åðßóçò ôéò óõíôïìåýóåéò ðëçêôñïëïãßïõ, üðïõ õðÜñ÷ïõí.

29.11.3 alpine

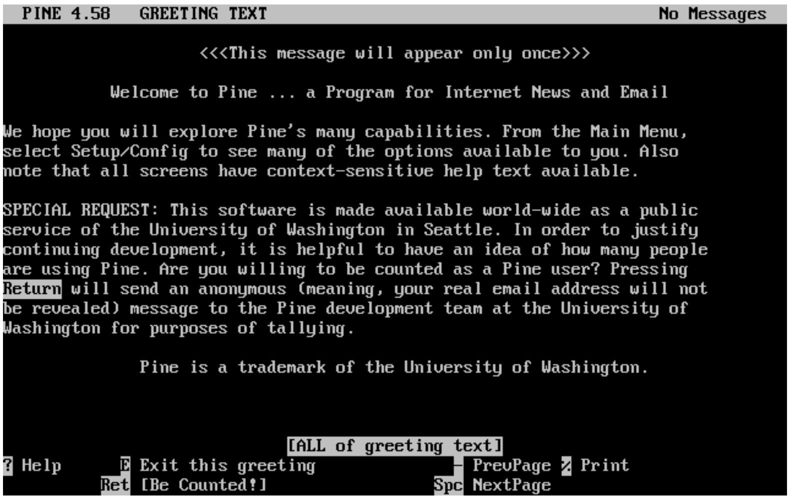
Ôï **alpine** áðåõèýíåôáé êõñßùò óôïí áñ÷Üñéï ÷ñÞóôç, áëëÜ ðåñéëáìâÜíåé åðßóçò êÜðïéá ðñï÷ùñçìÝíá ÷áñáêôçñéóôéêÜ.

> **Ðñïåéäïðïßçóç:** Ôï **alpine** Ý÷åé éóôïñéêü ðñïâëçìÜôùí áóöáëåßáò. Óôï ðáñåëèüí, áíáêáëýöèçêáí ðñïâëÞìáôá ðïõ åðÝôñåðáí óå áðïìáêñõóìÝíïõò åéóâïëåßò íá åêôåëÝóïõí ôï äéêü ôïõò êþäéêá óôï ôïðéêü óýóôçìá, óôÝëíïíôáò áðëþò Ýíá åéäéêÜ äéáìïñöùìÝíï email. ¼ëá áõôÜ ôá *ãíùóôÜ* ðñïâëÞìáôá Ý÷ïõí ðëÝïí äéïñèùèåß, áëëÜ ï êþäéêáò ôïõ **alpine** åßíáé ãñáììÝíïò ìå éäéáßôåñá áíáóöáëÞ ôñüðï, êáé ï Õðåýèõíïò ÁóöÜëåéáò ôïõ FreeBSD, ðéóôåýåé üôé åßíáé áñêåôÜ ðéèáíüí íá õðÜñ÷ïõí êáé Üëëá êåíÜ áóöáëåßáò ðïõ äåí Ý÷ïõí áíáêáëõöèåß áêüìá. Åãêáôáóôáóôå ôï **alpine** ìå äéêÞ óáò åõèýíç.

Ç ôñÝ÷ïõóá Ýêäïóç ôïõ **alpine** ìðïñåß íá åãêáôáóôáèåß ÷ñçóéìïðïéþíôáò ôï port `mail/alpine`. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ port ôï **alpine** ìðïñåß íá îåêéíÞóåé ÷ñçóéìïðïéþíôáò ôçí ðáñáêÜôù åíôïëÞ:

```
% alpine
```

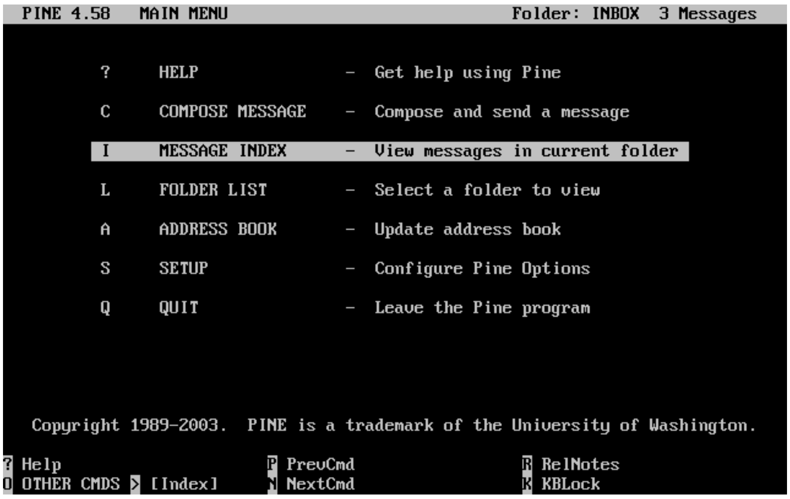
Ôçí ðñþôç öïñÜ ðïõ èá åêôåëÝóåôå ôï **alpine** èá óáò äåßîåé ìéá áñ÷éêÞ óåëßäá ÷áéñåôéóìïý, ìå ìéá óýíôïìç åéóáãùãÞ, êáèþò êáé ìéá áßôçóç áðü ôçí ïìÜäá áíÜðôõîçò ôïõ **alpine** íá ôïõò óôåßëåôå Ýíá áíþíõìï mail ôï ïðïßï èá ôïõò âïçèÞóåé íá Ý÷ïõí ìéá éäÝá ãéá ôï ðüóïé ÷ñÞóôåò ÷ñçóéìïðïéïýí ôï ëïãéóìéêü. Ãéá íá óôåßëåôå áõôü ôï áíþíõìï ìÞíõìá, ðéÝóôå **Enter**, Þ åíáëëáêôéêÜ ðéÝóôå **E** ãéá íá êëåßóåôå ôçí ïèüíç ÷áéñåôéóìïý ÷ùñßò íá óôåßëåôå ôï áíþíõìï ìÞíõìá. ¸íá ðáñÜäåéãìá ôçò óåëßäáò ÷áéñåôéóìïý öáßíåôáé ðáñáêÜôù:



```
 PINE 4.58   GREETING TEXT                                        No Messages

                   <<<This message will appear only once>>>

          Welcome to Pine ... a Program for Internet News and Email

We hope you will explore Pine's many capabilities. From the Main Menu,
select Setup/Config to see many of the options available to you. Also
note that all screens have context-sensitive help text available.

SPECIAL REQUEST: This software is made available world-wide as a public
service of the University of Washington in Seattle. In order to justify
continuing development, it is helpful to have an idea of how many people
are using Pine. Are you willing to be counted as a Pine user? Pressing
Return will send an anonymous (meaning, your real email address will not
be revealed) message to the Pine development team at the University of
Washington for purposes of tallying.

             Pine is a trademark of the University of Washington.



                             [ALL of greeting text]
? Help       E Exit this greeting              - PrevPage % Print
           Ret [Be Counted!]                 Spc NextPage
```

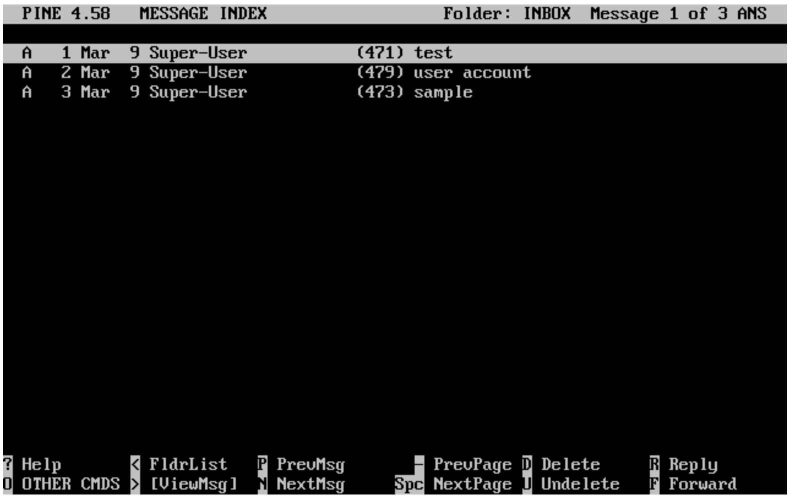
Èá åìöáíéóôåß êáôüðéí ôï êýñéï ìåíïý, óôï ïðïßï ìðïñåßôå íá ìåôáêéíçèåßôå åýêïëá ÷ñçóéìïðïéþíôáò ôá âåëÜêéá. Áõôü ôï êýñéï ìåíïý ðáñÝ÷åé ðëÞêôñá óõíôüìåõóçò ãéá äçìéïõñãßá íÝùí mail, ãéá áíß÷íåõóç óôïõò êáôáëüãïõò mail, êáé áêüìá ãéá äéá÷åßñéóç êáôá÷ùñÞóåùí óôï âéâëßï äéåõèýíóåùí. ÊÜôù áðü ôï êýñéï ìåíïý, åìöáíßæïíôáé óõíôïìåýóåéò ðëçêôñïëïãßïõ ó÷åôéêÝò ìå ôçí åñãáóßá ðïõ ãßíåôáé ôç óõãêåêñéìÝíç óôéãìÞ.

Ï ðñïåðéëåãìÝíïò êáôÜëïãïò ðïõ áíïßãåé ôï **alpine** åßíáé ôï `inbox`. Ãéá íá äåßôå ôï åõñåôÞñéï ôùí ìçíõìÜôùí, ðéÝóôå ôï **I**, Þ åðéëÝîôå ôï MESSAGE INDEX üðùò öáßíåôáé ðáñáêÜôù:



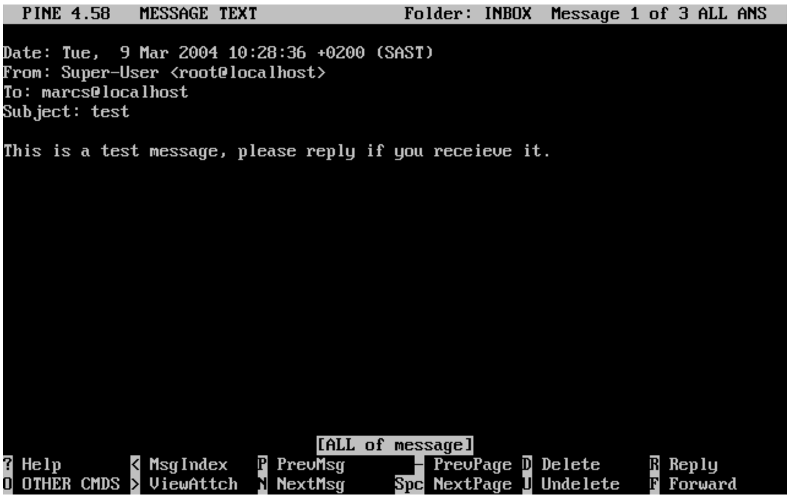
```
  PINE 4.58   MAIN MENU                        Folder: INBOX  3 Messages


          ?     HELP               -  Get help using Pine

          C     COMPOSE MESSAGE    -  Compose and send a message

          I     MESSAGE INDEX      -  View messages in current folder

          L     FOLDER LIST        -  Select a folder to view

          A     ADDRESS BOOK       -  Update address book

          S     SETUP              -  Configure Pine Options

          Q     QUIT               -  Leave the Pine program




   Copyright 1989-2003.  PINE is a trademark of the University of Washington.

? Help                 P PrevCmd                R RelNotes
O OTHER CMDS > [Index]  N NextCmd                K KBLock
```

Ôï åõñåôÞñéï ìçíõìÜôùí äåß÷íåé ìçíýìáôá áðü ôïí ôñÝ÷ïíôá êáôÜëïãï, êáé ìðïñåßôå íá ìåôáêéíçèåßôå óå áõôü ìå ôá âåëÜêéá. Ìðïñåßôå íá äéáâÜóåôå ôï åðéëåãìÝíï ìÞíõìá, ðéÝæïíôáò ôï ðëÞêôñï **Enter**.



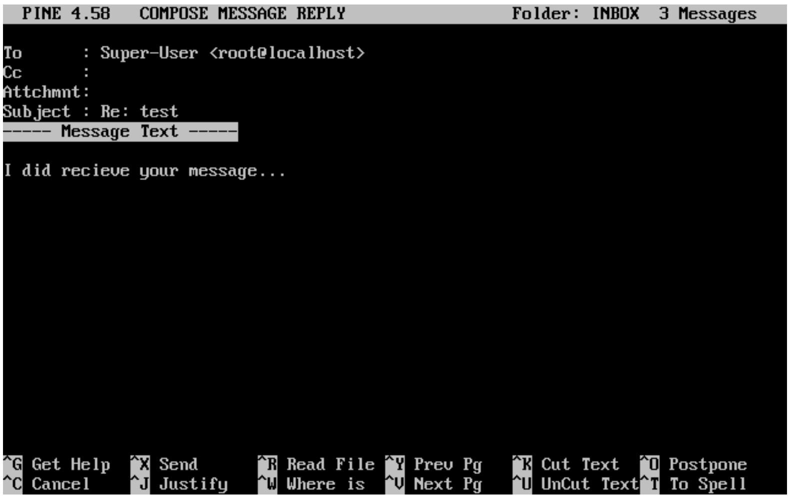
```
  PINE 4.58   MESSAGE INDEX                 Folder: INBOX  Message 1 of 3 ANS

  A    1 Mar   9 Super-User            (471) test
  A    2 Mar   9 Super-User            (479) user account
  A    3 Mar   9 Super-User            (473) sample























? Help          < FldrList   P PrevMsg       - PrevPage D Delete     R Reply
O OTHER CMDS    > [ViewMsg]  N NextMsg     Spc NextPage U Undelete   F Forward
```

Óôçí åéêüíá ðïõ öáßíåôáé ðáñáêÜôù, ôï **alpine** áðåéêïíßæåé Ýíá õðüäåéãìá ìçíýìáôïò. Óôï êÜôù ìÝñïò ôçò ïèüíçò öáßíïíôáé ó÷åôéêÝò óõíôïìåýóåéò ðëçêôñïëïãßïõ. ¿á ðáñÜäåéãìá ôÝôïéáò óõíôüìåõóçò, åßíáé ôï ðëÞêôñï **r** ôï ïðïßï ëÝåé óôï MUA íá äçìéïõñãÞóåé áðÜíôçóç ðñïò ôï ôñÝ÷ïí ìÞíõìá ðïõ áðåéêïíßæåôáé.



```
 PINE 4.58   MESSAGE TEXT              Folder: INBOX  Message 1 of 3 ALL ANS

Date: Tue,  9 Mar 2004 10:28:36 +0200 (SAST)
From: Super-User <root@localhost>
To: marcs@localhost
Subject: test

This is a test message, please reply if you receieve it.

                                   [ALL of message]
? Help       < MsgIndex   P PrevMsg      - PrevPage D Delete     R Reply
O OTHER CMDS > ViewAttch  N NextMsg    Spc NextPage U Undelete   F Forward
```

Ç áðÜíôçóç óå Ýíá mail ìÝóù ôïõ **alpine** ãßíåôáé ìå ôç ÷ñÞóç ôïõ óõíôÜêôç êåéìÝíïõ **pico**, ï ïðïßïò åãêáèßóôáôáé áðü ðñïåðéëïãÞ ìáæß ìå ôï **alpine**. Ôï **pico** äéåõêïëýíåé ôç ìåôáêßíçóç ìÝóá óôï ìÞíõìá, êáé åßíáé êÜðùò ðéï åýêïëï ãéá ôïõò áñ÷Üñéïõò ÷ñÞóôåò óå ó÷Ýóç ìå ôï vi(1) Þ ôï mail(1). Ìüëéò ïëïêëçñþóåôå ôçí áðÜíôçóç, ìðïñåßôå íá óôåßëåôå ôï ìÞíõìá ðéÝæïíôáò ôá ðëÞêôñá **Ctrl**+**X**. Ôï **alpine** èá óáò æçôÞóåé íá ôï åðéâåâáéþóåôå.



```
 PINE 4.58   COMPOSE MESSAGE REPLY                Folder: INBOX  3 Messages

To      : Super-User <root@localhost>
Cc      :
Attchmnt:
Subject : Re: test
----- Message Text -----

I did recieve your message...

^G Get Help  ^X Send      ^R Read File ^Y Prev Pg   ^K Cut Text  ^O Postpone
^C Cancel    ^J Justify   ^W Where is  ^V Next Pg   ^U UnCut Text^T To Spell
```

Ìðïñåßôå íá ðñïóáñìüóåôå ôï **alpine** ìå ôç ÷ñÞóç ôçò åðéëïãÞò SETUP áðü ôï êýñéï ìåíïý. Óõìâïõëåõèåßôå ôçí ôïðïèåóßá http://www.washington.edu/alpine/ ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

29.12 ×ñçóéìïðïéþíôáò ôï fetchmail

ÓõíåéóöïñÜ áðü ôïí Marc Silver.

Ôï **fetchmail** åßíáé Ýíáò ðëÞñçò ðåëÜôçò ãéá IMAP êáé POP, ï ïðïßïò åðéôñÝðåé óôïõò ÷ñÞóôåò íá êáôåâÜæïõí áõôüìáôá mail áðü áðïìáêñõóìÝíïõò åîõðçñåôçôÝò IMAP êáé POP êáé íá ôï áðïèçêåýïõí óå ôïðéêÝò èõñßäåò, áðü üðïõ ìðïñåß Ýðåéôá íá õðÜñ÷åé ðéï åýêïëç ðñüóâáóç. Ôï **fetchmail** ìðïñåß íá åãêáôáóôáèåß ÷ñçóéìïðïéþíôáò ôï port `mail/fetchmail` êáé ðáñÝ÷åé äéÜöïñá ÷áñáêôçñéóôéêÜ, ìåñéêÜ áðü ôá ïðïßá ðåñéëáìâÜíïõí:

- ÕðïóôÞñéîç ôùí ðñùôïêüëëùí POP3, APOP, KPOP, IMAP, ETRN êáé ODMR.
- Äõíáôüôçôá ðñïþèçóçò email ìÝóù SMTP, ôï ïðïßï åðéôñÝðåé ôç öõóéïëïãéêÞ ëåéôïõñãßá ôïõ öéëôñáñßóìáôïò, ôçò ðñïþèçóçò, êáé ôùí ðáñùíõìßùí (aliases).
- Ìðïñåß íá ëåéôïõñãÞóåé óå êáôÜóôáóç äáßìïíá, þóôå íá åëÝã÷åé ðåñéïäéêÜ ãéá íÝá ìçíýìáôá.
- Ìðïñåß íá áíáêôÜ ðïëëáðëÝò èõñßäåò êáé íá ôéò ðñïùèåß, áíÜëïãá ìå ôéò ñõèìßóåéò ôïõ, óå äéáöïñåôéêïýò ôïðéêïýò ÷ñÞóôåò.

Áí êáé åßíáé Ýîù áðü ôïõò óêïðïýò áõôïý ôïõ êåéìÝíïõ íá åîçãÞóåé üëåò ôéò äõíáôüôçôåò ôïõ **fetchmail**, èá áíáöåñèïýìå óå êÜðïéåò âáóéêÝò ëåéôïõñãßåò. Ôï **fetchmail** ÷ñçóéìïðïéåß Ýíá áñ÷åßï ñõèìßóåùí ãíùóôü ùò `.fetchmailrc`, ãéá íá ëåéôïõñãÞóåé óùóôÜ. Ôï áñ÷åßï áõôü ðåñéÝ÷åé ôéò ðëçñïöïñßåò ôïõ åîõðçñåôçôÞ áëëÜ êáé ôá óôïé÷åßá åéóüäïõ ôïõ ÷ñÞóôç. Ëüãù ôùí åõáßóèçôùí ðëçñïöïñéþí ôïõ áñ÷åßïõ áõôïý, óáò óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ôçí ðáñáêÜôù åíôïëÞ þóôå ç áíÜãíùóç ôïõ íá åðéôñÝðåôáé ìüíï áðü ôïí éäéïêôÞôç ôïõ:

```
% chmod 600 .fetchmailrc
```

Ôï `.fetchmailrc` ðïõ öáßíåôáé ðáñáêÜôù åßíáé Ýíá ðáñÜäåéãìá ìå ôï ïðïßï ìðïñåßôå íá êáôåâÜóåôå ôç èõñßäá åíüò ÷ñÞóôç ìÝóù ôïõ ðñùôïêüëëïõ POP. Êáôåõèýíåé ôï **fetchmail** íá óõíäåèåß óôï `example.com` ÷ñçóéìïðïéþíôáò üíïìá ÷ñÞóôç `joesoap` êáé êùäéêü `XXX`. Ôï ðáñÜäåéãìá õðïèÝôåé üôé ï ÷ñÞóôçò `joesoap` åßíáé åðßóçò êáé ÷ñÞóôçò ôïõ ôïðéêïý óõóôÞìáôïò.

```
poll example.com protocol pop3 username "joesoap" password "XXX"
```

Ôï åðüìåíï ðáñÜäåéãìá, äåß÷íåé óýíäåóç óå ðïëëáðëïýò POP êáé IMAP åîõðçñåôçôÝò, êáé áíáêáôåõèýíåé óå äéáöïñåôéêïýò ôïðéêïýò ÷ñÞóôåò üðïõ åßíáé áðáñáßôçôï:

```
poll example.com proto pop3:
user "joesoap", with password "XXX", is "jsoap" here;
user "andrea", with password "XXXX";
poll example2.net proto imap:
user "john", with password "XXXXX", is "myth" here;
```

Ôï âïçèçôéêü ðñüãñáììá **fetchmail** ìðïñåß íá ëåéôïõñãÞóåé óå êáôÜóôáóç äáßìïíá, áí ôï åêôåëÝóåôå ìå ôçí åðéëïãÞ `-d`, áêïëïõèïýìåíç áðü Ýíá äéÜóôçìá (óå äåõôåñüëåðôá) ôï ïðïßï èá ÷ñçóéìïðïéçèåß ãéá íá åñùôþíôáé ïé åîõðçñåôçôÝò ðïõ åßíáé êáôá÷ùñçìÝíïé óôï áñ÷åßï `.fetchmailrc`. Ôï ðáñáêÜôù ðáñÜäåéãìá ïäçãåß ôï **fetchmail** íá áíé÷íåýåé ãéá íÝï mail êÜèå 600 äåõôåñüëåðôá:

```
% fetchmail -d 600
```

Ìðïñåßôå íá âñåßôå ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôï **fetchmail** óôçí ôïðïèåóßá http://fetchmail.berlios.de/.

29.13 ×ñçóéìïðïéþíôáò ôï procmail

ÓõíåéóöïñÜ áðü ôïí Marc Silver.

Ôï âïçèçôéêü ðñüãñáììá **procmail** åßíáé ìéá áðßóôåõôá éó÷õñÞ åöáñìïãÞ ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôï öéëôñÜñéóìá ôïõ åéóåñ÷üìåíïõ mail. ÅðéôñÝðåé óôïõò ÷ñÞóôåò íá ïñßæïõí “êáíüíåò” ïé ïðïßïé ìðïñåß íá ôáéñéÜæïõí óå åéóåñ÷üìåíá mail êáé íá åêôåëïýí äéÜöïñåò ëåéôïõñãßåò, Þ íá áíáêáôåõèýíïõí ôï mail óå åíáëëáêôéêÝò èõñßäåò Þ / êáé äéåõèýíóåéò ôá÷õäñïìåßïõ. Ôï **procmail** ìðïñåß íá åãêáôáóôáèåß ÷ñçóéìïðïéþíôáò ôï port `mail/procmail`. ÌåôÜ ôçí åãêáôÜóôáóç ôïõ, ìðïñåß íá åíóùìáôùèåß ó÷åäüí óå ïðïéïäÞðïôå MTA. Óõìâïõëåõèåßôå ôçí ôåêìçñßùóç ôïõ MTA ðïõ ÷ñçóéìïðïéåßôå ãéá ðåñéóóüôåñåò ðëçñïöïñßåò. ÅíáëëáêôéêÜ, ìðïñåßôå íá åíóùìáôþóåôå ôï **procmail** ðñïóèÝôïíôáò ôçí áêüëïõèç ãñáììÞ óå Ýíá áñ÷åßï `.forward` óôïí êáôÜëïãï ôïõ ÷ñÞóôç, ÷ñçóéìïðïéþíôáò ôéò äõíáôüôçôåò ôïõ **procmail**:

```
"|exec /usr/local/bin/procmail || exit 75"
```

Óôçí ðáñáêÜôù åíüôçôá, èá äåßîïõìå ìåñéêïýò áðü ôïõò âáóéêïýò êáíüíåò ôïõ **procmail**, êáèþò êáé óýíôïìåò ðåñéãñáöÝò ôçò ëåéôïõñãßáò ôïõò. ÐñÝðåé íá ôïðïèåôÞóåôå áõôïýò (êáé Üëëïõò) êáíüíåò óå Ýíá áñ÷åßï `.procmailrc`, ôï ïðïßï èá ðñÝðåé íá âñßóêåôáé ìÝóá óôïí êáôÜëïãï ôïõ ÷ñÞóôç:

Ìðïñåßôå íá âñåßôå ôïõò ðåñéóóüôåñïõò áðü áõôïýò ôïõò êáíüíåò, óôç óåëßäá manual ôïõ procmailex(5).

Ðñïþèçóç üëïõ ôïõ email ôçò äéåýèõíóçò <`user@example.com`> ðñïò ôçí åîùôåñéêÞ äéåýèõíóç <`goodmail@example2.com`>:

```
:0
* ^From.*user@example.com
! goodmail@example2.com
```

Ðñïþèçóç üëùí ôùí email ðïõ åßíáé ìéêñüôåñá áðü 1000 bytes ðñïò ìéá åîùôåñéêÞ äéåýèõíóç email <`goodmail@example2.com`>:

```
:0
* < 1000
! goodmail@example2.com
```

ÁðïóôïëÞ üëïõ ôïõ mail ðïõ óôÝëíåôáé ðñïò ôï <`alternate@example.com`> óå ìéá èõñßäá ðïõ êáëåßôáé `alternate`:

```
:0
* ^TOalternate@example.com
alternate
```

ÁðïóôïëÞ üëïõ ôïõ mail ìå èÝìá “Spam” ðñïò ôï `/dev/null`:

```
:0
^Subject:.*Spam
/dev/null
```

Ìéá ÷ñÞóéìç ëýóç ðïõ îå÷ùñßæåé ôá email áðü ôéò ëßóôåò ôá÷õäñïìåßïõ `FreeBSD.org` êáé ôïðïèåôåß ôï êÜèå ìÞíõìá óå äéáöïñåôéêÞ èõñßäá:

```
:0
* ^Sender:.owner-freebsd-\/[^@]+@FreeBSD.ORG
{
        LISTNAME=${MATCH}
        :0
        * LISTNAME??^\/[^@]+
        FreeBSD-${MATCH}
}
```

ÊåöÜëáéï 30 ÅîõðçñåôçôÝò Äéêôýïõ

Áíáäéïñãáíþèçêå áðü ôïí Murray Stokely.

30.1 Óýíïøç

Ôï êåöÜëáéï áõôü êáëýðôåé ïñéóìÝíåò áðü ôéò ðéï óõ÷íÜ ÷ñçóéìïðïéïýìåíåò äéêôõáêÝò õðçñåóßåò ôùí óõóôçìÜôùí UNIX. Èá ðáñïõóéÜóïõìå ôçí åãêáôÜóôáóç, ñýèìéóç, Ýëåã÷ï êáé óõíôÞñçóç ðïëëþí äéáöïñåôéêþí ôýðùí äéêôõáêþí õðçñåóéþí. Óå üëï ôï êåöÜëáéï, ãéá ôç äéêÞ óáò äéåõêüëõíóç, õðÜñ÷ïõí ðáñáäåßãìáôá äéáöüñùí áñ÷åßùí ñõèìßóåùí.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá äéá÷åéñßæåóôå ôçí õðçñåóßá **inetd**.
- Ðùò íá ñõèìßóåôå Ýíá äéêôõáêü óýóôçìá áñ÷åßùí.
- Ðùò íá ñõèìßóåôå Ýíá åîõðçñåôçôÞ äéêôõáêþí ðëçñïöïñéþí ãéá ôï äéáìïéñáóìü ëïãáñéáóìþí ÷ñçóôþí.
- Ðùò íá ÷ñçóéìïðïéÞóåôå ôï DHCP ãéá ôçí áõôüìáôç ñýèìéóç ôùí ðáñáìÝôñùí ôïõ äéêôýïõ.
- Ðùò íá ñõèìßóåôå Ýíá åîõðçñåôçôÞ ïíïìáóßáò ðåñéï÷þí (DNS).
- Ðùò íá ñõèìßóåôå ôïí åîõðçñåôçôÞ éóôïóåëßäùí **Apache**.
- Ðùò íá ñõèìßóåôå Ýíá åîõðçñåôçôÞ ìåôáöïñÜò áñ÷åßùí (FTP).
- Ðùò íá ñõèìßóåôå Ýíá åîõðçñåôçôÞ áñ÷åßùí êáé åêôõðùôþí ãéá ðåëÜôåò Windows ìå ÷ñÞóç ôçò åöáñìïãÞò **Samba**.
- Ðùò íá óõã÷ñïíßóåôå ôçí çìåñïìçíßá êáé ôçí þñá, êáé íá ñõèìßóåôå Ýíá åîõðçñåôçôÞ þñáò ìå ôç âïÞèåéá ôïõ NTP ðñùôïêüëëïõ.

Ðñéí äéáâÜóåôå áõôü êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò ôùí áñ÷åßùí script `/etc/rc`.
- Íá åßóôå åîïéêåéùìÝíïé ìå ôç âáóéêÞ ïñïëïãßá ôùí äéêôýùí.
- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

30.2 The inetd “Super-Server”

Contributed by Chern Lee. Updated for FreeBSD 6.1-RELEASE by The FreeBSD Documentation Project.

30.2.1 Overview

inetd(8) is sometimes referred to as the “Internet Super-Server” because it manages connections for several services. When a connection is received by **inetd**, it determines which program the connection is destined for, spawns the particular process and delegates the socket to it (the program is invoked with the service socket as its standard input, output and error descriptors). Running **inetd** for servers that are not heavily used can reduce the overall system load, when compared to running each daemon individually in stand-alone mode.

Primarily, **inetd** is used to spawn other daemons, but several trivial protocols are handled directly, such as **chargen**, **auth**, and **daytime**.

This section will cover the basics in configuring **inetd** through its command-line options and its configuration file, `/etc/inetd.conf`.

30.2.2 Settings

inetd is initialized through the rc(8) system. The `inetd_enable` option is set to `NO` by default, but may be turned on by **sysinstall** during installation, depending on the configuration chosen by the user. Placing:

```
inetd_enable="YES"
```

or

```
inetd_enable="NO"
```

into `/etc/rc.conf` will enable or disable **inetd** starting at boot time. The command:

```
/etc/rc.d/inetd rcvar
```

can be run to display the current effective setting.

Additionally, different command-line options can be passed to **inetd** via the `inetd_flags` option.

30.2.3 Command-Line Options

Like most server daemons, **inetd** has a number of options that it can be passed in order to modify its behaviour. The full list of options reads:

```
inetd [-d] [-l] [-w] [-W] [-c maximum] [-C rate] [-a address | hostname] [-p filename]
[-R rate] [-s maximum] [configuration file]
```

Options can be passed to **inetd** using the `inetd_flags` option in `/etc/rc.conf`. By default, `inetd_flags` is set to `-wW -C 60`, which turns on TCP wrapping for **inetd**'s services, and prevents any single IP address from requesting any service more than 60 times in any given minute.

Novice users may be pleased to note that these parameters usually do not need to be modified, although we mention the rate-limiting options below as they be useful should you find that you are receiving an excessive amount of connections. A full list of options can be found in the inetd(8) manual.

-c maximum

Specify the default maximum number of simultaneous invocations of each service; the default is unlimited. May be overridden on a per-service basis with the `max-child` parameter.

-C rate

Specify the default maximum number of times a service can be invoked from a single IP address in one minute; the default is unlimited. May be overridden on a per-service basis with the `max-connections-per-ip-per-minute` parameter.

-R rate

Specify the maximum number of times a service can be invoked in one minute; the default is 256. A rate of 0 allows an unlimited number of invocations.

-s maximum

Specify the maximum number of times a service can be invoked from a single IP address at any one time; the default is unlimited. May be overridden on a per-service basis with the `max-child-per-ip` parameter.

30.2.4 `inetd.conf`

Configuration of **inetd** is done via the file `/etc/inetd.conf`.

When a modification is made to `/etc/inetd.conf`, **inetd** can be forced to re-read its configuration file by running the command:

ÐáñÜäåéãìá 30-1. Reloading the inetd configuration file

```
# /etc/rc.d/inetd reload
```

Each line of the configuration file specifies an individual daemon. Comments in the file are preceded by a “#”. The format of each entry in `/etc/inetd.conf` is as follows:

```
service-name
socket-type
protocol
{wait|nowait}[/max-child[/max-connections-per-ip-per-minute[/max-child-per-ip]]]
user[:group][/login-class]
server-program
server-program-arguments
```

An example entry for the ftpd(8) daemon using IPv4 might read:

```
ftp     stream  tcp     nowait  root    /usr/libexec/ftpd       ftpd -l
```

service-name

This is the service name of the particular daemon. It must correspond to a service listed in `/etc/services`. This determines which port **inetd** must listen to. If a new service is being created, it must be placed in `/etc/services` first.

socket-type

Either `stream`, `dgram`, `raw`, or `seqpacket`. `stream` must be used for connection-based, TCP daemons, while `dgram` is used for daemons utilizing the UDP transport protocol.

protocol

One of the following:

Protocol	Explanation
tcp, tcp4	TCP IPv4

Protocol	Explanation
udp, udp4	UDP IPv4
tcp6	TCP IPv6
udp6	UDP IPv6
tcp46	Both TCP IPv4 and v6
udp46	Both UDP IPv4 and v6

{wait|nowait}[/max-child[/max-connections-per-ip-per-minute[/max-child-per-ip]]]

`wait|nowait` indicates whether the daemon invoked from **inetd** is able to handle its own socket or not. `dgram` socket types must use the `wait` option, while stream socket daemons, which are usually multi-threaded, should use `nowait`. `wait` usually hands off multiple sockets to a single daemon, while `nowait` spawns a child daemon for each new socket.

The maximum number of child daemons **inetd** may spawn can be set using the `max-child` option. If a limit of ten instances of a particular daemon is needed, a `/10` would be placed after `nowait`. Specifying `/0` allows an unlimited number of children

In addition to `max-child`, two other options which limit the maximum connections from a single place to a particular daemon can be enabled. `max-connections-per-ip-per-minute` limits the number of connections from any particular IP address per minutes, e.g. a value of ten would limit any particular IP address connecting to a particular service to ten attempts per minute. `max-child-per-ip` limits the number of children that can be started on behalf on any single IP address at any moment. These options are useful to prevent intentional or unintentional excessive resource consumption and Denial of Service (DoS) attacks to a machine.

In this field, either of `wait` or `nowait` is mandatory. `max-child`, `max-connections-per-ip-per-minute` and `max-child-per-ip` are optional.

A stream-type multi-threaded daemon without any `max-child`, `max-connections-per-ip-per-minute` or `max-child-per-ip` limits would simply be: `nowait`.

The same daemon with a maximum limit of ten daemons would read: `nowait/10`.

The same setup with a limit of twenty connections per IP address per minute and a maximum total limit of ten child daemons would read: `nowait/10/20`.

These options are utilized by the default settings of the fingerd(8) daemon, as seen here:

```
finger stream  tcp     nowait/3/10 nobody /usr/libexec/fingerd fingerd -s
```

Finally, an example of this field with a maximum of 100 children in total, with a maximum of 5 for any one IP address would read: `nowait/100/0/5`.

user

This is the username that the particular daemon should run as. Most commonly, daemons run as the `root` user. For security purposes, it is common to find some servers running as the `daemon` user, or the least privileged `nobody` user.

server-program

The full path of the daemon to be executed when a connection is received. If the daemon is a service provided by **inetd** internally, then `internal` should be used.

server-program-arguments

This works in conjunction with `server-program` by specifying the arguments, starting with `argv[0]`, passed to the daemon on invocation. If `mydaemon -d` is the command line, `mydaemon -d` would be the value of `server-program-arguments`. Again, if the daemon is an internal service, use `internal` here.

30.2.5 Security

Depending on the choices made at install time, many of **inetd**'s services may be enabled by default. If there is no apparent need for a particular daemon, consider disabling it. Place a "#" in front of the daemon in question in `/etc/inetd.conf`, and then reload the inetd configuration. Some daemons, such as **fingerd**, may not be desired at all because they provide information that may be useful to an attacker.

Some daemons are not security-conscious and have long, or non-existent, timeouts for connection attempts. This allows an attacker to slowly send connections to a particular daemon, thus saturating available resources. It may be a good idea to place `max-connections-per-ip-per-minute`, `max-child` or `max-child-per-ip` limitations on certain daemons if you find that you have too many connections.

By default, TCP wrapping is turned on. Consult the hosts_access(5) manual page for more information on placing TCP restrictions on various **inetd** invoked daemons.

30.2.6 Miscellaneous

daytime, **time**, **echo**, **discard**, **chargen**, and **auth** are all internally provided services of **inetd**.

The **auth** service provides identity network services, and is configurable to a certain degree, whilst the others are simply on or off.

Consult the inetd(8) manual page for more in-depth information.

30.3 Network File System (NFS)

Reorganized and enhanced by Tom Rhodes. Written by Bill Swingle.

Among the many different file systems that FreeBSD supports is the Network File System, also known as NFS. NFS allows a system to share directories and files with others over a network. By using NFS, users and programs can access files on remote systems almost as if they were local files.

Some of the most notable benefits that NFS can provide are:

- Local workstations use less disk space because commonly used data can be stored on a single machine and still remain accessible to others over the network.
- There is no need for users to have separate home directories on every network machine. Home directories could be set up on the NFS server and made available throughout the network.
- Storage devices such as floppy disks, CDROM drives, and Zip® drives can be used by other machines on the network. This may reduce the number of removable media drives throughout the network.

30.3.1 How NFS Works

NFS consists of at least two main parts: a server and one or more clients. The client remotely accesses the data that is stored on the server machine. In order for this to function properly a few processes have to be configured and running.

The server has to be running the following daemons:

Daemon	Description
nfsd	The NFS daemon which services requests from the NFS clients.
mountd	The NFS mount daemon which carries out the requests that nfsd(8) passes on to it.
rpcbind	This daemon allows NFS clients to discover which port the NFS server is using.

The client can also run a daemon, known as **nfsiod**. The **nfsiod** daemon services the requests from the NFS server. This is optional, and improves performance, but is not required for normal and correct operation. See the nfsiod(8) manual page for more information.

30.3.2 Configuring NFS

NFS configuration is a relatively straightforward process. The processes that need to be running can all start at boot time with a few modifications to your `/etc/rc.conf` file.

On the NFS server, make sure that the following options are configured in the `/etc/rc.conf` file:

```
rpcbind_enable="YES"
nfs_server_enable="YES"
mountd_flags="-r"
```

mountd runs automatically whenever the NFS server is enabled.

On the client, make sure this option is present in `/etc/rc.conf`:

```
nfs_client_enable="YES"
```

The `/etc/exports` file specifies which file systems NFS should export (sometimes referred to as “share”). Each line in `/etc/exports` specifies a file system to be exported and which machines have access to that file system. Along with what machines have access to that file system, access options may also be specified. There are many such options that can be used in this file but only a few will be mentioned here. You can easily discover other options by reading over the exports(5) manual page.

Here are a few example `/etc/exports` entries:

The following examples give an idea of how to export file systems, although the settings may be different depending on your environment and network configuration. For instance, to export the `/cdrom` directory to three example machines that have the same domain name as the server (hence the lack of a domain name for each) or have entries in your `/etc/hosts` file. The `-ro` flag makes the exported file system read-only. With this flag, the remote system will not be able to write any changes to the exported file system.

```
/cdrom -ro host1 host2 host3
```

The following line exports `/home` to three hosts by IP address. This is a useful setup if you have a private network without a DNS server configured. Optionally the `/etc/hosts` file could be configured for internal hostnames; please review hosts(5) for more information. The `-alldirs` flag allows the subdirectories to be mount points. In other words, it will not mount the subdirectories but permit the client to mount only the directories that are required or needed.

```
/home  -alldirs  10.0.0.2 10.0.0.3 10.0.0.4
```

The following line exports `/a` so that two clients from different domains may access the file system. The `-maproot=root` flag allows the `root` user on the remote system to write data on the exported file system as `root`. If the `-maproot=root` flag is not specified, then even if a user has `root` access on the remote system, he will not be able to modify files on the exported file system.

```
/a  -maproot=root  host.example.com box.example.org
```

In order for a client to access an exported file system, the client must have permission to do so. Make sure the client is listed in your `/etc/exports` file.

In `/etc/exports`, each line represents the export information for one file system to one host. A remote host can only be specified once per file system, and may only have one default entry. For example, assume that `/usr` is a single file system. The following `/etc/exports` would be invalid:

```
# Invalid when /usr is one file system
/usr/src   client
/usr/ports client
```

One file system, `/usr`, has two lines specifying exports to the same host, `client`. The correct format for this situation is:

```
/usr/src /usr/ports  client
```

The properties of one file system exported to a given host must all occur on one line. Lines without a client specified are treated as a single host. This limits how you can export file systems, but for most people this is not an issue.

The following is an example of a valid export list, where `/usr` and `/exports` are local file systems:

```
# Export src and ports to client01 and client02, but only
# client01 has root privileges on it
/usr/src /usr/ports -maproot=root    client01
/usr/src /usr/ports                  client02
# The client machines have root and can mount anywhere
# on /exports. Anyone in the world can mount /exports/obj read-only
/exports -alldirs -maproot=root      client01 client02
/exports/obj -ro
```

The **mountd** daemon must be forced to recheck the `/etc/exports` file whenever it has been modified, so the changes can take effect. This can be accomplished either by sending a HUP signal to the running daemon:

```
# kill -HUP ‘cat /var/run/mountd.pid‘
```

or by invoking the `mountd` rc(8) script with the appropriate parameter:

```
# /etc/rc.d/mountd onereload
```

Please refer to ÔìÞìá 12.7 for more information about using rc scripts.

Alternatively, a reboot will make FreeBSD set everything up properly. A reboot is not necessary though. Executing the following commands as `root` should start everything up.

On the NFS server:

```
# rpcbind
# nfsd -u -t -n 4
# mountd -r
```

On the NFS client:

```
# nfsiod -n 4
```

Now everything should be ready to actually mount a remote file system. In these examples the server’s name will be `server` and the client’s name will be `client`. If you only want to temporarily mount a remote file system or would rather test the configuration, just execute a command like this as `root` on the client:

```
# mount server:/home /mnt
```

This will mount the `/home` directory on the server at `/mnt` on the client. If everything is set up correctly you should be able to enter `/mnt` on the client and see all the files that are on the server.

If you want to automatically mount a remote file system each time the computer boots, add the file system to the `/etc/fstab` file. Here is an example:

```
server:/home    /mnt    nfs     rw      0       0
```

The fstab(5) manual page lists all the available options.

30.3.3 Locking

Some applications (e.g. **mutt**) require file locking to operate correctly. In the case of NFS, **rpc.lockd** can be used for file locking. To enable it, add the following to the `/etc/rc.conf` file on both client and server (it is assumed that the NFS client and server are configured already):

```
rpc_lockd_enable="YES"
rpc_statd_enable="YES"
```

Start the application by using:

```
# /etc/rc.d/nfslocking start
```

If real locking between the NFS clients and NFS server is not required, it is possible to let the NFS client do locking locally by passing `-L` to mount_nfs(8). Refer to the mount_nfs(8) manual page for further details.

30.3.4 Practical Uses

NFS has many practical uses. Some of the more common ones are listed below:

- Set several machines to share a CDROM or other media among them. This is cheaper and often a more convenient method to install software on multiple machines.

- On large networks, it might be more convenient to configure a central NFS server in which to store all the user home directories. These home directories can then be exported to the network so that users would always have the same home directory, regardless of which workstation they log in to.
- Several machines could have a common `/usr/ports/distfiles` directory. That way, when you need to install a port on several machines, you can quickly access the source without downloading it on each machine.

30.3.5 Automatic Mounts with amd

Contributed by Wylie Stilwell. Rewritten by Chern Lee.

amd(8) (the automatic mounter daemon) automatically mounts a remote file system whenever a file or directory within that file system is accessed. Filesystems that are inactive for a period of time will also be automatically unmounted by **amd**. Using **amd** provides a simple alternative to permanent mounts, as permanent mounts are usually listed in `/etc/fstab`.

amd operates by attaching itself as an NFS server to the `/host` and `/net` directories. When a file is accessed within one of these directories, **amd** looks up the corresponding remote mount and automatically mounts it. `/net` is used to mount an exported file system from an IP address, while `/host` is used to mount an export from a remote hostname.

An access to a file within `/host/foobar/usr` would tell **amd** to attempt to mount the `/usr` export on the host `foobar`.

ÐáñÜäåéãìá 30-2. Mounting an Export with amd

You can view the available mounts of a remote host with the `showmount` command. For example, to view the mounts of a host named `foobar`, you can use:

```
% showmount -e foobar
Exports list on foobar:
/usr                                10.10.10.0
/a                                  10.10.10.0
% cd /host/foobar/usr
```

As seen in the example, the `showmount` shows `/usr` as an export. When changing directories to `/host/foobar/usr`, **amd** attempts to resolve the hostname `foobar` and automatically mount the desired export.

amd can be started by the startup scripts by placing the following lines in `/etc/rc.conf`:

```
amd_enable="YES"
```

Additionally, custom flags can be passed to **amd** from the `amd_flags` option. By default, `amd_flags` is set to:

```
amd_flags="-a /.amd_mnt -l syslog /host /etc/amd.map /net /etc/amd.map"
```

The `/etc/amd.map` file defines the default options that exports are mounted with. The `/etc/amd.conf` file defines some of the more advanced features of **amd**.

Consult the amd(8) and amd.conf(5) manual pages for more information.

30.3.6 Problems Integrating with Other Systems

Contributed by John Lind.

Certain Ethernet adapters for ISA PC systems have limitations which can lead to serious network problems, particularly with NFS. This difficulty is not specific to FreeBSD, but FreeBSD systems are affected by it.

The problem nearly always occurs when (FreeBSD) PC systems are networked with high-performance workstations, such as those made by Silicon Graphics, Inc., and Sun Microsystems, Inc. The NFS mount will work fine, and some operations may succeed, but suddenly the server will seem to become unresponsive to the client, even though requests to and from other systems continue to be processed. This happens to the client system, whether the client is the FreeBSD system or the workstation. On many systems, there is no way to shut down the client gracefully once this problem has manifested itself. The only solution is often to reset the client, because the NFS situation cannot be resolved.

Though the “correct” solution is to get a higher performance and capacity Ethernet adapter for the FreeBSD system, there is a simple workaround that will allow satisfactory operation. If the FreeBSD system is the *server*, include the option `-w=1024` on the mount from the client. If the FreeBSD system is the *client*, then mount the NFS file system with the option `-r=1024`. These options may be specified using the fourth field of the `fstab` entry on the client for automatic mounts, or by using the `-o` parameter of the mount(8) command for manual mounts.

It should be noted that there is a different problem, sometimes mistaken for this one, when the NFS servers and clients are on different networks. If that is the case, make *certain* that your routers are routing the necessary UDP information, or you will not get anywhere, no matter what else you are doing.

In the following examples, `fastws` is the host (interface) name of a high-performance workstation, and `freebox` is the host (interface) name of a FreeBSD system with a lower-performance Ethernet adapter. Also, `/sharedfs` will be the exported NFS file system (see exports(5)), and `/project` will be the mount point on the client for the exported file system. In all cases, note that additional options, such as `hard` or `soft` and `bg` may be desirable in your application.

Examples for the FreeBSD system (`freebox`) as the client in `/etc/fstab` on `freebox`:

```
fastws:/sharedfs /project nfs rw,-r=1024 0 0
```

As a manual mount command on `freebox`:

```
# mount -t nfs -o -r=1024 fastws:/sharedfs /project
```

Examples for the FreeBSD system as the server in `/etc/fstab` on `fastws`:

```
freebox:/sharedfs /project nfs rw,-w=1024 0 0
```

As a manual mount command on `fastws`:

```
# mount -t nfs -o -w=1024 freebox:/sharedfs /project
```

Nearly any 16-bit Ethernet adapter will allow operation without the above restrictions on the read or write size.

For anyone who cares, here is what happens when the failure occurs, which also explains why it is unrecoverable. NFS typically works with a “block” size of 8 K (though it may do fragments of smaller sizes). Since the maximum Ethernet packet is around 1500 bytes, the NFS “block” gets split into multiple Ethernet packets, even though it is still a single unit to the upper-level code, and must be received, assembled, and *acknowledged* as a unit. The high-performance workstations can pump out the packets which comprise the NFS unit one right after the other, just as close together as the standard allows. On the smaller, lower capacity cards, the later packets overrun the earlier packets of the same unit before they can be transferred to the host and the unit as a whole cannot be reconstructed or acknowledged. As a result, the workstation will time out and try again, but it will try again with the entire 8 K unit, and the process will be repeated, ad infinitum.

By keeping the unit size below the Ethernet packet size limitation, we ensure that any complete Ethernet packet received can be acknowledged individually, avoiding the deadlock situation.

Overruns may still occur when a high-performance workstations is slamming data out to a PC system, but with the better cards, such overruns are not guaranteed on NFS “units”. When an overrun occurs, the units affected will be retransmitted, and there will be a fair chance that they will be received, assembled, and acknowledged.

30.4 Network Information System (NIS/YP)

Written by Bill Swingle. Enhanced by Eric Ogren êáé Udo Erdelhoff.

30.4.1 What Is It?

NIS, which stands for Network Information Services, was developed by Sun Microsystems to centralize administration of UNIX (originally SunOS) systems. It has now essentially become an industry standard; all major UNIX like systems (Solaris, HP-UX, AIX®, Linux, NetBSD, OpenBSD, FreeBSD, etc) support NIS.

NIS was formerly known as Yellow Pages, but because of trademark issues, Sun changed the name. The old term (and yp) is still often seen and used.

It is a RPC-based client/server system that allows a group of machines within an NIS domain to share a common set of configuration files. This permits a system administrator to set up NIS client systems with only minimal configuration data and add, remove or modify configuration data from a single location.

It is similar to the Windows NT® domain system; although the internal implementation of the two are not at all similar, the basic functionality can be compared.

30.4.2 Terms/Processes You Should Know

There are several terms and several important user processes that you will come across when attempting to implement NIS on FreeBSD, whether you are trying to create an NIS server or act as an NIS client:

Term	Description
NIS domainname	An NIS master server and all of its clients (including its slave servers) have a NIS domainname. Similar to an Windows NT domain name, the NIS domainname does not have anything to do with DNS.
rpcbind	Must be running in order to enable RPC (Remote Procedure Call, a network protocol used by NIS). If **rpcbind** is not running, it will be impossible to run an NIS server, or to act as an NIS client.
ypbind	“Binds” an NIS client to its NIS server. It will take the NIS domainname from the system, and using RPC, connect to the server. **ypbind** is the core of client-server communication in an NIS environment; if **ypbind** dies on a client machine, it will not be able to access the NIS server.

Term	Description
ypserv	Should only be running on NIS servers; this is the NIS server process itself. If ypserv(8) dies, then the server will no longer be able to respond to NIS requests (hopefully, there is a slave server to take over for it). There are some implementations of NIS (but not the FreeBSD one), that do not try to reconnect to another server if the server it used before dies. Often, the only thing that helps in this case is to restart the server process (or even the whole server) or the **ypbind** process on the client.
rpc.yppasswdd	Another process that should only be running on NIS master servers; this is a daemon that will allow NIS clients to change their NIS passwords. If this daemon is not running, users will have to login to the NIS master server and change their passwords there.

30.4.3 How Does It Work?

There are three types of hosts in an NIS environment: master servers, slave servers, and clients. Servers act as a central repository for host configuration information. Master servers hold the authoritative copy of this information, while slave servers mirror this information for redundancy. Clients rely on the servers to provide this information to them.

Information in many files can be shared in this manner. The `master.passwd`, `group`, and `hosts` files are commonly shared via NIS. Whenever a process on a client needs information that would normally be found in these files locally, it makes a query to the NIS server that it is bound to instead.

30.4.3.1 Machine Types

- A *NIS master server*. This server, analogous to a Windows NT primary domain controller, maintains the files used by all of the NIS clients. The `passwd`, `group`, and other various files used by the NIS clients live on the master server.

  Óçìåßùóç: It is possible for one machine to be an NIS master server for more than one NIS domain. However, this will not be covered in this introduction, which assumes a relatively small-scale NIS environment.

- *NIS slave servers*. Similar to the Windows NT backup domain controllers, NIS slave servers maintain copies of the NIS master's data files. NIS slave servers provide the redundancy, which is needed in important environments. They also help to balance the load of the master server: NIS Clients always attach to the NIS server whose response they get first, and this includes slave-server-replies.
- *NIS clients*. NIS clients, like most Windows NT workstations, authenticate against the NIS server (or the Windows NT domain controller in the Windows NT workstations case) to log on.

30.4.4 Using NIS/YP

This section will deal with setting up a sample NIS environment.

30.4.4.1 Planning

Let us assume that you are the administrator of a small university lab. This lab, which consists of 15 FreeBSD machines, currently has no centralized point of administration; each machine has its own `/etc/passwd` and `/etc/master.passwd`. These files are kept in sync with each other only through manual intervention; currently, when you add a user to the lab, you must run `adduser` on all 15 machines. Clearly, this has to change, so you have decided to convert the lab to use NIS, using two of the machines as servers.

Therefore, the configuration of the lab now looks something like:

Machine name	IP address	Machine role
`ellington`	`10.0.0.2`	NIS master
`coltrane`	`10.0.0.3`	NIS slave
`basie`	`10.0.0.4`	Faculty workstation
`bird`	`10.0.0.5`	Client machine
`cli[1-11]`	`10.0.0.[6-17]`	Other client machines

If you are setting up a NIS scheme for the first time, it is a good idea to think through how you want to go about it. No matter what the size of your network, there are a few decisions that need to be made.

30.4.4.1.1 Choosing a NIS Domain Name

This might not be the “domainname” that you are used to. It is more accurately called the “NIS domainname”. When a client broadcasts its requests for info, it includes the name of the NIS domain that it is part of. This is how multiple servers on one network can tell which server should answer which request. Think of the NIS domainname as the name for a group of hosts that are related in some way.

Some organizations choose to use their Internet domainname for their NIS domainname. This is not recommended as it can cause confusion when trying to debug network problems. The NIS domainname should be unique within your network and it is helpful if it describes the group of machines it represents. For example, the Art department at Acme Inc. might be in the “acme-art” NIS domain. For this example, assume you have chosen the name `test-domain`.

However, some operating systems (notably SunOS) use their NIS domain name as their Internet domain name. If one or more machines on your network have this restriction, you *must* use the Internet domain name as your NIS domain name.

30.4.4.1.2 Physical Server Requirements

There are several things to keep in mind when choosing a machine to use as a NIS server. One of the unfortunate things about NIS is the level of dependency the clients have on the server. If a client cannot contact the server for its NIS domain, very often the machine becomes unusable. The lack of user and group information causes most systems to temporarily freeze up. With this in mind you should make sure to choose a machine that will not be prone to being rebooted regularly, or one that might be used for development. The NIS server should ideally be a stand alone machine whose sole purpose in life is to be an NIS server. If you have a network that is not very heavily used, it is acceptable to put the NIS server on a machine running other services, just keep in mind that if the NIS server becomes unavailable, it will affect *all* of your NIS clients adversely.

30.4.4.2 NIS Servers

The canonical copies of all NIS information are stored on a single machine called the NIS master server. The databases used to store the information are called NIS maps. In FreeBSD, these maps are stored in `/var/yp/[domainname]` where `[domainname]` is the name of the NIS domain being served. A single NIS server can support several domains at once, therefore it is possible to have several such directories, one for each supported domain. Each domain will have its own independent set of maps.

NIS master and slave servers handle all NIS requests with the `ypserv` daemon. `ypserv` is responsible for receiving incoming requests from NIS clients, translating the requested domain and map name to a path to the corresponding database file and transmitting data from the database back to the client.

30.4.4.2.1 Setting Up a NIS Master Server

Setting up a master NIS server can be relatively straight forward, depending on your needs. FreeBSD comes with support for NIS out-of-the-box. All you need is to add the following lines to `/etc/rc.conf`, and FreeBSD will do the rest for you.

1.
   ```
   nisdomainname="test-domain"
   ```
   This line will set the NIS domainname to `test-domain` upon network setup (e.g. after reboot).
2.
   ```
   nis_server_enable="YES"
   ```
   This will tell FreeBSD to start up the NIS server processes when the networking is next brought up.
3.
   ```
   nis_yppasswdd_enable="YES"
   ```
   This will enable the `rpc.yppasswdd` daemon which, as mentioned above, will allow users to change their NIS password from a client machine.

> **Óçìåßùóç:** Depending on your NIS setup, you may need to add further entries. See the section about NIS servers that are also NIS clients, below, for details.

Now, all you have to do is to run the command `/etc/netstart` as superuser. It will set up everything for you, using the values you defined in `/etc/rc.conf`.

30.4.4.2.2 Initializing the NIS Maps

The *NIS maps* are database files, that are kept in the `/var/yp` directory. They are generated from configuration files in the `/etc` directory of the NIS master, with one exception: the `/etc/master.passwd` file. This is for a good reason, you do not want to propagate passwords to your `root` and other administrative accounts to all the servers in the NIS domain. Therefore, before we initialize the NIS maps, you should:

```
# cp /etc/master.passwd /var/yp/master.passwd
# cd /var/yp
# vi master.passwd
```

You should remove all entries regarding system accounts (`bin`, `tty`, `kmem`, `games`, etc), as well as any accounts that you do not want to be propagated to the NIS clients (for example `root` and any other UID 0 (superuser) accounts).

> **Óçìåßùóç:** Make sure the `/var/yp/master.passwd` is neither group nor world readable (mode 600)! Use the `chmod` command, if appropriate.

When you have finished, it is time to initialize the NIS maps! FreeBSD includes a script named `ypinit` to do this for you (see its manual page for more information). Note that this script is available on most UNIX Operating Systems, but not on all. On Digital UNIX/Compaq Tru64 UNIX it is called `ypsetup`. Because we are generating maps for an NIS master, we are going to pass the `-m` option to `ypinit`. To generate the NIS maps, assuming you already performed the steps above, run:

```
ellington# ypinit -m test-domain
Server Type: MASTER Domain: test-domain
Creating an YP server will require that you answer a few questions.
Questions will all be asked at the beginning of the procedure.
Do you want this procedure to quit on non-fatal errors? [y/n: n] n
Ok, please remember to go back and redo manually whatever fails.
If you don't, something might not work.
At this point, we have to construct a list of this domains YP servers.
rod.darktech.org is already known as master server.
Please continue to add any slave servers, one per line. When you are
done with the list, type a <control D>.
master server   :  ellington
next host to add:  coltrane
next host to add:  ^D
The current list of NIS servers looks like this:
ellington
coltrane
Is this correct?  [y/n: y] y

[..output from map generation..]

NIS Map update completed.
ellington has been setup as an YP master server without any errors.
```

`ypinit` should have created `/var/yp/Makefile` from `/var/yp/Makefile.dist`. When created, this file assumes that you are operating in a single server NIS environment with only FreeBSD machines. Since `test-domain` has a slave server as well, you must edit `/var/yp/Makefile`:

```
ellington# vi /var/yp/Makefile
```

You should comment out the line that says

```
NOPUSH = "True"
```

(if it is not commented out already).

30.4.4.2.3 Setting up a NIS Slave Server

Setting up an NIS slave server is even more simple than setting up the master. Log on to the slave server and edit the file `/etc/rc.conf` as you did before. The only difference is that we now must use the `-s` option when running `ypinit`. The `-s` option requires the name of the NIS master be passed to it as well, so our command line looks like:

```
coltrane# ypinit -s ellington test-domain

Server Type: SLAVE Domain: test-domain Master: ellington

Creating an YP server will require that you answer a few questions.
Questions will all be asked at the beginning of the procedure.

Do you want this procedure to quit on non-fatal errors? [y/n: n]  n

Ok, please remember to go back and redo manually whatever fails.
If you don’t, something might not work.
There will be no further questions. The remainder of the procedure
should take a few minutes, to copy the databases from ellington.
Transferring netgroup...
ypxfr: Exiting: Map successfully transferred
Transferring netgroup.byuser...
ypxfr: Exiting: Map successfully transferred
Transferring netgroup.byhost...
ypxfr: Exiting: Map successfully transferred
Transferring master.passwd.byuid...
ypxfr: Exiting: Map successfully transferred
Transferring passwd.byuid...
ypxfr: Exiting: Map successfully transferred
Transferring passwd.byname...
ypxfr: Exiting: Map successfully transferred
Transferring group.bygid...
ypxfr: Exiting: Map successfully transferred
Transferring group.byname...
ypxfr: Exiting: Map successfully transferred
Transferring services.byname...
ypxfr: Exiting: Map successfully transferred
Transferring rpc.bynumber...
ypxfr: Exiting: Map successfully transferred
Transferring rpc.byname...
ypxfr: Exiting: Map successfully transferred
Transferring protocols.byname...
ypxfr: Exiting: Map successfully transferred
Transferring master.passwd.byname...
ypxfr: Exiting: Map successfully transferred
Transferring networks.byname...
ypxfr: Exiting: Map successfully transferred
Transferring networks.byaddr...
ypxfr: Exiting: Map successfully transferred
Transferring netid.byname...
ypxfr: Exiting: Map successfully transferred
Transferring hosts.byaddr...
ypxfr: Exiting: Map successfully transferred
```

```
Transferring protocols.bynumber...
ypxfr: Exiting: Map successfully transferred
Transferring ypservers...
ypxfr: Exiting: Map successfully transferred
Transferring hosts.byname...
ypxfr: Exiting: Map successfully transferred

coltrane has been setup as an YP slave server without any errors.
Don't forget to update map ypservers on ellington.
```

You should now have a directory called `/var/yp/test-domain`. Copies of the NIS master server’s maps should be in this directory. You will need to make sure that these stay updated. The following `/etc/crontab` entries on your slave servers should do the job:

```
20      *       *       *       *       root   /usr/libexec/ypxfr passwd.byname
21      *       *       *       *       root   /usr/libexec/ypxfr passwd.byuid
```

These two lines force the slave to sync its maps with the maps on the master server. Although these entries are not mandatory, since the master server attempts to ensure any changes to its NIS maps are communicated to its slaves and because password information is vital to systems depending on the server, it is a good idea to force the updates. This is more important on busy networks where map updates might not always complete.

Now, run the command `/etc/netstart` on the slave server as well, which again starts the NIS server.

30.4.4.3 NIS Clients

An NIS client establishes what is called a binding to a particular NIS server using the `ypbind` daemon. `ypbind` checks the system’s default domain (as set by the `domainname` command), and begins broadcasting RPC requests on the local network. These requests specify the name of the domain for which `ypbind` is attempting to establish a binding. If a server that has been configured to serve the requested domain receives one of the broadcasts, it will respond to `ypbind`, which will record the server’s address. If there are several servers available (a master and several slaves, for example), `ypbind` will use the address of the first one to respond. From that point on, the client system will direct all of its NIS requests to that server. `ypbind` will occasionally “ping” the server to make sure it is still up and running. If it fails to receive a reply to one of its pings within a reasonable amount of time, `ypbind` will mark the domain as unbound and begin broadcasting again in the hopes of locating another server.

30.4.4.3.1 Setting Up a NIS Client

Setting up a FreeBSD machine to be a NIS client is fairly straightforward.

1. Edit the file `/etc/rc.conf` and add the following lines in order to set the NIS domainname and start `ypbind` upon network startup:

   ```
   nisdomainname="test-domain"
   nis_client_enable="YES"
   ```

2. To import all possible password entries from the NIS server, remove all user accounts from your `/etc/master.passwd` file and use `vipw` to add the following line to the end of the file:

   ```
   +:::::::::
   ```

Óçìåßùóç: This line will afford anyone with a valid account in the NIS server's password maps an account. There are many ways to configure your NIS client by changing this line. See the netgroups section below for more information. For more detailed reading see O'Reilly's book on `Managing NFS and NIS`.

Óçìåßùóç: You should keep at least one local account (i.e. not imported via NIS) in your `/etc/master.passwd` and this account should also be a member of the group `wheel`. If there is something wrong with NIS, this account can be used to log in remotely, become `root`, and fix things.

3. To import all possible group entries from the NIS server, add this line to your `/etc/group` file:

   ```
   +:*::
   ```

After completing these steps, you should be able to run `ypcat passwd` and see the NIS server's passwd map.

30.4.5 NIS Security

In general, any remote user can issue an RPC to ypserv(8) and retrieve the contents of your NIS maps, provided the remote user knows your domainname. To prevent such unauthorized transactions, ypserv(8) supports a feature called "securenets" which can be used to restrict access to a given set of hosts. At startup, ypserv(8) will attempt to load the securenets information from a file called `/var/yp/securenets`.

Óçìåßùóç: This path varies depending on the path specified with the `-p` option. This file contains entries that consist of a network specification and a network mask separated by white space. Lines starting with "#" are considered to be comments. A sample securenets file might look like this:

```
# allow connections from local host -- mandatory
127.0.0.1     255.255.255.255
# allow connections from any host
# on the 192.168.128.0 network
192.168.128.0 255.255.255.0
# allow connections from any host
# between 10.0.0.0 to 10.0.15.255
# this includes the machines in the testlab
10.0.0.0      255.255.240.0
```

If ypserv(8) receives a request from an address that matches one of these rules, it will process the request normally. If the address fails to match a rule, the request will be ignored and a warning message will be logged. If the `/var/yp/securenets` file does not exist, `ypserv` will allow connections from any host.

The `ypserv` program also has support for Wietse Venema's **TCP Wrapper** package. This allows the administrator to use the **TCP Wrapper** configuration files for access control instead of `/var/yp/securenets`.

Óçìåßùóç: While both of these access control mechanisms provide some security, they, like the privileged port test, are vulnerable to "IP spoofing" attacks. All NIS-related traffic should be blocked at your firewall.

Servers using `/var/yp/securenets` may fail to serve legitimate NIS clients with archaic TCP/IP implementations. Some of these implementations set all host bits to zero when doing broadcasts and/or fail to observe the subnet mask when calculating the broadcast address. While some of these problems can be fixed by changing the client configuration, other problems may force the retirement of the client systems in question or the abandonment of `/var/yp/securenets`.

Using `/var/yp/securenets` on a server with such an archaic implementation of TCP/IP is a really bad idea and will lead to loss of NIS functionality for large parts of your network.

The use of the **TCP Wrapper** package increases the latency of your NIS server. The additional delay may be long enough to cause timeouts in client programs, especially in busy networks or with slow NIS servers. If one or more of your client systems suffers from these symptoms, you should convert the client systems in question into NIS slave servers and force them to bind to themselves.

30.4.6 Barring Some Users from Logging On

In our lab, there is a machine `basie` that is supposed to be a faculty only workstation. We do not want to take this machine out of the NIS domain, yet the `passwd` file on the master NIS server contains accounts for both faculty and students. What can we do?

There is a way to bar specific users from logging on to a machine, even if they are present in the NIS database. To do this, all you must do is add `-username` to the end of the `/etc/master.passwd` file on the client machine, where `username` is the username of the user you wish to bar from logging in. This should preferably be done using `vipw`, since `vipw` will sanity check your changes to `/etc/master.passwd`, as well as automatically rebuild the password database when you finish editing. For example, if we wanted to bar user `bill` from logging on to `basie` we would:

```
basie# vipw
[add -bill to the end, exit]
vipw: rebuilding the database...
vipw: done

basie# cat /etc/master.passwd

root:[password]:0:0::0:0:The super-user:/root:/bin/csh
toor:[password]:0:0::0:0:The other super-user:/root:/bin/sh
daemon:*:1:1::0:0:Owner of many system processes:/root:/sbin/nologin
operator:*:2:5::0:0:System &:/:/sbin/nologin
bin:*:3:7::0:0:Binaries Commands and Source„,:/:/sbin/nologin
tty:*:4:65533::0:0:Tty Sandbox:/:/sbin/nologin
kmem:*:5:65533::0:0:KMem Sandbox:/:/sbin/nologin
games:*:7:13::0:0:Games pseudo-user:/usr/games:/sbin/nologin
news:*:8:8::0:0:News Subsystem:/:/sbin/nologin
man:*:9:9::0:0:Mister Man Pages:/usr/share/man:/sbin/nologin
bind:*:53:53::0:0:Bind Sandbox:/:/sbin/nologin
uucp:*:66:66::0:0:UUCP pseudo-user:/var/spool/uucppublic:/usr/libexec/uucp/uucico
xten:*:67:67::0:0:X-10 daemon:/usr/local/xten:/sbin/nologin
pop:*:68:6::0:0:Post Office Owner:/nonexistent:/sbin/nologin
nobody:*:65534:65534::0:0:Unprivileged user:/nonexistent:/sbin/nologin
+:::::::::
-bill
```

```
basie#
```

30.4.7 Using Netgroups

Contributed by Udo Erdelhoff.

The method shown in the previous section works reasonably well if you need special rules for a very small number of users and/or machines. On larger networks, you *will* forget to bar some users from logging onto sensitive machines, or you may even have to modify each machine separately, thus losing the main benefit of NIS: *centralized* administration.

The NIS developers' solution for this problem is called *netgroups*. Their purpose and semantics can be compared to the normal groups used by UNIX file systems. The main differences are the lack of a numeric ID and the ability to define a netgroup by including both user accounts and other netgroups.

Netgroups were developed to handle large, complex networks with hundreds of users and machines. On one hand, this is a Good Thing if you are forced to deal with such a situation. On the other hand, this complexity makes it almost impossible to explain netgroups with really simple examples. The example used in the remainder of this section demonstrates this problem.

Let us assume that your successful introduction of NIS in your laboratory caught your superiors' interest. Your next job is to extend your NIS domain to cover some of the other machines on campus. The two tables contain the names of the new users and new machines as well as brief descriptions of them.

User Name(s)	**Description**
`alpha`, `beta`	Normal employees of the IT department
`charlie`, `delta`	The new apprentices of the IT department
`echo`, `foxtrott`, `golf`, ...	Ordinary employees
`able`, `baker`, ...	The current interns

Machine Name(s)	**Description**
`war`, `death`, `famine`, `pollution`	Your most important servers. Only the IT employees are allowed to log onto these machines.
`pride`, `greed`, `envy`, `wrath`, `lust`, `sloth`	Less important servers. All members of the IT department are allowed to login onto these machines.
`one`, `two`, `three`, `four`, ...	Ordinary workstations. Only the *real* employees are allowed to use these machines.
`trashcan`	A very old machine without any critical data. Even the intern is allowed to use this box.

If you tried to implement these restrictions by separately blocking each user, you would have to add one `-user` line to each system's `passwd` for each user who is not allowed to login onto that system. If you forget just one entry, you could be in trouble. It may be feasible to do this correctly during the initial setup, however you *will* eventually forget to add the lines for new users during day-to-day operations. After all, Murphy was an optimist.

Handling this situation with netgroups offers several advantages. Each user need not be handled separately; you assign a user to one or more netgroups and allow or forbid logins for all members of the netgroup. If you add a new machine, you will only have to define login restrictions for netgroups. If a new user is added, you will only have to add the user to one or more netgroups. Those changes are independent of each other: no more “for each combination of user and machine do...” If your NIS setup is planned carefully, you will only have to modify exactly one central configuration file to grant or deny access to machines.

The first step is the initialization of the NIS map netgroup. FreeBSD’s ypinit(8) does not create this map by default, but its NIS implementation will support it once it has been created. To create an empty map, simply type

```
ellington# vi /var/yp/netgroup
```

and start adding content. For our example, we need at least four netgroups: IT employees, IT apprentices, normal employees and interns.

```
IT_EMP  (,alpha,test-domain)    (,beta,test-domain)
IT_APP  (,charlie,test-domain)  (,delta,test-domain)
USERS   (,echo,test-domain)     (,foxtrott,test-domain) \
        (,golf,test-domain)
INTERNS (,able,test-domain)     (,baker,test-domain)
```

`IT_EMP`, `IT_APP` etc. are the names of the netgroups. Each bracketed group adds one or more user accounts to it. The three fields inside a group are:

1. The name of the host(s) where the following items are valid. If you do not specify a hostname, the entry is valid on all hosts. If you do specify a hostname, you will enter a realm of darkness, horror and utter confusion.
2. The name of the account that belongs to this netgroup.
3. The NIS domain for the account. You can import accounts from other NIS domains into your netgroup if you are one of the unlucky fellows with more than one NIS domain.

Each of these fields can contain wildcards. See netgroup(5) for details.

> **Óçìåßùóç:** Netgroup names longer than 8 characters should not be used, especially if you have machines running other operating systems within your NIS domain. The names are case sensitive; using capital letters for your netgroup names is an easy way to distinguish between user, machine and netgroup names.
>
> Some NIS clients (other than FreeBSD) cannot handle netgroups with a large number of entries. For example, some older versions of SunOS start to cause trouble if a netgroup contains more than 15 *entries*. You can circumvent this limit by creating several sub-netgroups with 15 users or less and a real netgroup that consists of the sub-netgroups:
>
> ```
> BIGGRP1  (,joe1,domain)  (,joe2,domain)  (,joe3,domain) [...]
> BIGGRP2  (,joe16,domain)  (,joe17,domain) [...]
> BIGGRP3  (,joe31,domain)  (,joe32,domain)
> BIGGROUP  BIGGRP1 BIGGRP2 BIGGRP3
> ```
>
> You can repeat this process if you need more than 225 users within a single netgroup.

Activating and distributing your new NIS map is easy:

```
ellington# cd /var/yp
ellington# make
```

This will generate the three NIS maps `netgroup`, `netgroup.byhost` and `netgroup.byuser`. Use ypcat(1) to check if your new NIS maps are available:

```
ellington% ypcat -k netgroup
ellington% ypcat -k netgroup.byhost
ellington% ypcat -k netgroup.byuser
```

The output of the first command should resemble the contents of `/var/yp/netgroup`. The second command will not produce output if you have not specified host-specific netgroups. The third command can be used to get the list of netgroups for a user.

The client setup is quite simple. To configure the server `war`, you only have to start vipw(8) and replace the line

```
+:::::::::
```

with

```
+@IT_EMP:::::::::
```

Now, only the data for the users defined in the netgroup `IT_EMP` is imported into `war`'s password database and only these users are allowed to login.

Unfortunately, this limitation also applies to the ~ function of the shell and all routines converting between user names and numerical user IDs. In other words, `cd ~user` will not work, `ls -l` will show the numerical ID instead of the username and `find . -user joe -print` will fail with `No such user`. To fix this, you will have to import all user entries *without allowing them to login onto your servers*.

This can be achieved by adding another line to `/etc/master.passwd`. This line should contain:

`+:::::::::/sbin/nologin`, meaning "Import all entries but replace the shell with `/sbin/nologin` in the imported entries". You can replace any field in the `passwd` entry by placing a default value in your `/etc/master.passwd`.

> **Ðñïåéäïðïßçóç:** Make sure that the line `+:::::::::/sbin/nologin` is placed after `+@IT_EMP:::::::::`. Otherwise, all user accounts imported from NIS will have `/sbin/nologin` as their login shell.

After this change, you will only have to change one NIS map if a new employee joins the IT department. You could use a similar approach for the less important servers by replacing the old `+:::::::::` in their local version of `/etc/master.passwd` with something like this:

```
+@IT_EMP:::::::::
+@IT_APP:::::::::
+:::::::::/sbin/nologin
```

The corresponding lines for the normal workstations could be:

```
+@IT_EMP:::::::::
+@USERS:::::::::
+:::::::::/sbin/nologin
```

And everything would be fine until there is a policy change a few weeks later: The IT department starts hiring interns. The IT interns are allowed to use the normal workstations and the less important servers; and the IT apprentices are allowed to login onto the main servers. You add a new netgroup `IT_INTERN`, add the new IT interns to this netgroup and start to change the configuration on each and every machine... As the old saying goes: "Errors in centralized planning lead to global mess".

NIS’ ability to create netgroups from other netgroups can be used to prevent situations like these. One possibility is the creation of role-based netgroups. For example, you could create a netgroup called `BIGSRV` to define the login restrictions for the important servers, another netgroup called `SMALLSRV` for the less important servers and a third netgroup called `USERBOX` for the normal workstations. Each of these netgroups contains the netgroups that are allowed to login onto these machines. The new entries for your NIS map netgroup should look like this:

```
BIGSRV    IT_EMP  IT_APP
SMALLSRV  IT_EMP  IT_APP  ITINTERN
USERBOX   IT_EMP  ITINTERN USERS
```

This method of defining login restrictions works reasonably well if you can define groups of machines with identical restrictions. Unfortunately, this is the exception and not the rule. Most of the time, you will need the ability to define login restrictions on a per-machine basis.

Machine-specific netgroup definitions are the other possibility to deal with the policy change outlined above. In this scenario, the `/etc/master.passwd` of each box contains two lines starting with “+”. The first of them adds a netgroup with the accounts allowed to login onto this machine, the second one adds all other accounts with `/sbin/nologin` as shell. It is a good idea to use the “ALL-CAPS” version of the machine name as the name of the netgroup. In other words, the lines should look like this:

```
+@BOXNAME:::::::::
+:::::::::/sbin/nologin
```

Once you have completed this task for all your machines, you will not have to modify the local versions of `/etc/master.passwd` ever again. All further changes can be handled by modifying the NIS map. Here is an example of a possible netgroup map for this scenario with some additional goodies:

```
# Define groups of users first
IT_EMP    (,alpha,test-domain)    (,beta,test-domain)
IT_APP    (,charlie,test-domain)  (,delta,test-domain)
DEPT1     (,echo,test-domain)     (,foxtrott,test-domain)
DEPT2     (,golf,test-domain)     (,hotel,test-domain)
DEPT3     (,india,test-domain)    (,juliet,test-domain)
ITINTERN  (,kilo,test-domain)     (,lima,test-domain)
D_INTERNS (,able,test-domain)     (,baker,test-domain)
#
# Now, define some groups based on roles
USERS     DEPT1   DEPT2     DEPT3
BIGSRV    IT_EMP  IT_APP
SMALLSRV  IT_EMP  IT_APP    ITINTERN
USERBOX   IT_EMP  ITINTERN  USERS
#
# And a groups for a special tasks
# Allow echo and golf to access our anti-virus-machine
SECURITY  IT_EMP  (,echo,test-domain)  (,golf,test-domain)
#
# machine-based netgroups
# Our main servers
WAR       BIGSRV
FAMINE    BIGSRV
# User india needs access to this server
POLLUTION  BIGSRV  (,india,test-domain)
#
```

```
# This one is really important and needs more access restrictions
DEATH     IT_EMP
#
# The anti-virus-machine mentioned above
ONE       SECURITY
#
# Restrict a machine to a single user
TWO       (,hotel,test-domain)
# [...more groups to follow]
```

If you are using some kind of database to manage your user accounts, you should be able to create the first part of the map with your database's report tools. This way, new users will automatically have access to the boxes.

One last word of caution: It may not always be advisable to use machine-based netgroups. If you are deploying a couple of dozen or even hundreds of identical machines for student labs, you should use role-based netgroups instead of machine-based netgroups to keep the size of the NIS map within reasonable limits.

30.4.8 Important Things to Remember

There are still a couple of things that you will need to do differently now that you are in an NIS environment.

- Every time you wish to add a user to the lab, you must add it to the master NIS server *only*, and *you must remember to rebuild the NIS maps*. If you forget to do this, the new user will not be able to login anywhere except on the NIS master. For example, if we needed to add a new user `jsmith` to the lab, we would:

  ```
  # pw useradd jsmith
  # cd /var/yp
  # make test-domain
  ```

  You could also run `adduser jsmith` instead of `pw useradd jsmith`.
- *Keep the administration accounts out of the NIS maps*. You do not want to be propagating administrative accounts and passwords to machines that will have users that should not have access to those accounts.
- *Keep the NIS master and slave secure, and minimize their downtime*. If somebody either hacks or simply turns off these machines, they have effectively rendered many people without the ability to login to the lab.

  This is the chief weakness of any centralized administration system. If you do not protect your NIS servers, you will have a lot of angry users!

30.4.9 NIS v1 Compatibility

FreeBSD's **ypserv** has some support for serving NIS v1 clients. FreeBSD's NIS implementation only uses the NIS v2 protocol, however other implementations include support for the v1 protocol for backwards compatibility with older systems. The **ypbind** daemons supplied with these systems will try to establish a binding to an NIS v1 server even though they may never actually need it (and they may persist in broadcasting in search of one even after they receive a response from a v2 server). Note that while support for normal client calls is provided, this version of **ypserv** does not handle v1 map transfer requests; consequently, it cannot be used as a master or slave in conjunction with older NIS servers that only support the v1 protocol. Fortunately, there probably are not any such servers still in use today.

30.4.10 NIS Servers That Are Also NIS Clients

Care must be taken when running **ypserv** in a multi-server domain where the server machines are also NIS clients. It is generally a good idea to force the servers to bind to themselves rather than allowing them to broadcast bind requests and possibly become bound to each other. Strange failure modes can result if one server goes down and others are dependent upon it. Eventually all the clients will time out and attempt to bind to other servers, but the delay involved can be considerable and the failure mode is still present since the servers might bind to each other all over again.

You can force a host to bind to a particular server by running `ypbind` with the `-S` flag. If you do not want to do this manually each time you reboot your NIS server, you can add the following lines to your `/etc/rc.conf`:

```
nis_client_enable="YES" # run client stuff as well
nis_client_flags="-S NIS domain,server"
```

See ypbind(8) for further information.

30.4.11 Password Formats

One of the most common issues that people run into when trying to implement NIS is password format compatibility. If your NIS server is using DES encrypted passwords, it will only support clients that are also using DES. For example, if you have Solaris NIS clients in your network, then you will almost certainly need to use DES encrypted passwords.

To check which format your servers and clients are using, look at `/etc/login.conf`. If the host is configured to use DES encrypted passwords, then the `default` class will contain an entry like this:

```
default:\
        :passwd_format=des:\
        :copyright=/etc/COPYRIGHT:\
        [Further entries elided]
```

Other possible values for the `passwd_format` capability include `blf` and `md5` (for Blowfish and MD5 encrypted passwords, respectively).

If you have made changes to `/etc/login.conf`, you will also need to rebuild the login capability database, which is achieved by running the following command as `root`:

```
# cap_mkdb /etc/login.conf
```

> **Óçìåßùóç:** The format of passwords already in `/etc/master.passwd` will not be updated until a user changes his password for the first time *after* the login capability database is rebuilt.

Next, in order to ensure that passwords are encrypted with the format that you have chosen, you should also check that the `crypt_default` in `/etc/auth.conf` gives precedence to your chosen password format. To do this, place the format that you have chosen first in the list. For example, when using DES encrypted passwords, the entry would be:

```
crypt_default   =       des blf md5
```

Having followed the above steps on each of the FreeBSD based NIS servers and clients, you can be sure that they all agree on which password format is used within your network. If you have trouble authenticating on an NIS client, this is a pretty good place to start looking for possible problems. Remember: if you want to deploy an NIS server for a heterogenous network, you will probably have to use DES on all systems because it is the lowest common standard.

30.5 Automatic Network Configuration (DHCP)

Written by Greg Sutter.

30.5.1 What Is DHCP?

DHCP, the Dynamic Host Configuration Protocol, describes the means by which a system can connect to a network and obtain the necessary information for communication upon that network. FreeBSD versions prior to 6.0 use the ISC (Internet Software Consortium) DHCP client (dhclient(8)) implementation. Later versions use the OpenBSD `dhclient` taken from OpenBSD 3.7. All information here regarding `dhclient` is for use with either of the ISC or OpenBSD DHCP clients. The DHCP server is the one included in the ISC distribution.

30.5.2 What This Section Covers

This section describes both the client-side components of the ISC and OpenBSD DHCP client and server-side components of the ISC DHCP system. The client-side program, `dhclient`, comes integrated within FreeBSD, and the server-side portion is available from the `net/isc-dhcp3-server` port. The dhclient(8), dhcp-options(5), and dhclient.conf(5) manual pages, in addition to the references below, are useful resources.

30.5.3 How It Works

When `dhclient`, the DHCP client, is executed on the client machine, it begins broadcasting requests for configuration information. By default, these requests are on UDP port 68. The server replies on UDP 67, giving the client an IP address and other relevant network information such as netmask, router, and DNS servers. All of this information comes in the form of a DHCP “lease” and is only valid for a certain time (configured by the DHCP server maintainer). In this manner, stale IP addresses for clients no longer connected to the network can be automatically reclaimed.

DHCP clients can obtain a great deal of information from the server. An exhaustive list may be found in dhcp-options(5).

30.5.4 FreeBSD Integration

FreeBSD fully integrates the ISC or OpenBSD DHCP client, `dhclient` (according to the FreeBSD version you run). DHCP client support is provided within both the installer and the base system, obviating the need for detailed knowledge of network configurations on any network that runs a DHCP server. `dhclient` has been included in all FreeBSD distributions since 3.2.

DHCP is supported by **sysinstall**. When configuring a network interface within **sysinstall**, the second question asked is: “Do you want to try DHCP configuration of the interface?”. Answering affirmatively will execute `dhclient`, and if successful, will fill in the network configuration information automatically.

There are two things you must do to have your system use DHCP upon startup:

- Make sure that the `bpf` device is compiled into your kernel. To do this, add `device bpf` to your kernel configuration file, and rebuild the kernel. For more information about building kernels, see ÊåöÜëáéï 9.

  The `bpf` device is already part of the `GENERIC` kernel that is supplied with FreeBSD, so if you do not have a custom kernel, you should not need to create one in order to get DHCP working.

  > **Óçìåßùóç:** For those who are particularly security conscious, you should be warned that `bpf` is also the device that allows packet sniffers to work correctly (although they still have to be run as `root`). `bpf` *is* required to use DHCP, but if you are very sensitive about security, you probably should not add `bpf` to your kernel in the expectation that at some point in the future you will be using DHCP.

- Edit your `/etc/rc.conf` to include the following:

  ```
  ifconfig_fxp0="DHCP"
  ```

  > **Óçìåßùóç:** Be sure to replace `fxp0` with the designation for the interface that you wish to dynamically configure, as described in ÔìÞìá 12.8.

  If you are using a different location for `dhclient`, or if you wish to pass additional flags to `dhclient`, also include the following (editing as necessary):

  ```
  dhcp_program="/sbin/dhclient"
  dhcp_flags=""
  ```

The DHCP server, **dhcpd**, is included as part of the `net/isc-dhcp3-server` port in the ports collection. This port contains the ISC DHCP server and documentation.

30.5.5 Files

- `/etc/dhclient.conf`

  `dhclient` requires a configuration file, `/etc/dhclient.conf`. Typically the file contains only comments, the defaults being reasonably sane. This configuration file is described by the dhclient.conf(5) manual page.

- `/sbin/dhclient`

  `dhclient` is statically linked and resides in `/sbin`. The dhclient(8) manual page gives more information about `dhclient`.

- `/sbin/dhclient-script`

  `dhclient-script` is the FreeBSD-specific DHCP client configuration script. It is described in dhclient-script(8), but should not need any user modification to function properly.

- `/var/db/dhclient.leases`

  The DHCP client keeps a database of valid leases in this file, which is written as a log. dhclient.leases(5) gives a slightly longer description.

30.5.6 Further Reading

The DHCP protocol is fully described in RFC 2131 (http://www.freesoft.org/CIE/RFC/2131/). An informational resource has also been set up at http://www.dhcp.org/.

30.5.7 Installing and Configuring a DHCP Server

30.5.7.1 What This Section Covers

This section provides information on how to configure a FreeBSD system to act as a DHCP server using the ISC (Internet Software Consortium) implementation of the DHCP server.

The server is not provided as part of FreeBSD, and so you will need to install the `net/isc-dhcp3-server` port to provide this service. See ÊåöÜëáéï 5 for more information on using the Ports Collection.

30.5.7.2 DHCP Server Installation

In order to configure your FreeBSD system as a DHCP server, you will need to ensure that the bpf(4) device is compiled into your kernel. To do this, add `device bpf` to your kernel configuration file, and rebuild the kernel. For more information about building kernels, see ÊåöÜëáéï 9.

The `bpf` device is already part of the `GENERIC` kernel that is supplied with FreeBSD, so you do not need to create a custom kernel in order to get DHCP working.

> **Óçìåßùóç:** Those who are particularly security conscious should note that `bpf` is also the device that allows packet sniffers to work correctly (although such programs still need privileged access). `bpf` *is* required to use DHCP, but if you are very sensitive about security, you probably should not include `bpf` in your kernel purely because you expect to use DHCP at some point in the future.

The next thing that you will need to do is edit the sample `dhcpd.conf` which was installed by the `net/isc-dhcp3-server` port. By default, this will be `/usr/local/etc/dhcpd.conf.sample`, and you should copy this to `/usr/local/etc/dhcpd.conf` before proceeding to make changes.

30.5.7.3 Configuring the DHCP Server

`dhcpd.conf` is comprised of declarations regarding subnets and hosts, and is perhaps most easily explained using an example :

```
option domain-name "example.com";❶
option domain-name-servers 192.168.4.100;❷
option subnet-mask 255.255.255.0;❸
```

```
default-lease-time 3600;❹
max-lease-time 86400;❺
ddns-update-style none;❻

subnet 192.168.4.0 netmask 255.255.255.0 {
  range 192.168.4.129 192.168.4.254;❼
  option routers 192.168.4.1;❽
}

host mailhost {
  hardware ethernet 02:03:04:05:06:07;❾
  fixed-address mailhost.example.com;(10)
}
```

❶ This option specifies the domain that will be provided to clients as the default search domain. See resolv.conf(5) for more information on what this means.

❷ This option specifies a comma separated list of DNS servers that the client should use.

❸ The netmask that will be provided to clients.

❹ A client may request a specific length of time that a lease will be valid. Otherwise the server will assign a lease with this expiry value (in seconds).

❺ This is the maximum length of time that the server will lease for. Should a client request a longer lease, a lease will be issued, although it will only be valid for `max-lease-time` seconds.

❻ This option specifies whether the DHCP server should attempt to update DNS when a lease is accepted or released. In the ISC implementation, this option is *required*.

❼ This denotes which IP addresses should be used in the pool reserved for allocating to clients. IP addresses between, and including, the ones stated are handed out to clients.

❽ Declares the default gateway that will be provided to clients.

❾ The hardware MAC address of a host (so that the DHCP server can recognize a host when it makes a request).

(10) Specifies that the host should always be given the same IP address. Note that using a hostname is correct here, since the DHCP server will resolve the hostname itself before returning the lease information.

Once you have finished writing your `dhcpd.conf`, you should enable the DHCP server in `/etc/rc.conf`, i.e. by adding:

```
dhcpd_enable="YES"
dhcpd_ifaces="dc0"
```

Replace the `dc0` interface name with the interface (or interfaces, separated by whitespace) that your DHCP server should listen on for DHCP client requests.

Then, you can proceed to start the server by issuing the following command:

```
# /usr/local/etc/rc.d/isc-dhcpd.sh start
```

Should you need to make changes to the configuration of your server in the future, it is important to note that sending a `SIGHUP` signal to **dhcpd** does *not* result in the configuration being reloaded, as it does with most daemons. You will need to send a `SIGTERM` signal to stop the process, and then restart it using the command above.

30.5.7.4 Files

- `/usr/local/sbin/dhcpd`

  dhcpd is statically linked and resides in `/usr/local/sbin`. The dhcpd(8) manual page installed with the port gives more information about **dhcpd**.

- `/usr/local/etc/dhcpd.conf`

  dhcpd requires a configuration file, `/usr/local/etc/dhcpd.conf` before it will start providing service to clients. This file needs to contain all the information that should be provided to clients that are being serviced, along with information regarding the operation of the server. This configuration file is described by the dhcpd.conf(5) manual page installed by the port.

- `/var/db/dhcpd.leases`

  The DHCP server keeps a database of leases it has issued in this file, which is written as a log. The manual page dhcpd.leases(5), installed by the port gives a slightly longer description.

- `/usr/local/sbin/dhcrelay`

  dhcrelay is used in advanced environments where one DHCP server forwards a request from a client to another DHCP server on a separate network. If you require this functionality, then install the `net/isc-dhcp3-relay` port. The dhcrelay(8) manual page provided with the port contains more detail.

30.6 Domain Name System (DNS)

Contributed by Chern Lee, Tom Rhodes, êáé Daniel Gerzo.

30.6.1 Overview

FreeBSD utilizes, by default, a version of BIND (Berkeley Internet Name Domain), which is the most common implementation of the DNS protocol. DNS is the protocol through which names are mapped to IP addresses, and vice versa. For example, a query for `www.FreeBSD.org` will receive a reply with the IP address of The FreeBSD Project's web server, whereas, a query for `ftp.FreeBSD.org` will return the IP address of the corresponding FTP machine. Likewise, the opposite can happen. A query for an IP address can resolve its hostname. It is not necessary to run a name server to perform DNS lookups on a system.

FreeBSD currently comes with BIND9 DNS server software by default. Our installation provides enhanced security features, a new file system layout and automated chroot(8) configuration.

DNS is coordinated across the Internet through a somewhat complex system of authoritative root, Top Level Domain (TLD), and other smaller-scale name servers which host and cache individual domain information.

Currently, BIND is maintained by the Internet Software Consortium http://www.isc.org/.

30.6.2 Terminology

To understand this document, some terms related to DNS must be understood.

Term	Definition
Forward DNS	Mapping of hostnames to IP addresses.
Origin	Refers to the domain covered in a particular zone file.
named, BIND, name server	Common names for the BIND name server package within FreeBSD.
Resolver	A system process through which a machine queries a name server for zone information.
Reverse DNS	The opposite of forward DNS; mapping of IP addresses to hostnames.
Root zone	The beginning of the Internet zone hierarchy. All zones fall under the root zone, similar to how all files in a file system fall under the root directory.
Zone	An individual domain, subdomain, or portion of the DNS administered by the same authority.

Examples of zones:

- `.` is the root zone.
- `org.` is a Top Level Domain (TLD) under the root zone.
- `example.org.` is a zone under the `org.` TLD.
- `1.168.192.in-addr.arpa` is a zone referencing all IP addresses which fall under the `192.168.1.*` IP space.

As one can see, the more specific part of a hostname appears to its left. For example, `example.org.` is more specific than `org.`, as `org.` is more specific than the root zone. The layout of each part of a hostname is much like a file system: the `/dev` directory falls within the root, and so on.

30.6.3 Reasons to Run a Name Server

Name servers usually come in two forms: an authoritative name server, and a caching name server.

An authoritative name server is needed when:

- One wants to serve DNS information to the world, replying authoritatively to queries.
- A domain, such as `example.org`, is registered and IP addresses need to be assigned to hostnames under it.
- An IP address block requires reverse DNS entries (IP to hostname).
- A backup or second name server, called a slave, will reply to queries.

A caching name server is needed when:

- A local DNS server may cache and respond more quickly than querying an outside name server.

When one queries for `www.FreeBSD.org`, the resolver usually queries the uplink ISP's name server, and retrieves the reply. With a local, caching DNS server, the query only has to be made once to the outside world by the caching DNS server. Every additional query will not have to look to the outside of the local network, since the information is cached locally.

30.6.4 How It Works

In FreeBSD, the BIND daemon is called **named** for obvious reasons.

File	Description
named(8)	The BIND daemon.
rndc(8)	Name server control utility.
`/etc/namedb`	Directory where BIND zone information resides.
`/etc/namedb/named.conf`	Configuration file of the daemon.

Depending on how a given zone is configured on the server, the files related to that zone can be found in the `master`, `slave`, or `dynamic` subdirectories of the `/etc/namedb` directory. These files contain the DNS information that will be given out by the name server in response to queries.

30.6.5 Starting BIND

Since BIND is installed by default, configuring it all is relatively simple.

The default **named** configuration is that of a basic resolving name server, ran in a chroot(8) environment. To start the server one time with this configuration, use the following command:

```
# /etc/rc.d/named forcestart
```

To ensure the **named** daemon is started at boot each time, put the following line into the `/etc/rc.conf`:

```
named_enable="YES"
```

There are obviously many configuration options for `/etc/namedb/named.conf` that are beyond the scope of this document. However, if you are interested in the startup options for **named** on FreeBSD, take a look at the `named_*` flags in `/etc/defaults/rc.conf` and consult the rc.conf(5) manual page. The ÔìÞìá 12.7 section is also a good read.

30.6.6 Configuration Files

Configuration files for **named** currently reside in `/etc/namedb` directory and will need modification before use, unless all that is needed is a simple resolver. This is where most of the configuration will be performed.

30.6.6.1 Using `make-localhost`

To configure a master zone for the localhost visit the `/etc/namedb` directory and run the following command:

```
# sh make-localhost
```

If all went well, a new file should exist in the `master` subdirectory. The filenames should be `localhost.rev` for the local domain name and `localhost-v6.rev` for IPv6 configurations. As the default configuration file, required information will be present in the `named.conf` file.

30.6.6.2 `/etc/namedb/named.conf`

```
// $FreeBSD$
//
// Refer to the named.conf(5) and named(8) man pages, and the documentation
// in /usr/share/doc/bind9 for more details.
//
// If you are going to set up an authoritative server, make sure you
// understand the hairy details of how DNS works.  Even with
// simple mistakes, you can break connectivity for affected parties,
// or cause huge amounts of useless Internet traffic.

options {
        directory       "/etc/namedb";
        pid-file        "/var/run/named/pid";
        dump-file       "/var/dump/named_dump.db";
        statistics-file "/var/stats/named.stats";

// If named is being used only as a local resolver, this is a safe default.
// For named to be accessible to the network, comment this option, specify
// the proper IP address, or delete this option.
        listen-on       { 127.0.0.1; };

// If you have IPv6 enabled on this system, uncomment this option for
// use as a local resolver.  To give access to the network, specify
// an IPv6 address, or the keyword "any".
//      listen-on-v6    { ::1; };

// In addition to the "forwarders" clause, you can force your name
// server to never initiate queries of its own, but always ask its
// forwarders only, by enabling the following line:
//
//      forward only;

// If you’ve got a DNS server around at your upstream provider, enter
// its IP address here, and enable the line below.  This will make you
// benefit from its cache, thus reduce overall DNS traffic in the Internet.
/*
        forwarders {
                127.0.0.1;
        };
*/
```

Just as the comment says, to benefit from an uplink’s cache, `forwarders` can be enabled here. Under normal circumstances, a name server will recursively query the Internet looking at certain name servers until it finds the answer it is looking for. Having this enabled will have it query the uplink’s name server (or name server provided) first, taking advantage of its cache. If the uplink name server in question is a heavily trafficked, fast name server, enabling this may be worthwhile.

> **Ðñïåéäïðïßçóç:** `127.0.0.1` will *not* work here. Change this IP address to a name server at your uplink.

```
        /*
         * If there is a firewall between you and nameservers you want
         * to talk to, you might need to uncomment the query-source
         * directive below.  Previous versions of BIND always asked
         * questions using port 53, but BIND versions 8 and later
         * use a pseudo-random unprivileged UDP port by default.
         */
         // query-source address * port 53;
};

// If you enable a local name server, don’t forget to enter 127.0.0.1
// first in your /etc/resolv.conf so this server will be queried.
// Also, make sure to enable it in /etc/rc.conf.

zone "." {
        type hint;
        file "named.root";
};

zone "0.0.127.IN-ADDR.ARPA" {
        type master;
        file "master/localhost.rev";
};

// RFC 3152
zone "1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.IP6.ARPA" {
        type master;
        file "master/localhost-v6.rev";
};

// NB: Do not use the IP addresses below, they are faked, and only
// serve demonstration/documentation purposes!
//
// Example slave zone config entries.  It can be convenient to become
// a slave at least for the zone your own domain is in.  Ask
// your network administrator for the IP address of the responsible
// primary.
//
// Never forget to include the reverse lookup (IN-ADDR.ARPA) zone!
// (This is named after the first bytes of the IP address, in reverse
// order, with ".IN-ADDR.ARPA" appended.)
//
// Before starting to set up a primary zone, make sure you fully
// understand how DNS and BIND works.  There are sometimes
// non-obvious pitfalls.  Setting up a slave zone is simpler.
//
// NB: Don’t blindly enable the examples below. :-)  Use actual names
// and addresses instead.

/* An example master zone
zone "example.net" {
        type master;
        file "master/example.net";
```

```
};
*/

/* An example dynamic zone
key "exampleorgkey" {
        algorithm hmac-md5;
        secret "sf87HJqjkqh8ac87a02lla==";
};
zone "example.org" {
        type master;
        allow-update {
                key "exampleorgkey";
        };
        file "dynamic/example.org";
};
*/

/* Examples of forward and reverse slave zones
zone "example.com" {
        type slave;
        file "slave/example.com";
        masters {
                192.168.1.1;
        };
};
zone "1.168.192.in-addr.arpa" {
        type slave;
        file "slave/1.168.192.in-addr.arpa";
        masters {
                192.168.1.1;
        };
};
*/
```

In `named.conf`, these are examples of slave entries for a forward and reverse zone.

For each new zone served, a new zone entry must be added to `named.conf`.

For example, the simplest zone entry for `example.org` can look like:

```
zone "example.org" {
        type master;
        file "master/example.org";
};
```

The zone is a master, as indicated by the `type` statement, holding its zone information in `/etc/namedb/master/example.org` indicated by the `file` statement.

```
zone "example.org" {
        type slave;
        file "slave/example.org";
};
```

In the slave case, the zone information is transferred from the master name server for the particular zone, and saved in the file specified. If and when the master server dies or is unreachable, the slave name server will have the transferred zone information and will be able to serve it.

30.6.6.3 Zone Files

An example master zone file for `example.org` (existing within `/etc/namedb/master/example.org`) is as follows:

```
$TTL 3600        ; 1 hour
example.org.    IN      SOA      ns1.example.org. admin.example.org. (
                                2006051501      ; Serial
                                10800           ; Refresh
                                3600            ; Retry
                                604800          ; Expire
                                86400           ; Minimum TTL
                        )

; DNS Servers
                IN      NS      ns1.example.org.
                IN      NS      ns2.example.org.

; MX Records
                IN      MX 10   mx.example.org.
                IN      MX 20   mail.example.org.

                IN      A       192.168.1.1

; Machine Names
localhost       IN      A       127.0.0.1
ns1             IN      A       192.168.1.2
ns2             IN      A       192.168.1.3
mx              IN      A       192.168.1.4
mail            IN      A       192.168.1.5

; Aliases
www             IN      CNAME   @
```

Note that every hostname ending in a “.” is an exact hostname, whereas everything without a trailing “.” is referenced to the origin. For example, `www` is translated into `www.`*`origin`*. In our fictitious zone file, our origin is `example.org.`, so `www` would translate to `www.example.org.`

The format of a zone file follows:

```
recordname      IN recordtype   value
```

The most commonly used DNS records:

SOA

start of zone authority

NS

an authoritative name server

A

a host address

CNAME

the canonical name for an alias

MX

mail exchanger

PTR

a domain name pointer (used in reverse DNS)

```
example.org. IN SOA ns1.example.org. admin.example.org. (
                        2006051501      ; Serial
                        10800           ; Refresh after 3 hours
                        3600            ; Retry after 1 hour
                        604800          ; Expire after 1 week
                        86400 )         ; Minimum TTL of 1 day
```

`example.org.`

the domain name, also the origin for this zone file.

`ns1.example.org.`

the primary/authoritative name server for this zone.

`admin.example.org.`

the responsible person for this zone, email address with “@” replaced. (<`admin@example.org`> becomes `admin.example.org`)

`2006051501`

the serial number of the file. This must be incremented each time the zone file is modified. Nowadays, many admins prefer a `yyyymmddrr` format for the serial number. `2006051501` would mean last modified 05/15/2006, the latter `01` being the first time the zone file has been modified this day. The serial number is important as it alerts slave name servers for a zone when it is updated.

```
       IN NS           ns1.example.org.
```

This is an NS entry. Every name server that is going to reply authoritatively for the zone must have one of these entries.

```
localhost       IN      A       127.0.0.1
ns1             IN      A       192.168.1.2
ns2             IN      A       192.168.1.3
mx              IN      A       192.168.1.4
```

```
mail            IN      A       192.168.1.5
```

The A record indicates machine names. As seen above, `ns1.example.org` would resolve to `192.168.1.2`.

```
                IN      A       192.168.1.1
```

This line assigns IP address `192.168.1.1` to the current origin, in this case `example.org`.

```
www             IN CNAME        @
```

The canonical name record is usually used for giving aliases to a machine. In the example, `www` is aliased to the "master" machine which name equals to domain name `example.org` (`192.168.1.1`). CNAMEs can be used to provide alias hostnames, or round robin one hostname among multiple machines.

```
               IN MX   10      mail.example.org.
```

The MX record indicates which mail servers are responsible for handling incoming mail for the zone. `mail.example.org` is the hostname of the mail server, and 10 being the priority of that mail server.

One can have several mail servers, with priorities of 10, 20 and so on. A mail server attempting to deliver to `example.org` would first try the highest priority MX (the record with the lowest priority number), then the second highest, etc, until the mail can be properly delivered.

For in-addr.arpa zone files (reverse DNS), the same format is used, except with PTR entries instead of A or CNAME.

```
$TTL 3600

1.168.192.in-addr.arpa. IN SOA ns1.example.org. admin.example.org. (
                        2006051501      ; Serial
                        10800           ; Refresh
                        3600            ; Retry
                        604800          ; Expire
                        3600 )          ; Minimum

        IN      NS      ns1.example.org.
        IN      NS      ns2.example.org.

1       IN      PTR     example.org.
2       IN      PTR     ns1.example.org.
3       IN      PTR     ns2.example.org.
4       IN      PTR     mx.example.org.
5       IN      PTR     mail.example.org.
```

This file gives the proper IP address to hostname mappings of our above fictitious domain.

30.6.7 Caching Name Server

A caching name server is a name server that is not authoritative for any zones. It simply asks queries of its own, and remembers them for later use. To set one up, just configure the name server as usual, omitting any inclusions of zones.

30.6.8 Security

Although BIND is the most common implementation of DNS, there is always the issue of security. Possible and exploitable security holes are sometimes found.

While FreeBSD automatically drops **named** into a chroot(8) environment; there are several other security mechanisms in place which could help to lure off possible DNS service attacks.

It is always good idea to read CERT (http://www.cert.org/)’s security advisories and to subscribe to the çëåêôñïíéêÞ ëßóôá Áíáêïéíþóåùí ãéá ÈÝìáôá ÁóöÜëåéáò ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security-notifications) to stay up to date with the current Internet and FreeBSD security issues.

> **Õðüäåéîç:** If a problem arises, keeping sources up to date and having a fresh build of **named** would not hurt.

30.6.9 Further Reading

BIND/**named** manual pages: rndc(8) named(8) named.conf(5)

- Official ISC BIND Page (http://www.isc.org/products/BIND/)
- Official ISC BIND Forum (http://www.isc.org/sw/guild/bf/)
- BIND FAQ (http://www.nominum.com/getOpenSourceResource.php?id=6)
- O’Reilly DNS and BIND 5th Edition (http://www.oreilly.com/catalog/dns5/)
- RFC1034 - Domain Names - Concepts and Facilities (ftp://ftp.isi.edu/in-notes/rfc1034.txt)
- RFC1035 - Domain Names - Implementation and Specification (ftp://ftp.isi.edu/in-notes/rfc1035.txt)

30.7 Ï åîõðçñåôçôÞò HTTP Apache

Óõíåéóöïñü ôïõ ÌåôÜöñáóç Murray Stokely êáé ÂáãÝëçò ÔõðÜëäïò.

30.7.1 Óýíïøç

Ôï FreeBSD ÷ñçóéìïðïéåßôáé ãéá íá öéëïîåíåß ðáãêïóìßùò éóôïóåëßäåò ìåãÜëçò åðéóêåøéìüôçôáò. Ïé ðåñéóóüôåñïé äéáêïìéóôÝò web óôï äéáäßêôõï ÷ñçóéìïðïéïýí ôïí **åîõðçñåôçôÞ HTTP Apache**. Ôá ðáêÝôá ëïãéóìéêïý ôïõ **Apache** èá ðñÝðåé íá ðåñéÝ÷ïíôáé óôï ìÝóï åãêáôÜóôáóçò ôïõ FreeBSD ðïõ ÷ñçóéìïðïéåßôå. Áí äåí åãêáôáóôÞóáôå ôïí **Apache** êáôÜ ôçí äéÜñêåéá ôçò åãêáôÜóôáóçò ôïõ FreeBSD, ôüôå ìðïñåßôå íá ôïí åãêáôáóôÞóåôå áðü ôï ðáêÝôï `www/apache13` Þ áðü ôï ðáêÝôï `www/apache20`.

Áöïý ïëïêëçñþóåôå åðéôõ÷þò ôçí åãêáôÜóôáóç ôïõ **Apache**, èá ðñÝðåé íá êÜíåôå ôéò áðáñáßôçôåò ñõèìßóåéò.

> **Óçìåßùóç:** ÁõôÞ ç åíüôçôá êáëýðôåé ôçí Ýêäïóç åîõðçñåôçôþí **Apache HTTP 1.3.X**, ìéáò ðïõ áõôÞ ç Ýêäïóç åßíáé ç ðéï äéáäåäïìÝíç ãéá ôï FreeBSD. Ï **Apache** 2.X ðáñïõóéÜæåé ðïëëÝò íÝåò ôå÷íïëïãßåò áëëÜ áõôÝò äåí ðåñéãñÜöïíôáé óå áõôÞ ôçí åíüôçôá. Ðåñéóóüôåñåò ðëçñïöïñßåò ãéá ôïí **Apache** 2.X, ìðïñåßôå íá äåßôå óôçí óåëßäá http://httpd.apache.org/.

30.7.2 Ñõèìßóåéò

Óôï FreeBSD ôï óçìáíôéêüôåñï áñ÷åßï ñõèìßóåùí ôïõ **ÅîõðçñåôçôÞ HTTP Apache** åßíáé ôï `/usr/local/etc/apache/httpd.conf`. Åßíáé Ýíá ôõðéêü UNIX ñõèìéóôéêü áñ÷åßï êåéìÝíïõ, ìå ãñáììÝò ó÷ïëßùí ðïõ îåêéíïýí ìå ôïí ÷áñáêôÞñá #. Óêïðüò ìáò åäþ äåí åßíáé ìéá ïëïêëçñùìÝíç ðåñéãñáöÞ üëùí ôùí ðéèáíþí åðéëïãþí, åðïìÝíùò èá ðåñéãñÜøïõìå ìüíï ôéò ðéï äçìïöéëåßò åðéëïãÝò ñõèìßóåéò (configuration directives).

`ServerRoot "/usr/local"`

Åäþ ðåñéãñÜöåôáé ï ðñïåðéëåãìÝíïò éåñáñ÷éêÜ êáôÜëïãïò åãêáôÜóôáóçò ãéá ôïí **Apache**. Ôá åêôåëÝóéìá áñ÷åßá åßíáé áðïèçêåõìÝíá óôïõò õðïêáôáëüãïõò `bin` êáé `sbin` ôïõ êáôáëüãïõ “ServerRoot” êáé ôá áñ÷åßá ñõèìßóåùí áðïèçêåýïíôáé óôïí êáôÜëïãï `etc/apache`.

`ServerAdmin you@your.address`

Ç çëåêôñïíéêÞ äéåýèõíóç óôçí ïðïßá èá ðñÝðåé íá áðïóôÝëëïíôáé áíáöïñÝò ðñïâëçìÜôùí ó÷åôéêÜ ìå ôïí åîõðçñåôçôÞ. ÁõôÞ ç äéåýèõíóç åìöáíßæåôáé óå êÜðïéåò óåëßäåò ðïõ äçìéïõñãïýíôáé áðü ôïí åîõðçñåôçôÞ, üðùò ïé óåëßäåò óöáëìÜôùí.

`ServerName www.example.com`

Ôï `ServerName` óáò åðéôñÝðåé íá èÝóåôå Ýíá üíïìá êüìâïõ (hostname) ãéá ôïí åîõðçñåôçôÞ óáò, ôï ïðïßï áðïóôÝëëåôáé ðßóù óôïõò clients áí åßíáé äéáöïñåôéêü áðü åêåßíï ðïõ Ý÷åôå Þäç ñõèìßóåé óôïí êüìâï óáò (åäþ ìðïñåßôå, ãéá ðáñÜäåéãìá, íá ÷ñçóéìïðïéÞóåôå `www` áíôß ôïõ ðñáãìáôéêïý ïíüìáôïò ôïõ êüìâïõ).

`DocumentRoot "/usr/local/www/data"`

`DocumentRoot`: Åßíáé ï êáôÜëïãïò áðü ôïí ïðïßï èá ðñïóöÝñïíôáé ôá Ýããñáöá óáò. ÐñïåðéëåãìÝíá, üëá ôá áéôÞìáôá èá åîõðçñåôïýíôáé áðü áõôü ôïí êáôÜëïãï, áëëÜ ìðïñïýí åðßóçò íá ÷ñçóéìïðïéçèïýí óõìâïëéêïß äåóìïß (symbolic link) Þ ðáñùíýìéá (aliases) ðïõ èá óôï÷åýïõí óå Üëëåò ôïðïèåóßåò.

Ðñéí êÜíåôå ïðïéáäÞðïôå áëëáãÞ, åßíáé êáëü íá äçìéïõñãåßôå áíôßãñáöá áóöáëåßáò (backup) ôïõ áñ÷åßïõ ñõèìßóåùí ôïõ **Apache**. Ìüëéò êñßíåôå ðùò åßóôå éêáíïðïéçìÝíïé ìå ôéò áñ÷éêÝò ñõèìßóåéò ìðïñåßôå íá îåêéíÞóåôå ìå ôçí åêôÝëåóç ôïõ **Apache**.

30.7.3 ÅêôÝëåóç ôïõ Apache

O **Apache** äåí ôñÝ÷åé äéáìÝóïõ ôïõ õðåñ-äéáêïìéóôÞ **inetd** üðùò êÜíïõí ðïëëïß Üëëïé äéêôõáêïß åîõðçñåôçôÝò. Åßíáé ñõèìéóìÝíïò íá ôñÝ÷åé áõôüíïìá ãéá íá åîõðçñåôåß êáëýôåñá ôéò áéôÞóåéò HTTP ôùí ðåëáôþí ôïõ, äçëáäÞ ôùí ðñïãñáììÜôùí ðëïÞãçóçò (browsers). Ç åãêáôÜóôáóç ôïõ **Apache** áðü ôá FreeBSD Ports ðåñéÝ÷åé Ýíá âïçèçôéêü shell script ãéá ôçí åêêßíçóç, ôï óôáìÜôçìá êáé ôçí åðáíåêêßíçóç ôïõ åîõðçñåôçôÞ. Ãéá íá îåêéíÞóåôå ôïí **Apache** ãéá ðñþôç öïñÜ, áðëÜ ôñÝîôå:

```
# /usr/local/sbin/apachectl start
```

Ìðïñåßôå ïðïéáäÞðïôå óôéãìÞ íá óôáìáôÞóåôå ôïí åîõðçñåôçôÞ, ðëçêôñïëïãþíôáò:

```
# /usr/local/sbin/apachectl stop
```

ÌåôÜ áðü áëëáãÝò ðïõ ðéèáíþò íá êÜíáôå ãéá ïðïéïíäÞðïôå ëüãï óôï áñ÷åßï ñõèìßóåùí, èá ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôïí åîõðçñåôçôÞ:

```
# /usr/local/sbin/apachectl restart
```

Ãéá íá åðáíåêêéíÞóåôå ôïí **Apache** äß÷ùò íá äéáêüøåôå ôéò ôñÝ÷ïõóåò óõíäÝóåéò, ôñÝîôå:

```
# /usr/local/sbin/apachectl graceful
```

Ðåñéóóüôåñåò ðëçñïöïñßåò èá âñåßôå óôç óåëßäá âïÞèåéáò ôïõ apachectl(8).

Ãéá íá îåêéíÜåé ï **Apache** áõôüìáôá êáôÜ ôç äéÜñêåéá åêêßíçóçò ôïõ óõóôÞìáôïò, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï `/etc/rc.conf`:

```
apache_enable="YES"
```

Áí åðéèõìåßôå íá ðáñÝ÷ïíôáé êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò ðñüóèåôåò åðéëïãÝò óôçí ãñáììÞ åíôïëþí ãéá ôï ðñüãñáììá **Apache** `httpd` ìðïñåßôå íá ôéò äçëþóåôå ìå ìéá ðñüóèåôç ãñáììÞ óôï `rc.conf`:

```
apache_flags=""
```

Ôþñá ðïõ Ý÷åé îåêéíÞóåé ï åîõðçñåôçôÞò web, ìðïñåßôå íá äåßôå ôçí éóôïóåëßäá óáò óôï÷åýïíôáò ôï ðñüãñáììá ðëïÞãçóçò óôï `http://localhost/`. Ç ðñïêáèïñéóìÝíç óåëßäá ðïõ åìöáíßæåôáé åßíáé ç `/usr/local/www/data/index.html`.

30.7.4 Virtual Hosting

Ï **Apache** õðïóôçñßæåé äýï äéáöïñåôéêïýò ôýðïõò Virtual Hosting. Ôï Ïíïìáóôéêü virtual hosting ÷ñçóéìïðïéåß ôïõò HTTP/1.1 headers ãéá íá êáèïñßóåé ôïí êüìâï. Áõôü åðéôñÝðåé ôçí êïéíÞ ÷ñÞóç ôçò ßäéáò IP ãéá ðïëëÜ êáé äéáöïñåôéêÜ domains.

Ãéá íá ñõèìßóåôå ôïí **Apache** íá ÷ñçóéìïðïéåß ôï Ïíïìáóôéêü Virtual Hosting åéóÜãåôå ìéá êáôá÷þñéóç óôï `httpd.conf` óáí ôçí áêüëïõèç:

```
NameVirtualHost *
```

Áí ï äéáêïìéóôÞò web ïíïìÜæåôáé `www.domain.tld` êáé åðéèõìåßôå íá åãêáôáóôÞóåôå Ýíá virtual domain ãéá ôï `www.someotherdomain.tld` ôüôå èá ðñÝðåé íá ðñïóèÝóåôå ôéò áêüëïõèåò êáôá÷ùñÞóåéò óôï`httpd.conf`:

```
<VirtualHost *>
ServerName www.domain.tld
DocumentRoot /www/domain.tld
</VirtualHost>

<VirtualHost *>
ServerName www.someotherdomain.tld
DocumentRoot /www/someotherdomain.tld
</VirtualHost>
```

ÁíôéêáôáóôÞóôå ôéò äéåõèýíóåéò ìå åêåßíåò ðïõ åðéèõìåßôå íá ÷ñçóéìïðïéÞóåôå êáé ôçí êáôÜëëçëç äéáäñïìÞ ðñïò ôá Ýããñáöá óáò.

Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ñõèìßóåéò ãéá ôá virtual host, óáò ðñïôñÝðïõìå íá óõìâïõëåõôåßôå ôçí åðßóçìç ôåêìçñßùóç ôïõ **Apache** óôï http://httpd.apache.org/docs/vhosts/.

30.7.5 Apache Modules

ÕðÜñ÷ïõí ðïëëïß êáé äéÜöïñïé äéáèÝóéìïé ôýðïé áñèñùìÜôùí (modules) ãéá ôïí **Apache**, ôá ïðïßá åðåêôåßíïõí êé åìðëïõôßæïõí ôéò ëåéôïõñãßåò ôïõ âáóéêïý åîõðçñåôçôÞ. Ç ÓõëëïãÞ ôùí Ports ôïõ FreeBSD ðáñÝ÷åé Ýíáí åýêïëï ôñüðï ãéá íá åãêáôáóôÞóåôå ôïí **Apache** êáé ìåñéêÜ áðü ôá ðéï äçìïöéëÞ áñèñþìáôá.

30.7.5.1 mod_ssl

Ôï Üñèñùìá **mod_ssl** ÷ñçóéìïðïéåß ôçí âéâëéïèÞêç OpenSSL ãéá íá ðáñÝ÷åé éó÷õñÞ êñõðôïãñÜöçóç äéáìÝóïõ ôùí ðñùôïêüëëùí Secure Sockets Layer (SSL v2/v3) êáé Transport Layer Security (TLS v1). Ôï Üñèñùìá ðáñÝ÷åé üëá ôá áðáñáßôçôá óõóôáôéêÜ ãéá íá ìðïñåß íá áéôåßôáé õðïãåãñáììÝíá ðéóôïðïéçôéêÜ áðü Ýìðéóôïõò åîïõóéïäïôçìÝíïõò öïñåßò ðéóôïðïßçóçò Ýôóé þóôå íá ìðïñåßôå íá ôñÝ÷åôå Ýíáí áóöáëÞ åîõðçñåôçôÞ web óôï FreeBSD.

ÅÜí äåí Ý÷åôå åãêáôáóôÞóåé áêüìç ôïí **Apache**, ìðïñåßôå íá åãêáôáóôÞóåôå ôçí Ýêäïóç ôïõ **Apache** 1.3.X ðïõ ðåñéëáìâÜíåé ôï **mod_ssl** áðü ôçí port `www/apache13-modssl`. Ôï SSL åßíáé åðßóçò äéáèÝóéìï ãéá ôïí **Apache** 2.X óôçí port `www/apache20`, üðïõ ôï SSL åßíáé åíåñãïðïéçìÝíï áðü ðñïåðéëïãÞ.

30.7.5.2 ÄõíáìéêÝò Éóôïóåëßäåò ìå Perl & PHP

Ôçí ôåëåõôáßá äåêáåôßá, ðïëëÝò åðé÷åéñÞóåéò óôñÝøáíå ôéò äñáóôçñéüôçôåò ôïõò ðñïò ôï ºíôåñíåô ìå óêïðü íá âåëôéþóïõí ôá Ýóïäá ôïõò êáé ãéá ìåãáëýôåñç ðñïâïëÞ. Áõôü ìå ôç óåéñÜ ôïõ äçìéïýñãçóå ôçí áíÜãêç ãéá äéáäñáóôéêü äéáäéêôõáêü ðåñéå÷üìåíï. Åíþ êÜðïéåò åôáéñåßåò, üðùò ç Microsoft, ðáñïõóßáóáí ëýóåéò åíóùìáôùìÝíåò óôá éäéüêôçôá ðñïúüíôá ôïõò, ç êïéíüôçôá áíïé÷ôïý ëïãéóìéêïý Ýëáâå ôï ìÞíõìá. Óýã÷ñïíåò åðéëïãÝò ãéá äéáäéêôõáêÝò óåëßäåò äõíáìéêïý ðåñéå÷ïìÝíïõ ðåñéëáìâÜíïõí ôá Django, Ruby on Rails, mod_perl êáé mod_php. **mod_perl** & **mod_php**.

30.7.5.2.1 mod_perl

Ôï ãåãïíüò óõíýðáñîçò **Apache**/Perl öÝñíåé êïíôÜ ôç ìåãÜëç äýíáìç ôçò ãëþóóáò ðñïãñáììáôéóìïý Perl êáé ôïí **åîõðçñåôçôÞ HTTP Apache**. Ìå ôï Üñèñùìá **mod_perl** Ý÷åôå ôç äõíáôüôçôá íá ãñÜøåôå åðåêôÜóåéò ãéá ôïí **Apache** åî’ ïëïêëÞñïõ óå Perl. ÅðéðëÝïí, ï äéáôçñÞóéìïò ìåôáãëùôôéóôÞò ðïõ åßíáé åíóùìáôùìÝíïò óôïí åîõðçñåôçôÞ óáò åðéôñÝðåé íá áðïöýãåôå ôçí ÷ñÞóç åíüò åîùôåñéêïý ìåôáãëùôôéóôÞ Perl êáé íá åðéâáñõíèåßôå áðü ôï ÷ñüíï åêêßíçóçò ôïõ.

Ôï **mod_perl** äéáôßèåôáé ìå äéÜöïñïõò ôñüðïõò. Ãéá íá ÷ñçóéìïðïéÞóåôå ôï **mod_perl** íá èõìÜóôå üôé ôï mod_perl 1.0 **mod_perl** 1.0 äïõëåýåé ìüíï ìå ôïí **Apache** 1.3 êáé ôï **mod_perl** 2.0 äïõëåýåé ìüíï ìå ôïí **Apache** 2. Ôï **mod_perl** 1.0 åßíáé äéáèÝóéìï óôï port `www/mod_perl` åíþ ìéá óôáôéêÜ ìåôáãëùôôéóìÝíç Ýêäïóç åßíáé äéáèÝóéìç óôï `www/apache13-modperl`. Ôï **mod_perl** 2.0 äéáôßèåôáé óôï port `www/mod_perl2`.

30.7.5.2.2 mod_php

ÓõããñáöÞ áðü ôïí Tom Rhodes.

Ôï PHP, ãíùóôü êáé ùò “PHP: Hypertext Preprocessor” åßíáé ìéá script ãëþóóá ðñïãñáììáôéóìïý ãåíéêÞò ÷ñÞóçò áëëÜ éäéáßôåñá êáôÜëëçëç ãéá áíÜðôõîç ëïãéóìéêïý Web. Ç óýíôáîÞ ôçò ðñïÝñ÷åôáé áðü ôéò C, Java êáé Perl êáé

Ý÷åé ôçí äõíáôüôçôá íá åíóùìáôþíåôáé óå êþäéêá HTML, ìå óêïðü íá åðéôñÝðåé óôïõò ðñïãñáììáôéóôÝò web íá ãñÜöïõí ãñÞãïñá äõíáìéêÝò éóôïóåëßäåò.

Ï **Apache** õðïóôçñßæåé ôï PHP5. Ìðïñåßôå íá îåêéíÞóåôå åãêáèéóôþíôáò ôï ðáêÝôï `lang/php5`.

Áí ôï ðáêÝôï `lang/php5` åãêáèßóôáôáé ãéá ðñþôç öïñÜ, áõôüìáôá èá óáò åìöáíéóôïýí üëåò ïé äõíáôÝò åðéëïãÝò `OPTIONS`. Áí êÜðïéï ìåíïý äåí åìöáíßæåôáé, ð.÷. åðåéäÞ ôï ðáêÝôï `lang/php5` åß÷å åãêáôáóôáèåß óôï ðáñåëèüí, ìðïñåßôå ðÜíôá íá ñõèìßóåôå áðü ôçí áñ÷Þ ôï ðáêÝôï, ôñÝ÷ïíôáò óôïí êáôÜëïãï ôïõ port:

```
# make config
```

Óôéò åðéëïãÝò åãêáôÜóôáóçò, äéáëÝîôå ôçí åðéëïãÞ `APACHE` þóôå íá óõìðåñéëçöèåß êáé ôï Üñèñùìá **mod_php** ãéá ôïí åîõðçñåôçôÞ **Apache**.

> **Óçìåßùóç:** ÌåñéêÝò ôïðïèåóßåò ÷ñçóéìïðïéïýí áêüìç ôï PHP4 ãéá äéÜöïñïõò ëüãïõò (ð.÷. èÝìáôá óõìâáôüôçôïò Þ åðåéäÞ Ý÷ïõí Þäç åãêáôåóôçìÝíåò åöáñìïãÝò ðïõ ôï áðáéôïýí). Áí åßíáé áíÜãêç íá ÷ñçóéìïðïéÞóåôå ôï **mod_php4** áíôß ôïõ **mod_php5**, ôüôå ÷ñçóéìïðïéåßóôå ôï port `lang/php4`. Ôï port `lang/php4` õðïóôçñßæåé ðïëëÝò áðü ôéò ñõèìßóåéò êáé ôéò åðéëïãÝò åãêáôÜóôáóçò ôïõ port `lang/php5`.

Ìå áõôü ôïí ôñüðï èá åãêáôáóôáèïýí êáé èá ñõèìéóôïýí ôá áðáéôïýìåíá áñèñþìáôá þóôå íá õðïóôçñßæïíôáé äõíáìéêÝò åöáñìïãÝò PHP. Ãéá åðéâåâáßùóç åëÝãîôå ðùò Ý÷ïõí ðñïóôåèåß óôéò áíôßóôïé÷åò åíüôçôåò ôïõ `/usr/local/etc/apache/httpd.conf` ôá áêüëïõèá::

```
LoadModule php5_module        libexec/apache/libphp5.so

AddModule mod_php5.c
    <IfModule mod_php5.c>
        DirectoryIndex index.php index.html
    </IfModule>
    <IfModule mod_php5.c>
        AddType application/x-httpd-php .php
        AddType application/x-httpd-php-source .phps
    </IfModule>
```

Áöïý ïëïêëçñþóåôå ôïí Ýëåã÷ï, ãéá íá öïñôùèåß ôï Üñèñùìá PHP ÷ñåéÜæåôáé ìéá áðëÞ êëÞóç ìå ôçí åíôïëÞ `apachectl` ãéá ìéá êáíïíéêÞ (graceful) åðáíåêêßíçóç:

```
# apachectl graceful
```

Ãéá ìåëëïíôéêÝò áíáâáèìßóåéò ôïõ PHP, äåí áðáéôåßôáé ç åíôïëÞ `make config`. Ïé åðéëåãìÝíåò `OPTIONS` áðïèçêåýïíôáé áõôüìáôá áðü ôï ìç÷áíéóìü åãêáôÜóôáóçò ôùí Ports ôïõ FreeBSD.

Ç óýíèåóç ôïõ PHP óôï FreeBSD, åßíáé åîáéñåôéêÜ óôïé÷åéáêÞ, êáé ï âáóéêüò êïñìüò ðïõ Ý÷åé åãêáôáóôáèåß åßíáé ðïëý ðåñéïñéóìÝíïò. Åßíáé ðïëý åýêïëï üìùò íá ðñïóèÝóïõìå åðåêôÜóåéò ÷ñçóéìïðïéþíôáò ôï port `lang/php5-extensions`. Áõôü ôï port ðáñÝ÷åé ìåíïý åðéëïãþí ãéá ôçí åãêáôÜóôáóç ôùí åðåêôÜóåùí õðóôáôéêþí ôïõ PHP. ÅíáëëáêôéêÜ, ìðïñåßôå íá åãêáôáóôÞóåôå êáèåìßá åðÝêôáóç îå÷ùñéóôÜ ÷ñçóéìïðïéþíôáò ôï êáôÜëëçëï port.

Ãéá ðáñÜäåéãìá, ãéá íá ðñïóèÝóåôå óôï PHP5, ôç äõíáôüôçôá õðïóôÞñéîçò ãéá âÜóåéò äåäïìÝíùí**MySQL** áðëÜ åãêáôáóôÞóôå ôï port `databases/php5-mysql`.

ÌåôÜ ôçí åãêáôÜóôáóç åíüò íÝïõ áñèñþìáôïò Þ êÜðïéáò Üëëçò åðÝêôáóçò, ï åîõðçñåôçôÞò **Apache** èá ðñÝðåé íá åðáíáöïñôùèåß ãéá íá åíåñãïðïéçèïýí ïé íÝåò ñõèìßóåéò:

```
# apachectl graceful
```

30.8 Ðñùôüêïëëï ÌåôáöïñÜò Áñ÷åßùí (FTP)

ÓõíåéóöïñÜ ôïõ Murray Stokely.

30.8.1 Óýíïøç

Ôï Ðñùôüêïëëï ÌåôáöïñÜò Áñ÷åßùí (File Transfer Protocol - FTP) ðáñÝ÷åé óôïõò ÷ñÞóôåò Ýíáí åýêïëï ôñüðï ãéá íá ìåôáöÝñïõí ôá áñ÷åßá ôïõò áðü êáé ðñïò Ýíáí åîõðçñåôçôÞ FTP. Ôï âáóéêü óýóôçìá ôïõ FreeBSD ðåñéëáìâÜíåé Ýíá åîõðçñåôçôÞ FTP, ôï **ftpd**. Áõôü êáèéóôÜ ôçí åãêáôÜóôáóç êáé ôçí äéá÷åßñéóç ôïõ åîõðçñåôçôÞ FTP ðïëý åýêïëç õðüèåóç.

30.8.2 Ñõèìßóåéò

Ôï ðéï óçìáíôéêü âÞìá óôéò ñõèìßóåéò åßíáé íá áðïöáóßóåôå óå ðïéïýò ëïãáñéáóìïýò èá åðéôñáðåß ç ðñüóâáóç óôïí åîõðçñåôçôÞ FTP. ¸íá óõíçèéóìÝíï óýóôçìá FreeBSD äéáèÝôåé ðïëëïýò ëïãáñéáóìïýò óõóôÞìáôïò ãéá äéÜöïñïõò äáßìïíåò, áëëÜ äåí ðñÝðåé íá åðéôñÝðåôáé ç ðñüóâáóç óôï óýóôçìá ìå áõôïýò ôïõò ëïãáñéáóìïýò. Ôï áñ÷åßï `/etc/ftpusers` ðåñéÝ÷åé ìéá ëßóôá áðü ÷ñÞóôåò ãéá ôïõò ïðïßïõò áðïññßðôåôáé ç ðñüóâáóç ìÝóù FTP. ÐñïåðéëåãìÝíá, ðåñéÝ÷ïíôáé ïé ðñïáíáöåñèÝíôåò ëïãáñéáóìïß ôïõ óõóôÞìáôïò, áëëÜ ìðïñåßôå åðßóçò íá ðñïóèÝóåôå óõãêåêñéìÝíïõò ÷ñÞóôåò ðïõ äå èá ðñÝðåé íá Ý÷ïõí ðñüóâáóç ìÝóù FTP.

Ìðïñåßôå áí èÝëåôå íá ðåñéïñßóåôå ôçí ðñüóâáóç óå êÜðïéïõò ÷ñÞóôåò, ÷ùñßò íá ôïõò áðáãïñåýóåôå ðëÞñùò. Áõôü ìðïñåß íá ãßíåé ìå ôéò ñõèìßóåéò ôïõ áñ÷åßïõ `/etc/ftpchroot`. Áõôü ôï áñ÷åßï ðåñéÝ÷åé ëßóôåò ÷ñçóôþí êáé ïìÜäùí ðåñéïñéóìÝíçò ðñüóâáóçò FTP. Ç óåëßäá âïÞèåéáò ftpchroot(5) ðåñéÝ÷åé üëåò ôéò áðáñáßôçôåò ëåðôïìÝñåéåò, åðïìÝíùò äå èá ÷ñåéáóôåß íá ìðïýìå óå ëåðôïìÝñåéåò åäþ.

Áí åðéèõìåßôå íá åíåñãïðïéÞóåôå áíþíõìç ðñüóâáóç FTP óôïí åîõðçñåôçôÞ óáò, èá ðñÝðåé íá äçìéïõñãÞóåôå, óôï FreeBSD óýóôçìá óáò, Ýíá ÷ñÞóôç ìå üíïìá `ftp` . Ïé áíþíõìïé ÷ñÞóôåò èá ìðïñïýí íá åéóÝñ÷ïíôáé óôïí åîõðçñåôçôÞ FTP ìå ôï ãåíéêü üíïìá ÷ñÞóôç `ftp` Þ ìå `anonymous` êáé ìå ïðïéáäÞðïôå êùäéêü ðñüóâáóçò (óõíçèßæåôáé íá æçôåßôáé ç äéåýèõíóç email ôïõ ÷ñÞóôç ùò êùäéêüò ðñüóâáóçò). Ï åîõðçñåôçôÞò FTP èá êáëÝóåé ôï chroot(2) ìüëéò åéóÝëèåé ï áíþíõìïò ÷ñÞóôçò, ãéá íá ôïõ ðåñéïñßóåé ôçí ðñüóâáóç, åðéôñÝðïíôáò ôïõ ìüíï ôïí áñ÷éêü êáôÜëïãï (home directory) ôïõ ÷ñÞóôç `ftp`.

ÕðÜñ÷ïõí äýï áñ÷åßá êåéìÝíïõ ãéá ôïí ïñéóìü ìçíõìÜôùí êáëùóïñßóìáôïò ðïõ èá åìöáíßæïíôáé óôïõò ðåëÜôåò FTP. Ôï ðåñéå÷üìåíï ôïõ áñ÷åßïõ `/etc/ftpwelcome` åìöáíßæåôáé óôïõò ÷ñÞóôåò ðñéí öôÜóïõí óôçí ðñïôñïðÞ åéóüäïõ. ÌåôÜ áðü ìéá ðåôõ÷çìÝíç åßóïäï óôï óýóôçìá, åìöáíßæåôáé ôï ðåñéå÷üìåíï ôïõ áñ÷åßïõ `/etc/ftpmotd`. ÐáñáôçñÞóôå ðùò ç äéáäñïìÞ óå áõôü ôï áñ÷åßï åßíáé ó÷åôéêÞ ìå ôï ðåñéâÜëëïí ÷ñÞóôç, åðïìÝíùò ãéá ôïõò áíþíõìïõò ÷ñÞóôåò èá åìöáíßæåôáé ôï ðåñéå÷üìåíï ôïõ áñ÷åßïõ `~ftp/etc/ftpmotd`.

Áöïý ñõèìßóåôå êáôÜëëçëá ôïí åîõðçñåôçôÞ FTP, èá ðñÝðåé íá ôïí åíåñãïðïéÞóåôå óôï áñ÷åßï `/etc/inetd.conf`. Ôï ìüíï ðïõ ÷ñåéÜæåôáé íá êÜíåôå åßíáé íá áöáéñÝóåôå ôï óýìâïëï ó÷ïëßïõ “#” ìðñïóôÜ áðü ôçí õðÜñ÷ïõóá ãñáììÞ **ftpd** :

```
ftp     stream  tcp     nowait  root    /usr/libexec/ftpd       ftpd -l
```

¼ðùò åîçãÞóáìå óôï ÐáñÜäåéãìá 30-1, ç äéåñãáóßá **inetd** èá ðñÝðåé íá îáíáöïñôþóåé áí Ý÷ïõí ãßíåé áëëáãÝò óôï áñ÷åßï ñõèìßóåùí ôçò.

Ôþñá ìðïñåßôå íá äþóåôå ôá óôïé÷åßá ôïõ ëïãáñéáóìïý óáò ãéá íá åéóÝëèåôå óôïí åîõðçñåôçôÞ FTP.

```
% ftp localhost
```

30.8.3 ÓõíôÞñçóç

Ï äáßìïíáò **ftpd** ÷ñçóéìïðïéåß ôï syslog(3) ãéá ôçí äçìéïõñãßá ìçíõìÜôùí áíáöïñÜò. ÐñïåðéëåãìÝíá, ï äáßìïíáò ôùí log ôïõ óõóôÞìáôïò èá åíáðïèÝôåé ôéò ó÷åôéêÝò ìå ôï FTP áíáöïñÝò óôï áñ÷åßï `/var/log/xferlog`. Ç ôïðïèåóßá ôïõ áñ÷åßïõ áíáöïñÜò ìðïñåß íá ôñïðïðïéçèåß áëëÜæïíôáò ôçí áêüëïõèç ãñáììÞ óôï `/etc/syslog.conf`:

```
ftp.info      /var/log/xferlog
```

ÐñÝðåé íá åßóôå åíÞìåñïé ãéá ôá ðñïâëÞìáôá ðïõ ìðïñïýí íá ðáñïõóéáóôïýí ó÷åôéêÜ ìå ôç ëåéôïõñãßá åíüò áíþíõìïõ åîõðçñåôçôÞ FTP. Åéäéêüôåñá, èá ðñÝðåé íá óêåöôåßôå óïâáñÜ áí üíôùò åðéèõìåßôå íá Ý÷ïõí äõíáôüôçôá íá áíåâÜæïõí áñ÷åßá ïé áíþíõìïé ÷ñÞóôåò óáò. Áí áöÞóåôå ïðïéïíäÞðïôå áíþíõìï ÷ñÞóôç íá áíåâÜæåé áñ÷åßá, ìðïñåß îáöíéêÜ íá áíáêáëýøåôå ðùò ï åîõðçñåôçôÞò óáò FTP ÷ñçóéìïðïéåßôáé ãéá äéáêßíçóç ðåéñáôéêïý åìðïñéêïý ëïãéóìéêïý Þ ãéá Üëëï, áêüìá ÷åéñüôåñï, ðáñÜíïìï õëéêü. ÅÜí üíôùò ÷ñåéÜæåôáé ïé ÷ñÞóôåò íá Ý÷ïõí Üäåéá ðñïóèÞêçò áñ÷åßùí, ôüôå èá ðñÝðåé íá ñõèìßóåôå ôéò Üäåéåò Ýôóé þóôå ôá áñ÷åßá áõôÜ íá ìçí åßíáé ïñáôÜ áðü Üëëïõò áíþíõìïõò ÷ñÞóôåò, Ýùò üôïõ íá ðÜñïõí ôçí Ýãêñéóç óáò.

30.9 File and Print Services for Microsoft Windows clients (Samba)

Contributed by Murray Stokely.

30.9.1 Overview

Samba is a popular open source software package that provides file and print services for Microsoft Windows clients. Such clients can connect to and use FreeBSD filespace as if it was a local disk drive, or FreeBSD printers as if they were local printers.

Samba software packages should be included on your FreeBSD installation media. If you did not install **Samba** when you first installed FreeBSD, then you can install it from the `net/samba3` port or package.

30.9.2 Configuration

A default **Samba** configuration file is installed as `/usr/local/etc/smb.conf.default`. This file must be copied to `/usr/local/etc/smb.conf` and customized before **Samba** can be used.

The `smb.conf` file contains runtime configuration information for **Samba**, such as definitions of the printers and “file system shares” that you would like to share with Windows clients. The **Samba** package includes a web based tool called **swat** which provides a simple way of configuring the `smb.conf` file.

30.9.2.1 Using the Samba Web Administration Tool (SWAT)

The Samba Web Administration Tool (SWAT) runs as a daemon from **inetd**. Therefore, the following line in `/etc/inetd.conf` should be uncommented before **swat** can be used to configure **Samba**:

```
swat   stream  tcp     nowait/400      root    /usr/local/sbin/swat
```

As explained in ÐáñÜäåéãìá 30-1, the **inetd** must be reloaded after this configuration file is changed.

Once **swat** has been enabled in `inetd.conf`, you can use a browser to connect to http://localhost:901. You will first have to log on with the system `root` account.

Once you have successfully logged on to the main **Samba** configuration page, you can browse the system documentation, or begin by clicking on the Globals tab. The Globals section corresponds to the variables that are set in the `[global]` section of `/usr/local/etc/smb.conf`.

30.9.2.2 Global Settings

Whether you are using **swat** or editing `/usr/local/etc/smb.conf` directly, the first directives you are likely to encounter when configuring **Samba** are:

`workgroup`

NT Domain-Name or Workgroup-Name for the computers that will be accessing this server.

`netbios name`

This sets the NetBIOS name by which a **Samba** server is known. By default it is the same as the first component of the host's DNS name.

`server string`

This sets the string that will be displayed with the `net view` command and some other networking tools that seek to display descriptive text about the server.

30.9.2.3 Security Settings

Two of the most important settings in `/usr/local/etc/smb.conf` are the security model chosen, and the backend password format for client users. The following directives control these options:

`security`

The two most common options here are `security = share` and `security = user`. If your clients use usernames that are the same as their usernames on your FreeBSD machine then you will want to use user level security. This is the default security policy and it requires clients to first log on before they can access shared resources.

In share level security, client do not need to log onto the server with a valid username and password before attempting to connect to a shared resource. This was the default security model for older versions of **Samba**.

`passdb backend`

> **Samba** has several different backend authentication models. You can authenticate clients with LDAP, NIS+, a SQL database, or a modified password file. The default authentication method is `smbpasswd`, and that is all that will be covered here.

Assuming that the default `smbpasswd` backend is used, the `/usr/local/private/smbpasswd` file must be created to allow **Samba** to authenticate clients. If you would like to give your UNIX user accounts access from Windows clients, use the following command:

```
# smbpasswd -a username
```

Please see the Official Samba HOWTO (http://www.samba.org/samba/docs/man/Samba-HOWTO-Collection/) for additional information about configuration options. With the basics outlined here, you should have everything you need to start running **Samba**.

30.9.3 Starting Samba

The `net/samba3` port adds a new startup script, which can be used to control **Samba**. To enable this script, so that it can be used for example to start, stop or restart **Samba**, add the following line to the `/etc/rc.conf` file:

```
samba_enable="YES"
```

> **Óçìåßùóç:** This will also configure **Samba** to automatically start at system boot time.

It is possible then to start **Samba** at any time by typing:

```
# /usr/local/etc/rc.d/samba start
Starting SAMBA: removing stale tdbs :
Starting nmbd.
Starting smbd.
```

Please refer to ÔìÞìá 12.7 for more information about using rc scripts.

Samba actually consists of three separate daemons. You should see that both the **nmbd** and **smbd** daemons are started by the `samba.sh` script. If you enabled winbind name resolution services in `smb.conf`, then you will also see that the **winbindd** daemon is started.

You can stop **Samba** at any time by typing :

```
# /usr/local/etc/rc.d/samba.sh stop
```

Samba is a complex software suite with functionality that allows broad integration with Microsoft Windows networks. For more information about functionality beyond the basic installation described here, please see http://www.samba.org.

30.10 Óõã÷ñïíéóìüò Ñïëïãéïý ÓõóôÞìáôïò ìå NTP

ÓõíåéóöïñÜ ôïõ Tom Hukins.

30.10.1 Óýíïøç

Ìå ôï ðÝñáóìá ôïõ ÷ñüíïõ, ôï ñïëüé óõóôÞìáôïò åíüò õðïëïãéóôÞ Ý÷åé ôçí ôÜóç íá áðïóõã÷ñïíßæåôáé. Ôï Ðñùôüêïëëï ×ñïíéóìïý Äéêôýùí (Network Time Protocol Þ NTP) ðáñÝ÷åé Ýíá ôñüðï ãéá íá åîáóöáëßóåôå ôçí áêñßâåéá ôïõ clock óáò.

ÐïëëÝò äéáäéêôõáêÝò õðçñåóßåò âáóßæïíôáé Þ ùöåëïýíôáé óå ìåãÜëï âáèìü áðü ôçí áêñßâåéá ôïõ ñïëïãéïý óõóôÞìáôïò åíüò õðïëïãéóôÞ. Ãéá ðáñÜäåéãìá, Ýíáò åîõðçñåôçôÞò web ìðïñåß íá äå÷èåß áéôÞóåéò ãéá áðïóôïëÞ åíüò áñ÷åßïõ üôáí ôï áñ÷åßï áõôü Ý÷åé ôñïðïðïéçèåß ìÝ÷ñé êÜðïéá óõãêåêñéìÝíç þñá. Óå Ýíá ðåñéâÜëëïí ôïðéêïý äéêôýïõ, åßíáé èåìåëéþäçò áíÜãêç ïé õðïëïãéóôÝò ðïõ èá äéáìïéñáóôïýí áñ÷åßá áðü ôïí ßäéï äéáêïìéóôÞ áñ÷åßùí íá Ý÷ïõí óõã÷ñïíéóìÝíá ñïëüãéá, Ýôóé þóôå ôá ÷ñïíéêÜ ÷áñáêôçñéóôéêÜ ôïõ áñ÷åßïõ íá óõìöùíïýí. Åðßóçò äéåñãáóßåò üðùò ç cron(8) âáóßæïíôáé óå Ýíá áêñéâÝò ñïëüé þóôå íá ìðïñïýí íá ôñÝ÷ïõí åíôïëÝò óôïõò ðñïêáèïñéóìÝíïõò ÷ñüíïõò.

Ôï FreeBSD äéáôßèåôáé ìå ôïí åîõðçñåôçôÞ NTP ntpd(8), ï ïðïßïò ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá óõã÷ñïíßæåé ôï ñïëüé óõóôÞìáôïò ôïõ õðïëïãéóôÞ óáò, åñùôÜæïíôáò Üëëïõò åîõðçñåôçôÝò NTP Þ íá ðáñÝ÷åé ï ßäéïò õðçñåóßåò óõã÷ñïíéóìïý óå Üëëá ìç÷áíÞìáôá.

30.10.2 ÅðéëïãÞ ôùí ÊáôÜëëçëùí ÅîõðçñåôçôÞí NTP

Ãéá íá óõã÷ñïíßóåôå ôï ñïëüé óõóôÞìáôïò ôïõ õðïëïãéóôÞ óáò èá ðñÝðåé íá âñåßôå Ýíáí Þ ðåñéóóüôåñïõò äéáèÝóéìïõò NTP åîõðçñåôçôÝò ãéá íá ÷ñçóéìïðïéÞóåôå. Ï äéá÷åéñéóôÞò äéêôýïõ Þ ï ISP óáò ìðïñåß íá Ý÷ïõí åãêáôáóôÞóåé êÜðïéïí åîõðçñåôçôÞ NTP ãéá áõôü ôï óêïðü — åëÝãîôå ôçí ôåêìçñßùóç ôïõò íá äåßôå áí õðÜñ÷åé ôÝôïéá ðåñßðôùóç. ÕðÜñ÷åé ìßá online ëßóôá åîõðçñåôçôþí äçìüóéáò ðñüóâáóçò (http://ntp.isc.org/bin/view/Servers/WebHome), ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ãéá íá âñåßôå Ýíáí êïíôéíü åîõðçñåôçôÞ NTP. ¼ðïéïí åîõðçñåôçôÞ êé áí åðéëÝîåôå, âåâáéùèåßôå ãéá ôçí ðïëéôéêÞ ÷ñÞóçò ôïõ êáé æçôÞóôå Üäåéá íá ôïí ÷ñçóéìïðïéÞóåôå áí ÷ñåéÜæåôáé ôÝôïéá Üäåéá.

Åßíáé êáëÞ éäÝá íá åðéëÝîåôå ðïëëïýò åîõðçñåôçôÝò NTP, ïé ïðïßïé íá ìçí óõíäÝïíôáé ìåôáîý ôïõò, óôçí ðåñßðôùóç ðïõ êÜðïéïò áðü ôïõò åîõðçñåôçôÝò ðïõ ÷ñçóéìïðïéåßôå ãßíåé áðñüóéôïò Þ ôï ñïëüé ôïõ åßíáé áíáêñéâÝò. Ï åîõðçñåôçôÞò ntpd(8) ôïõ FreeBSD ÷ñçóéìïðïéåß Ýîõðíá ôéò áðáíôÞóåéò ðïõ ëáìâÜíåé áðü ôïõò Üëëïõò åîõðçñåôçôÝò — åõíïåß ôïõò ðéï áîéüðéóôïõò êáé äßíåé ìéêñüôåñç ðñïôßìçóç óôïõò ëéãüôåñï áîéüðéóôïõò åîõðçñåôçôÝò.

30.10.3 Ñõèìßóôå Ôï Ìç÷Üíçìá Óáò

30.10.3.1 ÂáóéêÝò Ñõèìßóåéò

Áí åðéèõìåßôå íá óõã÷ñïíßæåôáé ôï clock óáò ìüíï êáôÜ ôçí åêêßíçóç ëåéôïõñãßáò ôïõ ìç÷áíÞìáôïò, ôüôå ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ntpdate(8). Áõôüò ï ôñüðïò óõã÷ñïíéóìïý åßíáé êáôÜëëçëïò ãéá ìç÷áíÞìáôá desktop ôá ïðïßá êÜíïõí åðáíåêêßíçóç áíÜ ôáêôÜ ÷ñïíéêÜ äéáóôÞìáôá êáé ìüíï óå åéäéêÝò ðåñéðôþóåéò Ý÷ïõí áíÜãêç óõã÷ñïíéóìïý. ÁíôéèÝôùò, ôá õðüëïéðá ìç÷áíÞìáôá èá ðñÝðåé íá ôñÝ÷ïõí ôçí äéåñãáóßá ntpd(8).

Åßíáé êáëÞ ðñáêôéêÞ ôá ìç÷áíÞìáôá ðïõ ôñÝ÷ïõí ntpd(8) íá ÷ñçóéìïðïéïýí êáé ôï ntpdate(8) êáôÜ ôç äéÜñêåéá åêêßíçóçò ôïõò. Ôï ntpd(8) ìåôáâÜëëåé ôï clock âáèìéáßá, åíþ ôï ntpdate(8) ñõèìßæåé Üìåóá ôï clock áíåîÜñôçôá áðü ôï ðüóï ìåãÜëç åßíáé ç ÷ñïíéêÞ äéáöïñÜ ìåôáîý ðñáãìáôéêÞò êáé ôñÝ÷ïõóáò þñáò ôïõ clock ôïõ ìç÷áíÞìáôïò.

Ãéá íá åíåñãïðïéÞóåôå ôï ntpdate(8) êáôÜ ôçí åêêßíçóç, ðñïóèÝóôå `ntpdate_enable="YES"` óôï `/etc/rc.conf`. Èá ðñÝðåé íá ðñïóäéïñßóåôå óôï `ntpdate_flags` üëïõò ôïõò äéáêïìéóôÝò ìå ôïõò ïðïßïõò åðéèõìåßôå íá óõã÷ñïíßæåóôå êáé üëá ôá flag ðïõ èÝëåôå íá óõíïäåýïõí ôïntpdate(8).

30.10.3.2 ÃåíéêÝò Ñõèìßóåéò

Ïé ñõèìßóåéò ôïõ NTP âñßóêïíôáé óôï áñ÷åßï `/etc/ntp.conf` êáé åßíáé óôç ìïñöÞ ðïõ ðåñéãñÜöåôáé óôï ntp.conf(5). Áêïëïõèåß Ýíá áðëü ðáñÜäåéãìá:

```
server ntplocal.example.com prefer
server timeserver.example.org
server ntp2a.example.net

driftfile /var/db/ntp.drift
```

Ç åðéëïãÞ `server` ðñïóäéïñßæåé ðïéïé åîõðçñåôçôÝò èá ÷ñçóéìïðïéçèïýí, ðáñáèÝôïíôáò Ýíáí óå êÜèå ãñáììÞ. Áí Ýíáò åîõðçñåôçôÞò öÝñåé ôï ðñüèåìá `prefer`, üðùò óõìâáßíåé ìå ôïí `ntplocal.example.com`, ôüôå áõôüò ï åîõðçñåôçôÞò åßíáé ï ðñïôéìþìåíïò. Èá áðïññéöèåß ç áðÜíôçóç áðü ôïí ðñïôéìþìåíï åîõðçñåôçôÞ óå ðåñßðôùóç ðïõ äéáöÝñåé óçìáíôéêÜ áðü üëïõò ôïõò Üëëïõò åîõðçñåôçôÝò, Óå ðåñßðôùóç ðïõ äåí õðÜñ÷åé ìåãÜëç áðüêëéóç èá ÷ñçóéìïðïéçèåß äß÷ùò íá ëçöèïýí õðüøéí ïé Üëëåò áðáíôÞóåéò. Ôï ðñüèåìá `prefer` óõíÞèùò ÷ñçóéìïðïéåßôáé ìå åîõðçñåôçôÝò NTP áêñéâåßáò, üðùò áõôïß ðïõ öÝñïõí åéäéêïýò ìç÷áíéóìïýò ðáñáêïëïýèçóçò ÷ñüíïõ.

Ç åðéëïãÞ `driftfile` ðñïóäéïñßæåé ðïéü áñ÷åßï ÷ñçóéìïðïéåßôáé ãéá íá äéáôçñåß ôç óõ÷íüôçôá äéüñèùóçò ôïõ clock ôïõ óõóôÞìáôïò. Ôï ðñüãñáììá ntpd(8) ÷ñçóéìïðïéåß áõôüìáôá áõôÞ ôç ôéìÞ ãéá íá áíôéóôáèìßæåé ôéò öõóéêÝò áðïêëßóåéò ôïõ clock, åðéôñÝðïíôáò ôïõ íá äéáôçñåß ìéá ëïãéêÞ ñýèìéóç, áêüìç êé áí ôïõ áðáãïñåõôåß ãéá êÜðïéï ÷ñïíéêü äéÜóôçìá ç ðñüóâáóç ðñïò üëåò ôéò åîùôåñéêÝò ðçãÝò óõã÷ñïíéóìïý.

Ç åðéëïãÞ `driftfile` ðñïóäéïñßæåé ðïéü áñ÷åßï ÷ñçóéìïðïéåßôáé ãéá íá áðïèçêåýåé ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ðñïçãïýìåíåò áðáíôÞóåéò áðü ôïõò åîõðçñåôçôÝò NTP. Áõôü ôï áñ÷åßï ðåñéÝ÷åé åóùôåñéêÝò ðëçñïöïñßåò ôïõ NTP. Äåí èá Ýðñåðå íá ôñïðïðïéåßôå áðü êáìßá Üëëç äéåñãáóßá.

30.10.3.3 ¸ëåã÷ïò Ðñüóâáóçò óôïí ÅîõðçñåôçôÞ Óáò

ÐñïåðéëåãìÝíá, ï åîõðçñåôçôÞò óáò NTP èá åßíáé ðñïóâÜóéìïò áðü üëïõò ôïõò êüìâïõò óôï äéáäßêôõï. Ç åðéëïãÞ `restrict` óôï `/etc/ntp.conf` óáò åðéôñÝðåé íá åëÝã÷åôå ðïéá ìç÷áíÞìáôá èá ìðïñïýí íá Ý÷ïõí ðñüóâáóç óôïí åîõðçñåôçôÞ óáò.

Áí åðéèõìåßôå íá áðïññßøåôå ôçí ðñüóâáóç ðñïò ôïí åîõðçñåôçôÞ óáò NTP ãéá üëá ôá ìç÷áíÞìáôá, ðñïóèÝóôå ôçí áêüëïõèç ãñáììÞ óôï `/etc/ntp.conf`:

```
restrict default ignore
```

Áí èÝëåôå ìüíï íá åðéôñÝøåôå ôïí óõã÷ñïíéóìü ôïõ åîõðçñåôçôÞ óáò ìå ìç÷áíÞìáôá åíôüò ôïõ äéêôýïõ óáò, áëëÜ äß÷ùò äõíáôüôçôá ñýèìéóçò ôïõ åîõðçñåôçôÞ Þ íá ãßíïõí ïìïéüâáèìá ìå Üäåéá óõã÷ñïíéóìïý, ôüôå áíôéèÝôùò ðñïóèÝóôå:

```
restrict 192.168.1.0 mask 255.255.255.0 nomodify notrap
```

üðïõ `192.168.1.0` åßíáé ç äéåýèõíóç IP ôïõ äéêôýïõ êáé `255.255.255.0` åßíáé ç ìÜóêá ôïõ äéêôýïõ óáò.

Ôï `/etc/ntp.conf` ìðïñåß íá ðåñéÝ÷åé ðïëëáðëÝò åðéëïãÝò `restrict`. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôçí õðïåíüôçôá `ÕðïóôÞñéîç ÅëÝã÷ïõ Ðñüóâáóçò (Access Control Support)`, õðïåíüôçôá ôïõ ntp.conf(5).

30.10.4 ÅêôÝëåóç ôïõ NTP ÅîõðçñåôçôÞ Óáò

Ãéá íá âåâáéùèåßôå ðùò ï åîõðçñåôçôÞò NTP èá îåêéíÜåé êáôÜ ôçí äéÜñêåéá åêêßíçóçò ôïõ óõóôÞìáôïò, ðñïóèÝóôå ôç ãñáììÞ `ntpd_enable="YES"`óôï`/etc/rc.conf`. Ãéá íá îåêéíÞóåôå ôïí åîõðçñåôçôÞ äß÷ùò íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá óáò, ôñÝîôå ntpd(8) ðñïóäéïñßæïíôáò êÜèå åðéðñüóèåôç ðáñÜìåôñï áðü ôá `ntpd_flags` óôï `/etc/rc.conf`. Ãéá ðáñÜäåéãìá:

```
# ntpd -p /var/run/ntpd.pid
```

30.10.5 ×ñÞóç ôïõ ntpd ìå ÐñïóùñéíÞ Óýíäåóç óôï ºíôåñíåô

Ôï ðñüãñáììá ntpd(8) äåí ÷ñåéÜæåôáé ìéá ìüíéìç óýíäåóç óôï ºíôåñíåô ãéá íá äïõëÝøåé óùóôÜ. Áí Ý÷åôå ìéá ðñïóùñéíÞ óýíäåóç ðïõ åßíáé ñõèìéóìÝíç íá êÜíåé êëÞóåéò ìÝóù ôçëåöþíïõ (dial out on demand), åßíáé êáëü íá ìçí åßíáé ç êßíçóç äåäïìÝíùí ôïõ NTP ôï áßôéï ôçò êëÞóçò Þ áõôÞ ðïõ èá êñáôÜåé åíåñãÞ ôçí óýíäåóç. Áí ÷ñçóéìïðïéåßôå PPP ÷ñÞóôç, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ößëôñá óôïõò êþäéêåò ðáñáðïìðÞò ôïõ `/etc/ppp/ppp.conf`, üðùò ãéá ðáñÜäåéãìá:

```
 set filter dial 0 deny udp src eq 123
 # Prevent NTP traffic from initiating dial out
 set filter dial 1 permit 0 0
 set filter alive 0 deny udp src eq 123
 # Prevent incoming NTP traffic from keeping the connection open
 set filter alive 1 deny udp dst eq 123
 # Prevent outgoing NTP traffic from keeping the connection open
 set filter alive 2 permit 0/0 0/0
```

Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò äåßôå ôï `PACKET FILTERING` óôçí åíüôçôá ppp(8) êáé ôá ðáñáäåßãìáôá óôï `/usr/share/examples/ppp/`.

> **Óçìåßùóç:** Óçìåßùóç: Ìåñéêïß ISP ìðëïêÜñïõí ôçí ÷ñÞóç èýñáò ìå ÷áìçëü áñéèìü, åìðïäßæïíôáò óôï NTP íá äïõëåýåé áöïý ïé áðáíôÞóåéò äåí öôÜíïõí ðïôÝ óôï ìç÷Üíçìá óáò.

30.10.6 ÐåñáéôÝñù Ðëçñïöïñßåò

Ç ôåêìçñßùóç ãéá ôïõò åîõðçñåôçôÝò NTP äéáôßèåôáé êáé óå ìïñöÞ HTML óôï `/usr/share/doc/ntp/`.

ÊåöÜëáéï 31 Firewalls

ÓõíåéóöïñÜ ôïõ Joseph J. Barbish. ÌåôáôñÜðçêå óå SGML êáé áíáíåþèçêå áðü ôïí Brad Davis.

31.1 Óýíïøç

Ôï firewall (ôåß÷ïò ðñïóôáóßáò) êáèéóôÜ äõíáôü ôï öéëôñÜñéóìá ôçò åéóåñ÷üìåíçò êáé åîåñ÷üìåíçò êßíçóçò ðïõ äéÝñ÷åôáé áðü ôï óýóôçìá óáò. ¸íá firewall ìðïñåß íá ÷ñçóéìïðïéåß Ýíá Þ ðåñéóóüôåñá óåô “êáíüíùí” ãéá íá åðéèåùñåß ôá ðáêÝôá êáôÜ ôçí åßóïäï Þ Ýîïäï ôïõò áðü ìéá äéêôõáêÞ óýíäåóç, êáé íá ôá åðéôñÝðåé Þ íá ôá áðïññßðôåé. Ïé êáíüíåò ôïõ firewall ìðïñïýí íá åëÝã÷ïõí Ýíá Þ ðåñéóóüôåñá ÷áñáêôçñéóôéêÜ ôùí ðáêÝôùí, óõìðåñéëáìâáíïìÝíùí ìåôáîý Üëëùí êáé ôïõ ôýðïõ ôïõ ðñùôïêüëëïõ, êáèþò êáé ôçí äéåýèõíóç Þ/êáé èýñá (port) ôçò áöåôçñßáò Þ ôïõ ðñïïñéóìïý.

Ôá firewalls ìðïñïýí íá åíéó÷ýóïõí óçìáíôéêÜ ôçí áóöÜëåéá åíüò êüìâïõ Þ åíüò äéêôýïõ. Ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá ìßá Þ ðåñéóóüôåñåò áðü ôéò áêüëïõèåò ëåéôïõñãßåò:

- Íá ðñïóôáôåýïõí êáé íá áðïìïíþíïõí ôéò åöáñìïãÝò, ôéò õðçñåóßåò êáé ôá ìç÷áíÞìáôá ôïõ åóùôåñéêïý óáò äéêôýïõ áðü áíåðéèýìçôç êßíçóç ðïõ ðñïÝñ÷åôáé áðü ôï Internet.
- Íá ðåñéïñßæïõí Þ íá áðïêëåßïõí ôçí ðñüóâáóç ìç÷áíçìÜôùí ôïõ åóùôåñéêïý äéêôýïõ óå õðçñåóßåò ôïõ Internet.
- Íá õðïóôçñßæïõí ìåôÜöñáóç äéêôõáêþí äéåõèýíóåùí (NAT), ç ïðïßá åðéôñÝðåé óôï åóùôåñéêü óáò äßêôõï íá ÷ñçóéìïðïéåß éäéùôéêÝò IP äéåõèýíóåéò êáé íá ìïéñÜæåôáé ìßá ìïíáäéêÞ óýíäåóç ìå ôï Internet (åßôå ìÝóù ìßáò ìïíáäéêÞò äçìüóéáò IP äéåýèõíóçò, åßôå ìÝóù åíüò ðëÞèïõò äçìïóßùí äéåõèýíóåùí ðïõ áíáôßèåíôáé áõôüìáôá).

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ðùò íá äçìéïõñãÞóåôå óùóôïýò êáíüíåò öéëôñáñßóìáôïò ðáêÝôùí.
- Ôïõò äéÜöïñïõò ôýðïõò firewall ðïõ õðÜñ÷ïõí óôï FreeBSD êáé ôéò äéáöïñÝò ôïõò.
- Ðùò íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôï **PF** firewall ôïõ OpenBSD.
- Ðùò íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôï **IPFILTER**.
- Ðùò íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôï **IPFW**.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå âáóéêÝò áñ÷Ýò ôïõ FreeBSD êáé ôïõ Internet.

31.2 ÂáóéêÝò ¸íïéåò ôùí Firewalls

ÕðÜñ÷ïõí äýï âáóéêïß ôñüðïé ãéá ôç äçìéïõñãßá êáíüíùí óå Ýíá firewall: ï “inclusive” êáé ï “exclusive”. ¸íá exclusive firewall åðéôñÝðåé ôç äéÝëåõóç üëçò ôçò êßíçóçò, åêôüò áðü áõôÞ ðïõ ôáéñéÜæåé ìå ôïõò êáíüíåò ôïõ. ¸íá inclusive firewall êÜíåé ôï áíÜðïäï. ÅðéôñÝðåé ìüíï ôç äéÝëåõóç ôçò êßíçóçò ðïõ ôáéñéÜæåé ìå ôïõò êáíüíåò ôïõ, êáé áðïêëåßåé ïôéäÞðïôå Üëëï.

Ôá inclusive firewalls ðñïóöÝñïõí ðïëý êáëýôåñï Ýëåã÷ï ôçò åîåñ÷üìåíçò êßíçóçò êáé ãéá ôï ëüãï áõôü åßíáé êáëýôåñá ãéá óõóôÞìáôá ðïõ ðñïóöÝñïõí õðçñåóßåò óôï äçìüóéï Internet. ÅëÝã÷ïõí åðßóçò êáé ôá ðáêÝôá ðïõ ðñïÝñ÷ïíôáé áðü ôï äçìüóéï Internet ìå ðñïïñéóìü ôï éäéùôéêü óáò äßêôõï. Áðü ðñïåðéëïãÞ, üëç ç êßíçóç ðïõ äåí ôáéñéÜæåé ìå ôïõò êáíüíåò áðïññßðôåôáé êáé êáôáãñÜöåôáé. Ôá inclusive firewalls åßíáé ãåíéêÜ áóöáëÝóôåñá áðü ôá exclusive, êáèþò ìåéþíïõí óçìáíôéêÜ ôçí ðéèáíüôçôá äéÝëåõóçò áíåðéèýìçôçò êßíçóçò ìÝóá áðü áõôÜ.

> **Óçìåßùóç:** Åêôüò êáé áí áíáöÝñåôáé äéáöïñåôéêÜ, üëá ôá ðáñáäåßãìáôá ñõèìßóåùí êáé êáíüíùí ðïõ öáßíïíôáé óå áõôü ôï êåöÜëáéï, äçìéïõñãïýí inclusive firewalls.

Ç áóöÜëåéá ìðïñåß íá ãßíåé áêüìá éó÷õñüôåñç ìå ôç ÷ñÞóç åíüò “stateful firewall”. Áõôüò ï ôýðïò firewall áðïèçêåýåé ôçí êáôÜóôáóç ôùí óõíäÝóåùí ðïõ ìåôáöÝñïíôáé äéáìÝóïõ ìÝóá áðü áõôü, êáé åðéôñÝðåé ìüíï ôçí êßíçóç ðïõ åßôå ôáéñéÜæåé ìå ìéá áðü ôéò õðÜñ÷ïõóåò óõíäÝóåéò, Þ ðïõ îåêéíÜ ìéá íÝá óýíäåóç. Ôï ìåéïíÝêôçìá åíüò stateful firewall åßíáé üôé ìðïñåß íá åßíáé åõÜëùôï óå åðéèÝóåéò Denial of Service (¶ñíçóçò Õðçñåóßáò, DoS) áí äå÷èåß ôáõôü÷ñïíá ðïëëÝò áéôÞóåéò ãéá Üíïéãìá íÝùí óõíäÝóåùí óå ìéêñü ÷ñïíéêü äéÜóôçìá. Ìå ôá ðåñéóóüôåñá firewalls, åßíáé äõíáôüí íá ãßíåé óõíäõáóìüò êáé ôùí äýï óõìðåñéöïñþí (ôüóï stateful üóï êáé ìç-stateful) þóôå íá äçìéïõñãçèåß ôï âÝëôéóôï firewall ãéá ôçí óõãêåêñéìÝíç ÷ñÞóç.

31.3 ÐñïãñÜììáôá Firewall

Ôï FreeBSD Ý÷åé ôñßá äéáöïñåôéêÜ ðñïãñÜììáôá firewall åíóùìáôùìÝíá óôï âáóéêü óýóôçìá. Åßíáé ôá: *IPFILTER* (ãíùóôü åðßóçò êáé ùò IPF), ôï *IPFIREWALL* (ãíùóôü åðßóçò êáé ùò IPFW), êáé ôï *PacketFilter* ôïõ *OpenBSD* (ãíùóôü åðßóçò êáé ùò PF). Ôï FreeBSD åíóùìáôþíåé åðßóçò äýï ðñïãñÜììáôá ãéá äéáìüñöùóç êõêëïöïñßáò (traffic shaping, Ýëåã÷ïò ôïõ äéáèÝóéìïõ åýñïõò æþíçò): ôï altq(4) êáé ôï dummynet(4). Ôï Dummynet åßíáé êáôÜ ðáñÜäïóç óôåíÜ óõíäåäåìÝíï ìå ôï IPFW, êáé ôï ALTQ ìå ôï PF. Ç äéáìüñöùóç êõêëïöïñßáò ãéá ôï IPFILTER ìðïñåß ôç äåäïìÝíç óôéãìÞ íá ãßíåé ìå ôï IPFILTER ãéá ôï NAT êáé ôï öéëôñÜñéóìá êáé ìå ôï IPFW óå óõíäõáóìü ìå ôï dummynet(4) Þ ÷ñçóéìïðïéþíôáò ôï PF óå óõíäõáóìü ìå ôï ALTQ. Ôüóï ôï IPFW üóï êáé ôï PF ÷ñçóéìïðïéïýí êáíüíåò ãéá íá åëÝã÷ïõí ôçí êßíçóç ôùí ðáêÝôùí áðü êáé ðñïò ôï óýóôçìÜ óáò, áí êáé äéáèÝôïõí äéáöïñåôéêïýò ôñüðïõò ãéá íá ôï åðéôý÷ïõí, êáé ïé êáíüíåò ôïõò ÷ñçóéìïðïéïýí äéáöïñåôéêÞ óýíôáîç.

Ï ëüãïò ãéá ôïí ïðïßï ôï FreeBSD äéáèÝôåé ðïëëáðëÜ firewall, åßíáé üôé äéáöïñåôéêïß Üíèñùðïé Ý÷ïõí äéáöïñåôéêÝò áíÜãêåò êáé ðñïôéìÞóåéò. Äåí õðÜñ÷åé Ýíá êáé ìïíáäéêü firewall ðïõ íá åßíáé ôï êáëýôåñï.

Ï óõããñáöÝáò ðñïôéìÜ ôï IPFILTER, êáèþò ïé êáíüíåò ôýðïõ stateful ðïõ äéáèÝôåé åßíáé ëéãüôåñï ðïëýðëïêïé üôáí ÷ñçóéìïðïéïýíôáé óå Ýíá ðåñéâÜëëïí NAT, åíþ äéáèÝôåé êáé åíóùìáôùìÝíï ftp proxy ôï ïðïßï ôïõò áðëïðïéåß áêüìá ðåñéóóüôåñï, åðéôñÝðïíôáò áóöáëÞ óýíäåóç óå åîùôåñéêïýò åîõðçñåôçôÝò FTP.

Êáèþò üëá ôá firewall âáóßæïíôáé óôçí åðéèåþñçóç ôéìþí åëÝã÷ïõ ôùí ðáêÝôùí, ï äéá÷åéñéóôÞò ðïõ ðñüêåéôáé íá äçìéïõñãÞóåé ôïõò êáíüíåò ðñÝðåé íá êáôáíïåß ôïí ôñüðï ëåéôïõñãßáò ôïõ TCP/IP, ôï ñüëï ôùí äéáöüñùí ôéìþí óôá ðåäßá åëÝã÷ïõ ôùí ðáêÝôùí êáé ðùò ÷ñçóéìïðïéïýíôáé óôçí áíôáëëáãÞ ðëçñïöïñéþí óå ìéá óõíçèéóìÝíç óõíåäñßá. Ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò, äéáâÜóôå ôï http://www.ipprimer.com/overview.cfm.

31.4 Ôï Packet Filter (PF) êáé ôï ALTQ ôïõ OpenBSD

ÁíáèåùñÞèçêå êáé åíçìåñþèçêå áðü ôïí John Ferrell.

Ôïí Éïýëéï ôïõ 2003, ç åöáñìïãÞ firewall ôïõ OpenBSD (ãíùóôÞ ùò PF) ìåôáöÝñèçêå óôï FreeBSD êáé Ýãéíå äéáèÝóéìç óôçí ÓõëëïãÞ ôùí Ports. Ôï FreeBSD 5.3 ðïõ êõêëïöüñçóå ôï 2004, Þôáí ç ðñþôç åðßóçìç Ýêäïóç ç ïðïßá ðåñéåß÷å ôï PF ùò ôìÞìá ôïõ âáóéêïý óõóôÞìáôïò. Ôï PF åßíáé Ýíá ïëïêëçñùìÝíï firewall, ìå ðëÞèïò ÷áñáêôçñéóôéêþí, ôï ïðïßï åðßóçò äéáèÝôåé ðñïáéñåôéêÜ õðïóôÞñéîç ãéá ôï ALTQ (Alternate Queuing). Ôï ALTQ ðñïóöÝñåé õðçñåóßåò ÄéáóöÜëéóçò Ðïéüôçôáò (Quality of Service, QoS).

Ôï OpenBSD Project êÜíåé åîáéñåôéêÞ äïõëåéÜ óôç óõíôÞñçóç ôïõ PF FAQ (http://www.openbsd.org/faq/pf/). Ãéá ôï ëüãï áõôü, ç ðáñïýóá åíüôçôá ôïõ Åã÷åéñéäßïõ åóôéÜæåé êõñßùò óôéò éäéáéôåñüôçôåò ôïõ PF üóïí áöïñÜ ôï FreeBSD, åíþ ðáñÝ÷åé êáé ìåñéêÝò ãåíéêÝò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ÷ñÞóç ôïõ. Ãéá ðéï ëåðôïìåñåßò ðëçñïöïñßåò ó÷åôéêÜ ìå ôç ÷ñÞóç ôïõ PF, ðáñáêáëïýìå äéáâÜóôå ôï PF FAQ (http://www.openbsd.org/faq/pf/).

Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï PF óôï FreeBSD ìðïñåßôå íá âñåßôå óôï http://pf4freebsd.love2party.net/.

31.4.1 ×ñçóéìïðïéþíôáò ôá Áñèñþìáôá ÐõñÞíá ãéá ôï PF

Ãéá íá öïñôþóåôå ôï Üñèñùìá ðõñÞíá ãéá ôï PF, ðñïóèÝóôå ôçí ðáñáêÜôù ãñáììÞ óôï óôï `/etc/rc.conf`:

```
pf_enable="YES"
```

ÅêôåëÝóôå Ýðåéôá ôï script åêêßíçóçò ãéá íá öïñôþóåôå ôï Üñèñùìá:

```
# /etc/rc.d/pf start
```

Óçìåéþóôå üôé ôï Üñèñùìá PF äåí ðñüêåéôáé íá öïñôùèåß áí äåí âñåé ôï êáèïñéóìÝíï áñ÷åßï êáíüíùí. Ôï ðñïåðéëåãìÝíï áñ÷åßï åßíáé ôï `/etc/pf.conf`. Áí ôï áñ÷åßï êáíüíùí âñßóêåôáé óå êÜðïéá Üëëç ôïðïèåóßá, ìðïñåßôå íá ôçí êáèïñßóåôå ðñïóèÝôïíôáò ìéá ãñáììÞ üðùò ôçí ðáñáêÜôù óôï `/etc/rc.conf`:

```
pf_rules="/path/to/pf.conf"
```

Ìðïñåßôå íá âñåßôå Ýíá ðáñÜäåéãìá ôïõ áñ÷åßïõ `pf.conf` óôïí êáôÜëïãï `/usr/share/examples/pf`

Ôï Üñèñùìá PF ìðïñåß åðßóçò íá öïñôùèåß ÷åéñïêßíçôá áðü ôçí ãñáììÞ åíôïëþí:

```
# kldload pf.ko
```

Ç õðïóôÞñéîç êáôáãñáöÞò ôïõ PF ðáñÝ÷åôáé áðü ôï Üñèñùìá `pflog.ko` êáé ìðïñåßôå íá ôçí öïñôþóåôå ðñïóèÝôïíôáò ôçí ðáñáêÜôù ãñáììÞ óôï `/etc/rc.conf`:

```
pflog_enable="YES"
```

ÅêôåëÝóôå Ýðåéôá ôï script åêêßíçóçò ãéá íá öïñôþóåôå ôï Üñèñùìá:

```
# /etc/rc.d/pflog start
```

Áí ÷ñåéÜæåóôå êÜðïéï áðü ôá ðñï÷ùñçìÝíá ÷áñáêôçñéóôéêÜ ôïõ PF, èá ðñÝðåé íá ìåôáãëùôôßóåôå ôçí õðïóôÞñéîç ãéá ôï PF áðåõèåßáò ìÝóá óôïí ðõñÞíá.

31.4.2 ÅðéëïãÝò ôïõ PF ãéá ôïí ÐõñÞíá

Áí êáé äåí åßíáé áðáñáßôçôï íá ìåôáãëùôôßóåôå ôçí õðïóôÞñéîç PF ìÝóá óôïí ðõñÞíá ôïõ FreeBSD, ßóùò íá èÝëåôå íá ÷ñçóéìïðïéÞóåôå Ýíá áðü ôá ðñï÷ùñçìÝíá ÷áñáêôçñéóôéêÜ ôïõ PF ôï ïðïßï äåí ðåñéëáìâÜíåôáé óôï Üñèñùìá ôïõ ðõñÞíá: ôï pfsync(4). Ðñüêåéôáé ãéá ìéá øåõäï-óõóêåõÞ ç ïðïßá áðïêáëýðôåé óõãêåêñéìÝíåò áëëáãÝò óôïí ðßíáêá êáôáóôÜóåùí ðïõ ÷ñçóéìïðïéåßôáé áðü ôï PF. Ìðïñåß íá óõíäõáóôåß ìå ôï carp(4) ãéá íá äçìéïõñãçèïýí ìå ôï PF firewalls ìå äõíáôüôçôá áõôüìáôçò áëëáãÞò óå ðåñßðôùóç áðïôõ÷ßáò (failover). Ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï CARP ìðïñåßôå íá âñåßôå óôï ÔìÞìá 32.12 ôïõ Åã÷åéñéäßïõ.

Ìðïñåßôå íá äåßôå üëåò ôéò åðéëïãÝò ðõñÞíá ãéá ôï PF óôï áñ÷åßï `/usr/src/sys/conf/NOTES`. Ïé åðéëïãÝò öáßíïíôáé åðßóçò ðáñáêÜôù:

```
device pf
device pflog
device pfsync
```

Ç åðéëïãÞ `device pf` åíåñãïðïéåß ôçí õðïóôÞñéîç ãéá ôï firewall “Packet Filter” (pf(4)).

Ç åðéëïãÞ `device pflog` åíåñãïðïéåß ôçí ðñïáéñåôéêÞ øåõäï-äéêôõáêÞ óõóêåõÞ pflog(4) ðïõ ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôçí êáôáãñáöÞ ôçò êßíçóçò óå Ýíá bpf(4) descriptor. Ï äáßìïíáò pflogd(8) ìðïñåß íá áðïèçêåýóåé ôçí êáôáãñáöÞ áõôÞ óôï óêëçñü äßóêï.

Ç åðéëïãÞ `device pfsync` åíåñãïðïéåß ôçí ðñïáéñåôéêÞ øåõäü-äéêôõáêÞ óõóêåõÞ pfsync(4) ç ïðïßá ÷ñçóéìïðïéåßôáé ãéá íá áíé÷íåýåé “áëëáãÝò êáôÜóôáóçò”.

31.4.3 ÅðéëïãÝò óôï rc.conf

Ôï PF êáé ôï pflog(4) ìðïñïýí íá ñõèìéóôïýí êáôÜ ôçí åêêßíçóç ìå ôéò ðáñáêÜôù êáôá÷ùñßóåéò óôï rc.conf(5):

```
pf_enable="YES"                 # Enable PF (load module if required)
pf_rules="/etc/pf.conf"         # rules definition file for pf
pf_flags=""                     # additional flags for pfctl startup
pflog_enable="YES"              # start pflogd(8)
pflog_logfile="/var/log/pflog"  # where pflogd should store the logfile
pflog_flags=""                  # additional flags for pflogd startup
```

Áí ðßóù áðü áõôü ôï firewall õðÜñ÷åé êÜðïéï ôïðéêü äßêôõï (LAN) ðñïò ôï ïðïßï åðéèõìåßôå íá ðñïùèÞóåôå ðáêÝôá, Þ áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå NAT, èá ÷ñåéáóôåßôå åðßóçò êáé ôçí ðáñáêÜôù åðéëïãÞ:

```
gateway_enable="YES"            # Enable as LAN gateway
```

31.4.4 Äçìéïõñãßá Êáíüíùí Öéëôñáñßóìáôïò

Ôï PF äéáâÜæåé ôéò ñõèìßóåéò ôïõ áðü ôï pf.conf(5) (ç ðñïåðéëåãìÝíç ôïðïèåóßá åßíáé óôï `/etc/pf.conf`) êáé ôñïðïðïéåß, áðïññßðôåé Þ áðïäÝ÷åôáé ðáêÝôá óýìöùíá ìå ôïõò êáíüíåò êáé ôïõò ïñéóìïýò ðïõ ðåñéÝ÷ïíôáé óå áõôü. Ç åãêáôÜóôáóç ôïõ FreeBSD ðåñéëáìâÜíåé áñêåôÜ õðïäåßãìáôá áñ÷åßùí ñýèìéóçò, óôçí ôïðïèåóßá `/usr/share/examples/pf/`. Ðáñáêáëïýìå íá äéáâÜóåôå ôï PF FAQ (http://www.openbsd.org/faq/pf/) ãéá ðëÞñç áíÜëõóç ôùí êáíüíùí ôïõ PF.

> **Ðñïåéäïðïßçóç:** Êáèþò äéáâÜæåôå ôï PF FAQ (http://www.openbsd.org/faq/pf/), íá Ý÷åôå õðüøç óáò üôé äéáöïñåôéêÝò åêäüóåéò ôïõ FreeBSD ðåñéÝ÷ïõí äéáöïñåôéêÝò åêäüóåéò ôïõ PF. Ôç äåäïìÝíç óôéãìÞ, ôï FreeBSD 8.*X* êáé ïé ðñïçãïýìåíåò åêäüóåéò ÷ñçóéìïðïéïýí ôçí ßäéá Ýêäïóç ôïõ PF ðïõ ÷ñçóéìïðïéåß êáé ôï OpenBSD 4.1. Ôï FreeBSD 9.*X* êáé íåþôåñåò åêäüóåéò ÷ñçóéìïðïéïýí ôçí ßäéá Ýêäïóç ôïõ PF ìå ôï OpenBSD 4.5.

Ç çëåêôñïíéêÞ ëßóôá ôïõ FreeBSD ãéá ôï packet filter firewall (http://lists.FreeBSD.org/mailman/listinfo/freebsd-pf) åßíáé Ýíá êáëü ìÝñïò ãéá íá êÜíåôå åñùôÞóåéò ó÷åôéêÝò ìå ôç ñýèìéóç êáé ôç ëåéôïõñãßá ôïõ PF firewall. Ìç îå÷Üóåôå íá åëÝãîåôå ôá áñ÷åßá ôçò ëßóôáò ðñéí îåêéíÞóåôå ôéò åñùôÞóåéò!

31.4.5 Äïõëåýïíôáò ìå ôï PF

×ñçóéìïðïéÞóôå ôï pfctl(8) ãéá íá åëÝãîåôå ôï PF. ÐáñáêÜôù èá âñåßôå êÜðïéåò ÷ñÞóéìåò åíôïëÝò (âåâáéùèåßôå üôé Ý÷åôå äéáâÜóåé ôç óåëßäá manual ôïõ pfctl(8) ãéá íá äåßôå üëåò ôéò äéáèÝóéìåò åðéëïãÝò):

ÅíôïëÞ	**Óêïðüò**
`pfctl -e`	Åíåñãïðïßçóç ôïõ PF
`pfctl -d`	Áðåíåñãïðïßçóç ôïõ PF
`pfctl -F all -f /etc/pf.conf`	ÄéáãñáöÞ üëùí ôùí êáíüíùí (nat, filter, state, table, ê.ë.ð.) êáé åê íÝïõ áíÜãíùóç áðü ôï áñ÷åßï `/etc/pf.conf`
`pfctl -s [ rules | nat | state ]`	Åêôýðùóç áíáöïñÜò ó÷åôéêÜ ìå ôïõò êáíüíåò ôïõ ößëôñïõ, ôïõ NAT, Þ ôïõ ðßíáêá êáôÜóôáóçò
`pfctl -vnf /etc/pf.conf`	ÅëÝã÷åé ôï `/etc/pf.conf` ãéá ëÜèç, áëëÜ äåí öïñôþíåé ôïõò êáíüíåò

31.4.6 Åíåñãïðïßçóç ôïõ ALTQ

Ôï ALTQ äéáôßèåôáé ìüíï áí ìåôáãëùôôßóåôå áðåõèåßáò ôçí õðïóôÞñéîç ôïõ ìÝóá óôïí ðõñÞíá ôïõ FreeBSD. Ôï ALTQ äåí õðïóôçñßæåôáé áðü üëá ôá ðñïãñÜììáôá ïäÞãçóçò êáñôþí äéêôýïõ. Ðáñáêáëïýìå äåßôå ôç óåëßäá manual ôïõ altq(4) ãéá ôç ëßóôá ôùí ïäçãþí ðïõ õðïóôçñßæïíôáé óôçí Ýêäïóç ôïõ FreeBSD ðïõ äéáèÝôåôå.

Ïé ðáñáêÜôù åðéëïãÝò ôïõ ðõñÞíá åíåñãïðïéïýí ôï ALTQ êáé ðñïóèÝôïõí åðéðñüóèåôåò ëåéôïõñãßåò:

```
options         ALTQ
options         ALTQ_CBQ        # Class Bases Queuing (CBQ)
options         ALTQ_RED        # Random Early Detection (RED)
options         ALTQ_RIO        # RED In/Out
options         ALTQ_HFSC       # Hierarchical Packet Scheduler (HFSC)
options         ALTQ_PRIQ       # Priority Queuing (PRIQ)
options         ALTQ_NOPCC      # Required for SMP build
```

Ç ãñáììÞ `options ALTQ` åíåñãïðïéåß ôï ðëáßóéï ëåéôïõñãéþí ALTQ.

Ç ãñáììÞ `options ALTQ_CBQ` åíåñãïðïéåß ôï *Class Based Queuing* (CBQ). Ôï CBQ óáò åðéôñÝðåé íá ÷ùñßóåôå ôï åýñïò æþíçò ìéáò óýíäåóçò óå äéáöïñåôéêÝò êëÜóåéò Þ ïõñÝò, þóôå íá äßíïíôáé ðñïôåñáéüôçôåò óôçí êßíçóç áíÜëïãá ìå ôïõò êáíüíåò ôïõ ößëôñïõ.

Ç ãñáììÞ `options ALTQ_RED` åíåñãïðïéåß ôï *Random Early Detection* (RED). Ôï RED ÷ñçóéìïðïéåßôáé ãéá íá áðïöåõ÷èåß ç óõìöüñçóç ôïõ äéêôýïõ. Ãéá ôï óêïðü áõôü, ôï RED ìåôñÜåé ôï ìÞêïò ôçò ïõñÜò êáé ôï óõãêñßíåé ìå ôï ìÝãéóôï êáé åëÜ÷éóôï üñéï ôçò. Áí ç ïõñÜ åßíáé ðÜíù áðü ôï ìÝãéóôï, üëá ôá íÝá ðáêÝôá èá áðïññßðôïíôáé. Óýìöùíá êáé ìå ôï üíïìá ôïõ, ôï RED áðïññßðôåé ðáêÝôá áðü äéÜöïñåò óõíäÝóåéò ìå ôõ÷áßï ôñüðï.

Ç ãñáììÞ `options ALTQ_RIO` åíåñãïðïéåß ôï *Random Early Detection In and Out*.

Ç ãñáììÞ `options ALTQ_HFSC` åíåñãïðïéåß ôï *Hierarchical Fair Service Curve Packet Scheduler*. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôï HFSC äåßôå: http://www-2.cs.cmu.edu/~hzhang/HFSC/main.html.

Ç ãñáììÞ `options ALTQ_PRIQ` åíåñãïðïéåß ôï *Priority Queuing* (PRIQ). Ôï PRIQ ðÜíôïôå ðåñíÜåé ðñþôá ôçí êßíçóç ìå ôç ìåãáëýôåñç ðñïôåñáéüôçôá.

Ç ãñáììÞ `options ALTQ_NOPCC` åíåñãïðïéåß ôçí õðïóôÞñéîç SMP ãéá ôï ALTQ. Ç åðéëïãÞ áõôÞ áðáéôåßôáé óå óõóôÞìáôá SMP.

31.5 Ôï IPFILTER (IPF) Firewall

Ï óõããñáöÝáò ôïõ IPFILTER åßíáé ï Darren Reed. Ôï IPFILTER äåí åîáñôÜôáé áðü ôï ëåéôïõñãéêü óýóôçìá: åßíáé ìéá åöáñìïãÞ áíïéêôïý êþäéêá ðïõ Ý÷åé ìåôáöåñèåß óôï FreeBSD, ôï NetBSD, ôï OpenBSD, ôï SunOS, ôï HP/UX êáé ôï Solaris. Ôï IPFILTER åßíáé õðü äéáñêÞ êáé åíåñãÞ áíÜðôõîç êáé óõíôÞñçóç, êáé êõêëïöïñïýí ôáêôéêÜ ïé íÝåò åêäüóåéò ôïõ.

Ôï IPFILTER åßíáé Ýíá firewall êáé ìç÷áíéóìüò NAT ðïõ ëåéôïõñãåß óôïí ðõñÞíá êáé ìðïñåß íá åëÝã÷åôáé êáé íá ðáñáêïëïõèåßôáé áðü ðñïãñÜììáôá ÷ñÞóôç. Ïé êáíüíåò ôïõ firewall ìðïñïýí íá ôßèåíôáé óå éó÷ý Þ íá äéáãñÜöïíôáé ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò ipf(8). Ïé êáíüíåò ãéá ôï NAT ìðïñïýí íá ôßèåíôáé óå éó÷ý Þ íá äéáãñÜöïíôáé ìÝóù ôïõ âïçèçôéêïý ðñïãñÜììáôïò ipnat(1). Ôï âïçèçôéêü ðñüãñáììá ipfstat(8) ìðïñåß íá åêôõðþóåé óôáôéóôéêÜ åêôÝëåóçò ãéá ôï ôìÞìá ôïõ IPFILTER ðïõ åêôåëåßôáé óôïí ðõñÞíá. Ôï ðñüãñáììá ipmon(8) ìðïñåß íá êáôáãñÜøåé ôéò åíÝñãåéåò ôïõ IPFILTER óôï áñ÷åßá êáôáãñáöÞò óõìâÜíôùí ôïõ óõóôÞìáôïò.

Ôï IPF ãñÜöçêå áñ÷éêÜ ÷ñçóéìïðïéþíôáò ìéá ëïãéêÞ åðåîåñãáóßáò êáíüíùí ôïõ ôýðïõ “ï ôåëåõôáßï êáíüíáò ðïõ ôáéñéÜæåé, åßíáé êáé ï íéêçôÞò” êáé ÷ñçóéìïðïéïýóå ìüíï êáíüíåò ôýðïõ stateless. Ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ, ôï IPF âåëôéþèçêå ãéá íá ðåñéëáìâÜíåé ôçí åðéëïãÞ “quick” êáé ôçí åðéëïãÞ “keep state” ãéá stateful êáíüíåò. Ïé åðéëïãÝò áõôÝò åêóõã÷ñüíéóáí äñáìáôéêÜ ôç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí. Ç åðßóçìç ôåêìçñßùóç ôïõ IPF êáëýðôåé ìüíï ôéò ðáëéÝò ðáñáìÝôñïõò ñýèìéóçò êáé åðåîåñãáóßáò ôùí êáíüíùí. Ïé óýã÷ñïíåò ëåéôïõñãßåò êáëýðôïíôáé ìüíï ùò ðñüóèåôåò åðéëïãÝò, êáé Ýôóé äåí ôïíßæïíôáé áñêåôÜ ôá ðëåïíåêôÞìáôá ôïõò óôç äçìéïõñãßá åíüò ðïëý êáëýôåñïõ êáé áóöáëÝóôåñïõ firewall.

Ïé ïäçãßåò ðïõ ðåñéÝ÷ïíôáé óå áõôÞ ôçí åíüôçôá, âáóßæïíôáé óôç ÷ñÞóç êáíüíùí ðïõ ðåñéÝ÷ïõí ôçí åðéëïãÞ “quick” êáèþò êáé ôçí stateful åðéëïãÞ “keep state”. Áõôü åßíáé êáé ôï âáóéêü ðëáßóéï ëåéôïõñãéþí ãéá ôçí äçìéïõñãßá ôïõ óåô êáíüíùí åíüò inclusive firewall.

Ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôïí ðáëéüôåñï ôñüðï åðåîåñãáóßáò ôùí êáíüíùí, äåßôå: http://www.obfuscation.org/ipf/ipf-howto.html#TOC_1 êáé http://coombs.anu.edu.au/~avalon/ip-filter.html.

Ìðïñåßôå íá äåßôå ôï IPF FAQ óôçí ôïðïèåóßá http://www.phildev.net/ipf/index.html.

Ìðïñåßôå íá âñåßôå ôéò ðáëáéüôåñåò äçìïóéåýóåéò ôéò ëßóôáò ôá÷õäñïìåßïõ ôïõ IPFILTER óôï http://marc.theaimsgroup.com/?l=ipfilter. ÐáñÝ÷åôáé äõíáôüôçôá áíáæÞôçóçò.

31.5.1 Åíåñãïðïéþíôáò ôï IPF

Ôï IPF ðåñéëáìâÜíåôáé óôç âáóéêÞ åãêáôÜóôáóç ôïõ FreeBSD ùò Üñèñùìá ôï ïðïßï ìðïñåß íá öïñôùèåß ÷ùñéóôÜ. Ôï óýóôçìá èá öïñôþóåé äõíáìéêÜ ôï Üñèñùìá ôïõ IPF áí õðÜñ÷åé ç êáôá÷þñéóç `ipfilter_enable="YES"` óôï áñ÷åßï `/etc/rc.conf`. Ôï Üñèñùìá Ý÷åé äçìéïõñãçèåß ìå åíåñãïðïéçìÝíç ôçí äõíáôüôçôá êáôáãñáöÞò êáé ìå ôçí åðéëïãÞ `default pass all`. Ãéá íá áëëÜîåôå áõôÞ ôçí ðñïåðéëïãÞ óå `block all`, ìðïñåßôå áðëþò íá ðñïóèÝóåôå ôïí êáíüíá áðüññéøçò (block all) óôï ôÝëïò ôùí êáíüíùí óáò. Äåí ÷ñåéÜæåôáé íá ìåôáãëùôôßóåôå ôçí åðéëïãÞ IPF óôïí ðõñÞíá ôïõ FreeBSD ãéá ôï óêïðü áõôü.

31.5.2 ÅðéëïãÝò ãéá ôïí ÐõñÞíá

Äåí åßíáé õðï÷ñåùôéêü íá ìåôáãëùôôßóåôå ôéò ðáñáêÜôù åðéëïãÝò óôïí ðõñÞíá ôïõ FreeBSD ãéá íá åíåñãïðïéÞóåôå ôï IPF. Ç ðáñïõóßáóç ôïõò åäþ åßíáé êáèáñÜ åíçìåñùôéêÞ. Áí ìåôáãëùôôßóåôå ôï IPF áðåõèåßáò óôïí ðõñÞíá, äåí èá ÷ñçóéìïðïéçèåß ðïôÝ ôï áíôßóôïé÷ï Üñèñùìá.

Óôï áñ÷åßï `/usr/src/sys/conf/NOTES` èá âñåßôå ðáñáäåßãìáôá êáôá÷ùñßóåùí IPF ãéá ôï áñ÷åßï ñýèìéóçò ôïõ ðõñÞíá. Ïé åðéëïãÝò áõôÝò öáßíïíôáé åðßóçò ðáñáêÜôù:

```
options IPFILTER
options IPFILTER_LOG
options IPFILTER_DEFAULT_BLOCK
```

Ç åðéëïãÞ `options IPFILTER` åíåñãïðïéåß ôçí õðïóôÞñéîç ãéá ôï “IPFILTER” firewall.

Ç åðéëïãÞ `options IPFILTER_LOG` åíåñãïðïéåß ôçí õðïóôÞñéîç êáôáãñáöÞò ôïõ IPF, ç ïðïßá ãñÜöåé óôçí øåõäï-óõóêåõÞ êáôáãñáöÞò ðáêÝôùí `ipl` ãéá êÜèå êáíüíá ðïõ ðåñéëáìâÜíåé ôçí åðéëïãÞ `log`.

Ç åðéëïãÞ `options IPFILTER_DEFAULT_BLOCK` áëëÜæåé ôçí ðñïåðéëåãìÝíç óõìðåñéöïñÜ, þóôå êÜèå ðáêÝôï ðïõ äåí ôáéñéÜæåé ìå êÜðïéï êáíüíá `pass` ôïõ firewall, íá áðïññßðôåôáé áõôüìáôá.

Ïé ðáñáðÜíù åðéëïãÝò èá åíåñãïðïéçèïýí ìüíï áöïý ìåôáãëùôôßóåôå êáé åãêáôáóôÞóåôå Ýíá ðñïóáñìïóìÝíï ðõñÞíá ðïõ íá ôéò ðåñéëáìâÜíåé.

31.5.3 ÄéáèÝóéìåò ÅðéëïãÝò ãéá ôï rc.conf

×ñåéÜæåóôå ôéò ðáñáêÜôù êáôá÷ùñßóåéò óôï `/etc/rc.conf` ãéá íá åíåñãïðïéÞóåôå ôï IPF êáôÜ ôçí åêêßíçóç ôïõ õðïëïãéóôÞ:

```
ipfilter_enable="YES"             # Start ipf firewall
ipfilter_rules="/etc/ipf.rules"   # loads rules definition text file
ipmon_enable="YES"                # Start IP monitor log
ipmon_flags="-Ds"                 # D = start as daemon
                                  # s = log to syslog
                                  # v = log tcp window, ack, seq
                                  # n = map IP & port to names
```

Áí ðßóù áðü áõôü ôï firewall õðÜñ÷åé êÜðïéï LAN ðïõ ÷ñçóéìïðïéåß äåóìåõìÝíåò éäéùôéêÝò äéåõèýíóåéò, èá ÷ñåéáóôåß íá ðñïóèÝóåôå ôéò ðáñáêÜôù êáôá÷ùñßóåéò ãéá íá åíåñãïðïéÞóåôå ôç ëåéôïõñãßá NAT:

```
gateway_enable="YES"              # Enable as LAN gateway
ipnat_enable="YES"                # Start ipnat function
ipnat_rules="/etc/ipnat.rules"    # rules definition file for ipnat
```

31.5.4 IPF

Ç åíôïëÞ ipf(8) ÷ñçóéìïðïéåßôáé ãéá íá öïñôþóåé ôï áñ÷åßï ôùí êáíüíùí. ÖõóéïëïãéêÜ, èá äçìéïõñãÞóåôå Ýíá áñ÷åßï ìå ôïõò äéêïýò óáò ðñïóáñìïóìÝíïõò êáíüíåò êáé èá áíôéêáôáóôÞóåôå ìå áõôü åî’ïëïêëÞñïõ ôïõò åóùôåñéêïýò êáíüíåò ôïõ firewall:

```
# ipf -Fa -f /etc/ipf.rules
```

Ç åðéëïãÞ `-Fa` áäåéÜæåé ôïõò êáíüíåò áðü ôïõò åóùôåñéêïýò ðßíáêåò ôïõ firewall.

Ç åðéëïãÞ `-f` êáèïñßæåé ôï áñ÷åßï ôùí êáíüíùí ðïõ èá öïñôùèåß.

Áõôü óáò äßíåé ôçí äõíáôüôçôá íá áëëÜîåôå ôï áñ÷åßï êáíüíùí óáò, íá åêôåëÝóåôå ôçí åíôïëÞ IPF ðïõ áíáöÝñáìå ðáñáðÜíù, êáé íá áíáíåþóåôå ìå áõôü ôïí ôñüðï ôïõò êáíüíåò óôï firewall ðïõ åêôåëåßôáé Þäç ìå êáéíïýñãéïõò, ÷ùñßò íá ÷ñåéáóôåß íá åðáíåêêéíÞóåôå ôï óýóôçìá óáò. Ç ìÝèïäïò áõôÞ åßíáé ðïëý âïëéêÞ ãéá íá äïêéìÜóåôå íÝïõò êáíüíåò, êáèþò ìðïñåß íá åðáíáëçöèåß üóåò öïñÝò èÝëåôå.

Äåßôå ôç óåëßäá manual ôïõ ipf(8) ãéá ëåðôïìÝñåéåò ó÷åôéêÜ ìå ôéò õðüëïéðåò åðéëïãÝò ðïõ ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ìå ôçí åíôïëÞ áõôÞ.

Ç åíôïëÞ ipf(8) áíáìÝíåé Ýíá áðëü áñ÷åßï êåéìÝíïõ ùò áñ÷åßï êáíüíùí. Äåí èá äå÷èåß áñ÷åßï êáíüíùí ãñáììÝíï ùò script ìå óõìâïëéêÝò áíôéêáôáóôÜóåéò.

ÕðÜñ÷åé ùóôüóï ôñüðïò íá ãñÜøåôå êáíüíåò IPF ðïõ íá ÷ñçóéìïðïéïýí ôçí éó÷ý ôùí óõìâïëéêþí áíôéêáôáóôÜóåùí. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôï ÔìÞìá 31.5.9.

31.5.5 IPFSTAT

Ç ðñïåðéëåãìÝíç óõìðåñéöïñÜ ôïõ ipfstat(8) åßíáé íá áíáêôÜ êáé íá áðåéêïíßæåé ôï óýíïëï ôùí óôáôéóôéêþí ðïõ óõãêåíôñþèçêáí ùò áðïôÝëåóìá ôçò åöáñìïãÞò ôùí êáíüíùí ôïõ ÷ñÞóôç óôá ðáêÝôá ðïõ åéóÝñ÷ïíôáé êáé åîÝñ÷ïíôáé áðü ôï firewall, áðü ôç óôéãìÞ ôçò ôåëåõôáßáò ôïõ åêêßíçóçò Þ áðü ôïí ôåëåõôáßï ôïõò ìçäåíéóìü ìÝóù ôçò åíôïëÞò `ipf -Z`.

Äåßôå ôç óåëßäá manual ipfstat(8) ãéá ëåðôïìÝñåéåò.

Ç ðñïåðéëåãìÝíç Ýîïäïò ôçò åíôïëÞò ipfstat(8) èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
input packets: blocked 99286 passed 1255609 nomatch 14686 counted 0
 output packets: blocked 4200 passed 1284345 nomatch 14687 counted 0
 input packets logged: blocked 99286 passed 0
 output packets logged: blocked 0 passed 0
 packets logged: input 0 output 0
 log failures: input 3898 output 0
 fragment state(in): kept 0 lost 0
 fragment state(out): kept 0 lost 0
 packet state(in): kept 169364 lost 0
 packet state(out): kept 431395 lost 0
 ICMP replies: 0 TCP RSTs sent: 0
 Result cache hits(in): 1215208 (out): 1098963
 IN Pullups succeeded: 2 failed: 0
 OUT Pullups succeeded: 0 failed: 0
 Fastroute successes: 0 failures: 0
 TCP cksum fails(in): 0 (out): 0
 Packet log flags set: (0)
```

¼ôáí ÷ñçóéìïðïéçèåß ç åðéëïãÞ `-i` ãéá ôá åéóåñ÷üìåíá Þ ç åðéëïãÞ `-o` ãéá ôá åîåñ÷üìåíá ðáêÝôá, ç åíôïëÞ èá áíáêôÞóåé êáé èá áðåéêïíßóåé ôçí áíôßóôïé÷ç ëßóôá êáíüíùí ðïõ åßíáé åãêáôåóôçìÝíç êáé ÷ñçóéìïðïéåßôáé áðü ôïí ðõñÞíá ôç äåäïìÝíç óôéãìÞ.

Ç åíôïëÞ `ipfstat -in` äåß÷íåé Ýíá áñéèìçìÝíï ðßíáêá êáíüíùí ãéá åéóåñ÷üìåíá ðáêÝôá.

Ç åíôïëÞ `ipfstat -on` äåß÷íåé Ýíá áñéèìçìÝíï ðßíáêá êáíüíùí ãéá åîåñ÷üìåíá ðáêÝôá.

Ç Ýîïäïò èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
@1 pass out on xl0 from any to any
@2 block out on dc0 from any to any
@3 pass out quick on dc0 proto tcp/udp from any to any keep state
```

Ç åíôïëÞ `ipfstat -ih` äåß÷íåé ôïí ðßíáêá êáíüíùí ãéá ôá åéóåñ÷üìåíá ðáêÝôá, ôïðïèåôþíôáò ìðñïóôÜ áðü ôïí êÜèå êáíüíá Ýíá áñéèìü ðïõ äåß÷íåé ðüóåò öïñÝò Ý÷åé ÷ñçóéìïðïéçèåß.

Ç åíôïëÞ `ipfstat -oh` äåß÷íåé ôïí ðßíáêá êáíüíùí ãéá ôá åîåñ÷üìåíá ðáêÝôá, ôïðïèåôþíôáò ìðñïóôÜ áðü ôïí êÜèå êáíüíá Ýíá áñéèìü ðïõ äåß÷íåé ðüóåò öïñÝò Ý÷åé ÷ñçóéìïðïéçèåß.

Ç Ýîïäïò èá ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
2451423 pass out on xl0 from any to any
354727 block out on dc0 from any to any
430918 pass out quick on dc0 proto tcp/udp from any to any keep state
```

Ìéá áðü ôéò ðéï óçìáíôéêÝò ëåéôïõñãßåò ôçò åíôïëÞò `ipfstat` åßíáé ç åðéëïãÞ `-t` ç ïðïßá áðåéêïíßæåé ôïí ðßíáêá êáôáóôÜóåùí, ìå ôñüðï üìïéï ìå áõôü ðïõ ÷ñçóéìïðïéåß ç åíôïëÞ top(1) ãéá íá äåßîåé ôïí ðßíáêá äéåñãáóéþí ðïõ åêôåëïýíôáé óôï FreeBSD. ¼ôáí ôï firewall óáò äÝ÷åôáé åðßèåóç, ç ëåéôïõñãßá áõôÞ óáò äßíåé ôçí äõíáôüôçôá íá áíáãíùñßóåôå êáé íá åîåôÜóåôå óôá ßäéá ôá ðáêÝôá ðïõ ôçí áðïôåëïýí. Ïé ðñïáéñåôéêÝò õðï-åðéëïãÝò óáò äßíïõí ôçí äõíáôüôçôá íá åðéëÝîåôå ôï IP áöåôçñßáò Þ ðñïïñéóìïý, ôçí èýñá, Þ ôï ðñùôüêïëëï ôï ïðïßï èÝëåôå íá ðáñáêïëïõèÞóåôå óå ðñáãìáôéêü ÷ñüíï. Äåßôå ôç óåëßäá manual ôïõ ipfstat(8) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

31.5.6 IPMON

Ãéá íá ëåéôïõñãÞóåé óùóôÜ ç åíôïëÞ `ipmon`, èá ðñÝðåé íá åíåñãïðïéçèåß ç åðéëïãÞ `IPFILTER_LOG` óôïí ðõñÞíá. Ç åíôïëÞ áõôÞ äéáèÝôåé äýï äéáöïñåôéêïýò ôñüðïõò ëåéôïõñãßáò. Ï ðñïåðéëåãìÝíïò êáíïíéêüò ôñüðïò ëåéôïõñãßáò åíåñãïðïéåßôáé üôáí ç åíôïëÞ ÷ñçóéìïðïéåßôáé ÷ùñßò ôçí åðéëïãÞ `-D`.

Ç åíôïëÞ ìðïñåß íá ÷ñçóéìïðïéçèåß óå ëåéôïõñãßá äáßìïíá üôáí åðéèõìåßôå íá Ý÷åôå Ýíá óõíå÷üìåíï áñ÷åßï êáôáãñáöÞò þóôå íá ìðïñåßôå íá åîåôÜóåôå ôéò ðñïçãïýìåíåò åããñáöÝò. Áõôüò åßíáé êáé ï ôñüðïò ìå ôïí ïðïßï Ý÷åé ñõèìéóôåß íá óõíåñãÜæåôáé ôï FreeBSD ìå ôï IPFILTER. Ôï FreeBSD Ý÷åé åíóùìáôùìÝíç äõíáôüôçôá åíáëëáãÞò áñ÷åßùí êáôáãñáöÞò. Ãéá áõôü ôï ëüãï, åßíáé êáëýôåñï ç êáôáãñáöÞ íá ãßíåôáé ìÝóù ôïõ syslogd(8) ðáñÜ óå Ýíá óõíçèéóìÝíï áñ÷åßï. Áðü ðñïåðéëïãÞ, ç ñýèìéóç `ipmon_flags` óôï áñ÷åßï `rc.conf` ÷ñçóéìïðïéåß ôéò åðéëïãÝò `-Ds`:

```
ipmon_flags="-Ds" # D = start as daemon
                  # s = log to syslog
                  # v = log tcp window, ack, seq
                  # n = map IP & port to names
```

Ôá ðëåïíåêôÞìáôá ôçò êáôáãñáöÞò åßíáé ðñïöáíÞ. ÐáñÝ÷åé ôçí äõíáôüôçôá åðéóêüðçóçò ðëçñïöïñéþí üðùò ôá ðáêÝôá ðïõ áðïññßöèçêáí, ôéò äéåõèýíóåéò áðü ôéò ïðïßåò ëÞöèçêáí, êáé ôïí ðñïïñéóìü ôïõò. ¸÷åôå Ýôóé Ýíá óçìáíôéêü ðëåïíÝêôçìá üôáí ðñïóðáèåßôå íá áíáãíùñßóåôå Ýíá åéóâïëÝá.

Áêüìá êáé üôáí åíåñãïðïéÞóåôå ôçí äõíáôüôçôá êáôáãñáöÞò, ôï IPF äåí èá êáôáãñÜøåé ôßðïôá áí äåí Ý÷åé ãßíåé ç áíôßóôïé÷ç ñýèìéóç óôïõò êáíüíåò. Ï äéá÷åéñéóôÞò ôïõ firewall áðïöáóßæåé ãéá ðïéïõò êáíüíåò ôïõ óåô èÝëåé íá åíåñãïðïéÞóåé ôçí êáôáãñáöÞ, êáé ðñïóèÝôåé óå áõôïýò ôçí ëÝîç log. Óõíçèéóìáôéêá, ç êáôáãñáöÞ åíåñãïðïéåßôáé ìüíï óå êáíüíåò ðïõ áðïññßðôïõí ðáêÝôá.

Åßíáé ðïëý óõíçèéóìÝíï íá ðåñéëáìâÜíåôå Ýíáí êáíüíá óôï ôÝëïò ôïõ óõíüëïõ, ðïõ íá áðïññßðôåé áðü ðñïåðéëïãÞ üëá ôá ðáêÝôá ðïõ öôÜíïõí ìÝ÷ñé åêåß (default deny). Ìå ôïí ôñüðï áõôü ìðïñåßôå íá äåßôå üëá ôá ðáêÝôá ðïõ äåí ôáßñéáîáí ìå êáíÝíá êáíüíá ôïõ óåô.

31.5.7 ÊáôáãñáöÞ ôïõ IPMON

Ôï **syslogd** ÷ñçóéìïðïéåß ôç äéêÞ ôïõ åéäéêÞ ìÝèïäï ãéá ôï äéá÷ùñéóìü ôùí äåäïìÝíùí êáôáãñáöÞò. ÄéáèÝôåé åéäéêÝò ïìáäïðïéÞóåéò ðïõ ïíïìÜæïíôáé “facility” êáé “level”. ¼ôáí ôï IPMON ÷ñçóéìïðïéåßôáé ìå ôçí åðéëïãÞ `-Ds`,

÷ñçóéìïðïéåß áðü ðñïåðéëïãÞ ôï `local0` ùò üíïìá “facility”. Áí ôï åðéèõìåßôå, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá ðáñáêÜôù åðßðåäá ãéá ðåñáéôÝñù äéá÷ùñéóìü ôùí äåäïìÝíùí êáôáãñáöÞò:

```
LOG_INFO - packets logged using the "log" keyword as the action rather than pass or block.
LOG_NOTICE - packets logged which are also passed
LOG_WARNING - packets logged which are also blocked
LOG_ERR - packets which have been logged and which can be considered short
```

Ãéá íá ñõèìßóåôå ôï IPFILTER íá êáôáãñÜöåé üëá ôá äåäïìÝíá óôï `/var/log/ipfilter.log`, èá ÷ñåéáóôåß íá äçìéïõñãÞóåôå áðü ðñéí ôï áñ÷åßï. Áõôü ìðïñåß íá ãßíåé ìå ôçí ðáñáêÜôù åíôïëÞ:

```
# touch /var/log/ipfilter.log
```

Ç ëåéôïõñãßá ôïõ syslogd(8) ìðïñåß íá ñõèìéóôåß ìå êáôá÷ùñßóåéò óôï áñ÷åßï `/etc/syslog.conf`. Ôï áñ÷åßï `syslog.conf` ðñïóöÝñåé óçìáíôéêÞ åõåëéîßá óôïí ôñüðï ìå ôïí ïðïßï ôï **syslog** áíôéìåôùðßæåé ôá ìçíýìáôá óõóôÞìáôïò ðïõ ðñïÝñ÷ïíôáé áðü åöáñìïãÝò üðùò ôï IPF.

ÐñïóèÝóôå ôçí ðáñáêÜôù êáôá÷þñéóç óôï áñ÷åßï `/etc/syslog.conf`:

```
local0.* /var/log/ipfilter.log
```

Ôï `local0.*` óçìáßíåé üôé èá ãßíåôáé êáôáãñáöÞ üëùí ôùí ìçíõìÜôùí áõôïý ôïõ ôýðïõ óôçí ôïðïèåóßá ðïõ Ý÷åé ïñéóôåß.

Ãéá íá åíåñãïðïéÞóåôå ôéò áëëáãÝò óôï `/etc/syslog.conf` èá ðñÝðåé íá åðáíåêêéíÞóåôå ôï ìç÷Üíçìá Þ íá áíáãêÜóåôå ôï syslogd(8) íá îáíáäéáâÜóåé ôï `/etc/syslog.conf`, åêôåëþíôáò ôçí åíôïëÞ `/etc/rc.d/syslogd reload`

Ìçí îå÷Üóåôå íá ôñïðïðïéÞóåôå ôï `/etc/newsyslog.conf` þóôå íá åíáëëÜóóåé ôï áñ÷åßï êáôáãñáöÞò ðïõ äçìéïõñãÞóáôå ðáñáðÜíù.

31.5.8 Ç ÌïñöÞ ôùí ÌçíõìÜôùí ÊáôáãñáöÞò

Ôá ìçíýìáôá ðïõ ðáñÜãïíôáé áðü ôçí `ipmon` áðïôåëïýíôáé áðü ðåäßá äåäïìÝíùí ðïõ ÷ùñßæïíôáé áðü ëåõêü äéÜóôçìá. Ôá ðåäßá ðïõ åßíáé êïéíÜ óå üëá ôá ìçíýìáôá, åßíáé ôá ðáñáêÜôù:

1. Ç çìåñïìçíßá ðáñáëáâÞò ôïõ ðáêÝôïõ
2. Ç þñá ðáñáëáâÞò ôïõ ðáêÝôïõ. ¸÷åé ôçí ìïñöÞ HH:MM:SS.F, ç ïðïßá õðïäçëþíåé þñåò, ëåðôÜ, äåõôåñüëåðôá êáé êëÜóìáôá äåõôåñïëÝðôïõ (ôá ïðïßá ìðïñåß íá åßíáé ðïëëÜ äåêáäéêÜ øçößá).
3. Ôï üíïìá ôçò äéåðáöÞò óôçí ïðïßá Ýãéíå ç åðåîåñãáóßá ôïõ ðáêÝôïõ ð.÷. `dc0`.
4. Ï áñéèìüò ïìÜäáò êáé ï áýîùí áñéèìüò ôïõ êáíüíá, ð.÷. `@0:17`.

Ìðïñåßôå íá äåßôå ôá ðáñáêÜôù ìå ôçí åíôïëÞ `ipfstat -in`:

1. Ôï åßäïò ôçò åíÝñãåéáò: p áí ôï ðáêÝôï ðÝñáóå, b áí ôï ðáêÝôï áðïññßöèçêå, S ãéá óýíôïìï ðáêÝôï, n áí äåí ôáßñéáîå ìå êáíÝíá êáíüíá, L ãéá êáíüíá ìå êáôáãñáöÞ. Ç óåéñÜ ðñïôåñáéüôçôáò óôçí áðåéêüíéóç ôùí ðáñáðÜíù, åßíáé S, p, b, n, L. Ôï êåöáëáßï P Þ ôï B óçìáßíïõí üôé ç êáôáãñáöÞ ôïõ ðáêÝôïõ Ýãéíå ëüãù êÜðïéáò ãåíéêÞò ñýèìéóçò êáôáãñáöÞò êáé ü÷é åîáéôßáò êÜðïéïõ êáíüíá.

2. Ïé äéåõèýíóåéò. Ðñüêåéôáé óôçí ðñáãìáôéêüôçôá ãéá ôñßá ðåäßá: ôç äéåýèõíóç êáé ôç èýñá áöåôçñßáò (÷ùñßæïíôáé ìå êüììá), ôï óýìâïëï -> êáé ôçí äéåýèõíóç êáé èýñá ðñïïñéóìïý, ð.÷. `209.53.17.22,80 -> 198.73.220.17,1722`.
3. Ôï `PR` áêïëïõèïýìåíï áðü ôï üíïìá Þ ôïí áñéèìü ôïõ ðñùôïêüëëïõ, ð.÷. `PR tcp`.
4. Ôï `len` áêïëïõèïýìåíï áðü ôï ìÞêïò ôçò åðéêåöáëßäáò êáé ôï óõíïëéêü ìÞêïò ôïõ ðáêÝôïõ, ð.÷. `len 20 40`.

Áí ðñüêåéôáé ãéá ðáêÝôï TCP, èá õðÜñ÷åé Ýíá åðéðëÝïí ðåäßï ôï ïðïßï èá îåêéíÜåé ìå ìéá ðáýëá êáé èá áêïëïõèåßôáé áðü ãñÜììáôá ôá ïðïßá áíôéóôïé÷ïýí óôéò åðéëïãÝò (flags) ðïõ Ý÷ïõí ôåèåß. Äåßôå ôç óåëßäá manual ipf(5) ãéá ôç ëßóôá ôùí ãñáììÜôùí êáé ôùí áíôßóôïé÷ùí flags.

Áí ðñüêåéôáé ãéá ðáêÝôï ICMP, èá õðÜñ÷ïõí äýï ðåäßá óôï ôÝëïò, ôï ðñþôï èá åßíáé ðÜíôá “ICMP” êáé ôï åðüìåíï èá åßíáé ï ôýðïò ôïõ ìçíýìáôïò êáé ôïõ õðü-ìçíýìáôïò ICMP, ÷ùñéóìÝíá ìå ìéá êÜèåôï, ð.÷. ICMP 3/3 ãéá Ýíá ìÞíõìá ìç ðñïóâÜóéìçò èýñáò (port unreachable).

31.5.9 Äçìéïõñãßá Script Êáíüíùí ìå ÓõìâïëéêÞ ÕðïêáôÜóôáóç

ÏñéóìÝíïé Ýìðåéñïé ÷ñÞóôåò ôïõ IPF äçìéïõñãïýí Ýíá áñ÷åßï êáíüíùí ôï ïðïßï ìðïñåß íá åêôåëåóôåß ùò script ìå äõíáôüôçôá óõìâïëéêÞò õðïêáôÜóôáóçò. Ôï âáóéêü üöåëïò ôïõ ðáñáðÜíù, åßíáé üôé ÷ñåéÜæåôáé íá áëëÜîåôå ìüíï ôçí ôéìÞ ðïõ ó÷åôßæåôáé ìå ôï óõìâïëéêü üíïìá êáé üôáí ôï script åêôåëåóôåß, ç ôéìÞ èá õðïêáôáóôáèåß óå üëïõò ôïõò êáíüíåò ðïõ ðåñéÝ÷ïõí ôï üíïìá áõôü. Êáèþò ðñüêåéôáé ãéá script, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå óõìâïëéêÞ õðïêáôÜóôáóç ãéá íá êùäéêïðïéÞóåôå óõ÷íÜ ÷ñçóéìïðïéïýìåíåò ôéìÝò êáé íá ôéò õðïêáèéóôÜôå óå ðïëëáðëïýò êáíüíåò. Áõôü öáßíåôáé êáé óôï ðáñÜäåéãìá ðïõ áêïëïõèåß.

Ç óýíôáîç ôïõ script ðïõ ÷ñçóéìïðïéåßôáé åäþ, åßíáé óõìâáôÞ ìå ôá êåëýöç sh(1), csh(1), êáé tcsh(1).

Ôá ðåäßá óôá ïðïßá ãßíåôáé óõìâïëéêÞ õðïêáôÜóôáóç ðñïóçìåéþíïíôáé ìå ôï óÞìá ôïõ äïëáñßïõ: `$`.

Ôá óõìâïëéêÜ ðåäßá äåí Ý÷ïõí ôçí ðñïóçìåßùóç ìå ôï $.

Ç ôéìÞ ðïõ èá ÷ñçóéìïðïéçèåß óôï óõìâïëéêü ðåäßï, èá ðñÝðåé íá åóùêëåßåôáé óå äéðëÜ åéóáãùãéêÜ (").

ÎåêéíÞóôå ôï áñ÷åßï ôùí êáíüíùí óáò ìå êÜôé áíôßóôïé÷ï ìå ôï ðáñáêÜôù:

```
############# Start of IPF rules script ########################

oif="dc0"            # name of the outbound interface
odns="192.0.2.11"    # ISP’s DNS server IP address
myip="192.0.2.7"     # my static IP address from ISP
ks="keep state"
fks="flags S keep state"

# You can choose between building /etc/ipf.rules file
# from this script or running this script "as is".
#
# Uncomment only one line and comment out another.
#
# 1) This can be used for building /etc/ipf.rules:
#cat > /etc/ipf.rules << EOF
#
# 2) This can be used to run script "as is":
/sbin/ipf -Fa -f - << EOF

# Allow out access to my ISP’s Domain name server.
```

```
pass out quick on $oif proto tcp from any to $odns port = 53 $fks
pass out quick on $oif proto udp from any to $odns port = 53 $ks

# Allow out non-secure standard www function
pass out quick on $oif proto tcp from $myip to any port = 80 $fks

# Allow out secure www function https over TLS SSL
pass out quick on $oif proto tcp from $myip to any port = 443 $fks
EOF
################## End of IPF rules script ########################
```

Áõôü åßíáé üëï. Óôï ðáñáðÜíù ðáñÜäåéãìá äåí åßíáé óçìáíôéêüò ïé êáíüíåò, áëëÜ ï ôñüðïò ìå ôïí ïðïßï ëåéôïõñãïýí êáé ðáßñíïõí ôéìÝò ôá ðåäßá õðïêáôÜóôáóçò. Áí ôï ðáñáðÜíù ðáñÜäåéãìá âñßóêïíôáí óå Ýíá áñ÷åßï ìå ôï üíïìá `/etc/ipf.rules.script`, èá ìðïñïýóáôå íá åðáíáöïñôþóåôå áõôïýò ôïõò êáíüíåò ìå ôçí ðáñáêÜôù åíôïëÞ:

```
# sh /etc/ipf.rules.script
```

ÕðÜñ÷åé Ýíá ðñüâëçìá üôáí ÷ñçóéìïðïéïýíôáé áñ÷åßá êáíüíùí ìå åíóùìáôùìÝíïõò óõìâïëéóìïýò: Ôï IPF äåí êáôáëáâáßíåé ôç óõìâïëéêÞ õðïêáôÜóôáóç, êáé äåí ìðïñåß íá äéáâÜóåé áõôÜ ôá scripts Üìåóá.

¸íá ôÝôïéï script ìðïñåß íá ÷ñçóéìïðïéçèåß ìå Ýíá áðü ôïõò äýï ðáñáêÜôù ôñüðïõò:

- ÁöáéñÝóôå ôï ó÷üëéï áðü ôç ãñáììÞ ðïõ îåêéíÜåé ìå `cat`, êáé ìåôáôñÝøôå óå ó÷üëéï ôç ãñáììÞ ðïõ îåêéíÜåé ìå `/sbin/ipf`. Ôïðïèåôåßóôå ôï `ipfilter_enable="YES"` óôï áñ÷åßï `/etc/rc.conf` üðùò óõíÞèùò, êáé åêôåëÝóôå ôï script ìéá öïñÜ ìåôÜ áðü êÜèå áëëáãÞ ãéá íá äçìéïõñãÞóåôå Þ íá åíçìåñþóåôå ôï `/etc/ipf.rules`.
- Áðåíåñãïðïéåßóôå ôï IPFILTER óôá scripts åêêßíçóçò ôïõ óõóôÞìáôïò, ðñïóèÝôïíôáò ôçí êáôá÷þñéóç `ipfilter_enable="NO"` (ðñüêåéôáé ãéá ôçí ðñïåðéëåãìÝíç ôéìÞ) óôï áñ÷åßï `/etc/rc.conf`.

  ÐñïóèÝóôå Ýíá script üðùò ôï ðáñáêÜôù óôïí êáôÜëïãï åêêßíçóçò `/usr/local/etc/rc.d/`. Ôï script èá ðñÝðåé íá Ý÷åé Ýíá ðñïöáíÝò üíïìá, üðùò `ipf.loadrules.sh`. Ç åðÝêôáóç `.sh` åßíáé õðï÷ñåùôéêÞ.

  ```
  #!/bin/sh
  sh /etc/ipf.rules.script
  ```

  Ïé Üäåéåò óå áõôü ôï áñ÷åßï, èá ðñÝðåé íá åðéôñÝðïõí áíÜãíùóç, åããñáöÞ êáé åêôÝëåóç ãéá ôïí ÷ñÞóôç `root`.

  ```
  # chmod 700 /usr/local/etc/rc.d/ipf.loadrules.sh
  ```

Ïé êáíüíåò ôïõ IPF èá öïñôþíïíôáé ðëÝïí êáôÜ ôçí åêêßíçóç ôïõ óõóôÞìáôïò óáò.

31.5.10 Ôï Óýíïëï Êáíüíùí ôïõ IPF

Ùò “óýíïëï êáíüíùí” óôï IPF, ïñßæïõìå ìéá ïìÜäá êáíüíùí ðïõ Ý÷ïõí ãñáöåß ãéá íá åðéôñÝðïõí Þ íá áðïññßðôïõí ðáêÝôá áíÜëïãá ìå ôéò ôéìÝò ðïõ ðåñéÝ÷ïíôáé óå áõôÜ. Ç äéðëÞò êáôåýèõíóçò áíôáëëáãÞ ðáêÝôùí ìåôáîý õðïëïãéóôþí áðïôåëåß ìéá óõíåäñßá. Ôï óýíïëï êáíüíùí ôïõ firewall åðåîåñãÜæåôáé ôüóï ôá ðáêÝôá ðïõ Ýñ÷ïíôáé áðü ôï Internet, üóï êáé ôá ðáêÝôá ðïõ ðáñÜãïíôáé áðü ôï óýóôçìá ùò áðÜíôçóç óå áõôÜ. ÊÜèå õðçñåóßá TCP/IP (ð.÷. telnet, www, mail, ê.ë.ð.) êáèïñßæåôáé áðü ôï ðñùôüêïëëï êáé ôçí ðñïíüìéáêÞ (privileged) èýñá ðïõ ÷ñçóéìïðïéåß ãéá íá äÝ÷åôáé áéôÞìáôá åîõðçñÝôçóçò. Ôá ðáêÝôá ðïõ ðñïïñßæïíôáé ãéá ìéá óõãêåêñéìÝíç õðçñåóßá, îåêéíïýí áðü ôç äéåýèõíóç áöåôçñßáò ÷ñçóéìïðïéþíôáò ìéá ìç-ðñïíïìéáêÞ èýñá êáé êáôáëÞãïõí óôç óõãêåêñéìÝíç èýñá õðçñåóßáò óôïí ðñïïñéóìü. ¼ëåò ïé ðáñáðÜíù ðáñÜìåôñïé (èýñåò êáé äéåõèýíóåéò) ìðïñïýí íá ÷ñçóéìïðïéçèïýí ùò êñéôÞñéá åðéëïãÞò ãéá ôçí äçìéïõñãßá êáíüíùí ðïõ åðéôñÝðïõí Þ åìðïäßæïõí ôçí ðñüóâáóç óå õðçñåóßåò.

Ôï IPF ãñÜöôçêå áñ÷éêÜ ÷ñçóéìïðïéþíôáò ìéá ëïãéêÞ åðåîåñãáóßáò êáíüíùí ôïõ ôýðïõ “ï ôåëåõôáßïò êáíüíáò ðïõ ôáéñéÜæåé, åßíáé ï íéêçôÞò” êáé ÷ñçóéìïðïéïýóå ìüíï êáíüíåò stateless. Ìå ôçí ðÜñïäï ôïõ ÷ñüíïõ, ôï IPF åíéó÷ýèçêå ìå ôçí åðéëïãÞ “quick” êáé ìå äõíáôüôçôá áðïèÞêåõóçò êáôÜóôáóçò ìÝóù ôçò åðéëïãÞò “keep state”. Ìå ôïí ôñüðï áõôü, åêóõã÷ñïíßóôçêå äñáìáôéêÜ ç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí.

Ïé ïäçãßåò ðïõ ðåñéÝ÷ïíôáé óå áõôÞ ôçí åíüôçôá âáóßæïíôáé óôç ÷ñÞóç êáíüíùí ðïõ ðåñéÝ÷ïõí ôçí åðéëïãÞ “quick” êáé ôçí åðéëïãÞ “keep state” ãéá ôç äéáôÞñçóç ôçò êáôÜóôáóçò. ÁõôÝò åßíáé êáé ïé âáóéêÝò ëåéôïõñãßåò ãéá ôçí êùäéêïðïßçóç ôïõ óõíüëïõ êáíüíùí åíüò inclusive firewall.

> **Ðñïåéäïðïßçóç:** ¼ôáí äïõëåýåôå ìå ôïõò êáíüíåò ôïõ firewall, èá ðñÝðåé íá åßóôå *ðïëý ðñïóåêôéêïß*. Áí âÜëåôå ëáíèáóìÝíåò ñõèìßóåéò, ìðïñåß íá *êëåéäùèåßôå Ýîù* áðü ôïí åîõðçñåôçôÞ óáò. Ãéá íá åßóôå áóöáëåßò, åßíáé ðñïôéìüôåñï íá êÜíåôå ôéò áñ÷éêÝò óáò ñõèìßóåéò áðü ôçí ôïðéêÞ êïíóüëá, ðáñÜ ìÝóù áðïìáêñõóìÝíçò óýíäåóçò (ð.÷. ìÝóù **ssh**).

31.5.11 Óõíôáêôéêü Êáíüíùí

Ôï óõíôáêôéêü ôùí êáíüíùí ðïõ ðáñïõóéÜæïõìå åäþ, Ý÷åé áðëïðïéçèåß þóôå íá áðåéêïíßæåé ôç óýã÷ñïíç stateful õëïðïßçóç êáé ôç ëïãéêÞ ôïõ ôýðïõ “ï ðñþôïò êáíüíáò ðïõ ôáéñéÜæåé åßíáé êáé ï íéêçôÞò”. Ãéá ôçí ðåñéãñáöÞ ôïõ ðáëéüôåñïõ ôñüðïõ ëåéôïõñãßáò, äéáâÜóôå ôç óåëßäá manual ôïõ ipf(8).

Ï ÷áñáêôÞñáò # ÷ñçóéìïðïéåßôáé ãéá íá åðéóçìÜíåé ôçí áñ÷Þ åíüò ó÷ïëßïõ, êáé ìðïñåß íá åìöáíßæåôáé óôï ôÝëïò ìéáò ãñáììÞò êáíüíá Þ óôç äéêÞ ôïõ ãñáììÞ. Ïé êåíÝò ãñáììÝò áãíïïýíôáé.

Ïé êáíüíåò ðåñéÝ÷ïõí ëÝîåéò-êëåéäéÜ. Ïé ëÝîåéò áõôÝò èá ðñÝðåé íá êùäéêïðïéçèïýí ìå óõãêåêñéìÝíç óåéñÜ áðü ôá áñéóôåñÜ ðñïò ôá äåîéÜ ôçò ãñáììÞò. Ïé ëÝîåéò-êëåéäéÜ öáßíïíôáé ðáñáêÜôù ìå Ýíôïíá ãñÜììáôá. ÌåñéêÝò ëÝîåéò Ý÷ïõí õðï-åðéëïãÝò ïé ïðïßåò ìðïñåß íá åßíáé åðßóçò ëÝîåéò-êëåéäéÜ êáé íá ðåñéëáìâÜíïõí åðßóçò ðåñéóóüôåñåò õðï-åðéëïãÝò. ÊÜèå ìéá áðü ôéò åðéêåöáëßäåò óôï ðáñÜäåéãìá ðïõ öáßíåôáé ðáñáêÜôù Ý÷åé ìéá êåöáëßäá ìå Ýíôïíá ãñÜììáôá ç ïðïßá ðåñéÝ÷åé ôï ðåñéå÷üìåíï ôçò.

ACTION IN-OUT OPTIONS SELECTION STATEFUL PROTO SRC_ADDR,DST_ADDR OBJECT PORT_NUM TCP_FLAG STATEFUL

ACTION = block | pass

IN-OUT = in | out

OPTIONS = log | quick | on interface-name

SELECTION = proto value | source/destination IP | port = number | flags flag-value

PROTO = tcp/udp | udp | tcp | icmp

SRC_ADD,DST_ADDR = all | from object to object

OBJECT = IP address | any

PORT_NUM = port number

TCP_FLAG = S

STATEFUL = keep state

31.5.11.1 ACTION

Ç åíÝñãåéá (action) äåß÷íåé ôé ðñÝðåé íá ãßíåé ìå ôï ðáêÝôï áí ôáéñéÜæåé ìå ôïí êáíüíá ôïõ ößëôñïõ. ÊÜèå êáíüíáò *ðñÝðåé* íá äéáèÝôåé ìéá åíÝñãåéá. Ïé åíÝñãåéåò ðïõ áíáãíùñßæïíôáé, öáßíïíôáé ðáñáêÜôù:

Ôï `block` äåß÷íåé üôé ôï ðáêÝôï èá ðñÝðåé íá áðïññéöèåß áí ôáéñéÜæåé ìå ôéò ðáñáìÝôñïõò åðéëïãÞò ôïõ êáíüíá.

Ôï `pass` äåß÷íåé üôé ôï ðáêÝôï èá ðñÝðåé íá åîÝëèåé áðü ôï firewall, áí ôáéñéÜæåé ìå ôéò ðáñáìÝôñïõò åðéëïãÞò ôïõ êáíüíá.

31.5.11.2 IN-OUT

ÊÜèå êáíüíáò ôïõ ößëôñïõ ðñÝðåé õðï÷ñåùôéêÜ íá äéåõêñéíßæåé ìå óáöÞíåéá áí áíáöÝñåôáé óôçí åßóïäï Þ ôçí Ýîïäï ðáêÝôùí. Ç åðüìåíç ëÝîç-êëåéäß ðñÝðåé íá åßíáé `in` Þ `out` êáé áí äåí õðÜñ÷åé, ï êáíüíáò èá áðïôý÷åé êáôÜ ôï óõíôáêôéêü Ýëåã÷ï.

Ôï `in` óçìáßíåé üôé ï êáíüíáò èá åöáñìïóôåß óå Ýíá åéóåñ÷üìåíï ðáêÝôï ôï ïðïßï ìüëéò ëÞöèçêå óôç äéåðáöÞ ðïõ óõíäÝåôáé ìå ôï Äéáäßêôõï.

Ôï `out` óçìáßíåé üôé ï êáíüíáò èá åöáñìïóôåß óå Ýíá ðáêÝôï ðïõ ðñïïñßæåôáé ãéá Ýîïäï ìÝóù ôçò äéåðáöÞò ðïõ óõíäÝåôáé ìå ôï Äéáäßêôõï.

31.5.11.3 OPTIONS

Óçìåßùóç: Ïé ðáñáêÜôù åðéëïãÝò ðñÝðåé íá ÷ñçóéìïðïéçèïýí ìå ôç óåéñÜ ðïõ öáßíïíôáé åäþ.

Ôï `log` äåß÷íåé üôé ç åðéêåöáëßäá ôïõ ðáêÝôïõ èá ãñáöåß óôï áñ÷åßï êáôáãñáöÞò ôïõ `ipl` (üðùò ðåñéãñÜöåôáé óôçí åíüôçôá LOGGING ðïõ áêïëïõèåß) áí ïé ðáñÜìåôñïé ôçò åðéëïãÞò ôáéñéÜæïõí ìå ôï ðáêÝôï.

To `quick` äåß÷íåé üôé áí ïé ðáñÜìåôñïé ôçò åðéëïãÞò ôáéñéÜæïõí ìå ôï ðáêÝôï, ï óõãêåêñéìÝíïò êáíüíáò èá åßíáé êáé ï ôåëåõôáßïò êáíüíáò ðïõ èá åëåã÷èåß. Ç åðéëïãÞ áõôÞ åßíáé õðï÷ñåùôéêÞ ãéá ôç óýã÷ñïíç ëïãéêÞ åðåîåñãáóßáò ðáêÝôùí.

Ôï `on` äåß÷íåé ôï üíïìá ôçò äéåðáöÞò ðïõ èá åíóùìáôùèåß óôéò ðáñáìÝôñïõò åðéëïãÞò. Ôá ïíüìáôá ôùí äéåðáöþí öáßíïíôáé üôáí åêôåëåßôáé ç åíôïëÞ ifconfig(8). ×ñçóéìïðïéþíôáò ôçí åðéëïãÞ áõôÞ, ï êáíüíáò èá åëåã÷èåß ìüíï áí ôï ðáêÝôï äéÝñ÷åôáé ìÝóù ôçò óõãêåêñéìÝíçò äéåðáöÞò êáé ðñïò ôç óõãêåêñéìÝíç êáôåýèõíóç (åéóåñ÷üìåíá/åîåñ÷üìåíá). Ç åðéëïãÞ áõôÞ åßíáé õðï÷ñåùôéêÞ ãéá ôçí óýã÷ñïíç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí.

¼ôáí ãßíåôáé êáôáãñáöÞ åíüò ðáêÝôïõ, ïé åðéêåöáëßäåò ãñÜöïíôáé óôçí øåõäï-óõóêåõÞ êáôáãñáöÞò ðáêÝôùí IPL. ÌåôÜ ôçí åíôïëÞ `log`, ìðïñïýí íá ÷ñçóéìïðïéçèïýí ïé ðáñáêÜôù ðáñÜìåôñïé (ìå ôç óåéñÜ ðïõ öáßíïíôáé):

Ôï `body` äåß÷íåé üôé èá ãßíåé êáôáãñáöÞ ôùí ðñþôùí 128 bytes ôùí ðåñéå÷ïìÝíùí ôïõ ðáêÝôïõ, ðïõ âñßóêïíôáé áìÝóùò ìåôÜ ôçí åðéêåöáëßäá.

Ç åðéëïãÞ `first` óõíßóôáôáé íá ÷ñçóéìïðïéçèåß áí ç åðéëïãÞ `log` ÷ñçóéìïðïéåßôáé óå óõíäõáóìü ìå ôçí `keep state`. Ìå ôïí ôñüðï áõôü ãßíåôáé êáôáãñáöÞ ìüíï ôïõ ðñþôïõ ðáêÝôïõ (ìå ôï ïðïßï îåêßíçóå ç åðéêïéíùíßá), êáé ü÷é üëùí ôùí õðïëïßðùí ôá ïðïßá ôáéñéÜæïõí ìå ôçí ðëçñïöïñßá “keep state”.

31.5.11.4 SELECTION

Ïé ëÝîåéò êëåéäéÜ ðïõ ðåñéãñÜöïíôáé óå áõôÞ ôçí åíüôçôá, ÷ñçóéìïðïéïýíôáé ãéá íá ðåñéãñÜøïõí ðïéåò éäéüôçôåò ôïõ ðáêÝôïõ èá äéåñåõíçèïýí ãéá íá êáèïñéóôåß áí ôáéñéÜæåé Þ ü÷é ìå ôïõò êáíüíåò. Ìéá ëÝîç-êëåéäß ïñßæåé ôï êåíôñéêü èÝìá êáé áêïëïõèåßôáé áðü Üëëåò ëÝîåéò ðïõ ïñßæïõí ôéò áêñéâåßò åðéëïãÝò. ÐñÝðåé ðÜíôïôå íá åðéëÝãåôáé ìéá áðü áõôÝò ôéò ëÝîåéò. ÐáñÝ÷ïíôáé ïé ðáñáêÜôù éäéüôçôåò ãåíéêÞò ÷ñÞóçò ïé ïðïßåò ðñÝðåé íá ÷ñçóéìïðïéçèïýí ìå áõôÞ ôç óåéñÜ:

31.5.11.5 PROTO

Ôï `proto` åßíáé ç âáóéêÞ ëÝîç, êáé ðñÝðåé íá ãñÜöåôáé ìáæß ìå êÜðïéá áíôßóôïé÷ç ôéìÞ ãéá ðåñáéôÝñù åðéëïãÞ. Ç ôéìÞ åðéôñÝðåé ôï ôáßñéáóìá ìå Ýíá óõãêåêñéìÝíï ðñùôüêïëëï. Åßíáé õðï÷ñåùôéêü íá ÷ñçóéìïðïéçèåß ãéá íá ëåéôïõñãåß ç óýã÷ñïíç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí.

Ôá ïíüìáôá ðñùôïêüëëùí ðïõ áíáãíùñßæïíôáé êáé ìðïñïýí íá ÷ñçóéìïðïéçèïýí, åßíáé ôá `tcp/udp | udp | tcp | icmp` Þ ïðïéáäÞðïôå Üëëá åìöáíßæïíôáé óôï `/etc/protocols`. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï åéäéêü üíïìá `tcp/udp` ôï ïðïßï ôáéñéÜæåé åßôå ìå ðáêÝôï TCP åßôå ìå UDP. Ç åéäéêÞ áõôÞ ïíïìáóßá ðñïóôÝèçêå þóôå íá áðïöåýãïíôáé äéðëïß, áëëÜ êáôÜ ôá Üëëá üìïéïé, êáíüíåò.

31.5.11.6 SRC_ADDR/DST_ADDR

Ç ëÝîç `all` åßíáé ïõóéáóôéêÜ óõíþíõìç ìå ôçí öñÜóç “from any to any” ÷ùñßò íá õðÜñ÷ïõí Üëëåò ðáñÜìåôñïé ãéá ôï ôáßñéáóìá.

¼ôáí ÷ñçóéìïðïéåßôáé ôï `from src to dst`, ïé ëÝîåéò `from` êáé `to` äçëþíïõí äéåõèýíóåéò IP ðïõ èá ÷ñçóéìïðïéçèïýí ãéá ôï ôáßñéáóìá. Ïé êáíüíåò ðñÝðåé íá êáèïñßæïõí ôéò ðáñáìÝôñïõò ôüóï ôçò áöåôçñßáò üóï êáé ôïõ ðñïïñéóìïý. Ç ëÝîç `any` Ý÷åé ôçí åéäéêÞ éäéüôçôá íá ôáéñéÜæåé ìå ïðïéáäÞðïôå äéåýèõíóç IP. Ðáñáäåßãìáôá ÷ñÞóçò: `from any to any` Þ `from 0.0.0.0/0 to any` Þ `from any to 0.0.0.0/0` Þ `from 0.0.0.0 to any` Þ `from any to 0.0.0.0`.

Äåí õðÜñ÷åé ôñüðïò íá ðåñéãñáöïýí ðåñéï÷Ýò IP äéåõèýíóåùí ðïõ äåí ìðïñïýí íá åêöñáóôïýí åýêïëá ìå ôç ìïñöÞ áñéèìþí ÷ùñéóìÝíùí ìå ôåëåßåò / ìÜóêáò õðïäéêôýïõ. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï âïçèçôéêü ðñüãñáììá `net-mgmt/ipcalc` ãéá äéåõêüëõíóç óáò óôïõò õðïëïãéóìïýò. Äåßôå ôçí äéêôõáêÞ ôïðïèåóßá ôïõ ðñïãñÜììáôïò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò: http://jodies.de/ipcalc.

31.5.11.7 PORT

Ôï ôáßñéáóìá ìå êÜðïéá óõãêåêñéìÝíç èýñá áöåôçñßáò Þ/êáé ðñïïñéóìïý (áí õðÜñ÷åé) åöáñìüæåôáé ìüíï óå ðáêÝôá TCP êáé UDP. ÊáôÜ ôçí äçìéïõñãßá óõãêñßóåùí ìå èýñåò, ìðïñåßôå åßôå íá ÷ñçóéìïðïéÞóåôå ôïí áñéèìü ôçò èýñáò, åßôå ôï üíïìá ôçò áíôßóôïé÷çò õðçñåóßáò áðü ôï áñ÷åßï `/etc/services`. ¼ôáí ç èýñá åìöáíßæåôáé ùò ôéìÞ ôïõ áíôéêåéìÝíïõ `from`, ôï ôáßñéáóìá èá ãßíåé ìå ôçí èýñá ôçò áöåôçñßáò. ¼ôáí åìöáíßæåôáé ùò ôéìÞ ôïõ áíôéêåéìÝíïõ `to`, ôï ôáßñéáóìá èá ãßíåé ìå ôç èýñá ðñïïñéóìïý. Ãéá íá ëåéôïõñãåß ç óýã÷ñïíç ëïãéêÞ ôáéñéÜóìáôïò êáíüíùí, èá ðñÝðåé ïðùóäÞðïôå íá õðÜñ÷åé ç åðéëïãÞ èýñáò óôï áíôéêåßìåíï `to`. ÐáñÜäåéãìá ÷ñÞóçò: `from any to any port = 80`

Ïé óõãêñßóåéò ðïõ áíáöÝñïíôáé óå ìéá ìüíï èýñá, ìðïñïýí íá ãßíïõí ìå ðïëëïýò äéáöïñåôéêïýò ôñüðïõò, ÷ñçóéìïðïéþíôáò äéáöïñåôéêïýò ôåëåóôÝò óýãêñéóçò. Åßíáé åðßóçò äõíáôüí íá êáèïñéóôïýí ïëüêëçñåò ðåñéï÷Ýò áðü èýñåò.

port "=" | "!=" | "<" | ">" | "<=" | ">=" | "eq" | "ne" | "lt" | "gt" | "le" | "ge".

Ãéá íá êáèïñßóåôå ðåñéï÷Ýò èõñþí, ÷ñçóéìïðïéÞóôå port "<>" | "><"

Ðñïåéäïðïßçóç: ÌåôÜ ôéò ðáñáìÝôñïõò ãéá ôï ôáßñéáóìá ôçò áöåôçñßáò êáé ôïõ ðñïïñéóìïý, ïé ðáñáêÜôù äýï ðáñÜìåôñïé åßíáé õðï÷ñåùôéêÝò ãéá íá ëåéôïõñãåß ç óýã÷ñïíç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí.

31.5.11.8 TCP_FLAG

Ôá flags åßíáé åíåñãÜ ìüíï óôï öéëôñÜñéóìá ôïõ ðñùôïêüëëïõ TCP. Ôï êÜèå ãñÜììá áíôéðñïóùðåýåé Ýíá ðéèáíü flag ôï ãéá ôï ïðïßï ãßíåôáé áíß÷íåõóç óôçí åðéêåöáëßäá ôïõ ðáêÝôïõ TCP.

Ç óýã÷ñïíç ëïãéêÞ åðåîåñãáóßáò ôùí êáíüíùí, ÷ñçóéìïðïéåß ôçí ðáñÜìåôñï `flags S` ãéá ôçí áíáãíþñéóç ôçò Ýíáñîçò ìéá óõíåäñßáò tcp.

31.5.11.9 STATEFUL

Óå Ýíá êáíüíá ðïõ åðéôñÝðåé (pass) ôï ðÝñáóìá ôùí ðáêÝôùí, ç åðéëïãÞ `keep state` äåß÷íåé üôé èá ðñÝðåé íá åíåñãïðïéåßôáé ç ëåéôïõñãßá stateful filtering üôáí ôï ðáêÝôï ôáéñéÜæåé ìå ôá êñéôÞñéá åðéëïãÞò.

Óçìåßùóç: Ç åðéëïãÞ áõôÞ åßíáé õðï÷ñåùôéêÞ ãéá ôç ëåéôïõñãßá ôçò óýã÷ñïíçò ëïãéêÞò åðåîåñãáóßáò êáíüíùí.

31.5.12 ÖéëôñÜñéóìá ìå ÄéáôÞñçóç ôçò ÊáôÜóôáóçò (stateful)

Ôï stateful öéëôñÜñéóìá, áíôéìåôùðßæåé ôçí êßíçóç ôïõ äéêôýïõ ùò ìéáò äéðëÞò êáôåýèõíóçò áíôáëëáãÞ ðáêÝôùí ôá ïðïßá äçìéïõñãïýí ìéá óõíåäñßá. ¼ôáí åíåñãïðïéçèåß, ç äéáôÞñçóç ôçò êáôÜóôáóçò (keep-state) äçìéïõñãåß äõíáìéêÜ åóùôåñéêïýò êáíüíåò ãéá êÜèå ðáêÝôï ôï ïðïßï áíôáëëÜóóåôáé êáôÜ ôç äéÜñêåéá áõôÞò ôçò óõíåäñßáò. ¸÷åé åðßóçò ôç äõíáôüôçôá íá äéåñåõíÞóåé áí áêïëïõèïýíôáé ïé Ýãêõñïé êáíüíåò áíôáëëáãÞò ìçíõìÜôùí ìåôáîý ôïõ áðïóôïëÝá êáé ôïõ ðáñáëÞðôç. ÏðïéáäÞðïôå ðáêÝôá äåí ôáéñéÜæïõí ìå ôï ðñüôõðï áõôÞò ôçò åðéêïéíùíßáò, áðïññßðôïíôáé ùò øåýôéêá.

Ç äéáôÞñçóç ôçò êáôÜóôáóçò åðéôñÝðåé åðßóçò íá ðåñÜóïõí ôá ðáêÝôá ICMP ðïõ ó÷åôßæïíôáé ìå ìéá óõíåäñßá TCP Þ UDP. ¸ôóé, áí ëçöèïýí ðáêÝôá ICMP ôýðïõ 3 code 4 ùò áðÜíôçóç êáôÜ ôç äéÜñêåéá ôçò åðßóêåøçò óáò óå ìéá éóôïóåëßäá, (ç ïðïßá åðéôñÝðåôáé áðü ôïí áíôßóôïé÷ï êáíüíá åîåñ÷ïìÝíùí), èá ôïõò åðéôñáðåß ç åßóïäïò. ÏðïéïäÞðïôå ðáêÝôï ãéá ôï ïðïßï ôï IPF åßíáé óßãïõñï üôé ðñüêåéôáé ãéá ôìÞìá ìéáò åíåñãÞò óõíåäñßáò, èá ðåñÜóåé áêüìá êáé áí åßíáé äéáöïñåôéêü ðñùôüêïëëï.

Áõôü ðïõ óõìâáßíåé åßíáé ôï ðáñáêÜôù:

Ôá ðáêÝôá ðïõ ðñïïñßæïíôáé íá åîÝëèïõí ìÝóù ôçò äéåðáöÞò ðïõ óõíäÝåôáé óôï Internet, åëÝã÷ïíôáé áñ÷éêÜ óýìöùíá ìå ôï äõíáìéêü ðßíáêá êáôáóôÜóåùí. Áí ôï ðáêÝôï ôáéñéÜæåé ìå ôï åðüìåíï ðïõ áíáìÝíåôáé óå ìéá åíåñãÞ óõíåäñßá, åîÝñ÷åôáé áðü ôï firewall êáé ôáõôü÷ñïíá åíçìåñþíåôáé ç êáôÜóôáóç ôçò óõãêåêñéìÝíçò óõíåäñßáò óôïí ðáñáðÜíù äõíáìéêü ðßíáêá. Ôá õðüëïéðá ðáêÝôá (ðïõ äåí ôáéñéÜæïõí ìå êÜðïéá óõíåäñßá óå åîÝëéîç) åëÝã÷ïíôáé óýìöùíá ìå ôï óýíïëï êáíüíùí ãéá ôá åîåñ÷üìåíá ðáêÝôá.

Ôá ðáêÝôá ðïõ Ýñ÷ïíôáé áðü ôç äéåðáöÞ ðïõ åßíáé óõíäåìÝíç ìå ôï Internet, åëÝã÷ïíôáé áñ÷éêÜ ìÝóù ôïõ äõíáìéêïý ðßíáêá êáôáóôÜóåùí. Áí ôï ðáêÝôï ôáéñéÜæåé ìå ôï åðüìåíï ðïõ áíáìÝíåôáé óå ìéá åíåñãÞ óõíåäñßá, åîÝñ÷åôáé áðü ôï firewall êáé ôáõôü÷ñïíá åíçìåñþíåôáé ç êáôÜóôáóç ôçò óõãêåêñéìÝíçò óõíåäñßáò óôïí ðáñáðÜíù ðßíáêá. Ôá õðüëïéðá ðáêÝôá (ðïõ äåí ôáéñéÜæïõí ìå êÜðïéá óõíåäñßá óå åîÝëéîç) åëÝã÷ïíôáé óýìöùíá ìå ôï óýíïëï êáíüíùí ãéá ôá åéóåñ÷üìåíá ðáêÝôá.

¼ôáí ç åðéêïéíùíßá ïëïêëçñùèåß, äéáãñÜöåôáé áðü ôïí äõíáìéêü ðßíáêá êáôáóôÜóåùí.

Ôï stateful öéëôñÜñéóìá åðéôñÝðåé íá åóôéÜóïõìå ôçí ðñïóï÷Þ ìáò óôçí áðïäï÷Þ Þ áðüññéøç ôùí íÝùí óõíäÝóåùí. Áí åðéôñáðåß ìéá íÝá óõíåäñßá, üëá ôá õðüëïéðá ðáêÝôá ôçò èá åðéôñÝðïíôáé áõôüìáôá, åíþ ôõ÷üí øåýôéêá ðáêÝôá èá áðïññßðôïíôáé åðßóçò áõôüìáôá. Ôï stateful öéëôñÜñéóìá äéáèÝôåé ìéá óåéñÜ áðü ðñï÷ùñçìÝíåò éêáíüôçôåò äéåñåýíçóçò ôùí ðáêÝôùí, ìå äõíáôüôçôá íá áíôéìåôùðßóåé ôá ðñïâëÞìáôá óõíáöÞò ðïõ ÷ñçóéìïðïéïýí ïé åðéôéèÝìåíïé.

31.5.13 ÐáñÜäåéãìá Óõíüëïõ Êáíüíùí ãéá Ýíá Inclusive Firewall

Ôï ðáñáêÜôù óýíïëï êáíüíùí äßíåôáé ùò ðáñÜäåéãìá ãéá íá öôéÜîåôå Ýíá éäéáßôåñá áóöáëÝò inclusive firewall. ¸íá inclusive firewall åðéôñÝðåé ôï ðÝñáóìá ìüíï ôùí õðçñåóéþí ðïõ ôáéñéÜæïõí ìå ôïõò êáíüíåò ðïõ Ý÷åé ãéá áðïäï÷Þ ðáêÝôùí, êáé áðïññßðôåé üëá ôá õðüëïéðá. Ôá firewalls ðïõ ðñïóôáôåýïõí Üëëá ìç÷áíÞìáôá (ôá ïðïßá êáëïýíôáé êáé “network firewalls”) èá ðñÝðåé íá äéáèÝôïõí ôïõëÜ÷éóôïí äýï äéåðáöÝò. Ç ìéá äéåðáöÞ óõíäÝåôáé ìå ôï ôïðéêü äßêôõï (LAN) ôï ïðïßï èåùñåßôáé Ýìðéóôï, êáé ç Üëëç ìå ôï äçìüóéï Internet. ÅíáëëáêôéêÜ, Ýíá firewall ìðïñåß íá ðñïóôáôåýåé ìüíï ôï óýóôçìá óôï ïðïßï åêôåëåßôáé—áõôü êáëåßôáé “host based firewall” êáé åßíáé êáôÜëëçëï éäéáßôåñá ãéá åîõðçñåôçôÝò ðïõ ëåéôïõñãïýí óå ìç Ýìðéóôá äßêôõá.

¼ëá ôá óõóôÞìáôá ôýðïõ UNIX, óõìðåñéëáìâáíïìÝíïõ êáé ôïõ FreeBSD, Ý÷ïõí ó÷åäéáóôåß íá ÷ñçóéìïðïéïýí ôçí äéåðáöÞ `lo0` êáé ôçí IP äéåýèõíóç `127.0.0.1` ãéá åóùôåñéêÞ åðéêïéíùíßá ìÝóá óôï ßäéï ôï ëåéôïõñãéêü óýóôçìá. Ôï firewall ðñÝðåé íá ðåñéÝ÷åé êáíüíåò ðïõ íá åðéôñÝðïõí ôçí åëåýèåñç êáé ÷ùñßò ðåñéïñéóìïýò êßíçóç ôùí åéäéêþí áõôþí åóùôåñéêþí ðáêÝôùí.

Ïé êáíüíåò ðïõ åîïõóéïäïôïýí ôçí ðñüóâáóç ðñïò ôï Internet, ïñßæïíôáé óôçí äéåðáöÞ ôïõ äéêôýïõ ðïõ óõíäÝåôáé óå áõôü. Ïé êáíüíåò áõôïß åëÝã÷ïõí ôüóï ôçí åéóåñ÷üìåíç üóï êáé ôçí åîåñ÷üìåíç êßíçóç óôï Internet. Ç äéåðáöÞ áõôÞ ìðïñåß íá åßíáé ç `tun0` ðïõ ÷ñçóéìïðïéåßôáé óôï PPP ÷ñÞóôç, Þ áêüìá êáé ç êÜñôá äéêôýïõ ðïõ óõíäÝåôáé óå Ýíá DSL router Þ modem.

Óå ðåñßðôùóç ðïõ ìéá Þ ðåñéóóüôåñåò êÜñôåò äéêôýïõ óõíäÝïíôáé óå åóùôåñéêÜ éäéùôéêÜ äßêôõá ðßóù áðü ôï firewall, èá ðñÝðåé íá õðÜñ÷ïõí ïé áíôßóôïé÷ïé êáíüíåò ðïõ íá åðéôñÝðïõí ôçí åëåýèåñç äéáêßíçóç ôùí ðáêÝôùí áíÜìåóá óôéò äéåðáöÝò áõôÝò Þ/êáé óôï Internet.

Ïé êáíüíåò ðñÝðåé íá ïñãáíþíïíôáé óå ôñåéò êýñéåò åíüôçôåò: áñ÷éêÜ üëåò ïé äéåðáöÝò óôéò ïðïßåò åðéôñÝðåôáé ç åëåýèåñç äéáêßíçóç äåäïìÝíùí, Ýðåéôá ç äéåðáöÞ áðü ôçí ïðïßá åîÝñ÷ïíôáé ôá ðáêÝôá ðñïò ôï äçìüóéï äßêôõï (Internet) êáé ôÝëïò ç äéåðáöÞ áðü ôçí ïðïßá ëáìâÜíïíôáé ðáêÝôá áðü ôï Internet.

Óå êÜèå ìéá áðü ôéò åíüôçôåò ôùí äéåðáöþí ðïõ óõíäÝïíôáé óôï Internet, ðñÝðåé íá ôïðïèåôïýíôáé ðñþôïé ïé êáíüíåò ðïõ ôáéñéÜæïõí óõ÷íüôåñá ìå ôçí áíôßóôïé÷ç êßíçóç. Ï ôåëåõôáßïò êáíüíáò ôçò åíüôçôáò èá ðñÝðåé íá áðïññßðôåé êáé íá êáôáãñÜöåé üëá ôá ðáêÝôá ôçò óõãêåêñéìÝíçò äéåðáöÞò/êáôåýèõíóçò.

Ç åíüôçôá ôùí Åîåñ÷ïìÝíùí (Outbound) óôï áêüëïõèï óýíïëï êáíüíùí, ðåñéÝ÷åé ìüíï êáíüíåò ôýðïõ `pass` ïé ïðïßïé åðéôñÝðïõí (ìÝóù êáôÜëëçëùí ôéìþí óôéò ðáñáìÝôñïõò ôïõò) óå óõãêåêñéìÝíåò õðçñåóßåò íá áðïêôÞóïõí ðñüóâáóç óôï Internet. ¼ëïé ïé êáíüíåò äéáèÝôïõí ôéò åðéëïãÝò `quick`, `on`, `proto`, `port` êáé `keep state`. Ïé êáíüíåò `proto tcp` ðåñéëáìâÜíïõí ôçí åðéëïãÞ `flag` þóôå íá áíáãíùñßæïõí ôçí áßôçóç Ýíáñîçò ôçò óõíåäñßáò êáé íá åíåñãïðïéïýí ôç ëåéôïõñãßá äéáôÞñçóçò ôçò êáôÜóôáóçò (stateful).

Óôçí åíüôçôá ôùí åéóåñ÷üìåíùí ðáêÝôùí (Inbound) ðïõ öáßíåôáé ðáñáêÜôù, ðñþôïé åìöáíßæïíôáé ïé êáíüíåò ðïõ ÷ñçóéìïðïéïýíôáé ãéá ôçí áðüññéøç ôùí áíåðéèýìçôùí ðáêÝôùí. Áõôü ãßíåôáé ãéá äýï äéáöïñåôéêïýò ëüãïõò. Ï ðñþôïò åßíáé üôé ôá êáêüâïõëá ðáêÝôá ìðïñåß åí ìÝñåé íá ôáéñéÜæïõí ìå êÜðïéá ÷áñáêôçñéóôéêÜ ôçò Ýãêõñçò êßíçóçò. Ôá ðáêÝôá áõôÜ èá ðñÝðåé íá áðïññéöèïýí, áíôß íá ãßíïõí äåêôÜ áðü êÜðïéï åðüìåíï êáíüíá `allow`. Ï äåýôåñïò åßíáé üôé ìðïñåßôå íá áðïññßøåôå óõãêåêñéìÝíá ðáêÝôá ôá ïðïßá ãíùñßæåôå üôé äåí åßíáé Ýãêõñá, áëëÜ óáò åßíáé áäéÜöïñï ç êáôáãñáöÞ ôïõò. Ìå ôïí ôñüðï áõôü åìðïäßæåôáé ç ëÞøç êáé êáôáãñáöÞ ôïõò áðü ôïí ôåëåõôáßï êáíüíá. Ï ôåëåõôáßïò êáíüíáò ôõðéêÜ áðïññßðôåé êáé êáôáãñÜöåé üëá ôá ðáêÝôá ðïõ Ýöôáóáí ìÝ÷ñé áõôüí. Ï êáíüíáò áõôüò ÷ñçóéìïðïéåßôáé ãéá ôçí ðáñï÷Þ íïìéêþí áðïäåßîåùí óå ðåñßðôùóç ðïõ êéíÞóåôå äéêáóôéêÞ äéáäéêáóßá êáôÜ áôüìùí ðïõ ðñïÝâçóáí óå åðéèÝóåéò óôï óýóôçìá óáò.

Èá ðñÝðåé åðßóçò íá åîáóöáëßóåôå üôé ôï óýóôçìá óáò äåí èá äþóåé êáìéÜ áðÜíôçóç óå êáíÝíá áðü ôá áíåðéèýìçôá ðáêÝôá. Ôá ðáêÝôá áõôÜ èá ðñÝðåé íá áðïññéöèïýí êáé íá åîáöáíéóôïýí. Ìå ôïí ôñüðï áõôü, ï åðéôéèÝìåíïò äåí Ý÷åé êáìéÜ ãíþóç áí ôá ðáêÝôá ôïõ Ýöôáóáí ìÝ÷ñé ôï óýóôçìá óáò. ¼óï ëéãüôåñá ìðïñïýí íá ìÜèïõí ïé åðéôéèÝìåíïé ó÷åôéêÜ ìå ôï óýóôçìá óáò, ôüóï ðåñéóóüôåñï ÷ñüíï èá ÷ñåéáóôåß íá åðåíäýóïõí ãéá íá êáôáöÝñïõí íá óáò âëÜøïõí óôá áëÞèåéá. Ïé êáíüíåò ìå ôçí åðéëïãÞ `log first` êáôáãñÜöïõí ôï óõìâÜí ìüíï ôçí ðñþôç öïñÜ ðïõ åíåñãïðïéïýíôáé. Ç åðéëïãÞ áõôÞ ðåñéëáìâÜíåôáé óôïí êáíüíá `nmap OS fingerprint` óôï ðáñÜäåéãìá ðïõ öáßíåôáé ðáñáêÜôù. Ôï âïçèçôéêü ðñüãñáììá `security/nmap` ÷ñçóéìïðïéåßôáé óõ÷íÜ áðü êáêüâïõëá Üôïìá, ðïõ ðñïóðáèïýí ìå áõôü ôïí ôñüðï íá áíáãíùñßóïõí ôï ëåéôïõñãéêü óýóôçìá ôïõ ìç÷áíÞìáôüò óáò.

ÊÜèå öïñÜ ðïõ õðÜñ÷åé êáôáãñáöÞ áðü êÜðïéï êáíüíá ìå ôçí åðéëïãÞ `log first`, èá ðñÝðåé íá åêôåëÝóåôå ôçí åíôïëÞ `ipfstat -hio` ãéá íá äåßôå ðüóåò öïñÝò Ý÷åé åíåñãïðïéçèåß áõôüò ï êáíüíáò óõíïëéêÜ. ¸óé èá îÝñåôå áí ð.÷. óáò êÜíïõí åðßèåóç õðåñ÷åßëéóçò (flood).

Äåßôå ôï áñ÷åßï `/etc/services` ãéá íá âñåßôå áñéèìïýò èõñþí ðïõ äåí áíáãíùñßæåôå. Ìðïñåßôå åðßóçò íá åðéóêåöèåßôå ôçí ôïðïèåóßá http://www.securitystats.com/tools/portsearch.php êáé íá êÜíåôå áíáæÞôçóç ãéá ôç óõãêåêñéìÝíç èýñá, þóôå íá äåßôå ðïéá õðçñåóßá åîõðçñåôåß.

Äåßôå ôçí åðüìåíç ôïðïèåóßá ãéá ôéò èýñåò ðïõ ÷ñçóéìïðïéïýíôáé óõíÞèùò áðü êáêüâïõëá ðñïãñÜììáôá (trojans): http://www.simovits.com/trojans/trojans.html.

Ôï ðáñáêÜôù óýíïëï êáíüíùí åßíáé áñêåôÜ ðëÞñåò êáé ðïëý áóöáëÝò. Äçìéïõñãåß firewall ôýðïõ `inclusive`, êáé Ý÷åé äïêéìáóôåß óå ðñáãìáôéêÝò óõíèÞêåò ëåéôïõñãßáò. Ìðïñåß íá åîõðçñåôÞóåé ôï ßäéï êáëÜ êáé ôï äéêü óáò óýóôçìá. Áðëþò ìåôáôñÝøôå óå ó÷üëéï ôïõò êáíüíåò ãéá ôéò õðçñåóßåò ðïõ äåí èÝëåôå íá åíåñãïðïéÞóåôå.

Ãéá íá áðïöýãåôå ôçí êáôáãñáöÞ áíåðéèýìçôùí ìçíõìÜôùí, áðëþò ðñïóèÝóôå Ýíá áíôßóôïé÷ï êáíüíá áðüññéøçò (`block`) óôçí åíüôçôá ôùí åéóåñ÷ïìÝíùí (inbound).

Èá ðñÝðåé íá áëëÜîåôå ôï üíïìá ôçò äéåðáöÞò `dc0` ôïõ ðáñáäåßãìáôïò, ìå ôï ðñáãìáôéêü üíïìá ôçò êÜñôáò äéêôýïõ ðïõ óõíäÝåé ôï óýóôçìá óáò ìå ôï Internet. Ãéá üóïõò ÷ñçóéìïðïéïýí ôï PPP ÷ñÞóôç, ôï üíïìá èá åßíáé `tun0`.

ÐñïóèÝóôå ôéò áêüëïõèåò êáôá÷ùñßóåéò óôï áñ÷åßï `/etc/ipf.rules`:

```
#################################################################
# No restrictions on Inside LAN Interface for private network
# Not needed unless you have LAN
#################################################################

#pass out quick on xl0 all
#pass in quick on xl0 all

#################################################################
# No restrictions on Loopback Interface
#################################################################
pass in quick on lo0 all
pass out quick on lo0 all

#################################################################
# Interface facing Public Internet (Outbound Section)
# Match session start requests originating from behind the
# firewall on the private network
# or from this gateway server destined for the public Internet.
#################################################################

# Allow out access to my ISP’s Domain name server.
# xxx must be the IP address of your ISP’s DNS.
# Dup these lines if your ISP has more than one DNS server
# Get the IP addresses from /etc/resolv.conf file
pass out quick on dc0 proto tcp from any to xxx port = 53 flags S keep state
pass out quick on dc0 proto udp from any to xxx port = 53 keep state

# Allow out access to my ISP’s DHCP server for cable or DSL networks.
# This rule is not needed for ’user ppp’ type connection to the
# public Internet, so you can delete this whole group.
# Use the following rule and check log for IP address.
# Then put IP address in commented out rule & delete first rule
pass out log quick on dc0 proto udp from any to any port = 67 keep state
#pass out quick on dc0 proto udp from any to z.z.z.z port = 67 keep state


# Allow out non-secure standard www function
pass out quick on dc0 proto tcp from any to any port = 80 flags S keep state

# Allow out secure www function https over TLS SSL
pass out quick on dc0 proto tcp from any to any port = 443 flags S keep state

# Allow out send & get email function
pass out quick on dc0 proto tcp from any to any port = 110 flags S keep state
pass out quick on dc0 proto tcp from any to any port = 25 flags S keep state

# Allow out Time
pass out quick on dc0 proto tcp from any to any port = 37 flags S keep state

# Allow out nntp news
pass out quick on dc0 proto tcp from any to any port = 119 flags S keep state

# Allow out gateway & LAN users’ non-secure FTP ( both passive & active modes)
# This function uses the IPNAT built in FTP proxy function coded in
# the nat rules file to make this single rule function correctly.
# If you want to use the pkg_add command to install application packages
# on your gateway system you need this rule.
pass out quick on dc0 proto tcp from any to any port = 21 flags S keep state

# Allow out ssh/sftp/scp (telnet/rlogin/FTP replacements)
# This function is using SSH (secure shell)
pass out quick on dc0 proto tcp from any to any port = 22 flags S keep state

# Allow out insecure Telnet
pass out quick on dc0 proto tcp from any to any port = 23 flags S keep state

# Allow out FreeBSD CVSup function
pass out quick on dc0 proto tcp from any to any port = 5999 flags S keep state
```

```
# Allow out ping to public Internet
pass out quick on dc0 proto icmp from any to any icmp-type 8 keep state

# Allow out whois from LAN to public Internet
pass out quick on dc0 proto tcp from any to any port = 43 flags S keep state

# Block and log only the first occurrence of everything
# else that’s trying to get out.
# This rule implements the default block
block out log first quick on dc0 all

#################################################################
# Interface facing Public Internet (Inbound Section)
# Match packets originating from the public Internet
# destined for this gateway server or the private network.
#################################################################

# Block all inbound traffic from non-routable or reserved address spaces
block in quick on dc0 from 192.168.0.0/16 to any    #RFC 1918 private IP
block in quick on dc0 from 172.16.0.0/12 to any     #RFC 1918 private IP
block in quick on dc0 from 10.0.0.0/8 to any        #RFC 1918 private IP
block in quick on dc0 from 127.0.0.0/8 to any       #loopback
block in quick on dc0 from 0.0.0.0/8 to any         #loopback
block in quick on dc0 from 169.254.0.0/16 to any    #DHCP auto-config
block in quick on dc0 from 192.0.2.0/24 to any      #reserved for docs
block in quick on dc0 from 204.152.64.0/23 to any   #Sun cluster interconnect
block in quick on dc0 from 224.0.0.0/3 to any       #Class D & E multicast

##### Block a bunch of different nasty things. ############
# That I do not want to see in the log

# Block frags
block in quick on dc0 all with frags

# Block short tcp packets
block in quick on dc0 proto tcp all with short

# block source routed packets
block in quick on dc0 all with opt lsrr
block in quick on dc0 all with opt ssrr

# Block nmap OS fingerprint attempts
# Log first occurrence of these so I can get their IP address
block in log first quick on dc0 proto tcp from any to any flags FUP

# Block anything with special options
block in quick on dc0 all with ipopts

# Block public pings
block in quick on dc0 proto icmp all icmp-type 8

# Block ident
block in quick on dc0 proto tcp from any to any port = 113
```

```
# Block all Netbios service. 137=name, 138=datagram, 139=session
# Netbios is MS/Windows sharing services.
# Block MS/Windows hosts2 name server requests 81
block in log first quick on dc0 proto tcp/udp from any to any port = 137
block in log first quick on dc0 proto tcp/udp from any to any port = 138
block in log first quick on dc0 proto tcp/udp from any to any port = 139
block in log first quick on dc0 proto tcp/udp from any to any port = 81

# Allow traffic in from ISP’s DHCP server. This rule must contain
# the IP address of your ISP’s DHCP server as it’s the only
# authorized source to send this packet type. Only necessary for
# cable or DSL configurations. This rule is not needed for
# ’user ppp’ type connection to the public Internet.
# This is the same IP address you captured and
# used in the outbound section.
pass in quick on dc0 proto udp from z.z.z.z to any port = 68 keep state

# Allow in standard www function because I have apache server
pass in quick on dc0 proto tcp from any to any port = 80 flags S keep state

# Allow in non-secure Telnet session from public Internet
# labeled non-secure because ID/PW passed over public Internet as clear text.
# Delete this sample group if you do not have telnet server enabled.
#pass in quick on dc0 proto tcp from any to any port = 23 flags S keep state

# Allow in secure FTP, Telnet, and SCP from public Internet
# This function is using SSH (secure shell)
pass in quick on dc0 proto tcp from any to any port = 22 flags S keep state

# Block and log only first occurrence of all remaining traffic
# coming into the firewall. The logging of only the first
# occurrence avoids filling up disk with Denial of Service logs.
# This rule implements the default block.
block in log first quick on dc0 all
################### End of rules file #####################################
```

31.5.14 NAT

Ôï NAT åßíáé áêñùíýìéï ôùí ëÝîåùí *Network Address Translation* Þ ÌåôÜöñáóç Äéåõèýíóåùí Äéêôýïõ. Ãéá üóïõò åßíáé åîïéêåéùìÝíïé ìå ôï Linux, âáóßæåôáé óôçí áñ÷Þ ôïõ IP Masquerading. Óôçí ðñáãìáôéêüôçôá ôï NAT êáé ôï IP Masquerading åßíáé ôï ßäéï ðñÜãìá. Ìéá áðü ôéò ðïëëÝò äõíáôüôçôåò ðïõ ðáñÝ÷åé ç ëåéôïõñãßá NAT ôïõ IPF, åßíáé êáé ç äõíáôüôçôá íá Ý÷ïõìå Ýíá éäéùôéêü ôïðéêü äßêôõï (LAN) ðßóù áðü ôï firewall ôï ïðïßï íá ìïéñÜæåôáé ìéá ìïíáäéêÞ äçìüóéá äéåýèõíóç IP óôï Internet.

ºóùò íá áíáñùôçèåßôå ãéáôß íá èÝëåé êÜðïéïò íá ôï êÜíåé áõôü. Ïé ISPs óõíÞèùò áðïäßäïõí äõíáìéêÝò äéåõèýíóåéò óå ìç åôáéñéêïýò ðåëÜôåò. Áõôü ïõóéáóôéêÜ óçìáßíåé üôé ç äéåýèõíóç IP ðïõ áðïäßäåôáé óôï ìç÷Üíçìá óáò, ìðïñåß íá åßíáé äéáöïñåôéêÞ êÜèå öïñÜ ðïõ êÜíåôå êëÞóç ãéá íá óõíäåèåßôå. Ãéá ôïõò ÷ñÞóôåò DSL modem êáé router, ç áëëáãÞ äéåýèõíóçò ðñáãìáôïðïéåßôáé êÜèå öïñÜ ðïõ åíåñãïðïéåßôáé ôï modem. Ç äéåýèõíóç IP ðïõ óáò áðïäßäåôáé áðü ôïí ISP óáò, åßíáé áõôÞ ìå ôçí ïðïßá öáßíåóôå óôï Internet.

Áò õðïèÝóïõìå ôþñá üôé Ý÷åôå ðÝíôå PC óôï óðßôé óáò, êáé ÷ñåéÜæåóôå óå üëá óýíäåóç Internet. ÊáíïíéêÜ, èá Ýðñåðå íá ðëçñþóåôå ôïí ISP óáò ÷ùñéóôü ëïãáñéáóìü ãéá êÜèå PC êáé íá äéáèÝôåôå ðÝíôå ãñáììÝò ôçëåöþíïõ.

Ìå ôï NAT, ÷ñåéÜæåóôå ìüíï Ýíá ëïãáñéáóìü ìå ôïí ISP óáò. Ìðïñåßôå áðëþò íá óõíäÝóåôå ôá ôÝóóåñá PC óå Ýíá äéáíïìÝá Þ switch óôï ïðïßï èá óõíäÝóåôå åðßóçò êáé ôï FreeBSD ìç÷Üíçìá óáò. Ôï ìç÷Üíçìá áõôü èá åíåñãåß ùò ðýëç ôïõ ôïðéêïý óáò äéêôýïõ ãéá ôï Internet. Ôï NAT èá ìåôáöñÜóåé áõôüìáôá ôéò éäéùôéêÝò äéåõèýíóåéò IP ôïõ êÜèå ìç÷áíÞìáôïò óôçí ìïíáäéêÞ äçìüóéá IP äéåýèõíóç ðïõ Ý÷åôå, êáèþò ôï ðáêÝôï öåýãåé áðü ôï firewall êáé êáôåõèýíåôáé ðñïò ôï Internet. Åðßóçò èá ðñáãìáôïðïéåß êáé ôçí áíôßóôñïöç ìåôÜöñáóç ãéá ôá ðáêÝôá ðïõ åðéóôñÝöïõí.

ÕðÜñ÷åé ìéá åéäéêÞ ðåñéï÷Þ äéåõèýíóåùí IP ðïõ Ý÷ïõí ðáñá÷ùñçèåß ãéá ÷ñÞóç óå ôïðéêÜ äßêôõá ìå NAT. Óýìöùíá ìå ôï RFC 1918, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ãéá áõôü ôï óêïðü ôéò ðáñáêÜôù ðåñéï÷Ýò, ïé ïðïßåò äåí äñïìïëïãïýíôáé ðïôÝ áðåõèåßáò óôï äçìüóéï Internet:

Áñ÷éêü IP `10.0.0.0`	-	Ôåëéêü IP 10
Áñ÷éêü IP `172.16.0.0`	-	Ôåëéêü IP 17
Áñ÷éêü IP `192.168.0.0`	-	Ôåëéêü IP 19

31.5.15 IPNAT

Ïé êáíüíåò ôïõ NAT öïñôþíïíôáé ìå ôç ÷ñÞóç ôçò åíôïëÞò `ipnat`. ÔõðéêÜ, ïé êáíüíåò ôïõ NAT áðïèçêåýïíôáé óôï áñ÷åßï `/etc/ipnat.rules`. Äåßôå ôç óåëßäá manual ôïõ ipnat(1) ãéá ëåðôïìÝñåéåò.

Ãéá íá áëëÜîåôå ôïõò êáíüíåò ôïõ NAT êáèþò áõôü åêôåëåßôáé, ôñïðïðïéÞóôå ôï áñ÷åßï ðïõ ôïõò ðåñéÝ÷åé, êáé åêôåëÝóôå ôçí åíôïëÞ `ipnat` ìå ôçí ðáñÜìåôñï `-CF` ãéá íá äéáãñÜøåôå ôïõò åóùôåñéêïýò êáíüíåò ôïõ NAT êáé íá áäåéÜóåôå üëåò ôéò åíåñãÝò êáôá÷ùñßóåéò ôïõ ðßíáêá ìåôáöñÜóåùí.

Ãéá íá öïñôþóåôå ôïõò êáíüíåò ôïõ NAT áðü ôçí áñ÷Þ, åêôåëÝóôå ìéá åíôïëÞ üðùò ôçí ðáñáêÜôù:

```
# ipnat -CF -f /etc/ipnat.rules
```

Ãéá íá äåßôå êÜðïéá óôáôéóôéêÜ ó÷åôéêÜ ìå ôï NAT, ÷ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# ipnat -s
```

Ãéá íá äåßôå ìéá ëßóôá ìå ôéò ôñÝ÷ïõóåò êáôá÷ùñßóåéò ôïõ ðßíáêá NAT, ÷ñçóéìïðïéÞóôå ôçí ðáñáêÜôù åíôïëÞ:

```
# ipnat -l
```

Ãéá íá åíåñãïðïéÞóåôå ôçí ëåðôïìåñÞ áðåéêüíéóç ìçíõìÜôùí êáé íá äåßôå ðëçñïöïñßåò ðïõ ó÷åôßæïíôáé ìå ôçí åðåîåñãáóßá ôùí êáíüíùí êáé ôïõò åíåñãïýò êáíüíåò êáé êáôá÷ùñßóåéò óôïí ðßíáêá, ãñÜøôå:

```
# ipnat -v
```

31.5.16 Êáíüíåò ôïõ IPNAT

Ïé êáíüíåò ôïõ NAT åßíáé áñêåôÜ åõÝëéêôïé, êáé äéáèÝôïõí ðëÞèïò äõíáôïôÞôùí þóôå íá êáëýðôïõí ôéò áíÜãêåò ôùí ïéêéáêþí áëëÜ êáé ôùí åðé÷åéñçóéáêþí ÷ñçóôþí.

Ç óýíôáîç ôùí êáíüíùí ðïõ ðáñïõóéÜæåôáé åäþ, Ý÷åé áðëïðïéçèåß þóôå íá óõìâáäßæåé ìå ôç óõíÞèç ÷ñÞóç óå ìç-åìðïñéêÜ ðåñéâÜëëïíôá. Ãéá ðëÞñç ðåñéãñáöÞ ôçò óýíôáîçò, äåßôå ôç óåëßäá manual ôïõ ipnat(5).

Ç óýíôáîç åíüò êáíüíá NAT ìïéÜæåé ìå ôçí ðáñáêÜôù:

```
map IF LAN_IP_RANGE -> PUBLIC_ADDRESS
```

Ï êáíüíáò îåêéíÜåé ìå ôç ëÝîç `map`.

ÁíôéêáôáóôÞóôå ôï *`IF`* ìå ôçí åîùôåñéêÞ äéåðáöÞ (ôç êÜñôá äéêôýïõ ðïõ óõíäÝåôáé óôï Internet).

Ç ðáñÜìåôñïò *`LAN_IP_RANGE`* åßíáé ç ðåñéï÷Þ äéåõèýíóåùí ðïõ ÷ñçóéìïðïéåßôáé áðü ôï åóùôåñéêü óáò äßêôõï. Óôçí ðñáãìáôéêüôçôá èá ìïéÜæåé ìå êÜôé óáí ôï `192.168.1.0/24`.

Ç ðáñÜìåôñïò *`PUBLIC_ADDRESS`* ìðïñåß íá åßíáé åßôå ç åîùôåñéêÞ IP äéåýèõíóç, åßôå ç åéäéêÞ ëÝîç `0/32`, ç ïðïßá óçìáßíåé üôé èá ÷ñçóéìïðïéçèåß ç IP äéåýèõíóç ðïõ Ý÷åé áðïäïèåß óôï *`IF`*.

31.5.17 Ðùò ëåéôïõñãåß ôï NAT

¸íá ðáêÝôï öôÜíåé óôï firewall áðü ôï LAN ìå ðñïïñéóìü ôï Internet. ÐåñíÜåé äéáìÝóïõ ôùí êáíüíùí öéëôñáñßóìáôïò åîåñ÷üìåíùí, üðïõ ãßíåôáé ç åðåîåñãáóßá ôïõ áðü ôï NAT. Ïé êáíüíåò åöáñìüæïíôáé áðü ôïí ðñþôï êáé ðñïò ôá êÜôù, êáé êåñäßæåé ï ðñþôïò ðïõ ôáéñéÜæåé. Ï Ýëåã÷ïò ãßíåôáé ìå âÜóç ôç äéåðáöÞ áðü ôçí ïðïßá ëÞöèçêå ôï ðáêÝôï êáé ôç äéåýèõíóç IP áðü ôçí ïðïßá ðñïÝñ÷åôáé. ¼ôáí ôï üíïìá ôçò äéåðáöÞò åíüò ðáêÝôïõ ôáéñéÜæåé ìå êÜðïéï êáíüíá ôïõ NAT, ç äéåýèõíóç IP ôçò áöåôçñßáò (ðïõ ðñïÝñ÷åôáé áðü ôï éäéùôéêü äßêôõï) åëÝã÷åôáé ãéá íá åîáêñéâùèåß áí ôáéñéÜæåé ìå ôçí ðåñéï÷Þ äéåõèýíóåùí ðïõ êáèïñßæåôáé óôçí áñéóôåñÜ ðëåõñÜ ôïõ óõìâüëïõ (âÝëïò) ôïõ êáíüíá NAT. Áí ôáéñéÜæåé, ç äéåýèõíóç ôïõ ðáêÝôïõ îáíáãñÜöåôáé, ÷ñçóéìïðïéþíôáò ôç äçìüóéá äéåýèõíóç IP ç ïðïßá ðñïÝñ÷åôáé áðü ôï `0/32`. Ôï NAT äçìéïõñãåß ìéá êáôá÷þñéóç óôïí åóùôåñéêü ôïõ ðßíáêá, Ýôóé þóôå üôáí åðéóôñÝøåé ç áðÜíôçóç áðü ôï Internet, íá ìðïñåß íá áíôéóôïé÷çèåß îáíÜ óôçí áñ÷éêÞ éäéùôéêÞ äéåýèõíóç IP êáé íá ðåñÜóåé Ýðåéôá áðü ôïõò êáíüíåò ôïõ ößëôñïõ ãéá ðåñáéôÝñù åðåîåñãáóßá.

31.5.18 Åíåñãïðïéþíôáò ôï IPNAT

Ãéá íá åíåñãïðïéÞóåôå ôï IPNAT, ðñïóèÝóôå ôéò ðáñáêÜôù ãñáììÝò óôï `/etc/rc.conf`.

Ãéá íá åðéôñÝøåôå óôï ìç÷Üíçìá óáò íá äñïìïëïãåß ðáêÝôá ìåôáîý äéåðáöþí äéêôýïõ:

```
gateway_enable="YES"
```

Ãéá íá îåêéíÜåé áõôüìáôá ôï IPNAT óå êÜèå åêêßíçóç:

```
ipnat_enable="YES"
```

Ãéá íá êáèïñßóåôå áðü ðïõ åðéèõìåßôå íá öïñôþíïíôáé ïé êáíüíåò ôïõ IPNAT:

```
ipnat_rules="/etc/ipnat.rules"
```

31.5.19 Ôï NAT óå ¸íá ÌåãÜëï Ôïðéêü Äßêôõï

Ãéá ôïðéêÜ äßêôõá ìå ìåãÜëï áñéèìü õðïëïãéóôþí, Þ ãéá äßêôõá ðïõ äéáóõíäÝïõí ðåñéóóüôåñá áðü Ýíá LAN, ç äéáäéêáóßá ôçò ìåôáôñïðÞò üëùí áõôþí ôùí éäéùôéêþí äéåõèýíóåùí óå ìéá ìïíáäéêÞ äçìüóéá äéåýèõíóç, äçìéïõñãåß ðñüâëçìá êáôáíïìÞò ðüñùí, êáèþò ÷ñçóéìïðïéïýíôáé ðïëëÝò ïñÝò ïé ßäéïé áñéèìïß èõñþí, ïäçãþíôáò ôá PC ôïõ äéêôýïõ óå óõãêñïýóåéò. ÕðÜñ÷ïõí äýï ôñüðïé ãéá íá åëáôôþóïõìå áõôü ôï ðñüâëçìá.

31.5.19.1 ÁíÜèåóç ôùí èõñþí ðïõ èá ×ñçóéìïðïéçèïýí

¸íá óõíçèéóìÝíï êáíüíáò NAT ìïéÜæåé ìå ôïí ðáñáêÜôù:

```
map dc0 192.168.1.0/24 -> 0/32
```

Óôïí ðáñáðÜíù êáíüíá, ç èýñá áöåôçñßáò ôïõ ðáêÝôïõ ðáñáìÝíåé áíáëëïßùôç êáèþò ôï ðáêÝôï äéÝñ÷åôáé ìÝóù ôïõ IPNAT. Áí ðñïóèÝóåôå ôçí ëÝîç-êëåéäß `portmap`, ìðïñåßôå íá ñõèìßóåôå ôï IPNAT íá ÷ñçóéìïðïéåß èýñåò ðïõ áíÞêïõí óå ìéá êáèïñéóìÝíç ðåñéï÷Þ. Ãéá ðáñÜäåéãìá, ï ðáñáêÜôù êáíüíáò èá ïäçãÞóåé ôï NAT íá ôñïðïðïéÞóåé ôçí èýñá ôçò áöåôçñßáò, þóôå íá åßíáé ìÝóá óôçí ðåñéï÷Þ ðïõ öáßíåôáé:

```
map dc0 192.168.1.0/24 -> 0/32 portmap tcp/udp 20000:60000
```

Ìðïñïýìå åðßóçò íá áðëïðïéÞóïõìå áêüìá ðåñéóóüôåñï ôç äéáäéêáóßá ÷ñçóéìïðïéþíôáò ôç ëÝîç `auto` þóôå ôï IPNAT íá êáèïñßæåé áðü ìüíï ôïõ ðïéåò èýñåò åßíáé äéáèÝóéìåò ãéá ÷ñÞóç:

```
map dc0 192.168.1.0/24 -> 0/32 portmap tcp/udp auto
```

31.5.19.2 ×ñçóéìïðïéþíôáò Ýíá Áðüèåìá Äõíáìéêþí Äéåõèýíóåùí

Óå Ýíá ðïëý ìåãÜëï ôïðéêü äßêôõï, áñãÜ Þ ãñÞãïñá öôÜíïõìå óôï óçìåßï ðïõ ìéá ìïíáäéêÞ äçìüóéá äéåýèõíóç äåí åðáñêåß ãéá íá êáëýøåé ôüóá ðïëëÜ éäéùôéêÜ. Áí õðÜñ÷åé äéáèÝóéìï Ýíá åýñïò äçìïóßùí äéåõèýíóåùí, ìðïñïýí íá ÷ñçóéìïðïéçèïýí ùò “áðüèåìá (pool)”, åðéôñÝðïíôáò óôçí IPNAT íá åðéëÝîåé ìéá áðü áõôÝò êáèþò áíôéóôïé÷åß ôá ðáêÝôá êáôÜ ôçí Ýîïäï ôïõò ðñïò ôï äçìüóéï äßêôõï.

Ãéá ðáñÜäåéãìá, áíôß íá áíôéóôïé÷ïýí üëá ôá ðáêÝôá ìÝóù ìéáò ìïíáäéêÞò äçìüóéáò IP äéåýèõíóçò üðùò ðáñáêÜôù:

```
map dc0 192.168.1.0/24 -> 204.134.75.1
```

ìðïñïýìå íá ÷ñçóéìïðïéÞóïõìå Ýíá åýñïò IP äéåõèýíóåùí, åßôå ìå ôç ÷ñÞóç ìÜóêáò äéêôýïõ:

```
map dc0 192.168.1.0/24 -> 204.134.75.0/255.255.255.0
```

åßôå ìå óõìâïëéóìü CIDR:

```
map dc0 192.168.1.0/24 -> 204.134.75.0/24
```

31.5.20 Áíáêáôåýèõíóç Èõñþí

Åßíáé êïéíÞ ðñáêôéêÞ íá åãêáèßóôáíôáé õðçñåóßåò üðùò ï åîõðçñåôçôÞò éóôïóåëßäùí, ôá÷õäñïìåßïõ, âÜóçò äåäïìÝíùí êáé DNS óå äéáöïñåôéêÜ PC óôï ôïðéêü äßêôõï. Óôçí ðåñßðôùóç áõôÞ, ç êßíçóç ðáêÝôùí áðü áõôÜ ôá ìç÷áíÞìáôá åîáêïëïõèåß íá ÷ñåéÜæåôáé ôï NAT, áëëÜ ÷ñåéÜæåôáé åðßóçò íá õðÜñ÷åé êÜðïéïò ôñüðïò íá êáôåõèýíåôáé ç åéóåñ÷üìåíç êßíçóç óôá óùóôÜ PC ôïõ äéêôýïõ. Ôï IPNAT Ý÷åé ôéò êáôÜëëçëåò äõíáôüôçôåò ãéá ôçí åðßëõóç áõôïý ôïõ ðñïâëÞìáôïò. Ãéá ðáñÜäåéãìá, Ýóôù üôé Ýíáò åîõðçñåôçôÞò éóôïóåëßäùí âñßóêåôáé óôçí äéåýèõíóç LAN `10.0.10.25` êáé ç ìïíáäéêÞ äçìüóéá IP åßíáé `20.20.20.5`. Ï êáíüíáò ðïõ èá ãñÜøåôå èá Ýìïéáæå ìå ôïí ðáñáêÜôù:

```
rdr dc0 20.20.20.5/32 port 80 -> 10.0.10.25 port 80
```

Þ:

```
rdr dc0 0.0.0.0/0 port 80 -> 10.0.10.25 port 80
```

Þ ãéá Ýíá åîõðçñåôçôÞ DNS ìå äéåýèõíóç óôï ôïðéêü äßêôõï `10.0.10.33` ï ïðïßïò ðñÝðåé íá äÝ÷åôáé áíáæçôÞóåéò áðü ôï äçìüóéï äßêôõï:

```
rdr dc0 20.20.20.5/32 port 53 -> 10.0.10.33 port 53 udp
```

31.5.21 FTP êáé NAT

Ôï FTP åßíáé Ýíáò äåéíüóáõñïò ðïõ Ý÷åé áðïìåßíåé áðü ôçí åðï÷Þ ðïõ ôï Internet Þôáí óôá áñ÷éêÜ ôïõ óôÜäéá, üðïõ ôá åñåõíçôéêÜ åñãáóôÞñéá Þôáí óõíäåìÝíá ìåôáîý ôïõò ìå ìéóèùìÝíåò ãñáììÝò êáé ïé åñåõíçôÝò ôï ÷ñçóéìïðïéïýóáí ãéá íá óôÝëíïõí áñ÷åßá ï Ýíáò óôïí Üëëï. Ôçí åðï÷Þ åêåßíç, äåí õðÞñ÷áí áíçóõ÷ßåò ó÷åôéêÜ ìå ôçí áóöÜëåéá. Ìå ôï ðÝñáóìá ôïõ ÷ñüíïõ, ôï FTP èÜöôçêå óôï ðßóù ìÝñïò ôïõ ôá÷Ýùò åîåëéóóüìåíïõ Internet. Äåí åîåëß÷èçêå ðïôÝ þóôå íá îåðåñÜóåé ðñïâëÞìáôá áóöÜëåéáò, üðùò ð.÷. ôï ãåãïíüò üôé óôÝëíåé ôï üíïìá êáé ôïí êùäéêü ôïõ ÷ñÞóôç ùò áðëü êåßìåíï. Ôï FTP Ý÷åé äõï êáôáóôÜóåéò ëåéôïõñãßáò, ôçí åíåñãÞ êáé ôçí ðáèçôéêÞ. Ç äéáöïñÜ åßíáé óôï ðùò ãßíåôáé ç áíÜêôçóç ôïõ êáíáëéïý äåäïìÝíùí. Ç ðáèçôéêÞ ëåéôïõñãßá åßíáé ðéï áóöáëÞò, êáèþò ôï êáíÜëé äåäïìÝíùí áðïôåëåß ôï êýñéï êáíÜëé ôçò óõíåäñßáò. Ìðïñåßôå íá âñåßôå ðïëý êáëÞ åðåîÞãçóç ôïõ ðñùôïêüëëïõ êáé ôùí äéáöïñåôéêþí ôñüðùí ëåéôïõñãßáò ôïõ, óôï http://www.slacksite.com/other/ftp.html.

31.5.21.1 Êáíüíåò ôïõ IPNAT

Ôï IPNAT äéáèÝôåé ìéá åéäéêÞ åðéëïãÞ ãéá äéáìåóïëÜâçóç FTP (proxy) ç ïðïßá ìðïñåß íá êáèïñéóôåß óôïí êáôÜëëçëï êáíüíá ôïõ NAT. Ìðïñåß íá ðáñáêïëïõèåß üëá ôá åîåñ÷üìåíá ðáêÝôá ãéá íá áíé÷íåýóåé ôçí Ýíáñîç ìéáò åíåñãÞò Þ ðáèçôéêÞò óõíåäñßáò FTP, êáé íá äçìéïõñãÞóåé äõíáìéêÜ ðñïóùñéíïýò êáíüíåò óôï ößëôñï ðïõ íá ðåñéÝ÷ïõí ìüíï ôïí áñéèìü ôçò èýñáò ðïõ ÷ñçóéìïðïéåßôáé áðü ôï êáíÜëé äåäïìÝíùí. Áõôü åîáëåßöåé ôï ðñüâëçìá áóöÜëåéáò ðïõ äçìéïõñãåßôáé áðü ôï ãåãïíüò üôé äéáöïñåôéêÜ èá ÷ñåéáæüôáí íá áíïé÷èåß ìéá ìåãÜëç ðåñéï÷Þ èõñþí (óôçí õøçëÞ ðåñéï÷Þ) óôï firewall.

Ï ðáñáêÜôù êáíüíáò ÷åéñßæåôáé üëá ôá äåäïìÝíá ãéá ôï åóùôåñéêü äßêôõï (LAN):

```
map dc0 10.0.10.0/29 -> 0/32 proxy port 21 ftp/tcp
```

Ï ðáñáêÜôù êáíüíáò ÷åéñßæåôáé ôçí êßíçóç FTP áðü ôçí ðýëç (gateway):

```
map dc0 0.0.0.0/0 -> 0/32 proxy port 21 ftp/tcp
```

Ï ðáñáêÜôù êáíüíáò ÷åéñßæåôáé üëç ôçí êßíçóç áðü ôï åóùôåñéêü LAN ðïõ äåí áíÞêåé óôï ðñùôüêïëëï FTP:

```
map dc0 10.0.10.0/29 -> 0/32
```

Ï êáíüíáò ÷áñôïãñÜöçóçò ôïõ FTP ôïðïèåôåßôáé ðñéí áðü ôïí êáíïíéêü êáíüíá ÷áñôïãñÜöçóçò. ÊÜèå ðáêÝôï åëÝã÷åôáé áñ÷éêÜ áðü ôïí êáíüíá ðïõ âñßóêåôáé óôçí êïñõöÞ. Áí ôáéñéÜæåé ôçò äéåðáöÞ êáé óôçí éäéüôçôá äéåýèõíóç IP êáé ðñüêåéôáé ãéá ðáêÝôï FTP, ï äéáìåóïëáâçôÞò FTP äçìéïõñãåß ðñïóùñéíïýò êáíüíåò óôï ößëôñï ïé ïðïßïé åðéôñÝðïõí ôçí åéóåñ÷üìåíç êáé åîåñ÷üìåíç êßíçóç FTP åíþ ôáõôü÷ñïíá åêôåëïýí êáé ôçí áðáñáßôçôç ìåôÜöñáóç NAT. ¼ëá ôá ðáêÝôá ðïõ äåí áíÞêïõí óå ìåôÜäïóç FTP äåí ôáéñéÜæïõí ìå ôïí ðñþôï êáíüíá, Ýôóé êáôåõèýíïíôáé óôïí ôñßôï êáíüíá, åëÝã÷ïíôáé üóï áöïñÜ ôç äéåðáöÞ êáé ôï IP áðü ôï ïðïßï ðñïÝñ÷ïíôáé, êáé ãßíåôáé ç áíôßóôïé÷ç ìåôÜöñáóç ôïõò áðü ôï NAT.

31.5.21.2 Êáíüíåò Ößëôñïõ ãéá ôï IPNAT

¼ôáí ÷ñçóéìïðïéåßôáé ï ìåóïëáâçôÞò FTP, ÷ñåéÜæåôáé ìüíï Ýíáò êáíüíáò ãéá ôï NAT.

×ùñßò ôï ìåóïëáâçôÞ FTP, ÷ñåéÜæïíôáé ïé ðáñáêÜôù ôñåéò êáíüíåò:

```
# Allow out LAN PC client FTP to public Internet
# Active and passive modes
pass out quick on rl0 proto tcp from any to any port = 21 flags S keep state

# Allow out passive mode data channel high order port numbers
pass out quick on rl0 proto tcp from any to any port > 1024 flags S keep state

# Active mode let data channel in from FTP server
pass in quick on rl0 proto tcp from any to any port = 20 flags S keep state
```

31.6 IPFW

Ôï IPFIREWALL (IPFW) åßíáé ëïãéóìéêü ðïõ áíáðôý÷èçêå ãéá ôï FreeBSD. ¸÷åé ãñáöåß êáé óõíôçñåßôáé áðü åèåëïíôÝò ðïõ áíÞêïõí óôï Project. ×ñçóéìïðïéåß ôïõò êëáóéêïýò êáíüíåò ÷ùñßò äéáôÞñçóç ôçò êáôÜóôáóçò (stateless) êáèþò êáé ìéá ôå÷íéêÞ êùäéêïðïßçóçò ðïõ åðéôõã÷Üíåé áõôü ðïõ áíáöÝñåôáé ùò ÁðëÞ Stateful ËïãéêÞ (Simple Stateful Logic).

Ôï õðüäåéãìá êáíüíùí ãéá ôï IPFW (óôá áñ÷åßá `/etc/rc.firewall` êáé `/etc/rc.firewall6`) ôçò ôõðéêÞò åãêáôÜóôáóçò ôïõ FreeBSD åßíáé ìÜëëïí áðëü êáé èá ÷ñåéáóôåß íá êÜíåôå êÜðïéåò áëëáãÝò ðñéí ôï ÷ñçóéìïðïéÞóåôå. Ôï ðáñÜäåéãìá äåí ÷ñçóéìïðïéåß öéëôñÜñéóìá ôýðïõ stateful. Ç stateful ëåéôïõñãßá åßíáé åõåñãåôéêÞ óôéò ðåñéóóüôåñåò ðåñéðôþóåéò, Ýôóé äåí èá ÷ñçóéìïðïéÞóïõìå áõôü ôï ðáñÜäåéãìá ùò âÜóç áõôÞò ôçò åíüôçôáò.

Ç óýíôáîç ôùí êáíüíùí stateless ôïõ IPFW Ý÷åé åíéó÷õèåß ìå åîåëéãìÝíåò äõíáôüôçôåò åðéëïãÞò ïé ïðïßåò óõíÞèùò îåðåñíÜíå êáôÜ ðïëý ôéò ôõðéêÝò ãíþóåéò ôïõ áôüìïõ ðïõ êáëåßôáé íá ôï ñõèìßóåé. Ôï IPFW áðåõèýíåôáé óôïí åðáããåëìáôßá ÷ñÞóôç Þ ôïí ôå÷íéêÜ ðñï÷ùñçìÝíï ÷ïìðßóôá, ï ïðïßïò Ý÷åé áíÜãêç ðñï÷ùñçìÝíïõ öéëôñáñßóìáôïò ðáêÝôùí. Ç ðñáãìáôéêÞ äýíáìç ôùí êáíüíùí ôïõ IPFW áðïêáëýðôåôáé ìüíï áí äéáèÝôåôå ðñï÷ùñçìÝíåò ãíþóåéò ó÷åôéêÜ ìå ôï ðùò äéáöïñåôéêÜ ðñùôüêïëëá äçìéïõñãïýí êáé ÷ñçóéìïðïéïýí ôçí åðéêåöáëßäá ôùí ðáêÝôùí ôïõò. ÔÝôïéï åðßðåäï åðåîçãÞóåùí åßíáé ðÝñá áðü ôï óêïðü áõôÞò ôçò åíüôçôáò ôïõ Åã÷åéñéäßïõ.

Ôï IPFW áðïôåëåßôáé áðü åðôÜ åîáñôÞìáôá. Ôï âáóéêü åîÜñôçìá åßíáé ï åðåîåñãáóôÞò êáíüíùí ôïõ firewall óôïí ðõñÞíá, ìå åíóùìáôùìÝíç ôç äõíáôüôçôá êáôáãñáöÞò. Ôá õðüëïéðá åîáñôÞìáôá åßíáé ôï óýóôçìá êáôáãñáöÞò (logging), ï êáíüíáò `divert` ï ïðïßïò åíåñãïðïéåß ôç ëåéôïõñãßá NAT, êáèþò êáé ïé ðñï÷ùñçìÝíåò äõíáôüôçôåò åéäéêïý óêïðïý: ôï óýóôçìá äéáìüñöùóçò êßíçóçò (traffic shaper) dummynet, ç äõíáôüôçôá ðñïþèçóçò ìÝóù ôïõ `fwd rule`, ç äõíáôüôçôá ãåöýñùóçò (bridge) êáèþò êáé ç äõíáôüôçôá áðüêñõøçò (ipstealth). To IPFW õðïóôçñßæåé ôüóï ôï ðñùôüêïëëï IPv4 üóï êáé ôï IPv6.

31.6.1 Åíåñãïðïéþíôáò ôï IPFW

Ôï IPFW ðåñéëáìâÜíåôáé óôçí âáóéêÞ åãêáôÜóôáóç ôïõ FreeBSD ùò Üñèñùìá ôïõ ðõñÞíá ôï ïðïßï ìðïñåß íá öïñôùèåß äõíáìéêÜ. Ôï óýóôçìá èá öïñôþóåé äõíáìéêÜ ôï Üñèñùìá üôáí âñåé ôçí êáôá÷þñéóç `firewall_enable="YES"` óôï áñ÷åßï `/etc/rc.conf`. Äåí ÷ñåéÜæåôáé íá ìåôáãëùôôßóåôå ôï IPFW ìÝóá óôïí ðõñÞíá, åêôüò áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå ôéò ëåéôïõñãßåò NAT ðïõ ðáñÝ÷åé.

Áöïý åðáíåêêéíÞóåôå ôï óýóôçìá óáò ìå ôçí êáôá÷þñéóç `firewall_enable="YES"` óôï `rc.conf`, èá äåßôå ìå Üóðñá Ýíôïíá ãñÜììáôá ôï áêüëïõèï ìÞíõìá êáôÜ ôç äéáäéêáóßá ôçò åêêßíçóçò:

```
ipfw2 initialized, divert disabled, rule-based forwarding disabled, default to deny, logging disa
```

Ôï Üñèñùìá Ý÷åé åíóùìáôùìÝíç ôç äõíáôüôçôá êáôáãñáöÞò. Ãéá íá åíåñãïðïéÞóåôå ôçí êáôáãñáöÞ êáé íá èÝóåôå ôï åðßðåäï ëåðôïìÝñåéáò, õðÜñ÷ïõí êÜðïéåò ñõèìßóåéò ðïõ ìðïñåßôå íá èÝóåôå óôï `/etc/sysctl.conf`. ÐñïóèÝôïíôáò ôéò ðáñáêÜôù êáôá÷ùñßóåéò, èá åíåñãïðïéçèåß ç êáôáãñáöÞ óôéò åðüìåíåò åêêéíÞóåéò:

```
net.inet.ip.fw.verbose=1
net.inet.ip.fw.verbose_limit=5
```

31.6.2 ÅðéëïãÝò ôïõ ÐõñÞíá

Äåí åßíáé õðï÷ñåùôéêü íá åíåñãïðïéÞóåôå ôï IPFW ìåôáãëùôôßæïíôáò ôéò ðáñáêÜôù åðéëïãÝò óôïí ðõñÞíá ôïõ FreeBSD, åêôüò êáé áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå NAT. Ï óêïðüò áõôÞò ôçò ðáñïõóßáóçò åßíáé êáèáñÜ åíçìåñùôéêüò.

```
options    IPFIREWALL
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôï IPFW ùò ìÝñïò ôïõ ðõñÞíá.

```
options    IPFIREWALL_VERBOSE
```

Åíåñãïðïéåß ôçí êáôáãñáöÞ ôùí ðáêÝôùí ðïõ ðåñíïýí ìÝóù ôïõ IPFW êáé ðåñéëáìâÜíïõí ôç ëÝîç `log` óôïí êáíüíá ôïõò.

```
options    IPFIREWALL_VERBOSE_LIMIT=5
```

Ðåñéïñßæåé ôïí ðëÞèïò ôùí ðáêÝôùí ðïõ êáôáãñÜöïíôáé ìÝóù ôïõ syslogd(8) óå óõãêåêñéìÝíï áñéèìü áíÜ êáôá÷þñéóç. Ç ñýèìéóç åßíáé ÷ñÞóéìç óå å÷èñéêÜ ðåñéâÜëëïíôá óôá ïðïßá åßíáé åðéèõìçôÞ ç êáôáãñáöÞ. Ìå áõôü ôïí ôñüðï ìðïñåß íá áðïöåõ÷èåß ìéá ðéèáíÞ åðßèåóç ìå óôü÷ï ôçí õðåñ÷åßëéóç ôùí áñ÷åßùí êáôáãñáöÞò.

```
options    IPFIREWALL_DEFAULT_TO_ACCEPT
```

Ç åðéëïãÞ áõôÞ áöÞíåé ôá ðÜíôá íá ðåñíÜíå ìÝóá áðü ôï firewall, ôï ïðïßï åßíáé êáëÞ éäÝá ôçí ðñþôç öïñÜ ðïõ ñõèìßæåôå ôï firewall óáò.

```
options    IPDIVERT
```

Ç åðéëïãÞ áõôÞ åíåñãïðïéåß ôç ëåéôïõñãßá NAT.

> **Óçìåßùóç:** Ôï firewall èá áðïññßðôåé üëá ôá ðáêÝôá ðïõ êáôåõèýíïíôáé áðü êáé ðñïò ôï ìç÷Üíçìá, áí äåí ðåñéëÜâåôå ôçí åðéëïãÞ `IPFIREWALL_DEFAULT_TO_ACCEPT` Þ áí äåí ñõèìßóåôå Ýíá êáôÜëëçëï êáíüíá ðïõ íá åðéôñÝðåé áõôÝò ôéò óõíäÝóåéò.

31.6.3 ÅðéëïãÝò óôï `/etc/rc.conf`

Åíåñãïðïéåßóôå ôï firewall:

```
firewall_enable="YES"
```

Ãéá íá åðéëÝîåôå Ýíá áðü ôïõò ðñïåðéëåãìÝíïõò ôýðïõò firewall ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD, äéáâÜóôå ôï áñ÷åßï `/etc/rc.firewall` êáé äçìéïõñãÞóôå ìéá åããñáöÞ üðùò ôçí ðáñáêÜôù:

```
firewall_type="open"
```

Ïé äéáèÝóéìåò ôéìÝò ãéá áõôÞ ôç ñýèìéóç åßíáé:

- `open` — åðéôñÝðåé ôç äéÝëåõóç üëçò ôçò êßíçóçò.
- `client` — ðñïóôáôåýåé ìüíï ôï óõãêåêñéìÝíï ìç÷Üíçìá.
- `simple` — ðñïóôáôåýåé ïëüêëçñï ôï äßêôõï.
- `closed` — áðåíåñãïðïéåß åíôåëþò ôçí êßíçóç ðáêÝôùí, åêôüò áðü ôçí åóùôåñéêÞ äéåðáöÞ (loopback).
- `UNKNOWN` — áðåíåñãïðïéåß ôçí öüñôùóç êáíüíùí ôïõ firewall.
- *`filename`* — ôï ðëÞñåò ìïíïðÜôé ôïõ áñ÷åßïõ ðïõ ðåñéÝ÷åé ôïõò êáíüíåò ôïõ firewall.

Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå äýï äéáöïñåôéêïýò ôñüðïõò ãéá íá öïñôþóåôå ðñïóáñìïóìÝíïõò êáíüíåò óôï **ipfw** firewall. Ï Ýíáò åßíáé èÝôïíôáò ôç ìåôáâëçôÞ `firewall_type` óôçí áðüëõôç äéáäñïìÞ ôïõ áñ÷åßïõ ðïõ ðåñéÝ÷åé ôïõò *êáíüíåò ôïõ firewall*, ÷ùñßò íá äþóåôå ïñßóìáôá óôçí ãñáììÞ åíôïëþí ãéá ôï ßäéï ôï ipfw(8). Ôï áñ÷åßï êáíüíùí ðïõ öáßíåôáé ðáñáêÜôù, áðïññßðôåé üëç ôçí åéóåñ÷üìåíç êáé åîåñ÷üìåíç êßíçóç:

```
add deny in
add deny out
```

Áðü ôçí Üëëç ìåñéÜ, åßíáé åðßóçò äõíáôü íá èÝóåôå ôç ìåôáâëçôÞ `firewall_script` óôçí áðüëõôç äéáäñïìÞ åíüò åêôåëÝóéìïõ script ðïõ ðåñéëáìâÜíåé ìéá óåéñÜ áðü åíôïëÝò `ipfw` ðïõ èá åêôåëåóôïýí êáôÜ ôçí åêêßíçóç. ¸íá Ýãêõñï ôÝôïéï script ôï ïðïßï åßíáé áíôßóôïé÷ï ìå ôï áñ÷åßï êáíüíùí ðïõ äåßîáìå ðáñáðÜíù, åßíáé ôï áêüëïõèï:

```
#!/bin/sh

ipfw -q flush

ipfw add deny in
ipfw add deny out
```

> **Óçìåßùóç:** Áí èÝóåôå ôçí ôéìÞ ôïõ `firewall_type` åßôå óå `client` åßôå óå `simple`, èá ðñÝðåé íá åëÝãîåôå üôé ïé ðñïåðéëåãìÝíïé êáíüíåò ðïõ ðåñéÝ÷ïíôáé óôï `/etc/rc.firewall` ôáéñéÜæïõí ìå ôéò ñõèìßóåéò ôïõ óõãêåêñéìÝíïõ ìç÷áíÞìáôïò. ÐáñáôçñÞóôå åðßóçò üôé ôá ðáñáäåßãìáôá ðïõ ÷ñçóéìïðïéïýíôáé óå áõôü ôï êåöÜëáéï áíáìÝíïõí íá Ý÷åôå èÝóåé ôç ìåôáâëçôÞ `firewall_script` óôçí ôéìÞ `/etc/ipfw.rules`.

ÅíåñãïðïéÞóôå ôçí êáôáãñáöÞ:

```
firewall_logging="YES"
```

> **Ðñïåéäïðïßçóç:** Ôï ìüíï ðñÜãìá ðïõ êÜíåé ç ìåôáâëçôÞ `firewall_logging` åßíáé íá èÝóåé ôçí ôéìÞ ôçò ìåôáâëçôÞò sysctl `net.inet.ip.fw.verbose` óôçí ôéìÞ `1` (äåßôå ôï ÔìÞìá 31.6.1). Äåí õðÜñ÷åé ìåôáâëçôÞ ôïõ

`rc.conf` ðïõ íá ïñßæåé ðåñéïñéóìïýò óôçí êáôáãñáöÞ, áëëÜ áõôü ìðïñåß íá ñõèìéóôåß ìÝóù ôçò ðáñáðÜíù ìåôáâëçôÞò sysctl åßôå ÷åéñïêßíçôá, åßôå ìÝóù ôïõ áñ÷åßïõ `/etc/sysctl.conf`:

```
net.inet.ip.fw.verbose_limit=5
```

Áí ôï ìç÷Üíçìá óáò ëåéôïõñãåß ùò ðýëç (gateway), äçëáäÞ ðáñÝ÷åé õðçñåóßá ìåôÜöñáóçò äéåõèýíóåùí äéêôýïõ (Network Address Translation, NAT) ìÝóù ôïõ natd(8), ðáñáêáëïýìå íá äéáâÜóåôå ôï ÔìÞìá 32.8 ãéá ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ñõèìßóåéò ðïõ áðáéôïýíôáé óôï áñ÷åßï `/etc/rc.conf`.

31.6.4 Ç ÅíôïëÞ IPFW

Ç åíôïëÞ `ipfw` åßíáé ï óõíÞèçò ôñüðïò ãéá ôçí ðñïóèÞêç ç äéáãñáöÞ êáíüíùí óôïõò åóùôåñéêïýò áíåíåñãïýò êáíüíåò ôïõ firewall, êáèþò áõôü åêôåëåßôáé. Ôï ðñüâëçìá ìå ôç ÷ñÞóç áõôÞò ôçò ìåèüäïõ åßíáé üôé ïé áëëáãÝò ÷Üíïíôáé ìå ôïí ôåñìáôéóìü ëåéôïõñãßáò ôïõ ìç÷áíÞìáôïò. Ìðïñåßôå íá ãñÜøåôå üëïõò ôïõò êáíüíåò óáò óå Ýíá áñ÷åßï êáé íá ôï ÷ñçóéìïðïéåßôå ãéá íá ôïõò öïñôþíåôå óôçí åêêßíçóç. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ßäéï áñ÷åßï ãéá íá áíôéêáôáóôÞóåôå ôïõò ôñÝ÷ïíôåò êáíüíåò ôïõ firewall, ôçí þñá ðïõ áõôü åêôåëåßôáé. Áõôüò åßíáé êáé ï óõíéóôþìåíïò ôñüðïò ðïõ ÷ñçóéìïðïéïýìå óôá ðáñáäåßãìáôá ìáò.

Ç åíôïëÞ `ipfw` åßíáé åðßóçò ÷ñÞóéìç ãéá íá áðåéêïíßæåé ôïõò ôñÝ÷ïíôåò êáíüíåò óôç êïíóüëá óáò. Ôï óýóôçìá êáôáãñáöÞò ÷ñÞóçò ôçò IPFW äçìéïõñãåß áõôüìáôá Ýíá ìåôñçôÞ ãéá êÜèå êáíüíá, ï ïðïßïò ìåôñÜåé ðüóá ðáêÝôá ôáßñéáîáí ìå áõôüí. ÊáôÜ ôç äéÜñêåéá ôùí äïêéìþí, ç äõíáôüôçôá íá åëÝãîåôå ôçí ôéìÞ ôïõ ìåôñçôÞ åßíáé Ýíáò ôñüðïò ãéá íá äéáðéóôþóåôå áí ï êáíüíáò ëåéôïõñãåß êáíïíéêÜ.

Ãéá íá äåßôå üëïõò ôïõò êáíüíåò ìå ôç óåéñÜ:

```
# ipfw list
```

Ãéá íá äåßôå ìéá ëßóôá üëùí ôùí êáíüíùí, ìáæß ìå ôçí þñá ðïõ åíåñãïðïéÞèçêå ôåëåõôáßá öïñÜ ï êÜèå êáíüíáò, ãñÜøôå:

```
# ipfw -t list
```

Ôï åðüìåíï ðáñÜäåéãìá äåß÷íåé ôïí áñéèìü ôùí ðáêÝôùí ðïõ ôáßñéáîáí ìáæß ìå ôïí áíôßóôïé÷ï êáíüíá. Ç ðñþôç óôÞëç äåß÷íåé ôïí áñéèìü ôïõ êáíüíá, áêïëïõèåßôáé áðü ôïí áñéèìü ðáêÝôùí ðïõ ôáßñéáîáí (ðñþôá ôá åîåñ÷üìåíá êáé ìåôÜ ôá åéóåñ÷üìåíá) êáé ôÝëïò áðü ôïí ßäéï ôïí êáíüíá.

```
# ipfw -a list
```

Ãéá íá äåßôå ìéá ëßóôá ðïõ íá ðåñéëáìâÜíåé ôüóï ôïõò äõíáìéêïýò üóï êáé ôïõò óôáôéêïýò êáíüíåò:

```
# ipfw -d list
```

Ãéá íá äåßôå êáé ôïõò äõíáìéêïýò êáíüíåò ðïõ Ý÷ïõí ëÞîåé:

```
# ipfw -d -e list
```

Ãéá íá ìçäåíßóåôå ôïõò ìåôñçôÝò:

```
# ipfw zero
```

Ãéá íá ìçäåíßóåôå ôïõò ìåôñçôÝò ìüíï ãéá ôïí êáíüíá ìå ôïí áñéèìü *NUM*:

```
# ipfw zero NUM
```

31.6.5 Ôï Óýíïëï Êáíüíùí ôïõ IPFW

Ùò “óýíïëï êáíüíùí” óôï IPFW, ïñßæïõìå ìéá ïìÜäá êáíüíùí ðïõ Ý÷ïõí ãñáöåß ãéá íá åðéôñÝðïõí Þ íá áðïññßðôïõí ðáêÝôá áíÜëïãá ìå ôéò ôéìÝò ðïõ ðåñéÝ÷ïíôáé óå áõôÜ. Ç äéðëÞò êáôåýèõíóçò áíôáëëáãÞ ðáêÝôùí ìåôáîý õðïëïãéóôþí áðïôåëåß ìéá óõíåäñßá. Ôï óýíïëï êáíüíùí ôïõ firewall åðåîåñãÜæåôáé ôüóï ôá ðáêÝôá ðïõ Ýñ÷ïíôáé áðü ôï Internet, üóï êáé ôá ðáêÝôá ðïõ ðáñÜãïíôáé áðü ôï óýóôçìá ùò áðÜíôçóç óå áõôÜ. ÊÜèå õðçñåóßá TCP/IP (ð.÷. telnet, www, mail, ê.ë.ð.) êáèïñßæåôáé áðü ôï ðñùôüêïëëï êáé ôçí ðñïíïìéáêÞ (privileged) èýñá ðïõ ÷ñçóéìïðïéåß ãéá íá äÝ÷åôáé áéôÞìáôá åîõðçñÝôçóçò. Ôá ðáêÝôá ðïõ ðñïïñßæïíôáé ãéá ìéá óõãêåêñéìÝíç õðçñåóßá, îåêéíïýí áðü ôç äéåýèõíóç áöåôçñßáò ÷ñçóéìïðïéþíôáò ìéá ìç-ðñïíïìéáêÞ èýñá êáé êáôáëÞãïõí óôç óõãêåêñéìÝíç èýñá õðçñåóßáò óôïí ðñïïñéóìü. ¼ëåò ïé ðáñáðÜíù ðáñÜìåôñïé (èýñåò êáé äéåõèýíóåéò) ìðïñïýí íá ÷ñçóéìïðïéçèïýí ùò êñéôÞñéá åðéëïãÞò ãéá ôçí äçìéïõñãßá êáíüíùí ðïõ åðéôñÝðïõí Þ åìðïäßæïõí ôçí ðñüóâáóç óå õðçñåóßåò.

¼ôáí Ýíá ðáêÝôï åéóÝñ÷åôáé óôï firewall, óõãêñßíåôáé ìå âÜóç ôïí ðñþôï êáíüíá. Ç óýãêñéóç óõíå÷ßæåôáé äéáäï÷éêÜ ìå ôïõò õðüëïéðïõò êáíüíåò, áðü ôïí ðñþôï ðñïò ôïí ôåëåõôáßï, ìå âÜóç ôïí áýîïíôá áñéèìü ôïõò. ¼ôáí ôï ðáêÝôï ôáéñéÜîåé ìå ôéò ðáñáìÝôñïõò åðéëïãÞò êÜðïéïõ êáíüíá, åêôåëåßôáé ç ïäçãßá ðïõ áíáöÝñåôáé óôï ðåäßï åíåñãåéþí ôïõ êáíüíá áõôïý êáé ç áíáæÞôçóç êáíüíùí ãéá ôï óõãêåêñéìÝíï ðáêÝôï ôåñìáôßæåôáé. Óå áõôÞ ôç ìÝèïäï áíáæÞôçóçò, “ï ðñþôïò êáíüíáò ðïõ ôáéñéÜæåé, åßíáé ï íéêçôÞò”. Áí ôï ðáêÝôï äåí ôáéñéÜæåé ìå êáíÝíá áðü ôïõò êáíüíåò, èá ëçöèåß áðü ôïí õðï÷ñåùôéêü ðñïåðéëåãìÝíï êáíüíá ôïõ IPFW, ìå áñéèìü 65535, ï ïðïßïò åìðïäßæåé ôç äéÝëåõóç üëùí ôùí ðáêÝôùí, êáé ôá áðïññßðôåé ÷ùñßò íá óôåßëåé êáìéÜ áðÜíôçóç óôïí áñ÷éêü áðïóôïëÝá ôïõò.

Óçìåßùóç: Ç áíáæÞôçóç óõíå÷ßæåôáé ìåôÜ áðü êáíüíåò ôýðïõ `count`, `skipto` êáé `tee`.

Ïé ïäçãßåò ðïõ öáßíïíôáé åäþ, âáóßæïíôáé óôç ÷ñÞóç êáíüíùí ðïõ ðåñéÝ÷ïõí ôéò ïäçãßåò `keep state`, `limit`, `in`, `out` êáé `via`. ÁõôÝò åßíáé êáé ïé âáóéêÝò ëåéôïõñãßåò ãéá ôçí äüìçóç åíüò firewall ôýðïõ inclusive ìå stateful ëåéôïõñãßá.

Ðñïåéäïðïßçóç: Íá äßíåôå ìåãÜëç ðñïóï÷Þ üôáí äïõëåýåôå ìå ôïõò êáíüíåò åíüò firewall. Ìðïñåß Üèåëá óáò íá êëåéäùèåßôå Ýîù áðü ôï óýóôçìá óáò.

31.6.5.1 Óýíôáîç Êáíüíùí

Óôçí åíüôçôá áõôÞ, èá ðáñïõóéÜóïõìå ìéá áðëïðïéçìÝíç óýíôáîç êáíüíùí. Äåß÷íïõìå ìüíï üôé ÷ñåéÜæåôáé ãéá íá äçìéïõñãçèåß Ýíá ôõðïðïéçìÝíï óýíïëï êáíüíùí ãéá Ýíá inclusive firewall. Ãéá ðëÞñç ðåñéãñáöÞ, äåßôå ôç óåëßäá manual ôïõ ipfw(8).

Ïé êáíüíåò ðåñéÝ÷ïõí ëÝîåéò-êëåéäéÜ. Ïé ëÝîåéò áõôÝò èá ðñÝðåé íá êùäéêïðïéçèïýí ìå óõãêåêñéìÝíç óåéñÜ áðü ôá áñéóôåñÜ ðñïò ôá äåîéÜ ôçò ãñáììÞò. Ïé ëÝîåéò-êëåéäéÜ öáßíïíôáé ðáñáêÜôù ìå Ýíôïíá ãñÜììáôá. ÌåñéêÝò ëÝîåéò Ý÷ïõí õðï-åðéëïãÝò ïé ïðïßåò ìðïñåß íá åßíáé åðßóçò ëÝîåéò-êëåéäéÜ êáé íá ðåñéëáìâÜíïõí åðßóçò áêüìá ðåñéóóüôåñåò õðï-åðéëïãÝò.

Ç áñ÷Þ åíüò ó÷ïëßïõ, óçìáôïäïôåßôáé ìå ôï óýìâïëï #, ôï ïðïßï ìðïñåß íá åìöáíßæåôáé óôï ôÝëïò ìéáò ãñáììÞò êáíüíá, Þ êáé óå ìéá äéêÞ ôïõ ãñáììÞ. Ïé êåíÝò ãñáììÝò áãíïïýíôáé.

```
CMD RULE_NUMBER ACTION LOGGING SELECTION STATEFUL
```

31.6.5.1.1 CMD

Ãéá íá ãßíåé ç ðñïóèÞêç åíüò íÝïõ êáíüíá óôïí åóùôåñéêü ðßíáêá, ôïðïèåôåßôáé ìðñïóôÜ áðü áõôüí ç ðáñÜìåôñïò *`add`*.

31.6.5.1.2 RULE_NUMBER

ÊÜèå êáíüíáò ó÷åôßæåôáé ìå Ýíá áñéèìü êáíüíá (rule_number) óôçí ðåñéï÷Þ 1..65535.

31.6.5.1.3 ACTION

¸íáò êáíüíáò ìðïñåß íá ó÷åôßæåôáé ìå ìéá Þ ðåñéóóüôåñåò åíÝñãåéåò, ïé ïðïßåò åêôåëïýíôáé üôáí ôï ðáêÝôï ôáéñéÜæåé ìå ôá êñéôÞñéá åðéëïãÞò áõôïý ôïõ êáíüíá.

`allow | accept | pass | permit`

¼ëá ôá ðáñáðÜíù Ý÷ïõí ôï ßäéï áðïôÝëåóìá: ôï ðáêÝôï åîÝñ÷åôáé áðü ôçí óýóôçìá ôïõ firewall. Ç áíáæÞôçóç ãéá ôï óõãêåêñéìÝíï ðáêÝôï ôåñìáôßæåôáé óå áõôü ôïí êáíüíá.

`check-state`

ÅëÝã÷åé ôï ðáêÝôï ìå âÜóç ôï äõíáìéêü ðßíáêá êáíüíùí. Áí âñåèåß êáíüíáò ðïõ íá ôáéñéÜæåé, èá åêôåëåóôåß ç åíÝñãåéá ôïõ êáíüíá ï ïðïßïò äçìéïýñãçóå ôïí óõãêåêñéìÝíï äõíáìéêü êáíüíá. ÄéáöïñåôéêÜ, ç áíáæÞôçóç óõíå÷ßæåôáé ìå ôïí åðüìåíï êáíüíá. ¸íáò êáíüíáò check-state äåí Ý÷åé êñéôÞñéá åðéëïãÞò. Áí äåí õðÜñ÷åé êáíüíáò check-state óôï óýíïëï êáíüíùí, ï Ýëåã÷ïò ôïõ ðßíáêá äõíáìéêþí êáíüíùí îåêéíÜåé áðü ôïí ðñþôï êáíüíá ôýðïõ keep-state Þ limit.

`deny | drop`

Êáé ïé äýï ëÝîåéò óçìáßíïõí ôï ßäéï ðñÜãìá: ôá ðáêÝôá ðïõ ôáéñéÜæïõí ìå áõôü ôïí êáíüíá áðïññßðôïíôáé. Ç áíáæÞôçóç ôåñìáôßæåôáé.

31.6.5.1.4 ÊáôáãñáöÞ

`log` Þ *`logamount`*

¼ôáí Ýíá ðáêÝôï ôáéñéÜæåé ìå Ýíá êáíüíá ðïõ ðåñéÝ÷åé ôç ëÝîç `log`, ãßíåôáé êáôáãñáöÞ ôïõ ìçíýìáôïò ìÝóù ôïõ syslogd(8) óôç äéáôüôçôá SECURITY. Ç êáôáãñáöÞ óõìâáßíåé ìüíï áí ï áñéèìüò ôùí ðáêÝôùí ðïõ Ý÷åé êáôáãñáöåß ìÝ÷ñé óôéãìÞò äåí õðåñâáßíåé ôçí ðáñÜìåôñï `logamount`. Áí ç ðáñÜìåôñïò áõôÞ äåí Ý÷åé êáèïñéóôåß, ôï üñéï ñõèìßæåôáé ìå âÜóç ôçí ôéìÞ ôçò ìåôáâëçôÞò sysctl `net.inet.ip.fw.verbose_limit`. Êáé óôéò äýï ðåñéðôþóåéò, ìéá ìçäåíéêÞ ôéìÞ óçìáßíåé üôé äåí èá õðÜñ÷åé üñéï óôçí êáôáãñáöÞ. Ìüëéò ç êáôáãñáöÞ öôÜóåé óôï üñéï, ìðïñåß íá ãßíåé åðáíåíåñãïðïßçóç ôçò ìå ôï ìçäåíéóìü ôïõ ìåôñçôÞ êáôáãñáöÞò, Þ ôïõ ìåôñçôÞ ãéá ôï óõãêåêñéìÝíï êáíüíá. Äåßôå ôçí åíôïëÞ `ipfw reset log`.

> **Óçìåßùóç:** Ç êáôáãñáöÞ ãßíåôáé ìüíï áöïý åðáëçèåõèïýí üëåò ïé Üëëåò óõíèÞêåò ôáéñéÜóìáôïò ôïõ ðáêÝôïõ, êáé ðñéí ôçí ôåëéêÞ áðïäï÷Þ Þ áðüññéøç ôïõ. Åßíáé óôç äéêÞ óáò åõ÷Ýñåéá íá áðïöáóßóåôå óå ðïéïõò êáíüíåò èá åíåñãïðïéÞóåôå ôçí êáôáãñáöÞ.

31.6.5.1.5 ÅðéëïãÞ

Ïé ëÝîåéò-êëåéäéÜ ðïõ ðåñéãñÜöïíôáé óå áõôÞ ôçí åíüôçôá, ÷ñçóéìïðïéïýíôáé ãéá íá ðåñéãñÜøïõí ÷áñáêôçñéóôéêÜ ôïõ ðáêÝôïõ ðïõ èá ðñÝðåé íá äéåñåõíçèïýí ãéá íá êáèïñéóôåß áí ôï ðáêÝôï ôáéñéÜæåé Þ ü÷é ìå ôïí êáíüíá. Ç åðéëïãÞ ìðïñåß íá ãßíåé ìå âÜóç ôá ðáñáêÜôù ãåíéêÞò öýóåùò ÷áñáêôçñéóôéêÜ, ôá ïðïßá êáé èá ðñÝðåé íá ÷ñçóéìïðïéçèïýí ìå ôç óåéñÜ ðïõ öáßíïíôáé:

`udp | tcp | icmp`

Ìðïñïýí åðßóçò íá ÷ñçóéìïðïéçèïýí ôá ðñùôüêïëëá ðïõ ðåñéÝ÷ïíôáé óôï áñ÷åßï `/etc/protocols`. Ç ôéìÞ ðïõ êáèïñßæåôáé ÷ñçóéìïðïéåßôáé ãéá ôï ôáßñéáóìá ôïõ ðñùôïêüëëïõ. Ðñüêåéôáé ãéá õðï÷ñåùôéêÞ ðáñÜìåôñï.

`from src to dst`

Ïé ëÝîåéò `from` êáé `to` ÷ñçóéìïðïéïýíôáé ãéá ôï ôáßñéáóìá IP äéåõèýíóåùí. Ïé êáíüíåò ðñÝðåé íá êáèïñßæïõí *ôüóï* ôçí ðçãÞ üóï êáé ôïí ðñïïñéóìü. Ç ëÝîç `any` ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá ôáßñéáóìá ìå ïðïéáäÞðïôå äéåýèõíóç. Ç ëÝîç `me` Ý÷åé åðßóçò åéäéêÞ óçìáóßá. ÔáéñéÜæåé ìå ïðïéáäÞðïôå äéåýèõíóç ðïõ Ý÷åé ñõèìéóôåß óå êÜðïéá äéåðáöÞ ôïõ óõóôÞìáôïò óáò, áíôéðñïóùðåýïíôáò Ýôóé ôï PC óôï ïðïßï åêôåëåßôáé ôï firewall. Ìðïñïýí Ýôóé íá ãñáöïýí êáíüíåò ôïõ ôýðïõ `from me to any` Þ `from any to me` Þ `from any to 0.0.0.0/0` Þ `from 0.0.0.0/0 to me` Þ `from any to 0.0.0.0` Þ `from me to 0.0.0.0`. Ïé äéåõèýíóåéò IP êáèïñßæïíôáé ùò áñéèìçôéêÝò ïêôÜäåò ÷ùñéóìÝíåò ìå ôåëåßåò êáé áêïëïõèïýíôáé áðü ôï ìÞêïò ôçò ìÜóêáò õðïäéêôýïõ. Ìéá IP äéåýèõíóç ìðïñåß íá êáèïñßæåôáé ìå áñéèìïýò ðïõ ÷ùñßæïíôáé ìå ôåëåßåò. Ìðïñåß åðßóçò íá áêïëïõèåßôáé áðü ôï ìÞêïò ôçò ìÜóêáò õðïäéêôýïõ (ìïñöÞ CIDR). Ðñüêåéôáé ãéá õðï÷ñåùôéêÞ ðáñÜìåôñï. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï âïçèçôéêü ðñüãñáììá `net-mgmt/ipcalc` ãéá äéåõêüëõíóç óáò óôïõò õðïëïãéóìïýò. Äåßôå ôçí äéêôõáêÞ ôïðïèåóßá ôïõ ðñïãñÜììáôïò ãéá ðåñéóóüôåñåò ðëçñïöïñßåò: http://jodies.de/ipcalc.

`port number`

×ñçóéìïðïéåßôáé óå ðñùôüêïëëá ðïõ õðïóôçñßæïõí áñéèìïýò èõñþí (üðùò åßíáé ôá TCP êáé UDP). Åßíáé õðï÷ñåùôéêü íá äßíåôáé ï áñéèìüò èýñáò ôçò õðçñåóßáò ðïõ èÝëåôå íá ôáéñéÜîåôå. Ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôá ïíüìáôá ôùí õðçñåóéþí (ìðïñåßôå íá ôá âñåßôå óôï áñ÷åßï `/etc/services`) áíôß ãéá ôïõò êáíïíéêïýò áñéèìïýò èõñþí.

`in | out`

Ìå ôï ðáñáðÜíù ìðïñåß íá êáèïñéóôåß áí ôï ôáßñéáóìá èá ãßíåôáé óå åéóåñ÷üìåíá Þ óå åîåñ÷üìåíá ðáêÝôá áíôßóôïé÷á. Åßíáé õðï÷ñåùôéêü íá Ý÷åôå ùò ìÝñïò ôùí êñéôçñßùí ôïõ êáíüíá óáò, åßôå ôç ëÝîç `in` åßôå ôç ëÝîç `out`.

`via IF`

ÔáéñéÜæåé ôá ðáêÝôá ôá ïðïßá äéÝñ÷ïíôáé ìÝóù ôçò äéåðáöÞò ìå ôï üíïìá ðïõ êáèïñßæåôáé. Ç ëÝîç `via` åîáóöáëßæåé üôé ôï üíïìá ôçò äéåðáöÞò èá åßíáé ðÜíôá ìÝñïò ôùí êñéôçñßùí êáôÜ ôç äéáäéêáóßá ôáéñéÜóìáôïò.

`setup`

Ðñüêåéôáé ãéá õðï÷ñåùôéêÞ ðáñÜìåôñï ðïõ áíáãíùñßæåé ôçí áßôçóç Ýíáñîçò ìéáò óõíåäñßáò ãéá ðáêÝôá TCP.

`keep-state`

Ðñüêåéôáé ãéá õðï÷ñåùôéêÞ ðáñÜìåôñï. Ìüëéò õðÜñîåé ôáßñéáóìá, ôï firewall èá äçìéïõñãÞóåé Ýíá äõíáìéêü êáíüíá, ôïõ ïðïßïõ ç ðñïåðéëåãìÝíç óõìðåñéöïñÜ åßíáé íá ôáéñéÜæåé åðéêïéíùíßá äéðëÞò êáôåýèõíóçò ìåôáîý ôçò äéåýèõíóçò IP êáé ôçò èýñáò áöåôçñßáò êáé ðñïïñéóìïý, ÷ñçóéìïðïéþíôáò ôï ßäéï ðñùôüêïëëï.

`limit {src-addr | src-port | dst-addr | dst-port}`

Ôï firewall èá åðéôñÝøåé ìüíï *`N`* óõíäÝóåéò ìå ôéò ðáñáìÝôñïõò ðïõ ðåñéãñÜöïíôáé óå áõôü ôïí êáíüíá. Ìðïñïýí íá êáèïñéóôïýí ðåñéóóüôåñåò áðü ìéá äéåõèýíóåéò êáé ðüñôåò áöåôçñßáò êáé ðñïïñéóìïý. Äåí ìðïñïýí íá ÷ñçóéìïðïéçèïýí óôïí ßäéï êáíüíá ïé ðáñÜìåôñïé `limit` êáé `keep-state`. Ç åðéëïãÞ `limit` ðáñÝ÷åé ôçí ßäéá ëåéôïõñãßá stateful ìå ôçí `keep-state`, êáèþò êáé åðéðñüóèåôåò äéêÝò ôçò ëåéôïõñãßåò.

31.6.5.2 ÅðéëïãÞ ãéá Stateful Êáíüíåò

Ôï stateful öéëôñÜñéóìá, áíôéìåôùðßæåé ôçí êßíçóç ôïõ äéêôýïõ ùò äéðëÞò êáôåýèõíóçò áíôáëëáãÞ ðáêÝôùí ôá ïðïßá äçìéïõñãïýí ìéá óõíåäñßá. ¸÷åé åðßóçò ôç äõíáôüôçôá íá äéåñåõíÞóåé áí ôçñïýíôáé ïé Ýãêõñïé êáíüíåò áíôáëëáãÞò ìçíõìÜôùí ìåôáîý ôïõ áðïóôïëÝá êáé ôïõ ðáñáëÞðôç. Ïðïéáäçðïôå ðáêÝôá äåí ôáéñéÜæïõí ìå ôï ðñüôõðï áõôÞò ôçò åðéêïéíùíßáò, áðïññßðôïíôáé ùò øåýôéêá.

Ç åðéëïãÞ `check-state` ÷ñçóéìïðïéåßôáé ãéá íá áíáãíùñßóåé óå ðïéï óçìåßï ôïõ óõíüëïõ êáíüíùí ôïõ IPFW èá åëåã÷èåß ôï ðáêÝôï ìå âÜóç ôç äõíáôüôçôá ôùí äõíáìéêþí êáíüíùí. Óå ðåñßðôùóç ôáéñéÜóìáôïò, ôï ðáêÝôï åîÝñ÷åôáé áðü ôï firewall êáé óõíå÷ßæåé ôçí ðïñåßá ôïõ, åíþ ôçí ßäéá óôéãìÞ äçìéïõñãåßôáé Ýíáò íÝïò äõíáìéêüò êáíüíáò ãéá ôï åðüìåíï ðáêÝôï ðïõ áíáìÝíåôáé íá Ýñèåé ìå âÜóç ôç óõãêåêñéìÝíç äéðëÞò êáôåýèõíóçò åðéêïéíùíßá. Óå ðåñßðôùóç ðïõ ôï ðáêÝôï äåí ôáéñéÜæåé ìå ôï äõíáìéêü êáíüíá, èá ðñï÷ùñÞóåé ãéá íá åëåã÷èåß áðü ôïí åðüìåíï êáíüíá ôïõ firewall.

Ç äõíáôüôçôá äõíáìéêþí êáíüíùí åßíáé åõÜëùôç óå åîÜíôëçóç ðüñùí óå ðåñßðôùóç åðßèåóçò õðåñ÷åßëéóçò (flood) SYN. Ç åðßèåóç áõôÞ ìðïñåß íá äçìéïõñãÞóåé ðïëý ìåãÜëï ðëÞèïò äõíáìéêþí êáíüíùí. Ãéá ôçí áíôéìåôþðéóç ìéáò ôÝôïéáò åðßèåóçò, ôï FreeBSD ÷ñçóéìïðïéåß ìéá áêüìá åðéëïãÞ ðïõ ïíïìÜæåôáé `limit`. Ç åðéëïãÞ áõôÞ ìðïñåß íá ðåñéïñßóåé ôïí áñéèìü ôùí ôáõôü÷ñïíùí óõíåäñéþí, åîåôÜæïíôáò ôá ðåäßá áöåôçñßáò êáé ðñïïñéóìïý ôùí êáíüíùí. Áíé÷íåýåé ìå áõôü ôïí ôñüðï ôï ðëÞèïò ôùí äõíáìéêþí êáíüíùí êáé ðüóåò öïñÝò Ý÷åé ÷ñçóéìïðïéçèåß ï êáèÝíáò áðü ôç óõãêåêñéìÝíç IP äéåýèõíóç. Áí ï áñéèìüò áõôüò îåðåñÜóåé ôï üñéï ðïõ Ý÷åé ôåèåß ìå ôçí åðéëïãÞ `limit`, ôï ðáêÝôï áðïññßðôåôáé.

31.6.5.3 ÊáôáãñáöÞ ÌçíõìÜôùí ôïõ Firewall

Ôá ðëåïíåêôÞìáôá ôçò êáôáãñáöÞò óõìâÜíôùí ôïõ firewall, åßíáé ðñïöáíÞ: ðáñÝ÷ïõí ôç äõíáôüôçôá íá äåßôå ãéá ðïéï ëüãï åíåñãïðïéÞèçêáí ïé êáíüíåò óôïõò ïðïßïõò Ý÷åôå åíåñãïðïéÞóåé ôçí êáôáãñáöÞ. Ïé ðëçñïöïñßåò ðåñéëáìâÜíïõí ôá ðáêÝôá ðïõ áðïññßöèçêáí, ôéò äéåõèýíóåéò áðü ôéò ïðïßåò ðñïÞëèáí êáé ðïõ êáôåõèýíïíôáí. Ìå áõôü ôïí ôñüðï, Ý÷åôå Ýíá óçìáíôéêü ðëåïíÝêôçìá óôçí áíß÷íåõóç ôùí åéóâïëÝùí.

Áêüìá êáé áí åíåñãïðïéÞóåôå ôç ëåéôïõñãßá êáôáãñáöÞò, ôï IPFW äåí èá áñ÷ßóåé áðü ìüíï ôïõ ôçí êáôáãñáöÞ ãéá êáíÝíá êáíüíá. Ï äéá÷åéñéóôÞò ôïõ firewall èá áðïöáóßóåé óå ðïéïõò áðü üëïõò ôïõò êáíüíåò èá åíåñãïðïéÞóåé ôçí êáôáãñáöÞ, êáé èá ðñïóèÝóåé ôçí ëÝîç `log` óôçí áíôßóôïé÷ç êáôá÷þñçóç. ÖõóéïëïãéêÜ, ãßíåôáé êáôáãñáöÞ ìüíï ãéá êáíüíåò ðïõ áðïññßðôïõí ðáêÝôá (êáíüíåò `deny`), üðùò ãéá ðáñÜäåéãìá ï êáíüíáò áðüññéøçò ôùí åéóåñ÷üìåíùí ICMP pings. Åßíáé êïéíÞ ðñáêôéêÞ, íá áíôéãñÜöåôáé óôï ôÝëïò ôùí êáíüíùí ï êáíüíáò “ipfw default deny everything” êáé íá ðñïóôßèåôáé óå áõôüí ç åðéëïãÞ `log`. Ìå ôïí ôñüðï áõôü, ìðïñåßôå íá äåßôå üëá ôá ðáêÝôá ðïõ äåí ôáßñéáîáí ìå êáíÝíá êáíüíá ôïõ óõíüëïõ.

Ç êáôáãñáöÞ óõìâÜíôùí åßíáé äßêïðï ìá÷áßñé. Áí äåí åßóôå ðñïóåêôéêüò, èá ÷áèåßôå ìÝóá óôï ðëÞèïò ôùí äåäïìÝíùí ôçò êáôáãñáöÞò êáé èá ãåìßóåôå ôï äßóêï óáò ìå Ü÷ñçóôá áñ÷åßá. Ïé ðéï ðáëéÝò êáé êïéíÝò åðéèÝóåéò ôýðïõ Üñíçóçò õðçñåóßáò (DoS), åßíáé áõôÝò ðïõ ðñïóðáèïýí íá ãåìßóïõí ôïõò äßóêïõò óáò. Ôá ìçíýìáôá áõôÜ ü÷é ìüíï êáôáãñÜöïíôáé óôï **syslogd**, áëëÜ åìöáíßæïíôáé êáé óôçí êïíóüëá ôïõ óõóôÞìáôïò óáò, êáé óýíôïìá ãßíïíôáé ðïëý åíï÷ëçôéêÜ.

Ç åðéëïãÞ `IPFIREWALL_VERBOSE_LIMIT=5` óôïí ðõñÞíá, ðåñéïñßæåé ôïí áñéèìü ôùí óõíå÷üìåíùí üìïéùí ìçíõìÜôùí ðïõ óôÝëíïíôáé óôïí êáôáãñáöÝá óõóôÞìáôïò syslogd(8) ó÷åôéêÜ ìå ôï ôáßñéáóìá ðáêÝôùí åíüò óõãêåêñéìÝíïõ êáíüíá. ¼ôáí åíåñãïðïéåßôáé áõôÞ ç åðéëïãÞ óôïí ðõñÞíá, ï áñéèìüò ôùí óõíå÷üìåíùí ìçíõìÜôùí åíüò óõãêåêñéìÝíïõ êáíüíá, óôáìáôÜåé ìåôÜ ôïí áñéèìü ðïõ êáèïñßæåôáé. Äåí õðÜñ÷åé êáíÝíá üöåëïò áðü 200 óõíå÷üìåíá ìçíýìáôá ìå ôï ßäéï áêñéâþò ðåñéå÷üìåíï. Ãéá ðáñÜäåéãìá, ðÝíôå óõíå÷üìåíá ìçíýìáôá ãéá Ýíá óõãêåêñéìÝíï êáíüíá èá êáôáãñÜöïíôáí êáíïíéêÜ óôï **syslogd**. Ôá õðüëïéðá üìïéá ìçíýìáôá èá êáôáìåôñçèïýí êáé èá êáôáãñáöïýí üðùò öáßíåôáé ðáñáêÜôù:

```
last message repeated 45 times
```

¼ëá ôá ìçíýìáôá êáôáãñáöÞò ôùí ðáêÝôùí, ãñÜöïíôáé áðü ðñïåðéëïãÞ óôï áñ÷åßï `/var/log/security` ôï ïðïßï êáèïñßæåôáé óôï áñ÷åßï `/etc/syslog.conf`.

31.6.5.4 Äçìéïõñãßá Åíüò Script Êáíüíùí

Ïé ðåñéóóüôåñïé Ýìðåéñïé ÷ñÞóôåò ôïõ IPFW, äçìéïõñãïýí Ýíá áñ÷åßï ðïõ ðåñéÝ÷åé ôïõò êáíüíåò êáé ôï ãñÜöïõí ìå ôÝôïéï ôñüðï þóôå íá íá ìðïñåß íá åêôåëåóôåß ùò script. Ôï âáóéêü ðëåïíÝêôçìá ôïõ ðáñáðÜíù ôñüðïõ, åßíáé üôé ïé êáíüíåò ôïõ firewall ìðïñïýí íá áíáíåùèïýí ÷ùñßò ôçí áíÜãêç íá åðáíåêêéíÞóåé ôï óýóôçìá ãéá íá öïñôùèïýí ïé íÝïé. Ç ìÝèïäïò áõôÞ åßíáé ðïëý âïëéêÞ ãéá ôçí äïêéìÞ íÝùí êáíüíùí, êáèþò ç äéáäéêáóßá ìðïñåß íá åðáíáëçöèåß üóåò öïñÝò ÷ñåéÜæåôáé. Êáèþò ðñüêåéôáé ãéá êáíïíéêü script, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå óõìâïëéêÞ õðïêáôÜóôáóç ãéá íá êùäéêïðïéÞóåôå êáé íá õðïêáôáóôÞóåôå óõ÷íÜ ÷ñçóéìïðïéïýìåíåò ôéìÝò óå ðïëëáðëïýò êáíüíåò. Áõôü öáßíåôáé óôï ðáñáêÜôù ðáñÜäåéãìá.

Ç óýíôáîç ðïõ ÷ñçóéìïðïéåßôáé åäþ, åßíáé óõìâáôÞ ìå ôá êåëýöç sh(1), csh(1) êáé tcsh(1). ÌðñïóôÜ áðü ôá ðåäßá ôçò óõìâïëéêÞò õðïêáôÜóôáóçò, õðÜñ÷åé ôï óÞìá ôïõ äïëáñßïõ, $. Ôï óýìâïëï áõôü äåí õðÜñ÷åé ìðñïóôÜ áðü ôá óõìâïëéêÜ ðåäßá. Ç ôéìÞ ðïõ èá áðïäïèåß óôï óõìâïëéêü ðåäßï, ðñÝðåé íá åóùêëåßåôáé óå äéðëÜ åéóáãùãéêÜ.

ÎåêéíÞóôå ôï áñ÷åßï ôùí êáíüíùí óáò üðùò öáßíåôáé ðáñáêÜôù:

```
############### start of example ipfw rules script #############
#
ipfw -q -f flush       # Delete all rules
# Set defaults
oif="tun0"             # out interface
odns="192.0.2.11"      # ISP’s DNS server IP address
cmd="ipfw -q add "     # build rule prefix
ks="keep-state"        # just too lazy to key this each time
$cmd 00500 check-state
$cmd 00502 deny all from any to any frag
$cmd 00501 deny tcp from any to any established
$cmd 00600 allow tcp from any to any 80 out via $oif setup $ks
$cmd 00610 allow tcp from any to $odns 53 out via $oif setup $ks
$cmd 00611 allow udp from any to $odns 53 out via $oif $ks
################### End of example ipfw rules script ############
```

Áõôü åßíáé üëï. Óôï ðáñÜäåéãìá áõôü äåí åßíáé óçìáíôéêïß ïé êáíüíåò, áëëÜ ï ôñüðïò ìå ôïí ïðïßï ëåéôïõñãïýí êáé ðáßñíïõí ôéìÝò ôá ðåäßá óõìâïëéêÞò õðïêáôÜóôáóçò.

Áí ôï ðáñáðÜíù ðáñÜäåéãìá Þôáí óôï áñ÷åßï `/etc/ipfw.rules` èá ìðïñïýóáôå íá öïñôþóåôå áõôïýò ôïõò êáíüíåò, ãñÜöïíôáò ôçí ðáñáêÜôù åíôïëÞ:

```
# sh /etc/ipfw.rules
```

Ôï áñ÷åßï `/etc/ipfw.rules` ìðïñåß íá âñßóêåôáé óå üðïéï êáôÜëïãï èÝëåôå, êáé íá ïíïìÜæåôáé åðßóçò üðùò èÝëåôå.

Èá ìðïñïýóáôå íá åðéôý÷åôå ôï ßäéï ðñÜãìá, åêôåëþíôáò ôéò ðáñáêÜôù åíôïëÝò ÷åéñïêßíçôá:

```
# ipfw -q -f flush
# ipfw -q add check-state
# ipfw -q add deny all from any to any frag
# ipfw -q add deny tcp from any to any established
# ipfw -q add allow tcp from any to any 80 out via tun0 setup keep-state
# ipfw -q add allow tcp from any to 192.0.2.11 53 out via tun0 setup keep-state
# ipfw -q add 00611 allow udp from any to 192.0.2.11 53 out via tun0 keep-state
```

31.6.5.5 Óýíïëï Êáíüíùí Stateful

Ôï ðáñáêÜôù óýíïëï êáíüíùí (ðïõ äåí ðåñéÝ÷åé êáíüíåò ãéá NAT) åßíáé Ýíá ðáñÜäåéãìá ãñáöÞò åíüò inclusive firewall. ¸íá inclusive firewall åðéôñÝðåé ôçí åßóïäï ìüíï ôùí ðáêÝôùí ðïõ ôáéñéÜæïõí ìå ôïõò êáíüíåò áðïäï÷Þò (pass) êáé áðïññßðôåé áðü ðñïåðéëïãÞ üëá ôá Üëëá. Ôá firewalls ðïõ Ý÷ïõí ó÷åäéáóôåß íá ðñïóôáôåýïõí ïëüêëçñá äßêôõá, äéáèÝôïõí ôï ëéãüôåñï äýï äéåðáöÝò, óôéò ïðïßåò ðñÝðåé íá õðÜñ÷ïõí êáíüíåò þóôå ôï firewall íá ëåéôïõñãåß.

¼ëá ôá ëåéôïõñãéêÜ óõóôÞìáôá ôýðïõ UNIX, óõìðåñéëáìâáíïìÝíïõ êáé ôïõ FreeBSD, Ý÷ïõí ó÷åäéáóôåß íá ÷ñçóéìïðïéïýí ôç äéåðáöÞ `lo0` êáé ôç äéåýèõíóç IP `127.0.0.1` ãéá åóùôåñéêÞ åðéêïéíùíßá ìå ôï ëåéôïõñãéêü óýóôçìá. Ôï firewall ðñÝðåé íá ðåñéÝ÷åé êáíüíåò ðïõ íá åðéôñÝðïõí ôçí áðñüóêïðôç êßíçóç áõôþí ôùí åéäéêþí, ãéá åóùôåñéêÞ ÷ñÞóç, ðáêÝôùí.

Ïé êáíüíåò ðïõ ïñßæïõí ôçí ðñüóâáóç åéóåñ÷üìåíùí êáé åîåñ÷üìåíùí ðáêÝôùí, ãñÜöïíôáé ãéá ôç äéåðáöÞ ðïõ óõíäÝåôáé óôï äçìüóéï Internet. Ç äéåðáöÞ áõôÞ ìðïñåß íá åßíáé ãéá ðáñÜäåéãìá ç `tun0` (óå ðåñßðôùóç ðïõ ÷ñçóéìïðïéåßôå ôï PPP ÷ñÞóôç), Þ ç êÜñôá äéêôýïõ ðïõ óõíäÝåôáé óôï êáëùäéáêü Þ DSL modem óáò.

Óå ðåñßðôùóç ðïõ ìéá Þ ðåñéóóüôåñåò êÜñôåò äéêôýïõ óõíäÝïíôáé óå åóùôåñéêÜ éäéùôéêÜ äßêôõá ðßóù áðü ôï firewall, èá ðñÝðåé íá õðÜñ÷ïõí ïé áíôßóôïé÷ïé êáíüíåò ðïõ íá åðéôñÝðïõí ôçí åëåýèåñç äéáêßíçóç ôùí ðáêÝôùí áíÜìåóá óôéò äéåðáöÝò áõôÝò Þ/êáé óôï Internet.

Ïé êáíüíåò ðñÝðåé íá ïñãáíþíïíôáé óå ôñåéò êýñéåò åíüôçôåò: áñ÷éêÜ üëåò ïé äéåðáöÝò óôéò ïðïßåò åðéôñÝðåôáé ç åëåýèåñç äéáêßíçóç äåäïìÝíùí, Ýðåéôá ç äéåðáöÞ áðü ôçí ïðïßá åîÝñ÷ïíôáé ôá ðáêÝôá ðñïò ôï äçìüóéï äßêôõï (Internet) êáé ôÝëïò ç äéåðáöÞ áðü ôçí ïðïßá ëáìâÜíïíôáé ðáêÝôá áðü ôï Internet.

Óå êÜèå ìéá áðü ôéò åíüôçôåò ôùí äéåðáöþí ðïõ óõíäÝïíôáé óôï Internet, ðñÝðåé íá ôïðïèåôïýíôáé ðñþôïé ïé êáíüíåò ðïõ ôáéñéÜæïõí óõ÷íüôåñá ìå ôçí áíôßóôïé÷ç êßíçóç. Ï ôåëåõôáßïò êáíüíáò ôçò åíüôçôáò èá ðñÝðåé íá áðïññßðôåé êáé íá êáôáãñÜöåé üëá ôá ðáêÝôá ôçò óõãêåêñéìÝíçò äéåðáöÞò/êáôåýèõíóçò.

Ç åíüôçôá åîåñ÷üìåíùí (Outbound) óôï óýíïëï êáíüíùí ðïõ öáßíåôáé ðáñáêÜôù, ðåñéÝ÷åé ìüíï êáíüíåò ôýðïõ `allow`. Ïé êáíüíåò áõôïß ðåñéÝ÷ïõí óõãêåêñéìÝíåò åðéëåãìÝíåò ôéìÝò, ìå ôéò ïðïßåò áíáãíùñßæåôáé ìå ìïíáäéêü ôñüðï ç õðçñåóßá óôçí ïðïßá åðéôñÝðåôáé ç ðñüóâáóç áðü ôï äçìüóéï Internet. ¼ëïé ïé êáíüíåò Ý÷ïõí ôéò åðéëïãÝò `proto`, `port`, `in/out` êáé `keep-state`. Ïé êáíüíåò ôýðïõ `proto tcp` ðåñéÝ÷ïõí ôçí åðéëïãÞ `setup` ãéá ôçí áíáãíþñéóç ôïõ ðáêÝôïõ Ýíáñîçò ôçò óõíåäñßáò, þóôå íá ãßíåé ç êáôá÷þñéóç ôçò óôïí ðßíáêá óõíäÝóåùí (stateful).

Óôçí åíüôçôá ôùí åéóåñ÷üìåíùí ðáêÝôùí (Inbound) ðïõ öáßíåôáé ðáñáêÜôù, åìöáíßæïíôáé ðñþôïé ïé êáíüíåò ðïõ ÷ñçóéìïðïéïýíôáé ãéá ôçí áðüññéøç ôùí áíåðéèýìçôùí ðáêÝôùí. Áõôü ãßíåôáé ãéá äýï äéáöïñåôéêïýò ëüãïõò. Ï ðñþôïò åßíáé üôé ôá êáêüâïõëá ðáêÝôá ìðïñåß åí ìÝñåé íá ôáéñéÜæïõí ìå êÜðïéá ÷áñáêôçñéóôéêÜ ôçò Ýãêõñçò êßíçóçò. Ôá ðáêÝôá áõôÜ èá ðñÝðåé íá áðïññéöèïýí, áíôß íá ãßíïõí äåêôÜ áðü êÜðïéï åðüìåíï êáíüíá `allow`. Ï äåýôåñïò åßíáé üôé ìðïñåßôå íá áðïññßøåôå óõãêåêñéìÝíá ðáêÝôá ôá ïðïßá ãíùñßæåôå üôé äåí åßíáé Ýãêõñá, áëëÜ óáò åßíáé áäéÜöïñç ç êáôáãñáöÞ ôïõò. Ìå ôïí ôñüðï áõôü áðïôñÝðåôáé ç ëÞøç êáé êáôáãñáöÞ ôïõò áðü ôïí ôåëåõôáßï êáíüíá. Ï ôåëåõôáßïò êáíüíáò ôõðéêÜ áðïññßðôåé êáé êáôáãñÜöåé üëá ôá ðáêÝôá ðïõ Ýöèáóáí ìÝ÷ñé áõôüí. Ï êáíüíáò áõôüò ÷ñçóéìïðïéåßôáé ãéá ôçí ðáñï÷Þ íïìéêþí áðïäåßîåùí óå ðåñßðôùóç ðïõ êéíÞóåôå íïìéêÞ äéáäéêáóßá êáôÜ áôüìùí ðïõ ðñïÝâçóáí óå åðéèÝóåéò óôï óýóôçìá óáò.

Èá ðñÝðåé åðßóçò íá âåâáéùèåßôå üôé ôï óýóôçìá óáò äåí èá äþóåé êáìéÜ áðÜíôçóç óå êáíÝíá áðü ôá áíåðéèýìçôá ðáêÝôá. Ôá ðáêÝôá áõôÜ èá ðñÝðåé íá áðïññéöèïýí êáé íá åîáöáíéóôïýí. Ìå áõôü ôïí ôñüðï, ï åðéôéèÝìåíïò äåí Ý÷åé êáìéÜ ãíþóç áí ôá ðáêÝôá ôïõ Ýöèáóáí ìÝ÷ñé ôï óýóôçìá óáò. ¼óï ëéãüôåñá ìðïñïýí íá ìÜèïõí ïé åðéôéèÝìåíïé ó÷åôéêÜ ìå ôï óýóôçìá óáò, ôüóï ðéï áóöáëÝò åßíáé. ¼ôáí åêôåëåßôå êáôáãñáöÞ ðáêÝôùí ìå áñéèìïýò èõñþí ðïõ äåí áíáãíùñßæåôå, êïéôÜîôå óôï áñ÷åßï `/etc/services/` Þ äåßôå ôï http://www.securitystats.com/tools/portsearch.php êáé áíáæçôÞóôå ôïí áñéèìü ôçò èýñáò ãéá íá äåßôå ðïéïò åßíáé ï óêïðüò ôçò. ÅëÝãîôå ôçí ðáñáêÜôù ôïðïèåóßá ãéá ôïõò áñéèìïýò èõñþí ðïõ ÷ñçóéìïðïéïýíôáé óõ÷íÜ áðü êáêüâïõëá ðñïãñÜììáôá (Trojans): http://www.simovits.com/trojans/trojans.html.

31.6.5.6 ¸íá Õðüäåéãìá Óõíüëïõ Êáíüíùí Inclusive

Ôï ðáñáêÜôù óýíïëï êáíüíùí (óôï ïðïßï äåí õëïðïéåßôáé ëåéôïõñãßá NAT) åßíáé áñêåôÜ ðëÞñåò êáé ðïëý áóöáëÝò. Äçìéïõñãåß firewall ôýðïõ inclusive, êáé Ý÷åé äïêéìáóôåß óå ðñáãìáôéêÝò óõíèÞêåò ëåéôïõñãßáò. Ìðïñåß íá åîõðçñåôÞóåé ôï ßäéï êáëÜ êáé ôï äéêü óáò óýóôçìá. Áðëþò ìåôáôñÝøôå óå ó÷üëéï ôïõò êáíüíåò `pass` ãéá ôéò õðçñåóßåò ðïõ äåí èÝëåôå íá åíåñãïðïéÞóåôå. Ãéá íá áðïöýãåôå ôçí êáôáãñáöÞ áíåðéèýìçôùí ìçíõìÜôùí, áðëþò ðñïóèÝóôå Ýíá êáíüíá ôýðïõ `deny` óôçí åíüôçôá ôùí åéóåñ÷ïìÝíùí. Óå üëïõò ôïõò êáíüíåò, Èá ðñÝðåé íá áëëÜîåôå ôï üíïìá ôçò äéåðáöÞò áðü `dc0` óôï ðñáãìáôéêü üíïìá ôçò äéåðáöÞò ðïõ óõíäÝåôáé óôï äçìüóéï Internet. Óå ðåñßðôùóç ðïõ ÷ñçóéìïðïéåßôå ôï PPP ÷ñÞóôç, ôï üíïìá ôçò äéåðáöÞò èá åßíáé `tun0`.

Èá äéáðéóôþóåôå üôé õðÜñ÷åé ìéá óõãêåêñéìÝíç ëïãéêÞ óôç ÷ñÞóç áõôþí ôùí êáíüíùí.

- ¼ëïé ïé êáíüíåò ðïõ áðïôåëïýí áßôçóç ãéá Ýíáñîç ìéáò íÝáò óõíåäñßáò ìå ôï äçìüóéï Internet, ÷ñçóéìïðïéïýí ôçí åðéëïãÞ `keep-state`.
- ¼ëåò ïé äéáðéóôåõìÝíåò õðçñåóßåò ðïõ ðñïÝñ÷ïíôáé áðü ôï äçìüóéï Internet, äéáèÝôïõí ôçí åðéëïãÞ `limit`, ãéá ôçí áðïöõãÞ åðéèÝóåùí õðåñ÷åßëéóçò (flooding).
- ¼ëïé ïé êáíüíåò ÷ñçóéìïðïéïýí ôéò åðéëïãÝò `in` Þ `out` ãéá íá äéåõêñéíßæïõí ôçí êáôåýèõíóç ôçò åðéêïéíùíßáò.
- ¼ëïé ïé êáíüíåò ÷ñçóéìïðïéïýí ôçí åðéëïãÞ `via` *`üíïìá-äéåðáöÞò`* ãéá íá êáèïñßóïõí ôç äéåðáöÞ áðü ôçí ïðïßá äéÝñ÷åôáé ôï ðáêÝôï.

Ïé êáíüíåò ðïõ öáßíïíôáé ðáñáêÜôù, èá ðñÝðåé íá ãñáöïýí óôï `/etc/ipfw.rules`.

```
################ Start of IPFW rules file ###############################
# Flush out the list before we begin.
ipfw -q -f flush

# Set rules command prefix
cmd="ipfw -q add"
pif="dc0"     # public interface name of NIC
              # facing the public Internet

#################################################################
# No restrictions on Inside LAN Interface for private network
# Not needed unless you have LAN.
# Change xl0 to your LAN NIC interface name
#################################################################
#$cmd 00005 allow all from any to any via xl0

#################################################################
# No restrictions on Loopback Interface
#################################################################
$cmd 00010 allow all from any to any via lo0

#################################################################
# Allow the packet through if it has previous been added to the
# the "dynamic" rules table by a allow keep-state statement.
```

```
#################################################################
$cmd 00015 check-state

#################################################################
# Interface facing Public Internet (Outbound Section)
# Check session start requests originating from behind the
# firewall on the private network or from this gateway server
# destined for the public Internet.
#################################################################

# Allow out access to my ISP’s Domain name server.
# x.x.x.x must be the IP address of your ISP.s DNS
# Dup these lines if your ISP has more than one DNS server
# Get the IP addresses from /etc/resolv.conf file
$cmd 00110 allow tcp from any to x.x.x.x 53 out via $pif setup keep-state
$cmd 00111 allow udp from any to x.x.x.x 53 out via $pif keep-state

# Allow out access to my ISP’s DHCP server for cable/DSL configurations.
# This rule is not needed for .user ppp. connection to the public Internet.
# so you can delete this whole group.
# Use the following rule and check log for IP address.
# Then put IP address in commented out rule & delete first rule
$cmd 00120 allow log udp from any to any 67 out via $pif keep-state
#$cmd 00120 allow udp from any to x.x.x.x 67 out via $pif keep-state

# Allow out non-secure standard www function
$cmd 00200 allow tcp from any to any 80 out via $pif setup keep-state

# Allow out secure www function https over TLS SSL
$cmd 00220 allow tcp from any to any 443 out via $pif setup keep-state

# Allow out send & get email function
$cmd 00230 allow tcp from any to any 25 out via $pif setup keep-state
$cmd 00231 allow tcp from any to any 110 out via $pif setup keep-state

# Allow out FBSD (make install & CVSUP) functions
# Basically give user root "GOD" privileges.
$cmd 00240 allow tcp from me to any out via $pif setup keep-state uid root

# Allow out ping
$cmd 00250 allow icmp from any to any out via $pif keep-state

# Allow out Time
$cmd 00260 allow tcp from any to any 37 out via $pif setup keep-state

# Allow out nntp news (i.e. news groups)
$cmd 00270 allow tcp from any to any 119 out via $pif setup keep-state

# Allow out secure FTP, Telnet, and SCP
# This function is using SSH (secure shell)
$cmd 00280 allow tcp from any to any 22 out via $pif setup keep-state

# Allow out whois
```

```
$cmd 00290 allow tcp from any to any 43 out via $pif setup keep-state

# deny and log everything else that.s trying to get out.
# This rule enforces the block all by default logic.
$cmd 00299 deny log all from any to any out via $pif

#################################################################
# Interface facing Public Internet (Inbound Section)
# Check packets originating from the public Internet
# destined for this gateway server or the private network.
#################################################################

# Deny all inbound traffic from non-routable reserved address spaces
$cmd 00300 deny all from 192.168.0.0/16 to any in via $pif  #RFC 1918 private IP
$cmd 00301 deny all from 172.16.0.0/12 to any in via $pif     #RFC 1918 private IP
$cmd 00302 deny all from 10.0.0.0/8 to any in via $pif          #RFC 1918 private IP
$cmd 00303 deny all from 127.0.0.0/8 to any in via $pif        #loopback
$cmd 00304 deny all from 0.0.0.0/8 to any in via $pif            #loopback
$cmd 00305 deny all from 169.254.0.0/16 to any in via $pif   #DHCP auto-config
$cmd 00306 deny all from 192.0.2.0/24 to any in via $pif       #reserved for docs
$cmd 00307 deny all from 204.152.64.0/23 to any in via $pif  #Sun cluster interconnect
$cmd 00308 deny all from 224.0.0.0/3 to any in via $pif         #Class D & E multicast

# Deny public pings
$cmd 00310 deny icmp from any to any in via $pif

# Deny ident
$cmd 00315 deny tcp from any to any 113 in via $pif

# Deny all Netbios service. 137=name, 138=datagram, 139=session
# Netbios is MS/Windows sharing services.
# Block MS/Windows hosts2 name server requests 81
$cmd 00320 deny tcp from any to any 137 in via $pif
$cmd 00321 deny tcp from any to any 138 in via $pif
$cmd 00322 deny tcp from any to any 139 in via $pif
$cmd 00323 deny tcp from any to any 81 in via $pif

# Deny any late arriving packets
$cmd 00330 deny all from any to any frag in via $pif

# Deny ACK packets that did not match the dynamic rule table
$cmd 00332 deny tcp from any to any established in via $pif

# Allow traffic in from ISP’s DHCP server. This rule must contain
# the IP address of your ISP.s DHCP server as it.s the only
# authorized source to send this packet type.
# Only necessary for cable or DSL configurations.
# This rule is not needed for .user ppp. type connection to
# the public Internet. This is the same IP address you captured
# and used in the outbound section.
#$cmd 00360 allow udp from any to x.x.x.x 67 in via $pif keep-state

# Allow in standard www function because I have apache server
```

```
$cmd 00400 allow tcp from any to me 80 in via $pif setup limit src-addr 2

# Allow in secure FTP, Telnet, and SCP from public Internet
$cmd 00410 allow tcp from any to me 22 in via $pif setup limit src-addr 2

# Allow in non-secure Telnet session from public Internet
# labeled non-secure because ID & PW are passed over public
# Internet as clear text.
# Delete this sample group if you do not have telnet server enabled.
$cmd 00420 allow tcp from any to me 23 in via $pif setup limit src-addr 2

# Reject & Log all incoming connections from the outside
$cmd 00499 deny log all from any to any in via $pif

# Everything else is denied by default
# deny and log all packets that fell through to see what they are
$cmd 00999 deny log all from any to any
################ End of IPFW rules file ###############################
```

31.6.5.7 ¸íá Õðüäåéãìá NAT ìå Stateful Óýíïëï Êáíüíùí

Ãéá íá åíåñãïðïéçèåß ç ëåéôïõñãßá NAT óôï IPFW, ÷ñåéÜæïíôáé êÜðïéåò åðéðëÝïí ñõèìßóåéò. Èá ðñÝðåé íá ðñïóèÝóåôå ôçí åðéëïãÞ `option IPDIVERT` ìáæß ìå ôéò õðüëïéðåò åðéëïãÝò ãéá ôï IPFIREWALL óôï áñ÷åßï ñõèìßóåùí ôïõ ðõñÞíá. Èá ðñÝðåé Ýðåéôá íá ìåôáãëùôôßóåôå êáé íá åãêáôáóôÞóåôå ôï íÝï óáò ðñïóáñìïóìÝíï ðõñÞíá.

Åêôüò áðü ôéò óõíçèéóìÝíåò åðéëïãÝò ãéá ôï IPFW, èá ðñÝðåé íá ðñïóèÝóåôå êáé ôéò ðáñáêÜôù óôï áñ÷åßï `/etc/rc.conf`:

```
natd_enable="YES"                   # Enable NATD function
natd_interface="rl0"                # interface name of public Internet NIC
natd_flags="-dynamic -m"            # -m = preserve port numbers if possible
```

Ç ÷ñÞóç êáíüíùí stateful ìáæß ìå ôïí êáíüíá `divert natd` (NAT), ðåñéðëÝêåé ðïëý ôçí ëïãéêÞ óõããñáöÞò ôùí êáíüíùí. Ç èÝóç åìöÜíéóçò ôùí êáíüíùí `check-state` êáé `divert natd` ìÝóá óôï óýíïëï êáíüíùí ãßíåôáé ðïëý êñßóéìç. Äåí ðñüêåéôáé ðëÝïí ãéá áðëÞ ëïãéêÞ ðåñÜóìáôïò áðü ôïí Ýíá êáíüíá óôïí åðüìåíï. ×ñçóéìïðïéåßôáé Ýíá íÝï åßäïò åíÝñãåéáò ðïõ ïíïìÜæåôáé `skipto`. Ãéá íá ÷ñçóéìïðïéçèåß ç åíôïëÞ `skipto`, åßíáé õðï÷ñåùôéêü íá Ý÷åôå áñéèìÞóåé ôïõò êáíüíåò, þóôå íá îÝñåôå óå ðïéï êáíüíá èá êáôáëÞîåé ôï Üëìá ðïõ èá åêôåëåóôåß áðü ôçí åíôïëÞ áõôÞ.

ÐáñáêÜôù èá âñåßôå Ýíá õðüäåéãìá (÷ùñßò ðñüóèåôá ó÷üëéá) ìéáò ìåèüäïõ óõããñáöÞò ðïõ åðéëÝîáìå åäþ ãéá íá åîçãÞóïõìå ôçí áêïëïõèßá ñïÞò ôïõ ðáêÝôïõ ìÝóá óôï óýíïëï êáíüíùí.

Ç ñïÞ ôçò åðåîåñãáóßáò îåêéíÜåé ìå ôïí ðñþôï áðü ôçí êïñõöÞ êáíüíá êáé óõíå÷ßæåé Ýíá êáíüíá êÜèå öïñÜ ðñïò ôá êÜôù, åßôå ìÝ÷ñé íá öôÜóåé ôïí ôåëåõôáßï, Þ ìÝ÷ñé ôï ðáêÝôï íá ôáéñéÜîåé ìå ôá êñéôÞñéá åðéëïãÞò êÜðïéïõ êáíüíá êáé íá áðåëåõèåñùèåß áðü ôï firewall. Åßíáé óçìáíôéêü íá ðáñáôçñÞóïõìå ôç èÝóç ôùí êáíüíùí ìå áñéèìïýò 100, 101, 450, 500 êáé 510. Ïé êáíüíåò áõôïß åëÝã÷ïõí ôçí ìåôÜöñáóç ôùí åîåñ÷üìåíùí êáé åéóåñ÷üìåíùí ðáêÝôùí, þóôå ïé êáôá÷ùñÞóåéò ôïõò óôïí äõíáìéêü ðßíáêá êáôáóôÜóåùí íá ðåñéÝ÷ïõí ðÜíôá ôçí éäéùôéêÞ IP äéåýèõíóç ôïõ ôïðéêïý äéêôýïõ. ÐáñáôçñÞóôå åðßóçò üôé üëïé ïé êáíüíåò allow êáé deny êáèïñßæïõí ôçí êáôåýèõíóç êßíçóçò ôïõ ðáêÝôïõ êáèþò êáé ôçí äéåðáöÞ. Åðßóçò, üëåò ïé åîåñ÷üìåíåò áéôÞóåéò ãéá íÝåò óõíäåóåéò ìåôáöÝñïíôáé áðåõèåßáò (ìÝóù ôïõ `skipto rule 500`) óôïí êáíüíá 500 ãéá íá ãßíåé ç ìåôÜöñáóç äéåõèýíóåùí äéêôýïõ (NAT).

Áò õðïèÝóïõìå üôé Ýíá ÷ñÞóôçò ôïõ ôïðéêïý äéêôýïõ ÷ñçóéìïðïéåß ôïí öõëëïìåôñçôÞ ôïõ ãéá íá äåé ìéá éóôïóåëßäá. Ïé éóôïóåëßäåò ÷ñçóéìïðïéïýí ôçí ðüñôá 80 ãéá ôçí åðéêïéíùíßá. Ôï ðáêÝôï åéóÝñ÷åôáé óôï firewall. Äåí ôáéñéÜæåé ìå ôïí êáíüíá 100 ãéáôß åßíáé åîåñ÷üìåíï êáé ü÷é åéóåñ÷üìåíï. ÐåñíÜåé ôïí êáíüíá 101 ãéáôß ðñüêåéôáé ãéá íÝá åðéêïéíùíßá êáé Ýôóé äåí õðÜñ÷åé áêüìá óôïí äõíáìéêü ðßíáêá êáôáóôÜóåùí. Ôï ðáêÝôï ôåëéêÜ öôÜíåé óôïí êáíüíá 125 ìå ôïí ïðïßï êáé ôáéñéÜæåé. ÅîÝñ÷åôáé ìÝóù ôçò êÜñôáò äéêôýïõ ðïõ óõíäÝåôáé óôï äçìüóéï Internet. Ôï ðáêÝôï Ý÷åé áêüìá ùò IP áöåôçñßáò ôçí éäéùôéêÞ äéåýèõíóç ôïõ ôïðéêïý äéêôýïõ. Ôï ôáßñéáóìá ìå áõôü ôïí êáíüíá ðñïêáëåß äýï åíÝñãåéåò. Ç åðéëïãÞ `keep-state` èá äçìéïõñãÞóåé Ýíá íÝï äõíáìéêü êáíüíá, èá ôïí êáôá÷ùñÞóåé óôïí ðßíáêá, êáé èá åêôåëÝóåé ôçí áíôßóôïé÷ç åíÝñãåéá. Ç åíÝñãåéá áõôÞ åßíáé ìÝñïò ôçò ðëçñïöïñßáò ðïõ ãñÜöåôáé óôïí äõíáìéêü ðßíáêá. Óôçí ðåñßðôùóç áõôÞ åßíáé ç “skipto rule 500”. Ï êáíüíáò 500 ìåôáöñÜæåé ìÝóù NAT ôç äéåýèõíóç IP ôïõ ðáêÝôïõ, ðñéí áõôü åîÝëèåé ðñïò ôï Internet. Áõôü åßíáé éäéáßôåñá óçìáíôéêü. Ôï ðáêÝôï êáôåõèýíåôáé ðñïò ôïí ðñïïñéóìü ôïõ, üðïõ äçìéïõñãåßôáé êáé áðïóôÝëëåôáé Ýíá íÝï ðáêÝôï ùò áðÜíôçóç. Ôï íÝï áõôü ðáêÝôï åéóÝñ÷åôáé îáíÜ óôï firewall, óôïí êáíüíá ðïõ åßíáé óôçí êïñõöÞ ôçò ëßóôáò. ÁõôÞ ôç öïñÜ ôáéñéÜæåé ìå ôïí êáíüíá 100 êáé ç äéåýèõíóç ðñïïñéóìïý ôïõ áëëÜæåé îáíÜ óôçí áñ÷éêÞ ôïõ ôïðéêïý äéêôýïõ. ¸ðåéôá, ãßíåôáé ç åðåîåñãáóßá ôïõ áðü ôïí êáíüíá `check-state` ï ïðïßïò áíáêáëýðôåé üôé ðñüêåéôáé ãéá ðáêÝôï óõíåäñßáò óå åîÝëéîç êáé ôï áðåëåõèåñþíåé óôï ôïðéêü äßêôõï. Êáôåõèýíåôáé ðñïò ôïí õðïëïãéóôÞ ôïõ ôïðéêïý äéêôýïõ ðïõ ôï Ýóôåéëå, ï ïðïßïò óôÝëíåé Ýíá íÝï ðáêÝôï æçôþíôáò ðåñéóóüôåñá äåäïìÝíá áðü ôïí áðïìáêñõóìÝíï åîõðçñåôçôÞ. Ôï ðáêÝôï áõôü åëÝã÷åôáé áðü ôïí êáíüíá `check-state`, ï ïðïßïò âñßóêåé ôçí êáôá÷þñéóç ôïõ óôá åîåñ÷üìåíá êáé åêôåëåß ôçí áíôßóôïé÷ç åíÝñãåéá ðïõ óå áõôÞ ôçí ðåñßðôùóç åßíáé “skipto 500”. Ôï ðáêÝôï ðñïùèåßôáé óôïí êáíüíá 500, ãßíåôáé ç ìåôÜöñáóç ôçò äéåýèõíóçò ôïõ ìÝóù NAT êáé áðåëåõèåñþíåôáé óôï Internet.

Áðü ôçí ìåñéÜ ôùí åéóåñ÷üìåíùí, üðïéï ðáêÝôï áíáãíùñßæåôáé ùò ìÝñïò ìéáò õðÜñ÷ïõóáò óõíåäñßáò, åëÝã÷åôáé áõôüìáôá áðü ôïí êáíüíá `check-state` êáé ôïõò áíôßóôïé÷ïõò êáíüíåò `divert natd`. Ôï ìüíï ðïõ ÷ñåéÜæåôáé íá áíôéìåôùðßóïõìå åßíáé ç áðüññéøç üëùí ôùí ðñïâëçìáôéêþí ðáêÝôùí êáé ç Ýãêñéóç ìüíï ôùí ðáêÝôùí ðïõ ðñïïñßæïíôáé ãéá åãêåêñéìÝíåò õðçñåóßåò. Áò õðïèÝóïõìå üôé Ý÷ïõìå Ýíá åîõðçñåôçôÞ apache ï ïðïßïò åêôåëåßôáé óôï ìç÷Üíçìá ìå ôï firewall, êáé åðéèõìïýìå ôï ôïðéêü site íá åßíáé ðñïóâÜóéìï áðü ôï äçìüóéï Internet. Ç åéóåñ÷üìåíç áßôçóç íÝáò óõíåäñßáò ôáéñéÜæåé ìå ôïí êáíüíá 100 êáé ç IP äéåýèõíóç ôçò áíôéóôïé÷ßæåôáé óôï ôïðéêü IP ôïõ ìç÷áíÞìáôïò ìå ôï firewall. Ôï ðáêÝôï Ýðåéôá åëÝã÷åôáé ãéá ïðïéïäÞðïôå ðñüâëçìá ìðïñåß íá Ý÷åé óýìöùíá ìå ôïõò êáíüíåò ðïõ ÷ñçóéìïðïéïýìå, êáé ôåëéêÜ ôáéñéÜæåé ìå ôïí êáíüíá 425. Óôçí ðåñßðôùóç áõôÞ óõìâáßíïõí äýï ðñÜãìáôá. Ï êáíüíáò ãéá ôï ðáêÝôï ãñÜöåôáé óôïí äõíáìéêü ðßíáêá êáôáóôÜóåùí, áëëÜ áõôÞ ôç öïñÜ ðåñéïñßæåôáé ï áñéèìüò áéôÞóåùí íÝáò óõíåäñßáò áðü ôïí óõãêåêñéìÝíï IP óå 2. Ìå áõôü ôïí ôñüðï ìðïñïýìå íá áìõíèïýìå óå åðéèÝóåéò ôýðïõ Üñíçóçò õðçñåóßáò (DoS) üóï áöïñÜ ôç óõãêåêñéìÝíç èýñá åðéêïéíùíßáò. Ç åíÝñãåéá ôïõ êáíüíá åßíáé ôï `allow`, êáé Ýôóé ôï ðáêÝôï áðåëåõèåñþíåôáé óôï ôïðéêü äßêôõï. Ôï ðáêÝôï ðïõ ðáñÜãåôáé ùò áðÜíôçóç, åëÝã÷åôáé áðü ôïí êáíüíá `check-state`, ï ïðïßïò áíáãíùñßæåé üôé áíÞêåé óå ìéá Þäç åíåñãÞ óõíåäñßá, êáé áðïóôÝëëåôáé óôïí êáíüíá 500 üðïõ ãßíåôáé ç ìåôÜöñáóç ôçò äéåýèõíóçò ôïõ ìÝóù NAT. Ôï ðáêÝôï ôåëéêÜ áðåëåõèåñþíåôáé ìÝóù ôçò äéåðáöÞò åîåñ÷ïìÝíùí.

Õðüäåéãìá Êáíüíùí #1:

```
#!/bin/sh
cmd="ipfw -q add"
skip="skipto 500"
pif=rl0
ks="keep-state"
good_tcpo="22,25,37,43,53,80,443,110,119"

ipfw -q -f flush

$cmd 002 allow all from any to any via xl0  # exclude LAN traffic
$cmd 003 allow all from any to any via lo0  # exclude loopback traffic

$cmd 100 divert natd ip from any to any in via $pif
$cmd 101 check-state
```

```
# Authorized outbound packets
$cmd 120 $skip udp from any to xx.168.240.2 53 out via $pif $ks
$cmd 121 $skip udp from any to xx.168.240.5 53 out via $pif $ks
$cmd 125 $skip tcp from any to any $good_tcpo out via $pif setup $ks
$cmd 130 $skip icmp from any to any out via $pif $ks
$cmd 135 $skip udp from any to any 123 out via $pif $ks


# Deny all inbound traffic from non-routable reserved address spaces
$cmd 300 deny all from 192.168.0.0/16  to any in via $pif  #RFC 1918 private IP
$cmd 301 deny all from 172.16.0.0/12   to any in via $pif  #RFC 1918 private IP
$cmd 302 deny all from 10.0.0.0/8      to any in via $pif  #RFC 1918 private IP
$cmd 303 deny all from 127.0.0.0/8     to any in via $pif  #loopback
$cmd 304 deny all from 0.0.0.0/8       to any in via $pif  #loopback
$cmd 305 deny all from 169.254.0.0/16  to any in via $pif  #DHCP auto-config
$cmd 306 deny all from 192.0.2.0/24    to any in via $pif  #reserved for docs
$cmd 307 deny all from 204.152.64.0/23 to any in via $pif  #Sun cluster
$cmd 308 deny all from 224.0.0.0/3     to any in via $pif  #Class D & E multicast

# Authorized inbound packets
$cmd 400 allow udp from xx.70.207.54 to any 68 in $ks
$cmd 420 allow tcp from any to me 80 in via $pif setup limit src-addr 1


$cmd 450 deny log ip from any to any

# This is skipto location for outbound stateful rules
$cmd 500 divert natd ip from any to any out via $pif
$cmd 510 allow ip from any to any

######################## end of rules  ##################
```

Ïé ðáñáêÜôù êáíüíåò åßíáé ó÷åäüí ßäéïé ìå ôïõò ðáñáðÜíù, áëëÜ ðåñéÝ÷ïõí ðåñéóóüôåñá ó÷üëéá ãéá íá âïçèÞóïõí ôïí áñ÷Üñéï ÷ñÞóôç ôïõ IPFW íá êáôáëÜâåé êáëýôåñá ðùò ëåéôïõñãïýí.

Õðüäåéãìá Êáíüíùí #2:

```
#!/bin/sh
################ Start of IPFW rules file ###############################
# Flush out the list before we begin.
ipfw -q -f flush

# Set rules command prefix
cmd="ipfw -q add"
skip="skipto 800"
pif="rl0"     # public interface name of NIC
              # facing the public Internet

#################################################################
# No restrictions on Inside LAN Interface for private network
# Change xl0 to your LAN NIC interface name
#################################################################
$cmd 005 allow all from any to any via xl0
```

```
#################################################################
# No restrictions on Loopback Interface
#################################################################
$cmd 010 allow all from any to any via lo0

#################################################################
# check if packet is inbound and nat address if it is
#################################################################
$cmd 014 divert natd ip from any to any in via $pif

#################################################################
# Allow the packet through if it has previous been added to the
# the "dynamic" rules table by a allow keep-state statement.
#################################################################
$cmd 015 check-state

#################################################################
# Interface facing Public Internet (Outbound Section)
# Check session start requests originating from behind the
# firewall on the private network or from this gateway server
# destined for the public Internet.
#################################################################

# Allow out access to my ISP’s Domain name server.
# x.x.x.x must be the IP address of your ISP’s DNS
# Dup these lines if your ISP has more than one DNS server
# Get the IP addresses from /etc/resolv.conf file
$cmd 020 $skip tcp from any to x.x.x.x 53 out via $pif setup keep-state


# Allow out access to my ISP’s DHCP server for cable/DSL configurations.
$cmd 030 $skip udp from any to x.x.x.x 67 out via $pif keep-state

# Allow out non-secure standard www function
$cmd 040 $skip tcp from any to any 80 out via $pif setup keep-state

# Allow out secure www function https over TLS SSL
$cmd 050 $skip tcp from any to any 443 out via $pif setup keep-state

# Allow out send & get email function
$cmd 060 $skip tcp from any to any 25 out via $pif setup keep-state
$cmd 061 $skip tcp from any to any 110 out via $pif setup keep-state

# Allow out FreeBSD (make install & CVSUP) functions
# Basically give user root "GOD" privileges.
$cmd 070 $skip tcp from me to any out via $pif setup keep-state uid root

# Allow out ping
$cmd 080 $skip icmp from any to any out via $pif keep-state

# Allow out Time
$cmd 090 $skip tcp from any to any 37 out via $pif setup keep-state
```

```
# Allow out nntp news (i.e. news groups)
$cmd 100 $skip tcp from any to any 119 out via $pif setup keep-state

# Allow out secure FTP, Telnet, and SCP
# This function is using SSH (secure shell)
$cmd 110 $skip tcp from any to any 22 out via $pif setup keep-state

# Allow out whois
$cmd 120 $skip tcp from any to any 43 out via $pif setup keep-state

# Allow ntp time server
$cmd 130 $skip udp from any to any 123 out via $pif keep-state

#################################################################
# Interface facing Public Internet (Inbound Section)
# Check packets originating from the public Internet
# destined for this gateway server or the private network.
#################################################################

# Deny all inbound traffic from non-routable reserved address spaces
$cmd 300 deny all from 192.168.0.0/16  to any in via $pif  #RFC 1918 private IP
$cmd 301 deny all from 172.16.0.0/12   to any in via $pif  #RFC 1918 private IP
$cmd 302 deny all from 10.0.0.0/8      to any in via $pif  #RFC 1918 private IP
$cmd 303 deny all from 127.0.0.0/8     to any in via $pif  #loopback
$cmd 304 deny all from 0.0.0.0/8       to any in via $pif  #loopback
$cmd 305 deny all from 169.254.0.0/16  to any in via $pif  #DHCP auto-config
$cmd 306 deny all from 192.0.2.0/24    to any in via $pif  #reserved for docs
$cmd 307 deny all from 204.152.64.0/23 to any in via $pif  #Sun cluster
$cmd 308 deny all from 224.0.0.0/3     to any in via $pif  #Class D & E multicast

# Deny ident
$cmd 315 deny tcp from any to any 113 in via $pif

# Deny all Netbios service. 137=name, 138=datagram, 139=session
# Netbios is MS/Windows sharing services.
# Block MS/Windows hosts2 name server requests 81
$cmd 320 deny tcp from any to any 137 in via $pif
$cmd 321 deny tcp from any to any 138 in via $pif
$cmd 322 deny tcp from any to any 139 in via $pif
$cmd 323 deny tcp from any to any 81  in via $pif

# Deny any late arriving packets
$cmd 330 deny all from any to any frag in via $pif

# Deny ACK packets that did not match the dynamic rule table
$cmd 332 deny tcp from any to any established in via $pif

# Allow traffic in from ISP’s DHCP server. This rule must contain
# the IP address of your ISP’s DHCP server as it’s the only
# authorized source to send this packet type.
# Only necessary for cable or DSL configurations.
# This rule is not needed for ’user ppp’ type connection to
# the public Internet. This is the same IP address you captured
# and used in the outbound section.
$cmd 360 allow udp from x.x.x.x to any 68 in via $pif keep-state

# Allow in standard www function because I have Apache server
$cmd 370 allow tcp from any to me 80 in via $pif setup limit src-addr 2

# Allow in secure FTP, Telnet, and SCP from public Internet
$cmd 380 allow tcp from any to me 22 in via $pif setup limit src-addr 2

# Allow in non-secure Telnet session from public Internet
# labeled non-secure because ID & PW are passed over public
# Internet as clear text.
# Delete this sample group if you do not have telnet server enabled.
$cmd 390 allow tcp from any to me 23 in via $pif setup limit src-addr 2

# Reject & Log all unauthorized incoming connections from the public Internet
$cmd 400 deny log all from any to any in via $pif

# Reject & Log all unauthorized out going connections to the public Internet
$cmd 450 deny log all from any to any out via $pif

# This is skipto location for outbound stateful rules
$cmd 800 divert natd ip from any to any out via $pif
$cmd 801 allow ip from any to any

# Everything else is denied by default
# deny and log all packets that fell through to see what they are
$cmd 999 deny log all from any to any
################ End of IPFW rules file ###############################
```

ÊåöÜëáéï 32 Ðñï÷ùñçìÝíá ÈÝìáôá Äéêôýùóçò

32.1 Óýíïøç

Ôï êåöÜëáéï áõôü êáëýðôåé ðñï÷ùñçìÝíá èÝìáôá äéêôýùóçò.

Áöïý äéáâÜóåôå áõôü ôï êåöÜëáéï, èá îÝñåôå:

- Ôá âáóéêÜ ôùí ðõëþí (gateways) êáé ôùí äñïìïëïãÞóåùí (routes).
- Ðùò íá ñõèìßóåôå óõóêåõÝò IEEE 802.11 êáé Bluetooth.
- Ðùò íá êÜíåôå ôï FreeBSD íá äñá ùò ãÝöõñá (bridge).
- Ðùò íá ñõèìßóåôå åêêßíçóç áðü ôï äßêôõï óå Ýíá ìç÷Üíçìá ÷ùñßò óêëçñü äßóêï.
- Ðùò íá ñõèìßóåôå ìåôÜöñáóç äéêôõáêþí äéåõèýíóåùí (NAT).
- Ðùò íá óõíäÝóåôå äýï õðïëïãéóôÝò ìÝóù PLIP.
- Ðùò íá ñõèìßóåôå ôï IPv6 óå Ýíá ìç÷Üíçìá FreeBSD.
- Ðùò íá ñõèìßóåôå ôï ATM.
- Ðùò íá ñõèìßóåôå êáé íá ÷ñçóéìïðïéÞóåôå ôéò äõíáôüôçôåò ôïõ CARP (Common Access Redundancy Protocol) óôï FreeBSD.

Ðñéí äéáâÜóåôå áõôü ôï êåöÜëáéï, èá ðñÝðåé:

- Íá êáôáíïåßôå ôéò âáóéêÝò Ýííïéåò ôùí áñ÷åßùí script `/etc/rc`.
- Íá åßóôå åîïéêåéùìÝíïò ìå ôç âáóéêÞ ïñïëïãßá ôùí äéêôýùí.
- Íá ãíùñßæåôå ðùò íá ñõèìßóåôå êáé íá åãêáôáóôÞóåôå Ýíá íÝï ðõñÞíá óôï FreeBSD (ÊåöÜëáéï 9).
- Íá ãíùñßæåôå ðùò íá åãêáôáóôÞóåôå ðñüóèåôï ëïãéóìéêü ôñßôïõ êáôáóêåõáóôÞ (ÊåöÜëáéï 5).

32.2 Gateways and Routes

Contributed by Coranth Gryphon.

For one machine to be able to find another over a network, there must be a mechanism in place to describe how to get from one to the other. This is called *routing*. A “route” is a defined pair of addresses: a “destination” and a “gateway”. The pair indicates that if you are trying to get to this *destination*, communicate through this *gateway*. There are three types of destinations: individual hosts, subnets, and “default”. The “default route” is used if none of the other routes apply. We will talk a little bit more about default routes later on. There are also three types of gateways: individual hosts, interfaces (also called “links”), and Ethernet hardware addresses (MAC addresses).

32.2.1 An Example

To illustrate different aspects of routing, we will use the following example from `netstat`:

```
% netstat -r
```

```
Routing tables

Destination      Gateway            Flags     Refs     Use     Netif Expire

default          outside-gw         UGSc       37      418      ppp0
localhost        localhost          UH          0      181       lo0
test0            0:e0:b5:36:cf:4f   UHLW        5    63288       ed0     77
10.20.30.255     link#1             UHLW        1     2421
example.com      link#1             UC          0        0
host1            0:e0:a8:37:8:1e    UHLW        3     4601       lo0
host2            0:e0:a8:37:8:1e    UHLW        0        5       lo0 =>
host2.example.com link#1             UC          0        0
224              link#1             UC          0        0
```

The first two lines specify the default route (which we will cover in the next section) and the `localhost` route.

The interface (`Netif` column) that this routing table specifies to use for `localhost` is `lo0`, also known as the loopback device. This says to keep all traffic for this destination internal, rather than sending it out over the LAN, since it will only end up back where it started.

The next thing that stands out are the addresses beginning with `0:e0:`. These are Ethernet hardware addresses, which are also known as MAC addresses. FreeBSD will automatically identify any hosts (`test0` in the example) on the local Ethernet and add a route for that host, directly to it over the Ethernet interface, `ed0`. There is also a timeout (`Expire` column) associated with this type of route, which is used if we fail to hear from the host in a specific amount of time. When this happens, the route to this host will be automatically deleted. These hosts are identified using a mechanism known as RIP (Routing Information Protocol), which figures out routes to local hosts based upon a shortest path determination.

FreeBSD will also add subnet routes for the local subnet (`10.20.30.255` is the broadcast address for the subnet `10.20.30`, and `example.com` is the domain name associated with that subnet). The designation `link#1` refers to the first Ethernet card in the machine. You will notice no additional interface is specified for those.

Both of these groups (local network hosts and local subnets) have their routes automatically configured by a daemon called **routed**. If this is not run, then only routes which are statically defined (i.e. entered explicitly) will exist.

The `host1` line refers to our host, which it knows by Ethernet address. Since we are the sending host, FreeBSD knows to use the loopback interface (`lo0`) rather than sending it out over the Ethernet interface.

The two `host2` lines are an example of what happens when we use an ifconfig(8) alias (see the section on Ethernet for reasons why we would do this). The `=>` symbol after the `lo0` interface says that not only are we using the loopback (since this address also refers to the local host), but specifically it is an alias. Such routes only show up on the host that supports the alias; all other hosts on the local network will simply have a `link#1` line for such routes.

The final line (destination subnet `224`) deals with multicasting, which will be covered in another section.

Finally, various attributes of each route can be seen in the `Flags` column. Below is a short table of some of these flags and their meanings:

U	Up: The route is active.
H	Host: The route destination is a single host.
G	Gateway: Send anything for this destination on to this remote system, which will figure out from there where to send it.
S	Static: This route was configured manually, not automatically generated by the system.

C	Clone: Generates a new route based upon this route for machines we connect to. This type of route is normally used for local networks.
W	WasCloned: Indicated a route that was auto-configured based upon a local area network (Clone) route.
L	Link: Route involves references to Ethernet hardware.

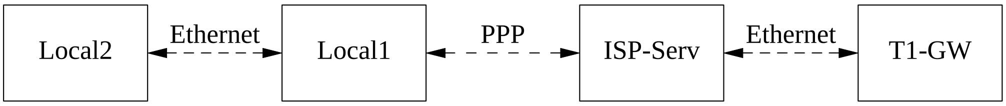
32.2.2 Default Routes

When the local system needs to make a connection to a remote host, it checks the routing table to determine if a known path exists. If the remote host falls into a subnet that we know how to reach (Cloned routes), then the system checks to see if it can connect along that interface.

If all known paths fail, the system has one last option: the “default” route. This route is a special type of gateway route (usually the only one present in the system), and is always marked with a `c` in the flags field. For hosts on a local area network, this gateway is set to whatever machine has a direct connection to the outside world (whether via PPP link, DSL, cable modem, T1, or another network interface).

If you are configuring the default route for a machine which itself is functioning as the gateway to the outside world, then the default route will be the gateway machine at your Internet Service Provider’s (ISP) site.

Let us look at an example of default routes. This is a common configuration:



The hosts `Local1` and `Local2` are at your site. `Local1` is connected to an ISP via a dial up PPP connection. This PPP server computer is connected through a local area network to another gateway computer through an external interface to the ISPs Internet feed.

The default routes for each of your machines will be:

Host	Default Gateway	Interface
Local2	Local1	Ethernet
Local1	T1-GW	PPP

A common question is “Why (or how) would we set the `T1-GW` to be the default gateway for `Local1`, rather than the ISP server it is connected to?”.

Remember, since the PPP interface is using an address on the ISP’s local network for your side of the connection, routes for any other machines on the ISP’s local network will be automatically generated. Hence, you will already know how to reach the `T1-GW` machine, so there is no need for the intermediate step of sending traffic to the ISP server.

It is common to use the address `X.X.X.1` as the gateway address for your local network. So (using the same example), if your local class-C address space was `10.20.30` and your ISP was using `10.9.9` then the default routes would be:

Host	Default Route

Host	Default Route
Local2 (10.20.30.2)	Local1 (10.20.30.1)
Local1 (10.20.30.1, 10.9.9.30)	T1-GW (10.9.9.1)

You can easily define the default route via the `/etc/rc.conf` file. In our example, on the `Local2` machine, we added the following line in `/etc/rc.conf`:

```
defaultrouter="10.20.30.1"
```

It is also possible to do it directly from the command line with the route(8) command:

```
# route add default 10.20.30.1
```

For more information on manual manipulation of network routing tables, consult route(8) manual page.

32.2.3 Dual Homed Hosts

There is one other type of configuration that we should cover, and that is a host that sits on two different networks. Technically, any machine functioning as a gateway (in the example above, using a PPP connection) counts as a dual-homed host. But the term is really only used to refer to a machine that sits on two local-area networks.

In one case, the machine has two Ethernet cards, each having an address on the separate subnets. Alternately, the machine may only have one Ethernet card, and be using ifconfig(8) aliasing. The former is used if two physically separate Ethernet networks are in use, the latter if there is one physical network segment, but two logically separate subnets.

Either way, routing tables are set up so that each subnet knows that this machine is the defined gateway (inbound route) to the other subnet. This configuration, with the machine acting as a router between the two subnets, is often used when we need to implement packet filtering or firewall security in either or both directions.

If you want this machine to actually forward packets between the two interfaces, you need to tell FreeBSD to enable this ability. See the next section for more details on how to do this.

32.2.4 Building a Router

A network router is simply a system that forwards packets from one interface to another. Internet standards and good engineering practice prevent the FreeBSD Project from enabling this by default in FreeBSD. You can enable this feature by changing the following variable to `YES` in rc.conf(5):

```
gateway_enable=YES          # Set to YES if this host will be a gateway
```

This option will set the sysctl(8) variable `net.inet.ip.forwarding` to `1`. If you should need to stop routing temporarily, you can reset this to `0` temporarily.

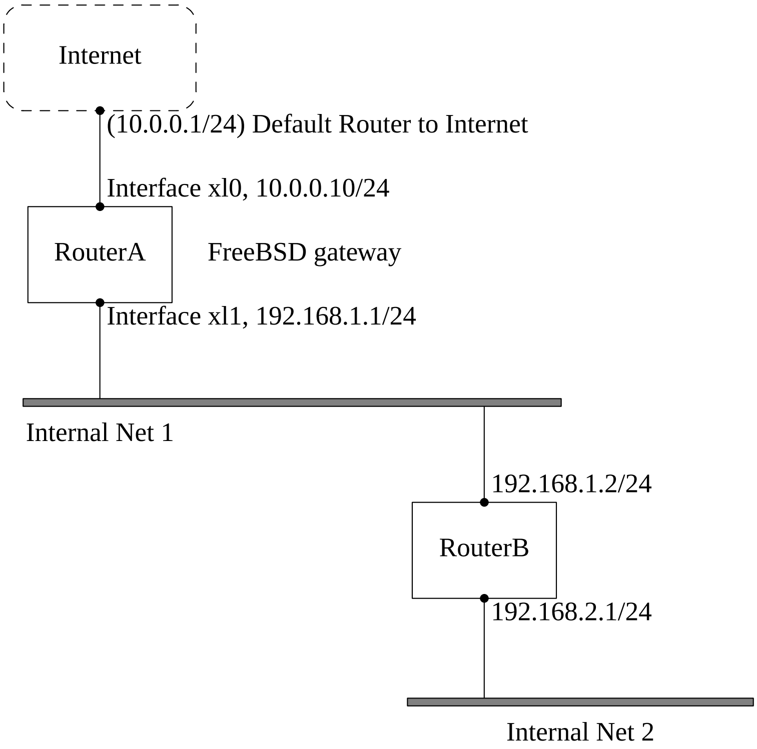
Your new router will need routes to know where to send the traffic. If your network is simple enough you can use static routes. FreeBSD also comes with the standard BSD routing daemon routed(8), which speaks RIP (both version 1 and version 2) and IRDP. Support for BGP v4, OSPF v2, and other sophisticated routing protocols is available with the `net/zebra` package. Commercial products such as **GateD®** are also available for more complex network routing solutions.

32.2.5 Setting Up Static Routes

Contributed by Al Hoang.

32.2.5.1 Manual Configuration

Let us assume we have a network as follows:


Internet
(10.0.0.1/24) Default Router to Internet
Interface xl0, 10.0.0.10/24
RouterA
FreeBSD gateway
Interface xl1, 192.168.1.1/24
Internal Net 1
192.168.1.2/24
RouterB
192.168.2.1/24
Internal Net 2

In this scenario, `RouterA` is our FreeBSD machine that is acting as a router to the rest of the Internet. It has a default route set to `10.0.0.1` which allows it to connect with the outside world. We will assume that `RouterB` is already configured properly and knows how to get wherever it needs to go. (This is simple in this picture. Just add a default route on `RouterB` using `192.168.1.1` as the gateway.)

If we look at the routing table for `RouterA` we would see something like the following:

```
% netstat -nr
Routing tables

Internet:
Destination        Gateway            Flags    Refs      Use  Netif  Expire
default            10.0.0.1           UGS         0    49378    xl0
127.0.0.1          127.0.0.1          UH          0        6    lo0
10.0.0/24          link#1             UC          0        0    xl0
192.168.1/24       link#2             UC          0        0    xl1
```

With the current routing table `RouterA` will not be able to reach our Internal Net 2. It does not have a route for `192.168.2.0/24`. One way to alleviate this is to manually add the route. The following command would add the Internal Net 2 network to `RouterA`'s routing table using `192.168.1.2` as the next hop:

```
# route add -net 192.168.2.0/24 192.168.1.2
```

Now `RouterA` can reach any hosts on the `192.168.2.0/24` network.

32.2.5.2 Persistent Configuration

The above example is perfect for configuring a static route on a running system. However, one problem is that the routing information will not persist if you reboot your FreeBSD machine. The way to handle the addition of a static route is to put it in your `/etc/rc.conf` file:

```
# Add Internal Net 2 as a static route
static_routes="internalnet2"
route_internalnet2="-net 192.168.2.0/24 192.168.1.2"
```

The `static_routes` configuration variable is a list of strings separated by a space. Each string references to a route name. In our above example we only have one string in `static_routes`. This string is *`internalnet2`*. We then add a configuration variable called `route_`*`internalnet2`* where we put all of the configuration parameters we would give to the route(8) command. For our example above we would have used the command:

```
# route add -net 192.168.2.0/24 192.168.1.2
```

so we need `"-net 192.168.2.0/24 192.168.1.2"`.

As said above, we can have more than one string in `static_routes`. This allows us to create multiple static routes. The following lines shows an example of adding static routes for the `192.168.0.0/24` and `192.168.1.0/24` networks on an imaginary router:

```
static_routes="net1 net2"
route_net1="-net 192.168.0.0/24 192.168.0.1"
route_net2="-net 192.168.1.0/24 192.168.1.1"
```

32.2.6 Routing Propagation

We have already talked about how we define our routes to the outside world, but not about how the outside world finds us.

We already know that routing tables can be set up so that all traffic for a particular address space (in our examples, a class-C subnet) can be sent to a particular host on that network, which will forward the packets inbound.

When you get an address space assigned to your site, your service provider will set up their routing tables so that all traffic for your subnet will be sent down your PPP link to your site. But how do sites across the country know to send to your ISP?

There is a system (much like the distributed DNS information) that keeps track of all assigned address-spaces, and defines their point of connection to the Internet Backbone. The “Backbone” are the main trunk lines that carry Internet traffic across the country, and around the world. Each backbone machine has a copy of a master set of tables, which direct traffic for a particular network to a specific backbone carrier, and from there down the chain of service providers until it reaches your network.

It is the task of your service provider to advertise to the backbone sites that they are the point of connection (and thus the path inward) for your site. This is known as route propagation.

32.2.7 Troubleshooting

Sometimes, there is a problem with routing propagation, and some sites are unable to connect to you. Perhaps the most useful command for trying to figure out where routing is breaking down is the traceroute(8) command. It is equally useful if you cannot seem to make a connection to a remote machine (i.e. ping(8) fails).

The traceroute(8) command is run with the name of the remote host you are trying to connect to. It will show the gateway hosts along the path of the attempt, eventually either reaching the target host, or terminating because of a lack of connection.

For more information, see the manual page for traceroute(8).

32.2.8 Multicast Routing

FreeBSD supports both multicast applications and multicast routing natively. Multicast applications do not require any special configuration of FreeBSD; applications will generally run out of the box. Multicast routing requires that support be compiled into the kernel:

```
options MROUTING
```

In addition, the multicast routing daemon, mrouted(8) must be configured to set up tunnels and DVMRP via `/etc/mrouted.conf`. More details on multicast configuration may be found in the manual page for mrouted(8).

32.3 Wireless Networking

Loader, Marc Fonvieille, êáé Murray Stokely.

32.3.1 Wireless Networking Basics

Most wireless networks are based on the IEEE 802.11 standards. A basic wireless network consists of multiple stations communicating with radios that broadcast in either the 2.4GHz or 5GHz band (though this varies according to the locale and is also changing to enable communication in the 2.3GHz and 4.9GHz ranges).

802.11 networks are organized in two ways: in *infrastructure mode* one station acts as a master with all the other stations associating to it; the network is known as a BSS and the master station is termed an access point (AP). In a BSS all communication passes through the AP; even when one station wants to communicate with another wireless station messages must go through the AP. In the second form of network there is no master and stations communicate directly. This form of network is termed an IBSS and is commonly known as an *ad-hoc network*.

802.11 networks were first deployed in the 2.4GHz band using protocols defined by the IEEE 802.11 and 802.11b standard. These specifications include the operating frequencies, MAC layer characteristics including framing and transmission rates (communication can be done at various rates). Later the 802.11a standard defined operation in the 5GHz band, including different signalling mechanisms and higher transmission rates. Still later the 802.11g standard was defined to enable use of 802.11a signalling and transmission mechanisms in the 2.4GHz band in such a way as to be backwards compatible with 802.11b networks.

Separate from the underlying transmission techniques 802.11 networks have a variety of security mechanisms. The original 802.11 specifications defined a simple security protocol called WEP. This protocol uses a fixed pre-shared key and the RC4 cryptographic cipher to encode data transmitted on a network. Stations must all agree on the fixed key in order to communicate. This scheme was shown to be easily broken and is now rarely used except to discourage transient users from joining networks. Current security practice is given by the IEEE 802.11i specification that defines new cryptographic ciphers and an additional protocol to authenticate stations to an access point and exchange keys for doing data communication. Further, cryptographic keys are periodically refreshed and there are mechanisms for detecting intrusion attempts (and for countering intrusion attempts). Another security protocol specification commonly used in wireless networks is termed WPA. This was a precursor to 802.11i defined by an industry group as an interim measure while waiting for 802.11i to be ratified. WPA specifies a subset of the requirements found in 802.11i and is designed for implementation on legacy hardware. Specifically WPA requires only the TKIP cipher that is derived from the original WEP cipher. 802.11i permits use of TKIP but also requires support for a stronger cipher, AES-CCM, for encrypting data. (The AES cipher was not required in WPA because it was deemed too computationally costly to be implemented on legacy hardware.)

Other than the above protocol standards the other important standard to be aware of is 802.11e. This defines protocols for deploying multi-media applications such as streaming video and voice over IP (VoIP) in an 802.11 network. Like 802.11i, 802.11e also has a precursor specification termed WME (later renamed WMM) that has been defined by an industry group as a subset of 802.11e that can be deployed now to enable multi-media applications while waiting for the final ratification of 802.11e. The most important thing to know about 802.11e and WME/WMM is that it enables prioritized traffic use of a wireless network through Quality of Service (QoS) protocols and enhanced media access protocols. Proper implementation of these protocols enable high speed bursting of data and prioritized traffic flow.

Since the 6.0 version, FreeBSD supports networks that operate using 802.11a, 802.11b, and 802.11g. The WPA and 802.11i security protocols are likewise supported (in conjunction with any of 11a, 11b, and 11g) and QoS and traffic prioritization required by the WME/WMM protocols are supported for a limited set of wireless devices.

32.3.2 Basic Setup

32.3.2.1 Kernel Configuration

To use wireless networking you need a wireless networking card and to configure the kernel with the appropriate wireless networking support. The latter is separated into multiple modules so that you only need to configure the software you are actually going to use.

The first thing you need is a wireless device. The most commonly used devices are those that use parts made by Atheros. These devices are supported by the ath(4) driver and require the following line to be added to the `/boot/loader.conf` file:

```
if_ath_load="YES"
```

The Atheros driver is split up into three separate pieces: the driver proper (ath(4)), the hardware support layer that handles chip-specific functions (ath_hal(4)), and an algorithm for selecting which of several possible rates for transmitting frames (ath_rate_sample here). When you load this support as modules these dependencies are automatically handled for you. If instead of an Atheros device you had another device you would select the module for that device; e.g.:

```
if_wi_load="YES"
```

for devices based on the Intersil Prism parts (wi(4) driver).

> **Óçìåßùóç:** In the rest of this document, we will use an ath(4) device, the device name in the examples must be changed according to your configuration. A list of available wireless drivers can be found at the beginning of the

wlan(4) manual page. If a native FreeBSD driver for your wireless device does not exist, it may be possible to directly use the Windows driver with the help of the NDIS driver wrapper.

With a device driver configured you need to also bring in the 802.11 networking support required by the driver. For the ath(4) driver this is at least the wlan(4) module; this module is automatically loaded with the wireless device driver. With that you will need the modules that implement cryptographic support for the security protocols you intend to use. These are intended to be dynamically loaded on demand by the wlan(4) module but for now they must be manually configured. The following modules are available: wlan_wep(4), wlan_ccmp(4) and wlan_tkip(4). Both wlan_ccmp(4) and wlan_tkip(4) drivers are only needed if you intend to use the WPA and/or 802.11i security protocols. If your network is to run totally open (i.e., with no encryption) then you do not even need the wlan_wep(4) support. To load these modules at boot time, add the following lines to `/boot/loader.conf`:

```
wlan_wep_load="YES"
wlan_ccmp_load="YES"
wlan_tkip_load="YES"
```

With this information in the system bootstrap configuration file (i.e., `/boot/loader.conf`), you have to reboot your FreeBSD box. If you do not want to reboot your machine for the moment, you can just load the modules by hand using kldload(8).

Óçìåßùóç: If you do not want to use modules, it is possible to compile these drivers into the kernel by adding the following lines to your kernel configuration file:

```
device ath               # Atheros IEEE 802.11 wireless network driver
device ath_hal           # Atheros Hardware Access Layer
device ath_rate_sample   # John Bicket’s SampleRate control algorithm.
device wlan              # 802.11 support (Required)
device wlan_wep          # WEP crypto support for 802.11 devices
device wlan_ccmp         # AES-CCMP crypto support for 802.11 devices
device wlan_tkip         # TKIP and Michael crypto support for 802.11 devices
```

With this information in the kernel configuration file, recompile the kernel and reboot your FreeBSD machine.

When the system is up, we could find some information about the wireless device in the boot messages, like this:

```
ath0: <Atheros 5212> mem 0xff9f0000-0xff9fffff irq 17 at device 2.0 on pci2
ath0: Ethernet address: 00:11:95:d5:43:62
ath0: mac 7.9 phy 4.5 radio 5.6
```

32.3.3 Infrastructure Mode

The infrastructure mode or BSS mode is the mode that is typically used. In this mode, a number of wireless access points are connected to a wired network. Each wireless network has its own name, this name is called the SSID of the network. Wireless clients connect to the wireless access points.

32.3.3.1 FreeBSD Clients

32.3.3.1.1 How to Find Access Points

To scan for networks, use the `ifconfig` command. This request may take a few moments to complete as it requires that the system switches to each available wireless frequency and probes for available access points. Only the super-user can initiate such a scan:

```
# ifconfig ath0 up scan
SSID            BSSID              CHAN RATE  S:N   INT CAPS
dlinkap         00:13:46:49:41:76    6   54M 29:0   100 EPS  WPA WME
freebsdap       00:11:95:c3:0d:ac    1   54M 22:0   100 EPS  WPA
```

> **Óçìåßùóç:** You must mark the interface `up` before you can scan. Subsequent scan requests do not require you to mark the interface up again.

The output of a scan request lists each BSS/IBSS network found. Beside the name of the network, `SSID`, we find the `BSSID` which is the MAC address of the access point. The `CAPS` field identifies the type of each network and the capabilities of the stations operating there:

`E`

Extended Service Set (ESS). Indicates that the station is part of an infrastructure network (in contrast to an IBSS/ad-hoc network).

`I`

IBSS/ad-hoc network. Indicates that the station is part of an ad-hoc network (in contrast to an ESS network).

`P`

Privacy. Data confidentiality is required for all data frames exchanged within the BSS. This means that this BSS requires the station to use cryptographic means such as WEP, TKIP or AES-CCMP to encrypt/decrypt data frames being exchanged with others.

`S`

Short Preamble. Indicates that the network is using short preambles (defined in 802.11b High Rate/DSSS PHY, short preamble utilizes a 56 bit sync field in contrast to a 128 bit field used in long preamble mode).

`s`

Short slot time. Indicates that the 802.11g network is using a short slot time because there are no legacy (802.11b) stations present.

One can also display the current list of known networks with:

```
# ifconfig ath0 list scan
```

This information may be updated automatically by the adapter or manually with a `scan` request. Old data is automatically removed from the cache, so over time this list may shrink unless more scans are done.

32.3.3.1.2 Basic Settings

This section provides a simple example of how to make the wireless network adapter work in FreeBSD without encryption. After you are familiar with these concepts, we strongly recommend using WPA to set up your wireless network.

There are three basic steps to configure a wireless network: selecting an access point, authenticating your station, and configuring an IP address. The following sections discuss each step.

32.3.3.1.2.1 Selecting an Access Point

Most of time it is sufficient to let the system choose an access point using the builtin heuristics. This is the default behaviour when you mark an interface up or otherwise configure an interface by listing it in `/etc/rc.conf`, e.g.:

```
ifconfig_ath0="DHCP"
```

If there are multiple access points and you want to select a specific one, you can select it by its SSID:

```
ifconfig_ath0="ssid your_ssid_here DHCP"
```

In an environment where there are multiple access points with the same SSID (often done to simplify roaming) it may be necessary to associate to one specific device. In this case you can also specify the BSSID of the access point (you can also leave off the SSID):

```
ifconfig_ath0="ssid your_ssid_here bssid xx:xx:xx:xx:xx:xx DHCP"
```

There are other ways to constrain the choice of an access point such as limiting the set of frequencies the system will scan on. This may be useful if you have a multi-band wireless card as scanning all the possible channels can be time-consuming. To limit operation to a specific band you can use the `mode` parameter; e.g.:

```
ifconfig_ath0="mode 11g ssid your_ssid_here DHCP"
```

will force the card to operate in 802.11g which is defined only for 2.4GHz frequencies so any 5GHz channels will not be considered. Other ways to do this are the `channel` parameter, to lock operation to one specific frequency, and the `chanlist` parameter, to specify a list of channels for scanning. More information about these parameters can be found in the ifconfig(8) manual page.

32.3.3.1.2.2 Authentication

Once you have selected an access point your station needs to authenticate before it can pass data. Authentication can happen in several ways. The most common scheme used is termed open authentication and allows any station to join the network and communicate. This is the authentication you should use for test purpose the first time you set up a wireless network. Other schemes require cryptographic handshakes be completed before data traffic can flow; either using pre-shared keys or secrets, or more complex schemes that involve backend services such as RADIUS. Most users will use open authentication which is the default setting. Next most common setup is WPA-PSK, also known as WPA Personal, which is described below.

> **Óçìåßùóç:** If you have an Apple AirPort® Extreme base station for an access point you may need to configure shared-key authentication together with a WEP key. This can be done in the `/etc/rc.conf` file or using the wpa_supplicant(8) program. If you have a single AirPort base station you can setup access with something like:
>
> ```
> ifconfig_ath0="authmode shared wepmode on weptxkey 1 wepkey 01234567 DHCP"
> ```

> In general shared key authentication is to be avoided because it uses the WEP key material in a highly-constrained manner making it even easier to crack the key. If WEP must be used (e.g., for compatibility with legacy devices) it is better to use WEP with `open` authentication. More information regarding WEP can be found in the ÔìÞìá 32.3.3.1.4.

32.3.3.1.2.3 Getting an IP Address with DHCP

Once you have selected an access point and set the authentication parameters, you will have to get an IP address to communicate. Most of time you will obtain your wireless IP address via DHCP. To achieve that, simply edit `/etc/rc.conf` and add `DHCP` to the configuration for your device as shown in various examples above:

```
ifconfig_ath0="DHCP"
```

At this point, you are ready to bring up the wireless interface:

```
# /etc/rc.d/netif start
```

Once the interface is running, use `ifconfig` to see the status of the interface `ath0`:

```
# ifconfig ath0
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
        inet 192.168.1.100 netmask 0xffffff00 broadcast 192.168.1.255
        ether 00:11:95:d5:43:62
        media: IEEE 802.11 Wireless Ethernet autoselect (OFDM/54Mbps)
        status: associated
        ssid dlinkap channel 6 bssid 00:13:46:49:41:76
        authmode OPEN privacy OFF txpowmax 36 protmode CTS bintval 100
```

The `status: associated` means you are connected to the wireless network (to the `dlinkap` network in our case). The `bssid 00:13:46:49:41:76` part is the MAC address of your access point; the `authmode` line informs you that the communication is not encrypted (`OPEN`).

32.3.3.1.2.4 Static IP Address

In the case you cannot obtain an IP address from a DHCP server, you can set a fixed IP address. Replace the `DHCP` keyword shown above with the address information. Be sure to retain any other parameters you have set up for selecting an access point:

```
ifconfig_ath0="inet 192.168.1.100 netmask 255.255.255.0 ssid your_ssid_here"
```

32.3.3.1.3 WPA

WPA (Wi-Fi Protected Access) is a security protocol used together with 802.11 networks to address the lack of proper authentication and the weakness of WEP. WPA leverages the 802.1X authentication protocol and uses one of several ciphers instead of WEP for data integrity. The only cipher required by WPA is TKIP (Temporary Key Integrity Protocol) which is a cipher that extends the basic RC4 cipher used by WEP by adding integrity checking, tamper detection, and measures for responding to any detected intrusions. TKIP is designed to work on legacy hardware with only software modification; it represents a compromise that improves security but is still not entirely immune to attack. WPA also specifies the AES-CCMP cipher as an alternative to TKIP and that is preferred when possible; for this specification the term WPA2 (or RSN) is commonly used.

WPA defines authentication and encryption protocols. Authentication is most commonly done using one of two techniques: by 802.1X and a backend authentication service such as RADIUS, or by a minimal handshake between the station and the access point using a pre-shared secret. The former is commonly termed WPA Enterprise with the latter known as WPA Personal. Since most people will not set up a RADIUS backend server for wireless network, WPA-PSK is by far the most commonly encountered configuration for WPA.

The control of the wireless connection and the authentication (key negotiation or authentication with a server) is done with the wpa_supplicant(8) utility. This program requires a configuration file, `/etc/wpa_supplicant.conf`, to run. More information regarding this file can be found in the wpa_supplicant.conf(5) manual page.

32.3.3.1.3.1 WPA-PSK

WPA-PSK also known as WPA-Personal is based on a pre-shared key (PSK) generated from a given password and that will be used as the master key in the wireless network. This means every wireless user will share the same key. WPA-PSK is intended for small networks where the use of an authentication server is not possible or desired.

> **Ðñïåéäïðïßçóç:** Always use strong passwords that are sufficiently long and made from a rich alphabet so they will not be guessed and/or attacked.

The first step is the configuration of the `/etc/wpa_supplicant.conf` file with the SSID and the pre-shared key of your network:

```
network={
  ssid="freebsdap"
  psk="freebsdmall"
}
```

Then, in `/etc/rc.conf`, we indicate that the wireless device configuration will be done with WPA and the IP address will be obtained with DHCP:

```
ifconfig_ath0="WPA DHCP"
```

Then, we can bring up the interface:

```
# /etc/rc.d/netif start
Starting wpa_supplicant.
DHCPDISCOVER on ath0 to 255.255.255.255 port 67 interval 5
DHCPDISCOVER on ath0 to 255.255.255.255 port 67 interval 6
DHCPOFFER from 192.168.0.1
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPACK from 192.168.0.1
bound to 192.168.0.254 -- renewal in 300 seconds.
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.254 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (OFDM/36Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA privacy ON deftxkey UNDEF TKIP 2:128-bit txpowmax 36
      protmode CTS roaming MANUAL bintval 100
```

Or you can try to configure it manually using the same `/etc/wpa_supplicant.conf` above, and run:

```
# wpa_supplicant -i ath0 -c /etc/wpa_supplicant.conf
Trying to associate with 00:11:95:c3:0d:ac (SSID='freebsdap' freq=2412 MHz)
Associated with 00:11:95:c3:0d:ac
WPA: Key negotiation completed with 00:11:95:c3:0d:ac [PTK=TKIP GTK=TKIP]
```

The next operation is the launch of the `dhclient` command to get the IP address from the DHCP server:

```
# dhclient ath0
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPACK from 192.168.0.1
bound to 192.168.0.254 -- renewal in 300 seconds.
# ifconfig ath0
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.254 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (OFDM/48Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA privacy ON deftxkey UNDEF TKIP 2:128-bit txpowmax 36
      protmode CTS roaming MANUAL bintval 100
```

> **Óçìåßùóç:** If the `/etc/rc.conf` is set up with the line `ifconfig_ath0="DHCP"` then it is no need to run the `dhclient` command manually, `dhclient` will be launched after `wpa_supplicant` plumbs the keys.

In the case where the use of DHCP is not possible, you can set a static IP address after `wpa_supplicant` has authenticated the station:

```
# ifconfig ath0 inet 192.168.0.100 netmask 255.255.255.0
# ifconfig ath0
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.100 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (OFDM/36Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA privacy ON deftxkey UNDEF TKIP 2:128-bit txpowmax 36
      protmode CTS roaming MANUAL bintval 100
```

When DHCP is not used, you also have to manually set up the default gateway and the nameserver:

```
# route add default your_default_router
# echo "nameserver your_DNS_server" >> /etc/resolv.conf
```

32.3.3.1.3.2 WPA with EAP-TLS

The second way to use WPA is with an 802.1X backend authentication server, in this case WPA is called WPA-Enterprise to make difference with the less secure WPA-Personal with its pre-shared key. The authentication in WPA-Enterprise is based on EAP (Extensible Authentication Protocol).

EAP does not come with an encryption method, it was decided to embed EAP inside an encrypted tunnel. Many types of EAP authentication methods have been designed, the most common methods are EAP-TLS, EAP-TTLS and EAP-PEAP.

EAP-TLS (EAP with Transport Layer Security) is a very well-supported authentication protocol in the wireless world since it was the first EAP method to be certified by the Wi-Fi alliance (http://www.wi-fi.org/). EAP-TLS will require three certificates to run: the CA certificate (installed on all machines), the server certificate for your authentication server, and one client certificate for each wireless client. In this EAP method, both authentication server and wireless client authenticate each other in presenting their respective certificates, and they verify that these certificates were signed by your organization’s certificate authority (CA).

As previously, the configuration is done via `/etc/wpa_supplicant.conf`:

```
network={
  ssid="freebsdap" ❶
  proto=RSN  ❷
  key_mgmt=WPA-EAP ❸
  eap=TLS ❹
  identity="loader" ❺
  ca_cert="/etc/certs/cacert.pem" ❻
  client_cert="/etc/certs/clientcert.pem" ❼
  private_key="/etc/certs/clientkey.pem" ❽
  private_key_passwd="freebsdmallclient" ❾
}
```

❶ This field indicates the network name (SSID).

❷ Here, we use RSN (IEEE 802.11i) protocol, i.e., WPA2.

❸ The `key_mgmt` line refers to the key management protocol we use. In our case it is WPA using EAP authentication: `WPA-EAP`.

❹ In this field, we mention the EAP method for our connection.

❺ The `identity` field contains the identity string for EAP.

❻ The `ca_cert` field indicates the pathname of the CA certificate file. This file is needed to verify the server certificat.

❼ The `client_cert` line gives the pathname to the client certificate file. This certificate is unique to each wireless client of the network.

❽ The `private_key` field is the pathname to the client certificate private key file.

❾ The `private_key_passwd` field contains the passphrase for the private key.

Then add the following line to `/etc/rc.conf`:

```
ifconfig_ath0="WPA DHCP"
```

The next step is to bring up the interface with the help of the `rc.d` facility:

```
# /etc/rc.d/netif start
Starting wpa_supplicant.
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPACK from 192.168.0.20
bound to 192.168.0.254 -- renewal in 300 seconds.
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.254 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (DS/11Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA2/802.11i privacy ON deftxkey UNDEF TKIP 2:128-bit
      txpowmax 36 protmode CTS roaming MANUAL bintval 100
```

As previously shown, it is also possible to bring up the interface manually with both `wpa_supplicant` and `ifconfig` commands.

32.3.3.1.3.3 WPA with EAP-TTLS

With EAP-TLS both the authentication server and the client need a certificate, with EAP-TTLS (EAP-Tunneled Transport Layer Security) a client certificate is optional. This method is close to what some secure web sites do , where the web server can create a secure SSL tunnel even if the visitors do not have client-side certificates. EAP-TTLS will use the encrypted TLS tunnel for safe transport of the authentication data.

The configuration is done via the `/etc/wpa_supplicant.conf` file:

```
network={
  ssid="freebsdap"
  proto=RSN
  key_mgmt=WPA-EAP
  eap=TTLS ❶
  identity="test" ❷
  password="test" ❸
  ca_cert="/etc/certs/cacert.pem" ❹
  phase2="auth=MD5" ❺
}
```

❶ In this field, we mention the EAP method for our connection.

❷ The `identity` field contains the identity string for EAP authentication inside the encrypted TLS tunnel.

❸ The `password` field contains the passphrase for the EAP authentication.

❹ The `ca_cert` field indicates the pathname of the CA certificate file. This file is needed to verify the server certificat.

❺ In this field, we mention the authentication method used in the encrypted TLS tunnel. In our case, EAP with MD5-Challenge has been used. The “inner authentication” phase is often called “phase2”.

You also have to add the following line to `/etc/rc.conf`:

```
ifconfig_ath0="WPA DHCP"
```

The next step is to bring up the interface:

```
# /etc/rc.d/netif start
Starting wpa_supplicant.
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPACK from 192.168.0.20
bound to 192.168.0.254 -- renewal in 300 seconds.
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.254 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (DS/11Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA2/802.11i privacy ON deftxkey UNDEF TKIP 2:128-bit
      txpowmax 36 protmode CTS roaming MANUAL bintval 100
```

32.3.3.1.3.4 WPA with EAP-PEAP

PEAP (Protected EAP) has been designed as an alternative to EAP-TTLS. There are two types of PEAP methods, the most common one is PEAPv0/EAP-MSCHAPv2. In the rest of this document, we will use the PEAP term to refer to that EAP method. PEAP is the most used EAP standard after EAP-TLS, in other words if you have a network with mixed OSes, PEAP should be the most supported standard after EAP-TLS.

PEAP is similar to EAP-TTLS: it uses a server-side certificate to authenticate clients by creating an encrypted TLS tunnel between the client and the authentication server, which protects the ensuing exchange of authentication information. In term of security the difference between EAP-TTLS and PEAP is that PEAP authentication broadcasts the username in clear, only the password is sent in the encrypted TLS tunnel. EAP-TTLS will use the TLS tunnel for both username and password.

We have to edit the `/etc/wpa_supplicant.conf` file and add the EAP-PEAP related settings:

```
network={
  ssid="freebsdap"
  proto=RSN
  key_mgmt=WPA-EAP
  eap=PEAP ❶
  identity="test" ❷
  password="test" ❸
  ca_cert="/etc/certs/cacert.pem" ❹
  phase1="peaplabel=0" ❺
  phase2="auth=MSCHAPV2" ❻
}
```

❶ In this field, we mention the EAP method for our connection.

❷ The `identity` field contains the identity string for EAP authentication inside the encrypted TLS tunnel.

❸ The `password` field contains the passphrase for the EAP authentication.

❹ The `ca_cert` field indicates the pathname of the CA certificate file. This file is needed to verify the server certificat.

❺ This field contains the parameters for the first phase of the authentication (the TLS tunnel). According to the authentication server used, you will have to specify a specific label for the authentication. Most of time, the label will be “client EAP encryption” which is set by using `peaplabel=0`. More information can be found in the wpa_supplicant.conf(5) manual page.

❻ In this field, we mention the authentication protocol used in the encrypted TLS tunnel. In the case of PEAP, it is `auth=MSCHAPV2`.

The following must be added to `/etc/rc.conf`:

```
ifconfig_ath0="WPA DHCP"
```

Then, we can bring up the interface:

```
# /etc/rc.d/netif start
Starting wpa_supplicant.
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPREQUEST on ath0 to 255.255.255.255 port 67
DHCPACK from 192.168.0.20
bound to 192.168.0.254 -- renewal in 300 seconds.
ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
      inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
      inet 192.168.0.254 netmask 0xffffff00 broadcast 192.168.0.255
      ether 00:11:95:d5:43:62
      media: IEEE 802.11 Wireless Ethernet autoselect (DS/11Mbps)
      status: associated
      ssid freebsdap channel 1 bssid 00:11:95:c3:0d:ac
      authmode WPA2/802.11i privacy ON deftxkey UNDEF TKIP 2:128-bit
      txpowmax 36 protmode CTS roaming MANUAL bintval 100
```

32.3.3.1.4 WEP

WEP (Wired Equivalent Privacy) is part of the original 802.11 standard. There is no authentication mechanism, only a weak form of access control, and it is easily to be cracked.

WEP can be set up with `ifconfig`:

```
# ifconfig ath0 inet 192.168.1.100 netmask 255.255.255.0 ssid my_net \
    wepmode on weptxkey 3 wepkey 3:0x3456789012
```

- The `weptxkey` means which WEP key will be used in the transmission. Here we used the third key. This must match the setting in the access point.

- The `wepkey` means setting the selected WEP key. It should in the format *`index:key`*, if the index is not given, key `1` is set. That is to say we need to set the index if we use keys other than the first key.

> **Óçìåßùóç:** You must replace the `0x3456789012` with the key configured for use on the access point.

You are encouraged to read ifconfig(8) manual page for further information.

The `wpa_supplicant` facility also can be used to configure your wireless interface with WEP. The example above can be set up by adding the following lines to `/etc/wpa_supplicant.conf`:

```
network={
  ssid="my_net"
  key_mgmt=NONE
  wep_key3=3456789012
  wep_tx_keyidx=3
}
```

Then:

```
# wpa_supplicant -i ath0 -c /etc/wpa_supplicant.conf
Trying to associate with 00:13:46:49:41:76 (SSID=’dlinkap’ freq=2437 MHz)
Associated with 00:13:46:49:41:76
```

32.3.4 Ad-hoc Mode

IBSS mode, also called ad-hoc mode, is designed for point to point connections. For example, to establish an ad-hoc network between the machine `A` and the machine `B` we will just need to choose two IP adresses and a SSID.

On the box `A`:

```
# ifconfig ath0 inet 192.168.0.1 netmask 255.255.255.0 ssid freebsdap mediaopt adhoc
# ifconfig ath0
  ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
          inet 192.168.0.1 netmask 0xffffff00 broadcast 192.168.0.255
          inet6 fe80::211:95ff:fec3:dac%ath0 prefixlen 64 scopeid 0x4
          ether 00:11:95:c3:0d:ac
          media: IEEE 802.11 Wireless Ethernet autoselect <adhoc> (autoselect <adhoc>)
          status: associated
          ssid freebsdap channel 2 bssid 02:11:95:c3:0d:ac
          authmode OPEN privacy OFF txpowmax 36 protmode CTS bintval 100
```

The `adhoc` parameter indicates the interface is running in the IBSS mode.

On `B`, we should be able to detect `A`:

```
# ifconfig ath0 up scan
  SSID            BSSID              CHAN RATE  S:N   INT CAPS
  freebsdap       02:11:95:c3:0d:ac    2   54M 19:0   100 IS
```

The `I` in the output confirms the machine `A` is in ad-hoc mode. We just have to configure `B` with a different IP address:

```
# ifconfig ath0 inet 192.168.0.2 netmask 255.255.255.0 ssid freebsdap mediaopt adhoc
# ifconfig ath0
  ath0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
          inet6 fe80::211:95ff:fed5:4362%ath0 prefixlen 64 scopeid 0x1
          inet 192.168.0.2 netmask 0xffffff00 broadcast 192.168.0.255
          ether 00:11:95:d5:43:62
          media: IEEE 802.11 Wireless Ethernet autoselect <adhoc> (autoselect <adhoc>)
          status: associated
          ssid freebsdap channel 2 bssid 02:11:95:c3:0d:ac
          authmode OPEN privacy OFF txpowmax 36 protmode CTS bintval 100
```

Both `A` and `B` are now ready to exchange informations.

32.3.5 Troubleshooting

If you are having trouble with wireless networking, there are a number of steps you can take to help troubleshoot the problem.

- If you do not see the access point listed when scanning be sure you have not configured your wireless device to a limited set of channels.
- If you cannot associate to an access point verify the configuration of your station matches the one of the access point. This includes the authentication scheme and any security protocols. Simplify your configuration as much as possible. If you are using a security protocol such as WPA or WEP configure the access point for open authentication and no security to see if you can get traffic to pass.
- Once you can associate to the access point diagnose any security configuration using simple tools like ping(8).

  The `wpa_supplicant` has much debugging support; try running it manually with the `-dd` option and look at the system logs.
- There are also many lower-level debugging tools. You can enable debugging messages in the 802.11 protocol support layer using the `wlandebug` program found in `/usr/src/tools/tools/net80211`. For example:

  ```
  # wlandebug -i ath0 +scan+auth+debug+assoc
    net.wlan.0.debug: 0 => 0xc80000<assoc,auth,scan>
  ```

  can be used to enable console messages related to scanning for access points and doing the 802.11 protocol handshakes required to arrange communication.

  There are also many useful statistics maintained by the 802.11 layer; the `wlanstats` tool will dump these informations. These statistics should identify all errors identified by the 802.11 layer. Beware however that some errors are identified in the device drivers that lie below the 802.11 layer so they may not show up. To diagnose device-specific problems you need to refer to the drivers' documentation.

If the above information does not help to clarify the problem, please submit a problem report and include output from the above tools.

32.4 Bluetooth

Written by Pav Lucistnik.

32.4.1 Introduction

Bluetooth is a wireless technology for creating personal networks operating in the 2.4 GHz unlicensed band, with a range of 10 meters. Networks are usually formed ad-hoc from portable devices such as cellular phones, handhelds and laptops. Unlike the other popular wireless technology, Wi-Fi, Bluetooth offers higher level service profiles, e.g. FTP-like file servers, file pushing, voice transport, serial line emulation, and more.

The Bluetooth stack in FreeBSD is implemented using the Netgraph framework (see netgraph(4)). A broad variety of Bluetooth USB dongles is supported by the ng_ubt(4) driver. The Broadcom BCM2033 chip based Bluetooth devices are supported via the ubtbcmfw(4) and ng_ubt(4) drivers. The 3Com Bluetooth PC Card 3CRWB60-A is supported by the ng_bt3c(4) driver. Serial and UART based Bluetooth devices are supported via sio(4), ng_h4(4) and hcseriald(8). This section describes the use of the USB Bluetooth dongle.

32.4.2 Plugging in the Device

By default Bluetooth device drivers are available as kernel modules. Before attaching a device, you will need to load the driver into the kernel:

```
# kldload ng_ubt
```

If the Bluetooth device is present in the system during system startup, load the module from `/boot/loader.conf`:

```
ng_ubt_load="YES"
```

Plug in your USB dongle. The output similar to the following will appear on the console (or in syslog):

```
ubt0: vendor 0x0a12 product 0x0001, rev 1.10/5.25, addr 2
ubt0: Interface 0 endpoints: interrupt=0x81, bulk-in=0x82, bulk-out=0x2
ubt0: Interface 1 (alt.config 5) endpoints: isoc-in=0x83, isoc-out=0x3,
      wMaxPacketSize=49, nframes=6, buffer size=294
```

> **Óçìåßùóç:** The Bluetooth stack has to be started manually on FreeBSD 6.0, and on FreeBSD 5.X before 5.5. It is done automatically from devd(8) on FreeBSD 5.5, 6.1 and newer.
>
> Copy `/usr/share/examples/netgraph/bluetooth/rc.bluetooth` into some convenient place, like `/etc/rc.bluetooth`. This script is used to start and stop the Bluetooth stack. It is a good idea to stop the stack before unplugging the device, but it is not (usually) fatal. When starting the stack, you will receive output similar to the following:

```
# /etc/rc.bluetooth start ubt0
BD_ADDR: 00:02:72:00:d4:1a
Features: 0xff 0xff 0xf 00 00 00 00 00
<3-Slot> <5-Slot> <Encryption> <Slot offset>
<Timing accuracy> <Switch> <Hold mode> <Sniff mode>
<Park mode> <RSSI> <Channel quality> <SCO link>
<HV2 packets> <HV3 packets> <u-law log> <A-law log> <CVSD>
<Paging scheme> <Power control> <Transparent SCO data>
Max. ACL packet size: 192 bytes
Number of ACL packets: 8
```

```
    Max. SCO packet size: 64 bytes
    Number of SCO packets: 8
```

32.4.3 Host Controller Interface (HCI)

Host Controller Interface (HCI) provides a command interface to the baseband controller and link manager, and access to hardware status and control registers. This interface provides a uniform method of accessing the Bluetooth baseband capabilities. HCI layer on the Host exchanges data and commands with the HCI firmware on the Bluetooth hardware. The Host Controller Transport Layer (i.e. physical bus) driver provides both HCI layers with the ability to exchange information with each other.

A single Netgraph node of type *hci* is created for a single Bluetooth device. The HCI node is normally connected to the Bluetooth device driver node (downstream) and the L2CAP node (upstream). All HCI operations must be performed on the HCI node and not on the device driver node. Default name for the HCI node is “devicehci”. For more details refer to the ng_hci(4) manual page.

One of the most common tasks is discovery of Bluetooth devices in RF proximity. This operation is called *inquiry*. Inquiry and other HCI related operations are done with the hccontrol(8) utility. The example below shows how to find out which Bluetooth devices are in range. You should receive the list of devices in a few seconds. Note that a remote device will only answer the inquiry if it put into *discoverable* mode.

```
% hccontrol -n ubt0hci inquiry
Inquiry result, num_responses=1
Inquiry result #0
       BD_ADDR: 00:80:37:29:19:a4
       Page Scan Rep. Mode: 0x1
       Page Scan Period Mode: 00
       Page Scan Mode: 00
       Class: 52:02:04
       Clock offset: 0x78ef
Inquiry complete. Status: No error [00]
```

`BD_ADDR` is unique address of a Bluetooth device, similar to MAC addresses of a network card. This address is needed for further communication with a device. It is possible to assign human readable name to a BD_ADDR. The `/etc/bluetooth/hosts` file contains information regarding the known Bluetooth hosts. The following example shows how to obtain human readable name that was assigned to the remote device:

```
% hccontrol -n ubt0hci remote_name_request 00:80:37:29:19:a4
BD_ADDR: 00:80:37:29:19:a4
Name: Pav’s T39
```

If you perform an inquiry on a remote Bluetooth device, it will find your computer as “your.host.name (ubt0)”. The name assigned to the local device can be changed at any time.

The Bluetooth system provides a point-to-point connection (only two Bluetooth units involved), or a point-to-multipoint connection. In the point-to-multipoint connection the connection is shared among several Bluetooth devices. The following example shows how to obtain the list of active baseband connections for the local device:

```
% hccontrol -n ubt0hci read_connection_list
```

```
Remote BD_ADDR    Handle Type Mode Role Encrypt Pending Queue State
00:80:37:29:19:a4     41  ACL    0 MAST    NONE       0     0 OPEN
```

A *connection handle* is useful when termination of the baseband connection is required. Note, that it is normally not required to do it by hand. The stack will automatically terminate inactive baseband connections.

```
# hccontrol -n ubt0hci disconnect 41
Connection handle: 41
Reason: Connection terminated by local host [0x16]
```

Refer to `hccontrol help` for a complete listing of available HCI commands. Most of the HCI commands do not require superuser privileges.

32.4.4 Logical Link Control and Adaptation Protocol (L2CAP)

Logical Link Control and Adaptation Protocol (L2CAP) provides connection-oriented and connectionless data services to upper layer protocols with protocol multiplexing capability and segmentation and reassembly operation. L2CAP permits higher level protocols and applications to transmit and receive L2CAP data packets up to 64 kilobytes in length.

L2CAP is based around the concept of *channels*. Channel is a logical connection on top of baseband connection. Each channel is bound to a single protocol in a many-to-one fashion. Multiple channels can be bound to the same protocol, but a channel cannot be bound to multiple protocols. Each L2CAP packet received on a channel is directed to the appropriate higher level protocol. Multiple channels can share the same baseband connection.

A single Netgraph node of type *l2cap* is created for a single Bluetooth device. The L2CAP node is normally connected to the Bluetooth HCI node (downstream) and Bluetooth sockets nodes (upstream). Default name for the L2CAP node is “devicel2cap”. For more details refer to the ng_l2cap(4) manual page.

A useful command is l2ping(8), which can be used to ping other devices. Some Bluetooth implementations might not return all of the data sent to them, so `0 bytes` in the following example is normal.

```
# l2ping -a 00:80:37:29:19:a4
0 bytes from 0:80:37:29:19:a4 seq_no=0 time=48.633 ms result=0
0 bytes from 0:80:37:29:19:a4 seq_no=1 time=37.551 ms result=0
0 bytes from 0:80:37:29:19:a4 seq_no=2 time=28.324 ms result=0
0 bytes from 0:80:37:29:19:a4 seq_no=3 time=46.150 ms result=0
```

The l2control(8) utility is used to perform various operations on L2CAP nodes. This example shows how to obtain the list of logical connections (channels) and the list of baseband connections for the local device:

```
% l2control -a 00:02:72:00:d4:1a read_channel_list
L2CAP channels:
Remote BD_ADDR     SCID/ DCID   PSM  IMTU/ OMTU State
00:07:e0:00:0b:ca    66/   64     3   132/  672 OPEN
% l2control -a 00:02:72:00:d4:1a read_connection_list
L2CAP connections:
Remote BD_ADDR    Handle Flags Pending State
00:07:e0:00:0b:ca     41 O           0 OPEN
```

Another diagnostic tool is btsockstat(1). It does a job similar to as netstat(1) does, but for Bluetooth network-related data structures. The example below shows the same logical connection as l2control(8) above.

```
% btsockstat
Active L2CAP sockets
PCB      Recv-Q Send-Q Local address/PSM       Foreign address   CID   State
c2afe900      0      0 00:02:72:00:d4:1a/3     00:07:e0:00:0b:ca 66    OPEN
Active RFCOMM sessions
L2PCB    PCB      Flag MTU   Out-Q DLCs State
c2afe900 c2b53380 1    127   0     Yes  OPEN
Active RFCOMM sockets
PCB      Recv-Q Send-Q Local address     Foreign address   Chan DLCI State
c2e8bc80      0    250 00:02:72:00:d4:1a 00:07:e0:00:0b:ca 3    6    OPEN
```

32.4.5 RFCOMM Protocol

The RFCOMM protocol provides emulation of serial ports over the L2CAP protocol. The protocol is based on the ETSI standard TS 07.10. RFCOMM is a simple transport protocol, with additional provisions for emulating the 9 circuits of RS-232 (EIATIA-232-E) serial ports. The RFCOMM protocol supports up to 60 simultaneous connections (RFCOMM channels) between two Bluetooth devices.

For the purposes of RFCOMM, a complete communication path involves two applications running on different devices (the communication endpoints) with a communication segment between them. RFCOMM is intended to cover applications that make use of the serial ports of the devices in which they reside. The communication segment is a Bluetooth link from one device to another (direct connect).

RFCOMM is only concerned with the connection between the devices in the direct connect case, or between the device and a modem in the network case. RFCOMM can support other configurations, such as modules that communicate via Bluetooth wireless technology on one side and provide a wired interface on the other side.

In FreeBSD the RFCOMM protocol is implemented at the Bluetooth sockets layer.

32.4.6 Pairing of Devices

By default, Bluetooth communication is not authenticated, and any device can talk to any other device. A Bluetooth device (for example, cellular phone) may choose to require authentication to provide a particular service (for example, Dial-Up service). Bluetooth authentication is normally done with *PIN codes*. A PIN code is an ASCII string up to 16 characters in length. User is required to enter the same PIN code on both devices. Once user has entered the PIN code, both devices will generate a *link key*. After that the link key can be stored either in the devices themselves or in a persistent storage. Next time both devices will use previously generated link key. The described above procedure is called *pairing*. Note that if the link key is lost by any device then pairing must be repeated.

The hcsecd(8) daemon is responsible for handling of all Bluetooth authentication requests. The default configuration file is `/etc/bluetooth/hcsecd.conf`. An example section for a cellular phone with the PIN code arbitrarily set to “1234” is shown below:

```
device {
        bdaddr  00:80:37:29:19:a4;
        name    "Pav’s T39";
        key     nokey;
        pin     "1234";
      }
```

There is no limitation on PIN codes (except length). Some devices (for example Bluetooth headsets) may have a fixed PIN code built in. The `-d` switch forces the hcsecd(8) daemon to stay in the foreground, so it is easy to see what is happening. Set the remote device to receive pairing and initiate the Bluetooth connection to the remote device. The remote device should say that pairing was accepted, and request the PIN code. Enter the same PIN code as you have in `hcsecd.conf`. Now your PC and the remote device are paired. Alternatively, you can initiate pairing on the remote device.

On FreeBSD 5.5, 6.1 and newer, the following line can be added to the `/etc/rc.conf` file to have **hcsecd** started automatically on system start:

```
hcsecd_enable="YES"
```

The following is a sample of the **hcsecd** daemon output:

```
hcsecd[16484]: Got Link_Key_Request event from ’ubt0hci’, remote bdaddr 0:80:37:29:19:a4
hcsecd[16484]: Found matching entry, remote bdaddr 0:80:37:29:19:a4, name ’Pav’s T39’, link key d
hcsecd[16484]: Sending Link_Key_Negative_Reply to ’ubt0hci’ for remote bdaddr 0:80:37:29:19:a4
hcsecd[16484]: Got PIN_Code_Request event from ’ubt0hci’, remote bdaddr 0:80:37:29:19:a4
hcsecd[16484]: Found matching entry, remote bdaddr 0:80:37:29:19:a4, name ’Pav’s T39’, PIN code e
hcsecd[16484]: Sending PIN_Code_Reply to ’ubt0hci’ for remote bdaddr 0:80:37:29:19:a4
```

32.4.7 Service Discovery Protocol (SDP)

The Service Discovery Protocol (SDP) provides the means for client applications to discover the existence of services provided by server applications as well as the attributes of those services. The attributes of a service include the type or class of service offered and the mechanism or protocol information needed to utilize the service.

SDP involves communication between a SDP server and a SDP client. The server maintains a list of service records that describe the characteristics of services associated with the server. Each service record contains information about a single service. A client may retrieve information from a service record maintained by the SDP server by issuing a SDP request. If the client, or an application associated with the client, decides to use a service, it must open a separate connection to the service provider in order to utilize the service. SDP provides a mechanism for discovering services and their attributes, but it does not provide a mechanism for utilizing those services.

Normally, a SDP client searches for services based on some desired characteristics of the services. However, there are times when it is desirable to discover which types of services are described by an SDP server’s service records without any a priori information about the services. This process of looking for any offered services is called *browsing*.

The Bluetooth SDP server sdpd(8) and command line client sdpcontrol(8) are included in the standard FreeBSD installation. The following example shows how to perform a SDP browse query.

```
% sdpcontrol -a 00:01:03:fc:6e:ec browse
Record Handle: 00000000
Service Class ID List:
        Service Discovery Server (0x1000)
Protocol Descriptor List:
        L2CAP (0x0100)
                Protocol specific parameter #1: u/int/uuid16 1
                Protocol specific parameter #2: u/int/uuid16 1

Record Handle: 0x00000001
```

```
Service Class ID List:
        Browse Group Descriptor (0x1001)

Record Handle: 0x00000002
Service Class ID List:
        LAN Access Using PPP (0x1102)
Protocol Descriptor List:
        L2CAP (0x0100)
        RFCOMM (0x0003)
                Protocol specific parameter #1: u/int8/bool 1
Bluetooth Profile Descriptor List:
        LAN Access Using PPP (0x1102) ver. 1.0
```

... and so on. Note that each service has a list of attributes (RFCOMM channel for example). Depending on the service you might need to make a note of some of the attributes. Some Bluetooth implementations do not support service browsing and may return an empty list. In this case it is possible to search for the specific service. The example below shows how to search for the OBEX Object Push (OPUSH) service:

```
% sdpcontrol -a 00:01:03:fc:6e:ec search OPUSH
```

Offering services on FreeBSD to Bluetooth clients is done with the sdpd(8) server. On FreeBSD 5.5, 6.1 and newer, the following line can be added to the `/etc/rc.conf` file:

```
sdpd_enable="YES"
```

Then the **sdpd** daemon can be started with:

```
# /etc/rc.d/sdpd start
```

On FreeBSD 6.0, and on FreeBSD 5.X before 5.5, **sdpd** is not integrated into the system startup scripts. It has to be started manually with:

```
# sdpd
```

The local server application that wants to provide Bluetooth service to the remote clients will register service with the local SDP daemon. The example of such application is rfcomm_pppd(8). Once started it will register Bluetooth LAN service with the local SDP daemon.

The list of services registered with the local SDP server can be obtained by issuing SDP browse query via local control channel:

```
# sdpcontrol -l browse
```

32.4.8 Dial-Up Networking (DUN) and Network Access with PPP (LAN) Profiles

The Dial-Up Networking (DUN) profile is mostly used with modems and cellular phones. The scenarios covered by this profile are the following:

- use of a cellular phone or modem by a computer as a wireless modem for connecting to a dial-up Internet access server, or using other dial-up services;
- use of a cellular phone or modem by a computer to receive data calls.

Network Access with PPP (LAN) profile can be used in the following situations:

- LAN access for a single Bluetooth device;
- LAN access for multiple Bluetooth devices;
- PC to PC (using PPP networking over serial cable emulation).

In FreeBSD both profiles are implemented with ppp(8) and rfcomm_pppd(8) - a wrapper that converts RFCOMM Bluetooth connection into something PPP can operate with. Before any profile can be used, a new PPP label in the `/etc/ppp/ppp.conf` must be created. Consult rfcomm_pppd(8) manual page for examples.

In the following example rfcomm_pppd(8) will be used to open RFCOMM connection to remote device with BD_ADDR 00:80:37:29:19:a4 on DUN RFCOMM channel. The actual RFCOMM channel number will be obtained from the remote device via SDP. It is possible to specify RFCOMM channel by hand, and in this case rfcomm_pppd(8) will not perform SDP query. Use sdpcontrol(8) to find out RFCOMM channel on the remote device.

```
# rfcomm_pppd -a 00:80:37:29:19:a4 -c -C dun -l rfcomm-dialup
```

In order to provide Network Access with PPP (LAN) service the sdpd(8) server must be running. A new entry for LAN clients must be created in the `/etc/ppp/ppp.conf` file. Consult rfcomm_pppd(8) manual page for examples. Finally, start RFCOMM PPP server on valid RFCOMM channel number. The RFCOMM PPP server will automatically register Bluetooth LAN service with the local SDP daemon. The example below shows how to start RFCOMM PPP server.

```
# rfcomm_pppd -s -C 7 -l rfcomm-server
```

32.4.9 OBEX Object Push (OPUSH) Profile

OBEX is a widely used protocol for simple file transfers between mobile devices. Its main use is in infrared communication, where it is used for generic file transfers between notebooks or PDAs, and for sending business cards or calendar entries between cellular phones and other devices with PIM applications.

The OBEX server and client are implemented as a third-party package **obexapp**, which is available as `comms/obexapp` port.

OBEX client is used to push and/or pull objects from the OBEX server. An object can, for example, be a business card or an appointment. The OBEX client can obtain RFCOMM channel number from the remote device via SDP. This can be done by specifying service name instead of RFCOMM channel number. Supported service names are: IrMC, FTRN and OPUSH. It is possible to specify RFCOMM channel as a number. Below is an example of an OBEX session, where device information object is pulled from the cellular phone, and a new object (business card) is pushed into the phone's directory.

```
% obexapp -a 00:80:37:29:19:a4 -C IrMC
obex> get telecom/devinfo.txt devinfo-t39.txt
Success, response: OK, Success (0x20)
obex> put new.vcf
Success, response: OK, Success (0x20)
obex> di
Success, response: OK, Success (0x20)
```

In order to provide OBEX Object Push service, sdpd(8) server must be running. A root folder, where all incoming objects will be stored, must be created. The default path to the root folder is `/var/spool/obex`. Finally, start OBEX server on valid RFCOMM channel number. The OBEX server will automatically register OBEX Object Push service with the local SDP daemon. The example below shows how to start OBEX server.

```
# obexapp -s -C 10
```

32.4.10 Serial Port Profile (SPP)

The Serial Port Profile (SPP) allows Bluetooth devices to perform RS232 (or similar) serial cable emulation. The scenario covered by this profile deals with legacy applications using Bluetooth as a cable replacement, through a virtual serial port abstraction.

The rfcomm_sppd(1) utility implements the Serial Port profile. A pseudo tty is used as a virtual serial port abstraction. The example below shows how to connect to a remote device Serial Port service. Note that you do not have to specify a RFCOMM channel - rfcomm_sppd(1) can obtain it from the remote device via SDP. If you would like to override this, specify a RFCOMM channel on the command line.

```
# rfcomm_sppd -a 00:07:E0:00:0B:CA -t /dev/ttyp6
rfcomm_sppd[94692]: Starting on /dev/ttyp6...
```

Once connected, the pseudo tty can be used as serial port:

```
# cu -l ttyp6
```

32.4.11 Troubleshooting

32.4.11.1 A remote device cannot connect

Some older Bluetooth devices do not support role switching. By default, when FreeBSD is accepting a new connection, it tries to perform a role switch and become master. Devices, which do not support this will not be able to connect. Note that role switching is performed when a new connection is being established, so it is not possible to ask the remote device if it does support role switching. There is a HCI option to disable role switching on the local side:

```
# hccontrol -n ubt0hci write_node_role_switch 0
```

32.4.11.2 Something is going wrong, can I see what exactly is happening?

Yes, you can. Use the third-party package **hcidump**, which is available as `comms/hcidump` port. The **hcidump** utility is similar to tcpdump(1). It can be used to display the content of the Bluetooth packets on the terminal and to dump the Bluetooth packets to a file.

32.5 Bridging

Written by Steve Peterson.

32.5.1 Introduction

It is sometimes useful to divide one physical network (such as an Ethernet segment) into two separate network segments without having to create IP subnets and use a router to connect the segments together. A device that connects two networks together in this fashion is called a “bridge”. A FreeBSD system with two network interface cards can act as a bridge.

The bridge works by learning the MAC layer addresses (Ethernet addresses) of the devices on each of its network interfaces. It forwards traffic between two networks only when its source and destination are on different networks.

In many respects, a bridge is like an Ethernet switch with very few ports.

32.5.2 Situations Where Bridging Is Appropriate

There are two common situations in which a bridge is used today.

32.5.2.1 High Traffic on a Segment

Situation one is where your physical network segment is overloaded with traffic, but you do not want for whatever reason to subnet the network and interconnect the subnets with a router.

Let us consider an example of a newspaper where the Editorial and Production departments are on the same subnetwork. The Editorial users all use server `A` for file service, and the Production users are on server `B`. An Ethernet network is used to connect all users together, and high loads on the network are slowing things down.

If the Editorial users could be segregated on one network segment and the Production users on another, the two network segments could be connected with a bridge. Only the network traffic destined for interfaces on the “other” side of the bridge would be sent to the other network, reducing congestion on each network segment.

32.5.2.2 Filtering/Traffic Shaping Firewall

The second common situation is where firewall functionality is needed without network address translation (NAT).

An example is a small company that is connected via DSL or ISDN to their ISP. They have a 13 globally-accessible IP addresses from their ISP and have 10 PCs on their network. In this situation, using a router-based firewall is difficult because of subnetting issues.

A bridge-based firewall can be configured and dropped into the path just downstream of their DSL/ISDN router without any IP numbering issues.

32.5.3 Configuring a Bridge

32.5.3.1 Network Interface Card Selection

A bridge requires at least two network cards to function. Unfortunately, not all network interface cards support bridging. Read bridge(4) for details on the cards that are supported.

Install and test the two network cards before continuing.

32.5.3.2 Kernel Configuration Changes

To enable kernel support for bridging, add the:

```
options BRIDGE
```

statement to your kernel configuration file, and rebuild your kernel.

32.5.3.3 Firewall Support

If you are planning to use the bridge as a firewall, you will need to add the `IPFIREWALL` option as well. Read ÊåöÜëáéï 31 for general information on configuring the bridge as a firewall.

If you need to allow non-IP packets (such as ARP) to flow through the bridge, there are three options available. The first is to add the following option to the kernel and rebuild:

```
option  IPFIREWALL_DEFAULT_TO_ACCEPT
```

The second is to set the firewall type to “`open`” in the `rc.conf` file:

```
firewall_type="open"
```

Note that these options will make the firewall seem completely transparent; any packet or connection will be permitted by default. This may require significant changes to the firewall ruleset.

The third option is to apply the following ipfw(8) rule:

```
# ipfw add allow mac-type arp layer2
```

Or add it to the current firewall ruleset. This rule effectively allows arp(8) packets through, so it must be be applied near the beginning of the ruleset for early evaluation.

32.5.3.4 Traffic Shaping Support

If you want to use the bridge as a traffic shaper, you will need to add the `DUMMYNET` option to your kernel configuration. Read dummynet(4) for further information.

32.5.4 Enabling the Bridge

Add the line:

```
net.link.ether.bridge.enable=1
```

to `/etc/sysctl.conf` to enable the bridge at runtime, and the line:

```
net.link.ether.bridge.config=if1,if2
```

to enable bridging on the specified interfaces (replace *`if1`* and *`if2`* with the names of your two network interfaces). If you want the bridged packets to be filtered by ipfw(8), you should add:

```
net.link.ether.bridge.ipfw=1
```

as well.

For versions prior to FreeBSD 5.2-RELEASE, use instead the following lines:

```
net.link.ether.bridge=1
net.link.ether.bridge_cfg=if1,if2
net.link.ether.bridge_ipfw=1
```

32.5.5 Other Information

If you want to be able to ssh(1) into the bridge from the network, it is correct to assign one of the network cards an IP address. The consensus is that assigning both cards an address is a bad idea.

If you have multiple bridges on your network, there cannot be more than one path between any two workstations. Technically, this means that there is no support for spanning tree link management.

A bridge can add latency to your ping(8) times, especially for traffic from one segment to another.

32.6 Diskless Operation

Updated by Jean-François Dockès. Reorganized and enhanced by Alex Dupre.

A FreeBSD machine can boot over the network and operate without a local disk, using file systems mounted from an NFS server. No system modification is necessary, beyond standard configuration files. Such a system is relatively easy to set up because all the necessary elements are readily available:

- There are at least two possible methods to load the kernel over the network:
  - PXE: The Intel Preboot eXecution Environment system is a form of smart boot ROM built into some networking cards or motherboards. See pxeboot(8) for more details.
  - The **Etherboot** port (`net/etherboot`) produces ROM-able code to boot kernels over the network. The code can be either burnt into a boot PROM on a network card, or loaded from a local floppy (or hard) disk drive, or from a running MS-DOS system. Many network cards are supported.

- A sample script (`/usr/share/examples/diskless/clone_root`) eases the creation and maintenance of the workstation's root file system on the server. The script will probably require a little customization but it will get you started very quickly.
- Standard system startup files exist in `/etc` to detect and support a diskless system startup.
- Swapping, if needed, can be done either to an NFS file or to a local disk.

There are many ways to set up diskless workstations. Many elements are involved, and most can be customized to suit local taste. The following will describe variations on the setup of a complete system, emphasizing simplicity and compatibility with the standard FreeBSD startup scripts. The system described has the following characteristics:

- The diskless workstations use a shared read-only `/` file system, and a shared read-only `/usr`.

  The root file system is a copy of a standard FreeBSD root (typically the server's), with some configuration files overridden by ones specific to diskless operation or, possibly, to the workstation they belong to.

  The parts of the root which have to be writable are overlaid with md(4) file systems. Any changes will be lost when the system reboots.
- The kernel is transferred and loaded either with **Etherboot** or PXE as some situations may mandate the use of either method.

> **Ðñïóï÷Þ:** As described, this system is insecure. It should live in a protected area of a network, and be untrusted by other hosts.

All the information in this section has been tested using FreeBSD 5.2.1-RELEASE.

32.6.1 Background Information

Setting up diskless workstations is both relatively straightforward and prone to errors. These are sometimes difficult to diagnose for a number of reasons. For example:

- Compile time options may determine different behaviors at runtime.
- Error messages are often cryptic or totally absent.

In this context, having some knowledge of the background mechanisms involved is very useful to solve the problems that may arise.

Several operations need to be performed for a successful bootstrap:

- The machine needs to obtain initial parameters such as its IP address, executable filename, server name, root path. This is done using the DHCP or BOOTP protocols. DHCP is a compatible extension of BOOTP, and uses the same port numbers and basic packet format.

  It is possible to configure a system to use only BOOTP. The bootpd(8) server program is included in the base FreeBSD system.

  However, DHCP has a number of advantages over BOOTP (nicer configuration files, possibility of using PXE, plus many others not directly related to diskless operation), and we will describe mainly a DHCP configuration, with equivalent examples using bootpd(8) when possible. The sample configuration will use the **ISC DHCP** software package (release 3.0.1.r12 was installed on the test server).

- The machine needs to transfer one or several programs to local memory. Either TFTP or NFS are used. The choice between TFTP and NFS is a compile time option in several places. A common source of error is to specify filenames for the wrong protocol: TFTP typically transfers all files from a single directory on the server, and would expect filenames relative to this directory. NFS needs absolute file paths.
- The possible intermediate bootstrap programs and the kernel need to be initialized and executed. There are several important variations in this area:
  - PXE will load pxeboot(8), which is a modified version of the FreeBSD third stage loader. The loader(8) will obtain most parameters necessary to system startup, and leave them in the kernel environment before transferring control. It is possible to use a `GENERIC` kernel in this case.
  - **Etherboot**, will directly load the kernel, with less preparation. You will need to build a kernel with specific options.

  PXE and **Etherboot** work equally well; however, because kernels normally let the loader(8) do more work for them, PXE is the preferred method.

  If your BIOS and network cards support PXE, you should probably use it.
- Finally, the machine needs to access its file systems. NFS is used in all cases.

See also diskless(8) manual page.

32.6.2 Setup Instructions

32.6.2.1 Configuration Using ISC DHCP

The **ISC DHCP** server can answer both BOOTP and DHCP requests.

ISC DHCP 3.0 is not part of the base system. You will first need to install the `net/isc-dhcp3-server` port or the corresponding package.

Once **ISC DHCP** is installed, it needs a configuration file to run (normally named `/usr/local/etc/dhcpd.conf`). Here follows a commented example, where host `margaux` uses **Etherboot** and host `corbieres` uses PXE:

```
default-lease-time 600;
max-lease-time 7200;
authoritative;

option domain-name "example.com";
option domain-name-servers 192.168.4.1;
option routers 192.168.4.1;

subnet 192.168.4.0 netmask 255.255.255.0 {
  use-host-decl-names on; ❶
  option subnet-mask 255.255.255.0;
  option broadcast-address 192.168.4.255;

  host margaux {
    hardware ethernet 01:23:45:67:89:ab;
    fixed-address margaux.example.com;
    next-server 192.168.4.4; ❷
    filename "/data/misc/kernel.diskless"; ❸
    option root-path "192.168.4.4:/data/misc/diskless"; ❹
  }
  host corbieres {
    hardware ethernet 00:02:b3:27:62:df;
    fixed-address corbieres.example.com;
    next-server 192.168.4.4;
    filename "pxeboot";
    option root-path "192.168.4.4:/data/misc/diskless";
  }
}
```

❶ This option tells **dhcpd** to send the value in the `host` declarations as the hostname for the diskless host. An alternate way would be to add an `option host-name` *`margaux`* inside the `host` declarations.

❷ The `next-server` directive designates the TFTP or NFS server to use for loading loader or kernel file (the default is to use the same host as the DHCP server).

❸ The `filename` directive defines the file that **Etherboot** or PXE will load for the next execution step. It must be specified according to the transfer method used. **Etherboot** can be compiled to use NFS or TFTP. The FreeBSD port configures NFS by default. PXE uses TFTP, which is why a relative filename is used here (this may depend on the TFTP server configuration, but would be fairly typical). Also, PXE loads `pxeboot`, not the kernel. There are other interesting possibilities, like loading `pxeboot` from a FreeBSD CD-ROM `/boot` directory (as pxeboot(8) can load a `GENERIC` kernel, this makes it possible to use PXE to boot from a remote CD-ROM).

❹ The `root-path` option defines the path to the root file system, in usual NFS notation. When using PXE, it is possible to leave off the host's IP as long as you do not enable the kernel option BOOTP. The NFS server will then be the same as the TFTP one.

32.6.2.2 Configuration Using BOOTP

Here follows an equivalent **bootpd** configuration (reduced to one client). This would be found in `/etc/bootptab`.

Please note that **Etherboot** must be compiled with the non-default option `NO_DHCP_SUPPORT` in order to use BOOTP, and that PXE *needs* DHCP. The only obvious advantage of **bootpd** is that it exists in the base system.

```
.def100:\
  :hn:ht=1:sa=192.168.4.4:vm=rfc1048:\
  :sm=255.255.255.0:\
  :ds=192.168.4.1:\
  :gw=192.168.4.1:\
  :hd="/tftpboot":\
  :bf="/kernel.diskless":\
  :rp="192.168.4.4:/data/misc/diskless":

margaux:ha=0123456789ab:tc=.def100
```

32.6.2.3 Preparing a Boot Program with Etherboot

Etherboot's Web site (http://etherboot.sourceforge.net) contains extensive documentation (http://etherboot.sourceforge.net/doc/html/userman/t1.html) mainly intended for Linux systems, but nonetheless containing useful information. The following will just outline how you would use **Etherboot** on a FreeBSD system.

You must first install the `net/etherboot` package or port.

You can change the **Etherboot** configuration (i.e. to use TFTP instead of NFS) by editing the `Config` file in the **Etherboot** source directory.

For our setup, we shall use a boot floppy. For other methods (PROM, or MS-DOS program), please refer to the **Etherboot** documentation.

To make a boot floppy, insert a floppy in the drive on the machine where you installed **Etherboot**, then change your current directory to the `src` directory in the **Etherboot** tree and type:

```
# gmake bin32/devicetype.fd0
```

`devicetype` depends on the type of the Ethernet card in the diskless workstation. Refer to the `NIC` file in the same directory to determine the right *`devicetype`*.

32.6.2.4 Booting with PXE

By default, the pxeboot(8) loader loads the kernel via NFS. It can be compiled to use TFTP instead by specifying the `LOADER_TFTP_SUPPORT` option in `/etc/make.conf`. See the comments in `/usr/share/examples/etc/make.conf` for instructions.

There are two other `make.conf` options which may be useful for setting up a serial console diskless machine: `BOOT_PXELDR_PROBE_KEYBOARD`, and `BOOT_PXELDR_ALWAYS_SERIAL`.

To use PXE when the machine starts, you will usually need to select the `Boot from network` option in your BIOS setup, or type a function key during the PC initialization.

32.6.2.5 Configuring the TFTP and NFS Servers

If you are using PXE or **Etherboot** configured to use TFTP, you need to enable **tftpd** on the file server:

1. Create a directory from which **tftpd** will serve the files, e.g. `/tftpboot`.
2. Add this line to your `/etc/inetd.conf`:

   ```
   tftp    dgram   udp     wait    root    /usr/libexec/tftpd      tftpd -l -s /tftpboot
   ```

   > **Óçìåßùóç:** It appears that at least some PXE versions want the TCP version of TFTP. In this case, add a second line, replacing `dgram udp` with `stream tcp`.

3. Tell **inetd** to reread its configuration file. The `inetd_enable="YES"` must be in the `/etc/rc.conf` file for this command to execute correctly:

   ```
   # /etc/rc.d/inetd restart
   ```

You can place the `tftpboot` directory anywhere on the server. Make sure that the location is set in both `inetd.conf` and `dhcpd.conf`.

In all cases, you also need to enable NFS and export the appropriate file system on the NFS server.

1. Add this to `/etc/rc.conf`:

   ```
   nfs_server_enable="YES"
   ```

2. Export the file system where the diskless root directory is located by adding the following to `/etc/exports` (adjust the volume mount point and replace *`margaux corbieres`* with the names of the diskless workstations):

   ```
   /data/misc -alldirs -ro margaux corbieres
   ```

3. Tell **mountd** to reread its configuration file. If you actually needed to enable NFS in `/etc/rc.conf` at the first step, you probably want to reboot instead.

   ```
   # /etc/rc.d/mountd restart
   ```

32.6.2.6 Building a Diskless Kernel

If using **Etherboot**, you need to create a kernel configuration file for the diskless client with the following options (in addition to the usual ones):

```
options     BOOTP          # Use BOOTP to obtain IP address/hostname
options     BOOTP_NFSROOT  # NFS mount root file system using BOOTP info
```

You may also want to use `BOOTP_NFSV3`, `BOOT_COMPAT` and `BOOTP_WIRED_TO` (refer to `NOTES`).

These option names are historical and slightly misleading as they actually enable indifferent use of DHCP and BOOTP inside the kernel (it is also possible to force strict BOOTP or DHCP use).

Build the kernel (see ÊåöÜëáéï 9), and copy it to the place specified in `dhcpd.conf`.

> **Óçìåßùóç:** When using PXE, building a kernel with the above options is not strictly necessary (though suggested). Enabling them will cause more DHCP requests to be issued during kernel startup, with a small risk of inconsistency between the new values and those retrieved by pxeboot(8) in some special cases. The advantage of using them is that the host name will be set as a side effect. Otherwise you will need to set the host name by another method, for example in a client-specific `rc.conf` file.

> **Óçìåßùóç:** In order to be loadable with **Etherboot**, a kernel needs to have the device hints compiled in. You would typically set the following option in the configuration file (see the `NOTES` configuration comments file):
>
> ```
> hints           "GENERIC.hints"
> ```

32.6.2.7 Preparing the Root Filesystem

You need to create a root file system for the diskless workstations, in the location listed as `root-path` in `dhcpd.conf`.

32.6.2.7.1 Using `make world` to populate root

This method is quick and will install a complete virgin system (not only the root file system) into `DESTDIR`. All you have to do is simply execute the following script:

```
#!/bin/sh
export DESTDIR=/data/misc/diskless
mkdir -p ${DESTDIR}
cd /usr/src; make buildworld && make buildkernel
cd /usr/src/etc; make distribution
```

Once done, you may need to customize your `/etc/rc.conf` and `/etc/fstab` placed into `DESTDIR` according to your needs.

32.6.2.8 Configuring Swap

If needed, a swap file located on the server can be accessed via NFS.

32.6.2.8.1 NFS Swap

The kernel does not support enabling NFS swap at boot time. Swap must be enabled by the startup scripts, by mounting a writable file system and creating and enabling a swap file. To create a swap file of appropriate size, you can do like this:

```
# dd if=/dev/zero of=/path/to/swapfile bs=1k count=1 oseek=100000
```

To enable it you have to add the following line to your `rc.conf`:

```
swapfile=/path/to/swapfile
```

32.6.2.9 Miscellaneous Issues

32.6.2.9.1 Running with a Read-only `/usr`

If the diskless workstation is configured to run X, you will have to adjust the **XDM** configuration file, which puts the error log on `/usr` by default.

32.6.2.9.2 Using a Non-FreeBSD Server

When the server for the root file system is not running FreeBSD, you will have to create the root file system on a FreeBSD machine, then copy it to its destination, using `tar` or `cpio`.

In this situation, there are sometimes problems with the special files in `/dev`, due to differing major/minor integer sizes. A solution to this problem is to export a directory from the non-FreeBSD server, mount this directory onto a FreeBSD machine, and use devfs(5) to allocate device nodes transparently for the user.

32.7 ISDN

A good resource for information on ISDN technology and hardware is Dan Kegel's ISDN Page (http://www.alumni.caltech.edu/~dank/isdn/).

A quick simple road map to ISDN follows:

- If you live in Europe you might want to investigate the ISDN card section.
- If you are planning to use ISDN primarily to connect to the Internet with an Internet Provider on a dial-up non-dedicated basis, you might look into Terminal Adapters. This will give you the most flexibility, with the fewest problems, if you change providers.
- If you are connecting two LANs together, or connecting to the Internet with a dedicated ISDN connection, you might consider the stand alone router/bridge option.

Cost is a significant factor in determining what solution you will choose. The following options are listed from least expensive to most expensive.

32.7.1 ISDN Cards

Contributed by Hellmuth Michaelis.

FreeBSD's ISDN implementation supports only the DSS1/Q.931 (or Euro-ISDN) standard using passive cards. Some active cards are supported where the firmware also supports other signaling protocols; this also includes the first supported Primary Rate (PRI) ISDN card.

The **isdn4bsd** software allows you to connect to other ISDN routers using either IP over raw HDLC or by using synchronous PPP: either by using kernel PPP with `isppp`, a modified sppp(4) driver, or by using userland ppp(8). By using userland ppp(8), channel bonding of two or more ISDN B-channels is possible. A telephone answering machine application is also available as well as many utilities such as a software 300 Baud modem.

Some growing number of PC ISDN cards are supported under FreeBSD and the reports show that it is successfully used all over Europe and in many other parts of the world.

The passive ISDN cards supported are mostly the ones with the Infineon (formerly Siemens) ISAC/HSCX/IPAC ISDN chipsets, but also ISDN cards with chips from Cologne Chip (ISA bus only), PCI cards with Winbond W6692 chips, some cards with the Tiger300/320/ISAC chipset combinations and some vendor specific chipset based cards such as the AVM Fritz!Card PCI V.1.0 and the AVM Fritz!Card PnP.

Currently the active supported ISDN cards are the AVM B1 (ISA and PCI) BRI cards and the AVM T1 PCI PRI cards.

For documentation on **isdn4bsd**, have a look at `/usr/share/examples/isdn/` directory on your FreeBSD system or at the homepage of isdn4bsd (http://www.freebsd-support.de/i4b/) which also has pointers to hints, erratas and much more documentation such as the isdn4bsd handbook (http://people.FreeBSD.org/~hm/).

In case you are interested in adding support for a different ISDN protocol, a currently unsupported ISDN PC card or otherwise enhancing **isdn4bsd**, please get in touch with Hellmuth Michaelis <`hm@FreeBSD.org`>.

For questions regarding the installation, configuration and troubleshooting **isdn4bsd**, a freebsd-isdn (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isdn) mailing list is available.

32.7.2 ISDN Terminal Adapters

Terminal adapters (TA), are to ISDN what modems are to regular phone lines.

Most TA's use the standard Hayes modem AT command set, and can be used as a drop in replacement for a modem.

A TA will operate basically the same as a modem except connection and throughput speeds will be much faster than your old modem. You will need to configure PPP exactly the same as for a modem setup. Make sure you set your serial speed as high as possible.

The main advantage of using a TA to connect to an Internet Provider is that you can do Dynamic PPP. As IP address space becomes more and more scarce, most providers are not willing to provide you with a static IP anymore. Most stand-alone routers are not able to accommodate dynamic IP allocation.

TA's completely rely on the PPP daemon that you are running for their features and stability of connection. This allows you to upgrade easily from using a modem to ISDN on a FreeBSD machine, if you already have PPP set up. However, at the same time any problems you experienced with the PPP program and are going to persist.

If you want maximum stability, use the kernel PPP option, not the userland PPP.

The following TA's are known to work with FreeBSD:

- Motorola BitSurfer and Bitsurfer Pro
- Adtran

Most other TA's will probably work as well, TA vendors try to make sure their product can accept most of the standard modem AT command set.

The real problem with external TA's is that, like modems, you need a good serial card in your computer.

You should read the FreeBSD Serial Hardware (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/serial-uart/index.html) tutorial for a detailed understanding of serial devices, and the differences between asynchronous and synchronous serial ports.

A TA running off a standard PC serial port (asynchronous) limits you to 115.2 Kbs, even though you have a 128 Kbs connection. To fully utilize the 128 Kbs that ISDN is capable of, you must move the TA to a synchronous serial card.

Do not be fooled into buying an internal TA and thinking you have avoided the synchronous/asynchronous issue. Internal TA's simply have a standard PC serial port chip built into them. All this will do is save you having to buy another serial cable and find another empty electrical socket.

A synchronous card with a TA is at least as fast as a stand-alone router, and with a simple 386 FreeBSD box driving it, probably more flexible.

The choice of synchronous card/TA v.s. stand-alone router is largely a religious issue. There has been some discussion of this in the mailing lists. We suggest you search the archives (http://www.FreeBSD.org/search/index.html) for the complete discussion.

32.7.3 Stand-alone ISDN Bridges/Routers

ISDN bridges or routers are not at all specific to FreeBSD or any other operating system. For a more complete description of routing and bridging technology, please refer to a networking reference book.

In the context of this section, the terms router and bridge will be used interchangeably.

As the cost of low end ISDN routers/bridges comes down, it will likely become a more and more popular choice. An ISDN router is a small box that plugs directly into your local Ethernet network, and manages its own connection to the other bridge/router. It has built in software to communicate via PPP and other popular protocols.

A router will allow you much faster throughput than a standard TA, since it will be using a full synchronous ISDN connection.

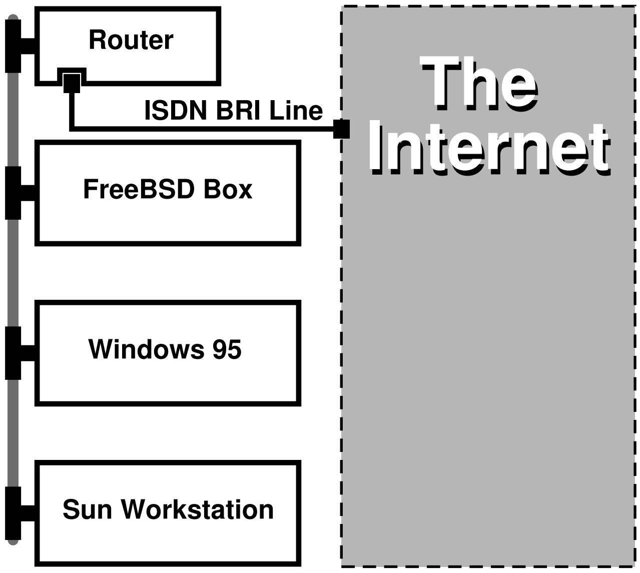
The main problem with ISDN routers and bridges is that interoperability between manufacturers can still be a problem. If you are planning to connect to an Internet provider, you should discuss your needs with them.

If you are planning to connect two LAN segments together, such as your home LAN to the office LAN, this is the simplest lowest maintenance solution. Since you are buying the equipment for both sides of the connection you can be assured that the link will work.

For example to connect a home computer or branch office network to a head office network the following setup could be used:

ÐáñÜäåéãìá 32-1. Branch Office or Home Network

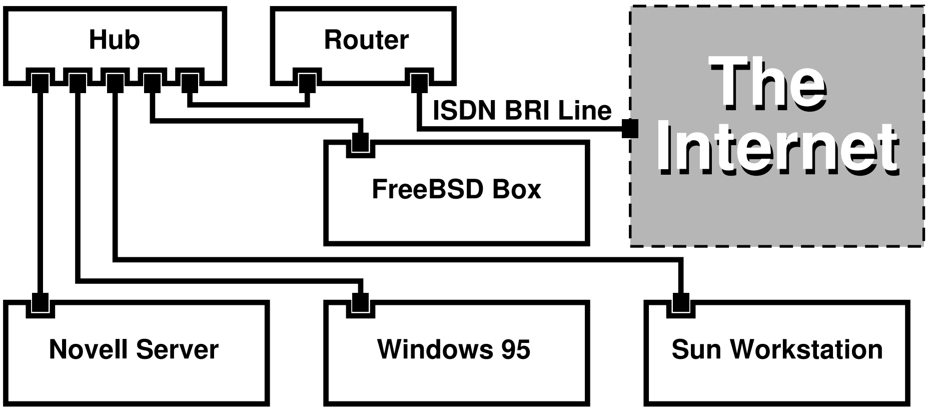
Network uses a bus based topology with 10 base 2 Ethernet (“thinnet”). Connect router to network cable with AUI/10BT transceiver, if necessary.



If your home/branch office is only one computer you can use a twisted pair crossover cable to connect to the stand-alone router directly.

ÐáñÜäåéãìá 32-2. Head Office or Other LAN

Network uses a star topology with 10 base T Ethernet (“Twisted Pair”).



One large advantage of most routers/bridges is that they allow you to have 2 *separate independent* PPP connections to 2 separate sites at the *same* time. This is not supported on most TA’s, except for specific (usually expensive) models that have two serial ports. Do not confuse this with channel bonding, MPP, etc.

This can be a very useful feature if, for example, you have an dedicated ISDN connection at your office and would like to tap into it, but do not want to get another ISDN line at work. A router at the office location can manage a dedicated B channel connection (64 Kbps) to the Internet and use the other B channel for a separate data connection. The second B channel can be used for dial-in, dial-out or dynamically bonding (MPP, etc.) with the first B channel for more bandwidth.

An Ethernet bridge will also allow you to transmit more than just IP traffic. You can also send IPX/SPX or whatever other protocols you use.

32.8 Network Address Translation

Contributed by Chern Lee.

32.8.1 Overview

FreeBSD’s Network Address Translation daemon, commonly known as natd(8) is a daemon that accepts incoming raw IP packets, changes the source to the local machine and re-injects these packets back into the outgoing IP packet stream. natd(8) does this by changing the source IP address and port such that when data is received back, it is able to determine the original location of the data and forward it back to its original requester.

The most common use of NAT is to perform what is commonly known as Internet Connection Sharing.

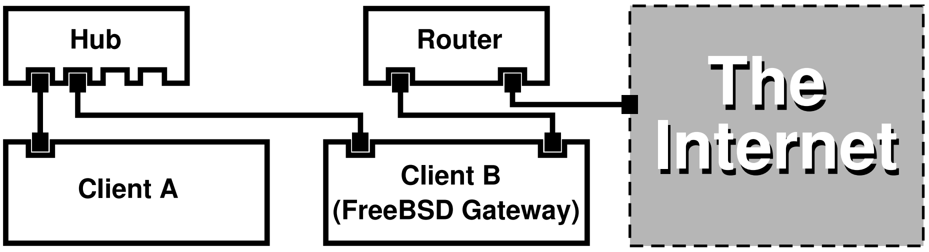
32.8.2 Setup

Due to the diminishing IP space in IPv4, and the increased number of users on high-speed consumer lines such as cable or DSL, people are increasingly in need of an Internet Connection Sharing solution. The ability to connect several computers online through one connection and IP address makes natd(8) a reasonable choice.

Most commonly, a user has a machine connected to a cable or DSL line with one IP address and wishes to use this one connected computer to provide Internet access to several more over a LAN.

To do this, the FreeBSD machine on the Internet must act as a gateway. This gateway machine must have two NICs—one for connecting to the Internet router, the other connecting to a LAN. All the machines on the LAN are connected through a hub or switch.

> **Óçìåßùóç:** There are many ways to get a LAN connected to the Internet through a FreeBSD gateway. This example will only cover a gateway with at least two NICs.



A setup like this is commonly used to share an Internet connection. One of the LAN machines is connected to the Internet. The rest of the machines access the Internet through that "gateway" machine.

32.8.3 Configuration

The following options must be in the kernel configuration file:

```
options IPFIREWALL
options IPDIVERT
```

Additionally, at choice, the following may also be suitable:

```
options IPFIREWALL_DEFAULT_TO_ACCEPT
options IPFIREWALL_VERBOSE
```

The following must be in `/etc/rc.conf`:

```
gateway_enable="YES" ❶
firewall_enable="YES" ❷
firewall_type="OPEN" ❸
natd_enable="YES"
natd_interface="fxp0" ❹
natd_flags="" ❺
```

❶ Sets up the machine to act as a gateway. Running `sysctl net.inet.ip.forwarding=1` would have the same effect.

❷ Enables the firewall rules in `/etc/rc.firewall` at boot.

❸ This specifies a predefined firewall ruleset that allows anything in. See `/etc/rc.firewall` for additional types.

❹ Indicates which interface to forward packets through (the interface connected to the Internet).

❺ Any additional configuration options passed to natd(8) on boot.

Having the previous options defined in `/etc/rc.conf` would run `natd -interface fxp0` at boot. This can also be run manually.

> **Óçìåßùóç:** It is also possible to use a configuration file for natd(8) when there are too many options to pass. In this case, the configuration file must be defined by adding the following line to `/etc/rc.conf`:
>
> ```
> natd_flags="-f /etc/natd.conf"
> ```
>
> The `/etc/natd.conf` file will contain a list of configuration options, one per line. For example the next section case would use the following file:
>
> ```
> redirect_port tcp 192.168.0.2:6667 6667
> redirect_port tcp 192.168.0.3:80 80
> ```
>
> For more information about the configuration file, consult the natd(8) manual page about the `-f` option.

Each machine and interface behind the LAN should be assigned IP address numbers in the private network space as defined by RFC 1918 (ftp://ftp.isi.edu/in-notes/rfc1918.txt) and have a default gateway of the **natd** machine's internal IP address.

For example, client `A` and `B` behind the LAN have IP addresses of `192.168.0.2` and `192.168.0.3`, while the natd machine's LAN interface has an IP address of `192.168.0.1`. Client `A` and `B`'s default gateway must be set to that of the **natd** machine, `192.168.0.1`. The **natd** machine's external, or Internet interface does not require any special modification for natd(8) to work.

32.8.4 Port Redirection

The drawback with natd(8) is that the LAN clients are not accessible from the Internet. Clients on the LAN can make outgoing connections to the world but cannot receive incoming ones. This presents a problem if trying to run Internet services on one of the LAN client machines. A simple way around this is to redirect selected Internet ports on the **natd** machine to a LAN client.

For example, an IRC server runs on client `A`, and a web server runs on client `B`. For this to work properly, connections received on ports 6667 (IRC) and 80 (web) must be redirected to the respective machines.

The `-redirect_port` must be passed to natd(8) with the proper options. The syntax is as follows:

```
 -redirect_port proto targetIP:targetPORT[-targetPORT]
             [aliasIP:]aliasPORT[-aliasPORT]
             [remoteIP[:remotePORT[-remotePORT]]]
```

In the above example, the argument should be:

```
-redirect_port tcp 192.168.0.2:6667 6667
-redirect_port tcp 192.168.0.3:80 80
```

This will redirect the proper *tcp* ports to the LAN client machines.

The `-redirect_port` argument can be used to indicate port ranges over individual ports. For example, *`tcp 192.168.0.2:2000-3000 2000-3000`* would redirect all connections received on ports 2000 to 3000 to ports 2000 to 3000 on client `A`.

These options can be used when directly running natd(8), placed within the `natd_flags=""` option in `/etc/rc.conf`, or passed via a configuration file.

For further configuration options, consult natd(8)

32.8.5 Address Redirection

Address redirection is useful if several IP addresses are available, yet they must be on one machine. With this, natd(8) can assign each LAN client its own external IP address. natd(8) then rewrites outgoing packets from the LAN clients with the proper external IP address and redirects all traffic incoming on that particular IP address back to the specific LAN client. This is also known as static NAT. For example, the IP addresses `128.1.1.1`, `128.1.1.2`, and `128.1.1.3` belong to the **natd** gateway machine. `128.1.1.1` can be used as the **natd** gateway machine's external IP address, while `128.1.1.2` and `128.1.1.3` are forwarded back to LAN clients `A` and `B`.

The `-redirect_address` syntax is as follows:

```
-redirect_address localIP publicIP
```

localIP	The internal IP address of the LAN client.
publicIP	The external IP address corresponding to the LAN client.

In the example, this argument would read:

```
-redirect_address 192.168.0.2 128.1.1.2
-redirect_address 192.168.0.3 128.1.1.3
```

Like `-redirect_port`, these arguments are also placed within the `natd_flags=""` option of `/etc/rc.conf`, or passed via a configuration file. With address redirection, there is no need for port redirection since all data received on a particular IP address is redirected.

The external IP addresses on the **natd** machine must be active and aliased to the external interface. Look at rc.conf(5) to do so.

32.9 Parallel Line IP (PLIP)

PLIP lets us run TCP/IP between parallel ports. It is useful on machines without network cards, or to install on laptops. In this section, we will discuss:

- Creating a parallel (laplink) cable.
- Connecting two computers with PLIP.

32.9.1 Creating a Parallel Cable

You can purchase a parallel cable at most computer supply stores. If you cannot do that, or you just want to know how it is done, the following table shows how to make one out of a normal parallel printer cable.

Ðßíáêáò 32-1. Wiring a Parallel Cable for Networking

A-name	A-End	B-End	Descr.	Post/Bit
DATA0 -ERROR	2 15	15 2	Data	0/0x01 1/0x08
DATA1 +SLCT	3 13	13 3	Data	0/0x02 1/0x10
DATA2 +PE	4 12	12 4	Data	0/0x04 1/0x20
DATA3 -ACK	5 10	10 5	Strobe	0/0x08 1/0x40
DATA4 BUSY	6 11	11 6	Data	0/0x10 1/0x80
GND	18-25	18-25	GND	-

32.9.2 Setting Up PLIP

First, you have to get a laplink cable. Then, confirm that both computers have a kernel with lpt(4) driver support:

```
# grep lp /var/run/dmesg.boot
lpt0: <Printer> on ppbus0
lpt0: Interrupt-driven port
```

The parallel port must be an interrupt driven port, you should have lines similar to the following in your in the `/boot/device.hints` file:

```
hint.ppc.0.at="isa"
hint.ppc.0.irq="7"
```

Then check if the kernel configuration file has a `device plip` line or if the `plip.ko` kernel module is loaded. In both cases the parallel networking interface should appear when you use the ifconfig(8) command to display it:

```
# ifconfig plip0
plip0: flags=8810<POINTOPOINT,SIMPLEX,MULTICAST> mtu 1500
```

Plug the laplink cable into the parallel interface on both computers.

Configure the network interface parameters on both sites as `root`. For example, if you want to connect the host `host1` with another machine `host2`:

```
                 host1 <-----> host2
IP Address    10.0.0.1      10.0.0.2
```

Configure the interface on `host1` by doing:

```
# ifconfig plip0 10.0.0.1 10.0.0.2
```

Configure the interface on `host2` by doing:

```
# ifconfig plip0 10.0.0.2 10.0.0.1
```

You now should have a working connection. Please read the manual pages lp(4) and lpt(4) for more details.

You should also add both hosts to `/etc/hosts`:

```
127.0.0.1               localhost.my.domain localhost
10.0.0.1                host1.my.domain host1
10.0.0.2                host2.my.domain
```

To confirm the connection works, go to each host and ping the other. For example, on `host1`:

```
# ifconfig plip0
plip0: flags=8851<UP,POINTOPOINT,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        inet 10.0.0.1 --> 10.0.0.2 netmask 0xff000000
# netstat -r
Routing tables

Internet:
Destination        Gateway          Flags     Refs     Use      Netif Expire
host2              host1            UH          0       0       plip0
# ping -c 4 host2
PING host2 (10.0.0.2): 56 data bytes
64 bytes from 10.0.0.2: icmp_seq=0 ttl=255 time=2.774 ms
64 bytes from 10.0.0.2: icmp_seq=1 ttl=255 time=2.530 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=255 time=2.556 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=255 time=2.714 ms

--- host2 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.530/2.643/2.774/0.103 ms
```

32.10 IPv6

Originally Written by Aaron Kaplan. Restructured and Added by Tom Rhodes. Extended by Brad Davis.

IPv6 (also known as IPng “IP next generation”) is the new version of the well known IP protocol (also known as IPv4). Like the other current *BSD systems, FreeBSD includes the KAME IPv6 reference implementation. So your FreeBSD system comes with all you will need to experiment with IPv6. This section focuses on getting IPv6 configured and running.

In the early 1990s, people became aware of the rapidly diminishing address space of IPv4. Given the expansion rate of the Internet there were two major concerns:

- Running out of addresses. Today this is not so much of a concern anymore since RFC1918 private address space (`10.0.0.0/8`, `172.16.0.0/12`, and `192.168.0.0/16`) and Network Address Translation (NAT) are being employed.
- Router table entries were getting too large. This is still a concern today.

IPv6 deals with these and many other issues:

- 128 bit address space. In other words theoretically there are 340,282,366,920,938,463,463,374,607,431,768,211,456 addresses available. This means there are approximately 6.67 * 10^27 IPv6 addresses per square meter on our planet.
- Routers will only store network aggregation addresses in their routing tables thus reducing the average space of a routing table to 8192 entries.

There are also lots of other useful features of IPv6 such as:

- Address autoconfiguration (RFC2462 (http://www.ietf.org/rfc/rfc2462.txt))
- Anycast addresses (“one-out-of many”)
- Mandatory multicast addresses
- IPsec (IP security)
- Simplified header structure
- Mobile IP
- IPv6-to-IPv4 transition mechanisms

For more information see:

- IPv6 overview at playground.sun.com (http://playground.sun.com/pub/ipng/html/ipng-main.html)
- KAME.net (http://www.kame.net)

32.10.1 Background on IPv6 Addresses

There are different types of IPv6 addresses: Unicast, Anycast and Multicast.

Unicast addresses are the well known addresses. A packet sent to a unicast address arrives exactly at the interface belonging to the address.

Anycast addresses are syntactically indistinguishable from unicast addresses but they address a group of interfaces. The packet destined for an anycast address will arrive at the nearest (in router metric) interface. Anycast addresses may only be used by routers.

Multicast addresses identify a group of interfaces. A packet destined for a multicast address will arrive at all interfaces belonging to the multicast group.

> **Óçìåßùóç:** The IPv4 broadcast address (usually `xxx.xxx.xxx.255`) is expressed by multicast addresses in IPv6.

Ðßíáêáò 32-2. Reserved IPv6 addresses

IPv6 address	Prefixlength (Bits)	Description	Notes
`::`	128 bits	unspecified	cf. `0.0.0.0` in IPv4
`::1`	128 bits	loopback address	cf. `127.0.0.1` in IPv4

IPv6 address	Prefixlength (Bits)	Description	Notes
`::00:xx:xx:xx:xx`	96 bits	embedded IPv4	The lower 32 bits are the IPv4 address. Also called “IPv4 compatible IPv6 address”
`::ff:xx:xx:xx:xx`	96 bits	IPv4 mapped IPv6 address	The lower 32 bits are the IPv4 address. For hosts which do not support IPv6.
`fe80::` - `feb::`	10 bits	link-local	cf. loopback address in IPv4
`fec0::` - `fef::`	10 bits	site-local	
`ff::`	8 bits	multicast	
`001` (base 2)	3 bits	global unicast	All global unicast addresses are assigned from this pool. The first 3 bits are “001”.

32.10.2 Reading IPv6 Addresses

The canonical form is represented as: `x:x:x:x:x:x:x:x`, each “x” being a 16 Bit hex value. For example `FEBC:A574:382B:23C1:AA49:4592:4EFE:9982`

Often an address will have long substrings of all zeros therefore one such substring per address can be abbreviated by “::”. Also up to three leading “0”s per hexquad can be omitted. For example `fe80::1` corresponds to the canonical form `fe80:0000:0000:0000:0000:0000:0000:0001`.

A third form is to write the last 32 Bit part in the well known (decimal) IPv4 style with dots “.” as separators. For example `2002::10.0.0.1` corresponds to the (hexadecimal) canonical representation `2002:0000:0000:0000:0000:0000:0a00:0001` which in turn is equivalent to writing `2002::a00:1`.

By now the reader should be able to understand the following:

```
# ifconfig

rl0: flags=8943<UP,BROADCAST,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
         inet 10.0.0.10 netmask 0xffffff00 broadcast 10.0.0.255
         inet6 fe80::200:21ff:fe03:8e1%rl0 prefixlen 64 scopeid 0x1
         ether 00:00:21:03:08:e1
         media: Ethernet autoselect (100baseTX )
         status: active
```

`fe80::200:21ff:fe03:8e1%rl0` is an auto configured link-local address. It is generated from the MAC address as part of the auto configuration.

For further information on the structure of IPv6 addresses see RFC3513 (http://www.ietf.org/rfc/rfc3513.txt).

32.10.3 Getting Connected

Currently there are four ways to connect to other IPv6 hosts and networks:

- Getting an IPv6 network from your upstream provider. Talk to your Internet provider for instructions.
- Tunnel via 6-to-4 (RFC3068 (http://www.ietf.org/rfc/rfc3068.txt))
- Use the `net/freenet6` port if you are on a dial-up connection.

32.10.4 DNS in the IPv6 World

There used to be two types of DNS records for IPv6. The IETF has declared A6 records obsolete. AAAA records are the standard now.

Using AAAA records is straightforward. Assign your hostname to the new IPv6 address you just received by adding:

```
MYHOSTNAME           AAAA    MYIPv6ADDR
```

To your primary zone DNS file. In case you do not serve your own DNS zones ask your DNS provider. Current versions of **bind** (version 8.3 and 9) and `dns/djbdns` (with the IPv6 patch) support AAAA records.

32.10.5 Applying the needed changes to `/etc/rc.conf`

32.10.5.1 IPv6 Client Settings

These settings will help you configure a machine that will be on your LAN and act as a client, not a router. To have rtsol(8) autoconfigure your interface on boot all you need to add is:

```
ipv6_enable="YES"
```

To statically assign an IP address such as `2001:471:1f11:251:290:27ff:fee0:2093`, to your `fxp0` interface, add:

```
ipv6_ifconfig_fxp0="2001:471:1f11:251:290:27ff:fee0:2093"
```

To assign a default router of `2001:471:1f11:251::1` add the following to `/etc/rc.conf`:

```
ipv6_defaultrouter="2001:471:1f11:251::1"
```

32.10.5.2 IPv6 Router/Gateway Settings

This will help you take the directions that your tunnel provider has given you and convert it into settings that will persist through reboots. To restore your tunnel on startup use something like the following in `/etc/rc.conf`:

List the Generic Tunneling interfaces that will be configured, for example `gif0`:

```
gif_interfaces="gif0"
```

To configure the interface with a local endpoint of *`MY_IPv4_ADDR`* to a remote endpoint of *`REMOTE_IPv4_ADDR`*:

```
gifconfig_gif0="MY_IPv4_ADDR REMOTE_IPv4_ADDR"
```

To apply the IPv6 address you have been assigned for use as your IPv6 tunnel endpoint, add:

```
ipv6_ifconfig_gif0="MY_ASSIGNED_IPv6_TUNNEL_ENDPOINT_ADDR"
```

Then all you have to do is set the default route for IPv6. This is the other side of the IPv6 tunnel:

```
ipv6_defaultrouter="MY_IPv6_REMOTE_TUNNEL_ENDPOINT_ADDR"
```

32.10.5.3 IPv6 Tunnel Settings

If the server is to route IPv6 between the rest of your network and the world, the following `/etc/rc.conf` setting will also be needed:

```
ipv6_gateway_enable="YES"
```

32.10.6 Router Advertisement and Host Auto Configuration

This section will help you setup rtadvd(8) to advertise the IPv6 default route.

To enable rtadvd(8) you will need the following in your `/etc/rc.conf`:

```
rtadvd_enable="YES"
```

It is important that you specify the interface on which to do IPv6 router solicitation. For example to tell rtadvd(8) to use `fxp0`:

```
rtadvd_interfaces="fxp0"
```

Now we must create the configuration file, `/etc/rtadvd.conf`. Here is an example:

```
fxp0:\
        :addrs#1:addr="2001:471:1f11:246::":prefixlen#64:tc=ether:
```

Replace `fxp0` with the interface you are going to be using.

Next, replace `2001:471:1f11:246::` with the prefix of your allocation.

If you are dedicated a `/64` subnet you will not need to change anything else. Otherwise, you will need to change the `prefixlen#` to the correct value.

32.11 Asynchronous Transfer Mode (ATM)

Contributed by Harti Brandt.

32.11.1 Configuring classical IP over ATM (PVCs)

Classical IP over ATM (CLIP) is the simplest method to use Asynchronous Transfer Mode (ATM) with IP. It can be used with switched connections (SVCs) and with permanent connections (PVCs). This section describes how to set up a network based on PVCs.

32.11.1.1 Fully meshed configurations

The first method to set up a CLIP with PVCs is to connect each machine to each other machine in the network via a dedicated PVC. While this is simple to configure it tends to become impractical for a larger number of machines. The example supposes that we have four machines in the network, each connected to the ATM network with an ATM adapter card. The first step is the planning of the IP addresses and the ATM connections between the machines. We use the following:

Host	IP Address
`hostA`	`192.168.173.1`
`hostB`	`192.168.173.2`
`hostC`	`192.168.173.3`
`hostD`	`192.168.173.4`

To build a fully meshed net we need one ATM connection between each pair of machines:

Machines	VPI.VCI couple
`hostA` - `hostB`	0.100
`hostA` - `hostC`	0.101
`hostA` - `hostD`	0.102
`hostB` - `hostC`	0.103
`hostB` - `hostD`	0.104
`hostC` - `hostD`	0.105

The VPI and VCI values at each end of the connection may of course differ, but for simplicity we assume that they are the same. Next we need to configure the ATM interfaces on each host:

```
hostA# ifconfig hatm0 192.168.173.1 up
hostB# ifconfig hatm0 192.168.173.2 up
hostC# ifconfig hatm0 192.168.173.3 up
hostD# ifconfig hatm0 192.168.173.4 up
```

assuming that the ATM interface is `hatm0` on all hosts. Now the PVCs need to be configured on `hostA` (we assume that they are already configured on the ATM switches, you need to consult the manual for the switch on how to do this).

```
hostA# atmconfig natm add 192.168.173.2 hatm0 0 100 llc/snap ubr
hostA# atmconfig natm add 192.168.173.3 hatm0 0 101 llc/snap ubr
hostA# atmconfig natm add 192.168.173.4 hatm0 0 102 llc/snap ubr

hostB# atmconfig natm add 192.168.173.1 hatm0 0 100 llc/snap ubr
hostB# atmconfig natm add 192.168.173.3 hatm0 0 103 llc/snap ubr
hostB# atmconfig natm add 192.168.173.4 hatm0 0 104 llc/snap ubr

hostC# atmconfig natm add 192.168.173.1 hatm0 0 101 llc/snap ubr
hostC# atmconfig natm add 192.168.173.2 hatm0 0 103 llc/snap ubr
hostC# atmconfig natm add 192.168.173.4 hatm0 0 105 llc/snap ubr

hostD# atmconfig natm add 192.168.173.1 hatm0 0 102 llc/snap ubr
```

```
hostD# atmconfig natm add 192.168.173.2 hatm0 0 104 llc/snap ubr
hostD# atmconfig natm add 192.168.173.3 hatm0 0 105 llc/snap ubr
```

Of course other traffic contracts than UBR can be used given the ATM adapter supports those. In this case the name of the traffic contract is followed by the parameters of the traffic. Help for the atmconfig(8) tool can be obtained with:

```
# atmconfig help natm add
```

or in the atmconfig(8) manual page.

The same configuration can also be done via `/etc/rc.conf`. For `hostA` this would look like:

```
network_interfaces="lo0 hatm0"
ifconfig_hatm0="inet 192.168.173.1 up"
natm_static_routes="hostB hostC hostD"
route_hostB="192.168.173.2 hatm0 0 100 llc/snap ubr"
route_hostC="192.168.173.3 hatm0 0 101 llc/snap ubr"
route_hostD="192.168.173.4 hatm0 0 102 llc/snap ubr"
```

The current state of all CLIP routes can be obtained with:

```
hostA# atmconfig natm show
```

32.12 Common Access Redundancy Protocol (CARP)

Contributed by Tom Rhodes.

The Common Access Redundancy Protocol, or CARP allows multiple hosts to share the same IP address. In some configurations, this may be used for availability or load balancing. Hosts may use separate IP addresses as well, as in the example provided here.

To enable support for CARP, the FreeBSD kernel must be rebuilt with the following option:

```
device  carp
```

CARP functionality should now be available and may be tuned via several `sysctl` OIDs. Devices themselves may be loaded via the `ifconfig` command:

```
# ifconfig carp0 create
```

In a real environment, these interfaces will need unique identification numbers known as a VHID. This VHID or Virtual Host Identification will be used to distinguish the host on the network.

32.12.1 Using CARP For Server Availability (CARP)

One use of CARP, as noted above, is for server availability. This example will provide failover support for three hosts, all with unique IP addresses and providing the same web content. These machines will act in conjunction with a Round Robin DNS configuration. The failover machine will have two additional CARP interfaces, one for each of the content server's IPs. When a failure occurs, the failover server should pick up the failed machine's IP address.

This means the failure should go completely unnoticed to the user. The failover server requires identical content and services as the other content servers it is expected to pick up load for.

The two machines should be configured identically other than their issued hostnames and VHIDs. This example calls these machines `hosta.example.org` and `hostb.example.org` respectively. First, the required lines for a CARP configuration have to be added to `rc.conf`. For `hosta.example.org`, the `rc.conf` file should contain the following lines:

```
hostname="hosta.example.org"
ifconfig_fxp0="inet 192.168.1.3 netmask 255.255.255.0"
cloned_interfaces="carp0"
ifconfig_carp0="vhid 1 pass testpast 192.168.1.50/24"
```

On `hostb.example.org` the following lines should be in `rc.conf`:

```
hostname="hostb.example.org"
ifconfig_fxp0="inet 192.168.1.4 netmask 255.255.255.0"
cloned_interfaces="carp0"
ifconfig_carp0="vhid 2 pass testpass 192.168.1.51/24"
```

> **Óçìåßùóç:** It is very important that the passwords, specified by the `pass` option to `ifconfig`, are identical. The `carp` devices will only listen to and accept advertisements from machines with the correct password. The VHID must also be different for each machine.

The third machine, `provider.example.org`, should be prepared so that it may handle failover from either host. This machine will require two `carp` devices, one to handle each host. The appropriate `rc.conf` configuration lines will be similar to the following:

```
hostname="provider.example.org"
ifconfig_fxp0="inet 192.168.1.5 netmask 255.255.255.0"
cloned_interfaces="carp0 carp1"
ifconfig_carp0="vhid 1 advskew 100 pass testpass 192.168.1.50/24"
ifconfig_carp1="vhid 2 advskew 100 pass testpass 192.168.1.51/24"
```

Having the two `carp` devices will allow `provider.example.org` to notice and pick up the IP address of either machine should it stop responding.

> **Óçìåßùóç:** The default FreeBSD kernel *may* have preemption enabled. If so, `provider.example.org` may not relinquish the IP address back to the original content server. In this case, an administrator may “nudge” the interface. The following command should be issued on `provider.example.org`:
>
> ```
> # ifconfig carp0 down && ifconfig carp0 up
> ```
>
> This should be done on the `carp` interface which corresponds to the correct host.

At this point, CARP should be completely enabled and available for testing. For testing, either networking has to be restarted or the machines need to be rebooted.

More information is always available in the carp(4) manual page.

V. ÐáñáñôÞìáôá

ÐáñÜñôçìá A. Ðïõ èá Âñåßôå ôï FreeBSD

A.1 Åêäüóåéò óå CDROM êáé DVD

A.1.1 Retail Åêäüóåéò

Ôï FreeBSD åßíáé äéáèÝóéìï ùò åìðïñéêü ðñïúüí (FreeBSD CD, åðéðñüóèåôï ëïãéóìéêü, êáé ôõðùìÝíç ôåêìçñßùóç) áðü äéÜöïñïõò ðñïìçèåõôÝò:

- CompUSA
  WWW: http://www.compusa.com/
- Frys Electronics
  WWW: http://www.frys.com/

A.1.2 CD êáé DVD äéáíïìÝò

Ôï FreeBSD åßíáé äéáèÝóéìï óå CD êáé DVD ãéá áãïñÜ ìÝóù äéáäéêôýïõ áðü ôïõò ðáñáêÜôù ðñïìçèåõôÝò:

- FreeBSD Mall, Inc.
  700 Harvest Park Ste F
  Brentwood, CA 94513
  USA
  ÔçëÝöùíï: +1 925 674-0783
  Fax: +1 925 674-0821
  Email: <`info@freebsdmall.com`>
  WWW: http://www.freebsdmall.com/
- Dr. Hinner EDV
  St. Augustinus-Str. 10
  D-81825 München
  Germany
  ÔçëÝöùíï: (089) 428 419
  WWW: http://www.hinner.de/linux/freebsd.html
- Ikarios
  22-24 rue Voltaire
  92000 Nanterre
  France
  WWW: http://ikarios.com/form/#freebsd
- JMC Software
  Ireland
  ÔçëÝöùíï: 353 1 6291282
  WWW: http://www.thelinuxmall.com
- The Linux Emporium
  Hilliard House, Lester Way

Wallingford
OX10 9TA
United Kingdom
ÔçëÝöùíï: +44 1491 837010
Fax: +44 1491 837016
WWW: http://www.linuxemporium.co.uk/products/bsd/

- Linux+ DVD Magazine
  Lewartowskiego 6
  Warsaw
  00-190
  Poland
  ÔçëÝöùíï: +48 22 860 18 18
  Email: <`editors@lpmagazine.org`>
  WWW: http://www.lpmagazine.org/
- Linux System Labs Australia
  21 Ray Drive
  Balwyn North
  VIC - 3104
  Australia
  ÔçëÝöùíï: +61 3 9857 5918
  Fax: +61 3 9857 8974
  WWW: http://www.lsl.com.au
- LinuxCenter.Kz
  Ust-Kamenogorsk
  Kazakhstan
  ÔçëÝöùíï: +7-705-501-6001
  Email: <`info@linuxcenter.kz`>
  WWW: http://linuxcenter.kz/page.php?page=fr
- LinuxCenter.Ru
  Galernaya Street, 55
  Saint-Petersburg
  190000
  Russia
  ÔçëÝöùíï: +7-812-3125208
  Email: <`info@linuxcenter.ru`>
  WWW: http://linuxcenter.ru/shop/freebsd

A.1.3 Äéáíïìåßò

Áí åßóôå ìåôáðùëçôÞò êáé ìðïñåßôå íá äéáíåßìåôå óå CD-ROM ðñïúüíôá âáóéóìÝíá óôï FreeBSD, ðáñáêáëïýìå åðéêïéíùíÞóôå ìå êÜðïéïí áðü ôïõò äéáíïìåßò:

- Cylogistics
  809B Cuesta Dr., #2149
  Mountain View, CA 94040

USA
ÔçëÝöùíï: +1 650 694-4949
Fax: +1 650 694-4953
Email: <`sales@cylogistics.com`>
WWW: http://www.cylogistics.com/

- Ingram Micro
  1600 E. St. Andrew Place
  Santa Ana, CA 92705-4926
  USA
  ÔçëÝöùíï: 1 (800) 456-8000
  WWW: http://www.ingrammicro.com/
- Kudzu, LLC
  7375 Washington Ave. S.
  Edina, MN 55439
  USA
  ÔçëÝöùíï: +1 952 947-0822
  Fax: +1 952 947-0876
  Email: <`sales@kudzuenterprises.com`>
- LinuxCenter.Ru
  Galernaya Street, 55
  Saint-Petersburg
  190000
  Russia
  ÔçëÝöùíï: +7-812-3125208
  Email: <`info@linuxcenter.ru`>
  WWW: http://linuxcenter.ru/freebsd
- Navarre Corp
  7400 49th Ave South
  New Hope, MN 55428
  USA
  ÔçëÝöùíï: +1 763 535-8333
  Fax: +1 763 535-0341
  WWW: http://www.navarre.com/

A.2 ÅîõðçñåôçôÝò FTP

Ïé åðßóçìåò åêäüóåéò ôïõ FreeBSD åßíáé äéáèÝóéìåò ìÝóù áíþíõìçò FTP óýíäåóçò áðü äéÜöïñïõò åîõðçñåôçôÝò FTP óå üëï ôïí êüóìï. Ï êåíôñéêüò åîõðçñåôçôÞò ftp://ftp.FreeBSD.org/pub/FreeBSD/ Ý÷åé ðïëý êáëÞ óýíäåóç ìå ôïí õðüëïéðï êüóìï, êáé åðéôñÝðåé Ýíá ìåãÜëï áñéèìü ôáõôü÷ñïíùí óõíäÝóåùí. Áêüìá êé Ýôóé üìùò, åßíáé ìÜëëïí êáëÞ éäÝá íá âñåßôå êÜðïéï åîõðçñåôçôÞ FTP ðïõ åßíáé ðéï "êïíôÜ" óáò (åéäéêÜ áí èÝëåôå íá óôÞóåôå êÜðïéï ôïðéêü mirror site).

Ôï FreeBSD åßíáé åðßóçò äéáèÝóéìï ìÝóù óýíäåóçò áíþíõìïõ FTP áðü ôá ðáñáêÜôù mirror sites. Áí åðéëÝîåôå íá êáôåâÜóåôå ôï FreeBSD ìÝóù áíþíõìïõ FTP, óáò ðáñáêáëïýìå íá äéáëÝîåôå êÜðïéï åîõðçñåôçôÞ ï ïðïßïò åßíáé êïíôÜ óáò. Ôá mirror sites ðïõ áíáöÝñïíôáé ùò "Êýñéá Mirror Sites" Ý÷ïõí óõíÞèùò ôçí ðëÞñç óõëëïãÞ áñ÷åßùí ôïõ

FreeBSD (üëåò ôéò äéáèÝóéìåò åêäüóåéò, ãéá êÜèå äéáèÝóéìç áñ÷éôåêôïíéêÞ óõóôÞìáôïò), áëëÜ åßíáé ðéèáíüí íá ðåôý÷åôå êáëýôåñåò ôá÷ýôçôåò åîõðçñÝôçóçò ìå êÜðïéï åîõðçñåôçôÞ ðïõ åßíáé óôç ÷þñá Þ ðåñéï÷Þ. Ôá ôïðéêÜ sites Ý÷ïõí óõíÞèùò ôéò ðéï ðñüóöáôåò åêäüóåéò ãéá ôéò ðéï äçìïöéëåßò áñ÷éôåêôïíéêÝò óõóôÞìáôïò, ïðüôå ìðïñåß íá ìçí Ý÷ïõí üëåò ôéò ðéèáíÝò åêäüóåéò ôïõ FreeBSD. ¼ëá ôá sites äÝ÷ïíôáé óõíäÝóåéò ìÝóù áíþíõìïõ FTP. ÌåñéêÜ áðü áõôÜ ìðïñåß íá õðïóôçñßæïõí êáé Üëëçò ìïñöÞò óõíäÝóåéò. Ïé åíáëëáêôéêÝò ìïñöÝò óýíäåóçò áíáöÝñïíôáé îå÷ùñéóôÜ ãéá êÜèå site ðáñáêÜôù:

Central Servers, Primary Mirror Sites, Armenia, Australia, Austria, Brazil, Canada, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Saudi Arabia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, USA.

(as of UTC)

Central Servers

- ftp://ftp.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp.FreeBSD.org/pub/FreeBSD/))

Primary Mirror Sites

In case of problems, please contact the hostmaster <`mirror-admin@FreeBSD.org`> for this domain.

- ftp://ftp1.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp4.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp4.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp5.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp6.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp7.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp8.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp9.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp10.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp10.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp10.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp11.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp12.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp13.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp14.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp14.FreeBSD.org/pub/FreeBSD/))

Armenia

In case of problems, please contact the hostmaster <`hostmaster@am.FreeBSD.org`> for this domain.

- ftp://ftp1.am.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp1.am.FreeBSD.org/pub/FreeBSD/) / rsync)

Australia

In case of problems, please contact the hostmaster <`hostmaster@au.FreeBSD.org`> for this domain.

- ftp://ftp.au.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.au.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.au.FreeBSD.org/pub/FreeBSD/ (ftp)

Austria

In case of problems, please contact the hostmaster <`hostmaster@at.FreeBSD.org`> for this domain.

- ftp://ftp.at.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp.at.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp.at.FreeBSD.org/pub/FreeBSD/))

Brazil

In case of problems, please contact the hostmaster <`hostmaster@br.FreeBSD.org`> for this domain.

- ftp://ftp.br.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.br.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp2.br.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.br.FreeBSD.org/))
- ftp://ftp3.br.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)
- ftp://ftp4.br.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp5.br.FreeBSD.org
- ftp://ftp6.br.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp7.br.FreeBSD.org/pub/FreeBSD/ (ftp)

Canada

In case of problems, please contact the hostmaster <`hostmaster@ca.FreeBSD.org`> for this domain.

- ftp://ftp.ca.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.ca.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.ca.FreeBSD.org/pub/FreeBSD/ (ftp)

China

In case of problems, please contact the hostmaster <`hostmaster@cn.FreeBSD.org`> for this domain.

- ftp://ftp.cn.FreeBSD.org/pub/FreeBSD/ (ftp)

Czech Republic

In case of problems, please contact the hostmaster <`hostmaster@cz.FreeBSD.org`> for this domain.

- ftp://ftp.cz.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp.cz.FreeBSD.org/pub/FreeBSD/) / http (http://ftp.cz.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp.cz.FreeBSD.org/pub/FreeBSD/) / rsync / rsyncv6)
- ftp://ftp2.cz.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.cz.FreeBSD.org/pub/FreeBSD/))

Denmark

In case of problems, please contact the hostmaster <`hostmaster@dk.FreeBSD.org`> for this domain.

- ftp://ftp.dk.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp.dk.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp.dk.FreeBSD.org/pub/FreeBSD/))

Estonia

In case of problems, please contact the hostmaster <`hostmaster@ee.FreeBSD.org`> for this domain.

- ftp://ftp.ee.FreeBSD.org/pub/FreeBSD/ (ftp)

Finland

In case of problems, please contact the hostmaster <`hostmaster@fi.FreeBSD.org`> for this domain.

- ftp://ftp.fi.FreeBSD.org/pub/FreeBSD/ (ftp)

France

In case of problems, please contact the hostmaster <`hostmaster@fr.FreeBSD.org`> for this domain.

- ftp://ftp.fr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp1.fr.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp1.fr.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp2.fr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.fr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.fr.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp4.fr.FreeBSD.org/pub/FreeBSD/) / http (http://ftp4.fr.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp4.fr.FreeBSD.org/pub/FreeBSD/) / rsync (rsync://ftp4.fr.FreeBSD.org/FreeBSD/) / rsyncv6 (rsync://ftp4.fr.FreeBSD.org/FreeBSD/))
- ftp://ftp5.fr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp6.fr.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)

- ftp://ftp7.fr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp8.fr.FreeBSD.org/pub/FreeBSD/ (ftp)

Germany

In case of problems, please contact the hostmaster <`de-bsd-hubs@de.FreeBSD.org`> for this domain.

- ftp://ftp.de.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp1.de.FreeBSD.org/freebsd/ (ftp / http (http://www1.de.FreeBSD.org/freebsd/) / rsync (rsync://rsync3.de.FreeBSD.org/freebsd/))
- ftp://ftp2.de.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.de.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp3.de.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.de.FreeBSD.org/FreeBSD/ (ftp / http (http://ftp4.de.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp5.de.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp6.de.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp7.de.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp7.de.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp8.de.FreeBSD.org/pub/FreeBSD/ (ftp)

Greece

In case of problems, please contact the hostmaster <`hostmaster@gr.FreeBSD.org`> for this domain.

- ftp://ftp.gr.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.gr.FreeBSD.org/pub/FreeBSD/ (ftp)

Hong Kong

- ftp://ftp.hk.FreeBSD.org/pub/FreeBSD/ (ftp)

Hungary

In case of problems, please contact the hostmaster <`hostmaster@hu.FreeBSD.org`> for this domain.

- ftp://ftp.hu.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.hu.FreeBSD.org/pub/FreeBSD/) / rsync)

Iceland

In case of problems, please contact the hostmaster <`hostmaster@is.FreeBSD.org`> for this domain.

- ftp://ftp.is.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)

Ireland

In case of problems, please contact the hostmaster <`hostmaster@ie.FreeBSD.org`> for this domain.

- ftp://ftp.ie.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.ie.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.ie.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp3.ie.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp3.ie.FreeBSD.org/pub/FreeBSD/) / rsync)

Israel

In case of problems, please contact the hostmaster <`hostmaster@il.FreeBSD.org`> for this domain.

- ftp://ftp.il.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6)

Italy

In case of problems, please contact the hostmaster <`hostmaster@it.FreeBSD.org`> for this domain.

- ftp://ftp.it.FreeBSD.org/pub/FreeBSD/ (ftp)

Japan

In case of problems, please contact the hostmaster <`hostmaster@jp.FreeBSD.org`> for this domain.

- ftp://ftp.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp5.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp6.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp7.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp8.jp.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp9.jp.FreeBSD.org/pub/FreeBSD/ (ftp)

Korea

In case of problems, please contact the hostmaster <`hostmaster@kr.FreeBSD.org`> for this domain.

- ftp://ftp.kr.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)
- ftp://ftp2.kr.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.kr.FreeBSD.org/pub/FreeBSD/))

Latvia

In case of problems, please contact the hostmaster <`hostmaster@lv.FreeBSD.org`> for this domain.

- ftp://ftp.lv.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.lv.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp2.lv.FreeBSD.org/pub/FreeBSD/ (ftp)

Lithuania

In case of problems, please contact the hostmaster <`hostmaster@lt.FreeBSD.org`> for this domain.

- ftp://ftp.lt.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.lt.FreeBSD.org/pub/FreeBSD/))

Netherlands

In case of problems, please contact the hostmaster <`hostmaster@nl.FreeBSD.org`> for this domain.

- ftp://ftp.nl.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.nl.FreeBSD.org/os/FreeBSD/) / rsync)
- ftp://ftp2.nl.FreeBSD.org/pub/FreeBSD/ (ftp)

New Zealand

- ftp://ftp.nz.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.nz.FreeBSD.org/pub/FreeBSD/))

Norway

In case of problems, please contact the hostmaster <`hostmaster@no.FreeBSD.org`> for this domain.

- ftp://ftp.no.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)
- ftp://ftp3.no.FreeBSD.org/pub/FreeBSD/ (ftp)

Poland

In case of problems, please contact the hostmaster <`hostmaster@pl.FreeBSD.org`> for this domain.

- ftp://ftp.pl.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.pl.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp2.pl.FreeBSD.org/pub/FreeBSD/) / http (http://ftp2.pl.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp2.pl.FreeBSD.org/pub/FreeBSD/) / rsync / rsyncv6)

Portugal

In case of problems, please contact the hostmaster <`hostmaster@pt.FreeBSD.org`> for this domain.

- ftp://ftp.pt.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.pt.FreeBSD.org/pub/freebsd/ (ftp)

- ftp://ftp4.pt.FreeBSD.org/pub/ISO/FreeBSD/ (ftp)

Romania

In case of problems, please contact the hostmaster <`hostmaster@ro.FreeBSD.org`> for this domain.

- ftp://ftp.ro.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp1.ro.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp1.ro.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp1.ro.FreeBSD.org/pub/FreeBSD/))

Russia

In case of problems, please contact the hostmaster <`hostmaster@ru.FreeBSD.org`> for this domain.

- ftp://ftp.ru.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.ru.FreeBSD.org/FreeBSD/) / rsync)
- ftp://ftp2.ru.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.ru.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp3.ru.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.ru.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp5.ru.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp5.ru.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp6.ru.FreeBSD.org/pub/FreeBSD/ (ftp)

Saudi Arabia

In case of problems, please contact the hostmaster <`ftpadmin@isu.net.sa`> for this domain.

- ftp://ftp.isu.net.sa/pub/ftp.freebsd.org/ (ftp)

Slovak Republic

In case of problems, please contact the hostmaster <`hostmaster@sk.FreeBSD.org`> for this domain.

- ftp://ftp.sk.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp.sk.FreeBSD.org/pub/FreeBSD/) / http (http://ftp.sk.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp.sk.FreeBSD.org/pub/FreeBSD/) / rsync / rsyncv6)
- ftp://ftp2.sk.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp2.sk.FreeBSD.org/pub/FreeBSD/) / http (http://ftp2.sk.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp2.sk.FreeBSD.org/pub/FreeBSD/))

Slovenia

In case of problems, please contact the hostmaster <`hostmaster@si.FreeBSD.org`> for this domain.

- ftp://ftp.si.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.si.FreeBSD.org/pub/FreeBSD/ (ftp)

South Africa

In case of problems, please contact the hostmaster <`hostmaster@za.FreeBSD.org`> for this domain.

- ftp://ftp.za.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.za.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.za.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.za.FreeBSD.org/pub/FreeBSD/ (ftp)

Spain

In case of problems, please contact the hostmaster <`hostmaster@es.FreeBSD.org`> for this domain.

- ftp://ftp.es.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.es.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp2.es.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.es.FreeBSD.org/pub/FreeBSD/ (ftp)

Sweden

In case of problems, please contact the hostmaster <`hostmaster@se.FreeBSD.org`> for this domain.

- ftp://ftp.se.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.se.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.se.FreeBSD.org/) / rsync (rsync://ftp2.se.FreeBSD.org/))
- ftp://ftp3.se.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.se.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp4.se.FreeBSD.org/pub/FreeBSD/) / http (http://ftp4.se.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp4.se.FreeBSD.org/pub/FreeBSD/) / rsync (rsync://ftp4.se.FreeBSD.org/pub/FreeBSD/) / rsyncv6 (rsync://ftp4.se.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp5.se.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp5.se.FreeBSD.org/) / rsync)

Switzerland

In case of problems, please contact the hostmaster <`hostmaster@ch.FreeBSD.org`> for this domain.

- ftp://ftp.ch.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.ch.FreeBSD.org/pub/FreeBSD/))

Taiwan

In case of problems, please contact the hostmaster <`hostmaster@tw.FreeBSD.org`> for this domain.

- ftp://ftp.tw.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp.tw.FreeBSD.org/pub/FreeBSD/) / rsync / rsyncv6)
- ftp://ftp2.tw.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 (ftp://ftp2.tw.FreeBSD.org/pub/FreeBSD/) / http (http://ftp2.tw.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp2.tw.FreeBSD.org/pub/FreeBSD/) / rsync / rsyncv6)

- ftp://ftp3.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp5.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp6.tw.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp6.tw.FreeBSD.org/) / rsync)
- ftp://ftp7.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp8.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp9.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp10.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp11.tw.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp11.tw.FreeBSD.org/FreeBSD/))
- ftp://ftp12.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp13.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp14.tw.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp15.tw.FreeBSD.org/pub/FreeBSD/ (ftp)

Turkey

- ftp://ftp.tr.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.tr.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp2.tr.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)

Ukraine

- ftp://ftp.ua.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp.ua.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp2.ua.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.ua.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp7.ua.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp8.ua.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp8.ua.FreeBSD.org/FreeBSD/))
- ftp://ftp11.ua.FreeBSD.org/pub/FreeBSD/ (ftp)

United Kingdom

In case of problems, please contact the hostmaster <`hostmaster@uk.FreeBSD.org`> for this domain.

- ftp://ftp.uk.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.uk.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp2.uk.FreeBSD.org/) / rsync)
- ftp://ftp3.uk.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.uk.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp5.uk.FreeBSD.org/pub/FreeBSD/ (ftp)

- ftp://ftp6.uk.FreeBSD.org/pub/FreeBSD/ (ftp)

USA

In case of problems, please contact the hostmaster <`hostmaster@us.FreeBSD.org`> for this domain.

- ftp://ftp1.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp2.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp3.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp4.us.FreeBSD.org/pub/FreeBSD/ (ftp / ftpv6 / http (http://ftp4.us.FreeBSD.org/pub/FreeBSD/) / httpv6 (http://ftp4.us.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp5.us.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)
- ftp://ftp6.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp7.us.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp7.us.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp8.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp9.us.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp9.us.FreeBSD.org/pub/os/FreeBSD/))
- ftp://ftp10.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp11.us.FreeBSD.org/pub/FreeBSD/ (ftp)
- ftp://ftp12.us.FreeBSD.org/pub/FreeBSD/ (ftp / rsync)
- ftp://ftp13.us.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp13.us.FreeBSD.org/pub/FreeBSD/) / rsync)
- ftp://ftp14.us.FreeBSD.org/pub/FreeBSD/ (ftp / http (http://ftp14.us.FreeBSD.org/pub/FreeBSD/))
- ftp://ftp15.us.FreeBSD.org/pub/FreeBSD/ (ftp)

A.3 BitTorrent

Ìðïñåßôå íá áíáêôÞóåôå ôá âáóéêÜ áñ÷åßá ISO ôùí åêäüóåùí ôïõ FreeBSD, ìÝóù ôïõ óõóôÞìáôïò BitTorrent. Óôçí ôïðïèåóßá http://torrents.freebsd.org:8080 (http://torrents.freebsd.org:8080/) õðÜñ÷åé ìéá ðëÞñçò óõëëïãÞ áðü áñ÷åßá torrent ðïõ ìðïñåßôå íá êáôåâÜóåôå.

Ãéá íá ÷ñçóéìïðïéÞóåôå ôá áñ÷åßá torrent, èá ÷ñåéáóôåßôå êáôÜëëçëï ëïãéóìéêü-ðåëÜôç, üðùò áõôü ðïõ ðáñÝ÷åôáé áðü ôï port Þ ðáêÝôï `net-p2p/py-bittorrent`.

Áöïý êáôåâÜóåôå ôï áñ÷åßï ISO ìå ôï BitTorrent, ìðïñåßôå íá ôï ãñÜøåôå óå CD Þ DVD, üðùò ðåñéãñÜöåôáé óôï ÔìÞìá 19.6.3 (burncd).

A.4 Áíþíõìï CVS

A.4.1 ÅéóáãùãÞ

Ç óýíäåóç áíþíõìïõ CVS (Þ *anoncvs* üðùò ëÝãåôáé ìåñéêÝò öïñÝò) õðïóôçñßæåôáé áðü ôá åñãáëåßá CVS ðïõ äéáíÝìïíôáé ìå ôï ßäéï ôï FreeBSD ãéá óõã÷ñïíéóìü ôïðéêþí áñ÷åßùí ìå Ýíá áðïìáêñõóìÝíï repository. ¼ëá áðü ôá ÷áñáêôçñéóôéêÜ ôïõ CVS åßíáé üôé åðéôñÝðåé óôïõò ÷ñÞóôåò ôïõ FreeBSD íá óõã÷ñïíßæïõí, ÷ùñßò éäéáßôåñá äéêáéþìáôá ÷ñÞóôç, ôá ôïðéêÜ áíôßãñáöá ðçãáßïõ êþäéêá ðïõ Ý÷ïõí ìå ôïõò êåíôñéêïýò, åðßóçìïõò åîõðçñåôçôÝò CVS ôïõ FreeBSD project. Ãéá íá ÷ñçóéìïðïéÞóåé êáíåßò ôï CVS áñêåß: (á) íá ïñßóåé ôçí ôéìÞ ôçò ìåôáâëçôÞò ðåñéâÜëëïíôïò `CVSROOT` Ýôóé þóôå íá äåß÷íåé ðñïò Ýíáí áðü ôïõò åðßóçìïõò åîõðçñåôçôÝò, êáé (â) íá äþóåé ôïí êùäéêü “anoncvs” óôçí ðñïôñïðÞ ôçò åíôïëÞò `cvs login`. Ôüôå ìðïñåß íá ÷ñçóéìïðïéÞóåé ôï åñãáëåßï cvs(1) ãéá íá ðñïóðåëÜóåé ôï áðïìáêñõóìÝíï CVS repository ôïõ FreeBSD óáí Ýíá ïðïéïäÞðïôå ôïðéêü repository.

> **Óçìåßùóç:** Ç åíôïëÞ `cvs login` áðïèçêåýåé ôïõò êùäéêïýò ðïõ ÷ñçóéìïðïéïýíôáé ãéá ðéóôïðïßçóçò ôçò ôáõôüôçôÜò óáò óôïí åîõðçñåôçôÞ CVS óå Ýíá áñ÷åßï ìå üíïìá `.cvspass` óôïí `HOME` êáôÜëïãï ôïõ ôïðéêïý óáò ëïãáñéáóìïý. Áí áõôü ôï áñ÷åßï äåí õðÜñ÷åé Þäç, ìðïñåß íá áðïôý÷åé ç åíôïëÞ `cvs login` ôçí ðñþôç öïñÜ. Ìðïñåßôå áðëÜ íá äçìéïõñãÞóåôå Ýíá Üäåéï áñ÷åßï `.cvspass` êáé íá îáíáôñÝîåôå ôçí åíôïëÞ `cvs login`.

Ìðïñåß íá ðåé êáíåßò üôé ôï CVSup êáé ôï *anoncvs* åßíáé ïõóéáóôéêÜ ðáñüìïéïé ôñüðïé óõã÷ñïíéóìïý áñ÷åßùí êáé õðïóôçñßæïõí ôçí ßäéá ëåéôïõñãéêüôçôá, áëëÜ õðÜñ÷ïõí êÜðïéåò äéáöïñÝò ïé ïðïßåò ìðïñåß íá ðáßîïõí óçìáíôéêü ñüëï óôçí åðéëïãÞ ìåôáîý áõôþí ôùí äýï ìåèüäùí. ÃåíéêÜ, ôï **CVSup** êÜíåé ðïëý ðéï áðïäïôéêÞ ÷ñÞóç ôçò óýíäåóçò ðïõ Ý÷åôå êáé ÷ñçóéìïðïéåß Ýíá ðïëý ðéï Ýîõðíï ðñùôüêïëëï åðéêïéíùíßáò, áëëÜ õðÜñ÷åé êáé ôï áíôßóôïé÷ï ôßìçìá. Ãéá íá ÷ñçóéìïðïéÞóåôå ôï **CVSup** ðñÝðåé íá åãêáôáóôÞóåôå êáé íá ñõèìßóåôå Ýíá åéäéêü ðñüãñáììá ðåëÜôç, êáé ôüôå ìðïñåßôå íá óõã÷ñïíßóåôå ìüíï ìåãÜëåò óõëëïãÝò áñ÷åßùí — ôéò ïðïßåò ôï **CVSup** áðïêáëåß “óõëëïãÝò” (collections).

Ôï **anoncvs**, áðü ôçí Üëëç, ìðïñåß íá ÷ñçóéìïðïéçèåß ãéá íá åîåôÜóåé êáíåßò ôéò áëëáãÝò åíüò êáé ìüíï áñ÷åßïõ Þ åíüò ìüíï ðñïãñÜììáôïò êáé ôùí óõíäåõôéêþí ôïõ áñ÷åßùí (ð.÷. ôïí ðçãáßï êþäéêá ôçò åíôïëÞò `ls` Þ ôçò `grep`), ìå ÷ñÞóç ôïõ ïíüìáôïò ôïõ êáôÜëëçëïõ module. Ôï **anoncvs** åßíáé ðéï âïëéêü ãéá åñãáóßåò ðïõ áðáéôïýí âÝâáéá ìüíï áíÜãíùóç. Ïðüôå, áí èÝëåôå íá õðïóôçñßîåôå ôçí áíÜðôõîç ðñïãñáììÜôùí ôïðéêÜ, ôï **CVSup** åßíáé ìÜëëïí ìïíüäñïìïò.

A.4.2 ×ñçóéìïðïéþíôáò Áíþíõìï CVS

Ç ñýèìéóç ôïõ cvs(1) þóôå íá ÷ñçóéìïðïéåß Ýíá áíþíõìï CVS repository ãßíåôáé áðëþò ñõèìßæïíôáò ôçí ìåôáâëçôÞ ðåñéâÜëëïíôïò `CVSROOT` þóôå íá äåß÷íåé óå Ýíáí áðü ôïõò *anoncvs* åîõðçñåôçôÝò ôïõ FreeBSD project. Ôçí þñá ðïõ ãñÜöïíôáé áõôÝò ïé ãñáììÝò, åßíáé äéáèÝóéìïé ïé áêüëïõèïé åîõðçñåôçôÝò:

- *Ãáëëßá*: :pserver:anoncvs@anoncvs.fr.FreeBSD.org:/home/ncvs (Ãéá pserver ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `cvs login` êáé äþóôå ôïí êùäéêü “anoncvs” üôáí óáò æçôçèåß. Ôï ssh äåí áðáéôåß ôç ÷ñÞóç êùäéêïý.)
- *ÔáÀâÜí*: :pserver:anoncvs@anoncvs.tw.FreeBSD.org:/home/ncvs (Ãéá pserver ÷ñçóéìïðïéÞóôå ôçí åíôïëÞ `cvs login` êáé äþóôå ïôéäÞðïôå ãéá êùäéêü üôáí óáò æçôçèåß, Ôï ssh äåí áðáéôåß ôç ÷ñÞóç êùäéêïý.)

  ```
  SSH2 HostKey: 1024 02:ed:1b:17:d6:97:2b:58:5e:5c:e2:da:3b:89:88:26 /etc/ssh/ssh_host_rsa_key.pub
  SSH2 HostKey: 1024 e8:3b:29:7b:ca:9f:ac:e9:45:cb:c8:17:ae:9b:eb:55 /etc/ssh/ssh_host_dsa_key.pub
  ```
- *ÇíùìÝíåò Ðïëéôåßåò ÁìåñéêÞò*: anoncvs@anoncvs1.FreeBSD.org:/home/ncvs (Ãéá ðñüóâáóç ìÝóù ssh, ÷ñçóéìïðïéÞóôå ôçí Ýêäïóç 2 ôïõ ssh, ÷ùñßò êùäéêü.)

```
SSH2 HostKey: 2048 53:1f:15:a3:72:5c:43:f6:44:0e:6a:e9:bb:f8:01:62 /etc/ssh/ssh_host_dsa_key.pub
```

Êáèþò ôï CVS óáò åðéôñÝðåé íá êÜíåôå “check out” ïõóéáóôéêÜ ïðïéáäÞðïôå Ýêäïóç ôïõ ðçãáßïõ êþäéêá ôïõ FreeBSD õðÞñîå ðïôÝ (êáé óå ïñéóìÝíåò ðåñéðôþóåéò áêüìá êáé åêäüóåéò ðïõ äåí Ý÷ïõí êõêëïöïñÞóåé áêüìá), èá ðñÝðåé íá åßóôå åîïéêåéùìÝíïò ìå ôçí åðéëïãÞ ôïõ cvs(1) ìå ôçí ïðïßá åðéëÝãåôáé ôï revision (ðñüêåéôáé ãéá ôçí `-r`) êáé ðïéåò åßíáé ïé åðéôñåðôÝò ôéìÝò ôçò ãéá ôï repository ôïõ FreeBSD project.

ÕðÜñ÷ïõí äýï åßäç tags (åôéêåôþí), ôá revision tags (åôéêÝôåò Ýêäïóçò) êáé ôá branch tags. ¸íá revision tag áíáöÝñåôáé óå ìéá óõãêåêñéìÝíç Ýêäïóç. Ç Ýííïéá ôïõ ðáñáìÝíåé óôáèåñÞ ìÝñá ìå ôç ìÝñá. Áðü ôçí Üëëç, Ýíá branch tag äåß÷íåé ôçí ôåëåõôáßá Ýêäïóç ìéáò óõãêåêñéìÝíçò ðïñåßáò áíÜðôõîçò, óå êÜèå ÷ñïíéêÞ óôéãìÞ. Êáèþò ôï branch tag äåí áíáöÝñåôáé óå êÜðïéá óõãêåêñéìÝíç Ýêäïóç, ìðïñåß áýñéï íá óçìáßíåé êÜôé äéáöïñåôéêü áðü üôé óçìáßíåé óÞìåñá.

Ôï ÔìÞìá A.7 ðåñéÝ÷åé revision tags ôá ïðïßá ìðïñåß íá åíäéáöÝñïõí ôïõò ÷ñÞóôåò. Õðåíèõìßæïõìå üôé êáíÝíá áðü áõôÜ äåí åßíáé Ýãêõñï ãéá ôçí ÓõëëïãÞ ôùí Ports, êáèþò áõôÞ äåí Ý÷åé ðïëëáðëÝò åêäüóåéò (revisions).

¼ôáí êáèïñßæåôå êÜðïéï branch tag, öõóéïëïãéêÜ ëáìâÜíåôå ôéò ôåëåõôáßåò åêäüóåéò ôùí áñ÷åßùí ðïõ õðÜñ÷ïõí óå áõôÞ ôç ãñáììÞ áíÜðôõîçò. Áí èÝëåôå íá ëÜâåôå êÜðïéá ðáëéüôåñç Ýêäïóç, ìðïñåßôå íá ôï êÜíåôå êáèïñßæïíôáò ìéá çìåñïìçíßá ìå ôçí åðéëïãÞ `-D date`. Äåßôå ôç óåëßäá manual ôïõ cvs(1) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

A.4.3 Ðáñáäåßãìáôá

Áí êáé ðñáãìáôéêÜ óõíßóôáôáé íá äéáâÜóåôå ðñïóåêôéêÜ ôç óåëßäá manual ôïõ cvs(1) ðñéí êÜíåôå ïôéäÞðïôå, ðáñáêÜôù óáò äßíïõìå êÜðïéá ãñÞãïñá ðáñáäåßãìáôá ôá ïðïßá ïõóéáóôéêÜ èá óáò äåßîïõí ðùò íá ÷ñçóéìïðïéÞóåôå ôï Áíþíõìï CVS:

ÐáñÜäåéãìá A-1. ËÞøç (Check out) ÊÜðïéïõ Áñ÷åßïõ áðü ôï -CURRENT (ls(1)):

```
% setenv CVSROOT :pserver:anoncvs@anoncvs.tw.FreeBSD.org:/home/ncvs
% cvs login
Óôçí ðñïôñïðÞ, äþóôå ïðïéáäÞðïôå ëÝîç ãéá “password”.
% cvs co ls
```

ÐáñÜäåéãìá A-2. ×ñÞóç SSH ãéá ËÞøç (check out) ôïõ ÄÝíôñïõ `src/`:

```
% cvs -d anoncvs@anoncvs1.FreeBSD.org:/home/ncvs co src
The authenticity of host ’anoncvs1.freebsd.org (216.87.78.137)’ can’t be established.
DSA key fingerprint is 53:1f:15:a3:72:5c:43:f6:44:0e:6a:e9:bb:f8:01:62.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added ’anoncvs1.freebsd.org’ (DSA) to the list of known hosts.
```

ÐáñÜäåéãìá A-3. ËÞøç ôçò ¸êäïóçò ôïõ Áñ÷åßïõ ls(1) áðü ôï 8-STABLE Branch:

```
% setenv CVSROOT :pserver:anoncvs@anoncvs.tw.FreeBSD.org:/home/ncvs
% cvs login
Óôçí ðñïôñïðÞ, äþóôå ïðïéáäÞðïôå ëÝîç ãéá “password”.
% cvs co -rRELENG_8 ls
```

ÐáñÜäåéãìá A-4. Äçìéïõñãßá ìéáò Ëßóôáò Áëëáãþí (ùò Unified Diffs) ôçò ls(1):

```
% setenv CVSROOT :pserver:anoncvs@anoncvs.tw.FreeBSD.org:/home/ncvs
% cvs login
Óôçí ðñïôñïðÞ, äþóôå ïðïéáäÞðïôå ëÝîç ãéá “password”.
% cvs rdiff -u -rRELENG_8_0_0_RELEASE -rRELENG_8_1_0_RELEASE ls
```

ÐáñÜäåéãìá A-5. Âñßóêïíôáò Ðïéá ¶ëëá Ïíüìáôá Modules ìðïñïýí íá ×ñçóéìïðïéçèïýí:

```
% setenv CVSROOT :pserver:anoncvs@anoncvs.tw.FreeBSD.org:/home/ncvs
% cvs login
Óôçí ðñïôñïðÞ, äþóôå ïðïéáäÞðïôå ëÝîç ãéá “password”.
% cvs co modules
% more modules/modules
```

A.4.4 ¶ëëåò ÐçãÝò Ðëçñïöïñéþí

Ïé ðáñáêÜôù ðçãÝò ðëçñïöïñéþí ßóùò óáò öáíïýí ÷ñÞóéìåò ãéá íá ìÜèåôå ôï CVS:

- CVS Tutorial (http://users.csc.calpoly.edu/~gfisher/classes/308/handouts/cvs-basics.html) áðü ôï California Polytechnic State University.
- CVS Home (http://ximbiot.com/cvs/wiki/), ç ïìÜäá áíÜðôõîçò êáé õðïóôÞñéîçò ôïõ CVS.
- CVSweb (http://www.FreeBSD.org/cgi/cvsweb.cgi) ÄéåðáöÞ Web ãéá ôï CVS ôïõ FreeBSD Project.

A.5 ×ñçóéìïðïéþíôáò ôï CTM

Ôï **CTM** åßíáé ìéá ìÝèïäïò íá äéáôçñïýìå óå óõã÷ñïíéóìü Ýíá áðïìáêñõóìÝíï êáôÜëïãï ìå Ýíá êåíôñéêü. Áíáðôý÷èçêå ãéá ÷ñÞóç ìå ôï äÝíôñï ðçãáßïõ êþäéêá ôïõ FreeBSD, áí êáé Üëëïé Üíèñùðïé ìðïñåß íá ôï âñïõí ÷ñÞóéìï êáé ãéá äéáöïñåôéêïýò óêïðïýò êáèþò ðåñíÜåé ï êáéñüò. Ôç äåäïìÝíç óôéãìÞ õðÜñ÷åé åëÜ÷éóôç ùò áíýðáñêôç ôåêìçñßùóç ãéá ôçí äéáäéêáóßá äçìéïõñãßáò áñ÷åßùí äéáöïñþí (deltas), êáé áí ÷ñåéÜæåóôå ðåñéóóüôåñåò ðëçñïöïñßåò, åðéêïéíùíÞóôå ìå ôç ëßóôá ôá÷õäñïìåßïõ ctm-users (http://lists.FreeBSD.org/mailman/listinfo/ctm-users) åéäéêÜ áí èÝëåôå íá ÷ñçóéìïðïéÞóåôå ôï **CTM** ãéá Üëëïõò óêïðïýò.

A.5.1 Ãéáôß ÐñÝðåé íá ×ñçóéìïðïéÞóù ôï CTM;

Ôï **CTM** èá óáò äþóåé Ýíá ôïðéêü áíôßãñáöï ôïõ äÝíôñïõ ðçãáßïõ êþäéêá ôïõ FreeBSD. ÕðÜñ÷åé äéáèÝóéìïò Ýíáò áñéèìüò áðü “ãåýóåéò” ôïõ äÝíôñïõ. Ôï **CTM** ìðïñåß íá óáò ðáñÝ÷åé ôéò ðëçñïöïñßåò ðïõ ÷ñåéÜæåóôå, åßôå áðïöáóßóåôå íá ðáñáêïëïõèåßôå ïëüêëçñï ôï äÝíôñï, åßôå êÜðïéï áðü ôá ðáñáêëÜäéá ôïõ. Áí áíÞêåôå óôá åíåñãÜ ìÝëç áíÜðôõîçò ôïõ FreeBSD áëëÜ Ý÷åôå êáêÞò ðïéüôçôáò (Þ êáèüëïõ) TCP/IP óõíäåóéìüôçôá, Þ áðëÜ èÝëåôå ïé áëëáãÝò íá óáò Ýñ÷ïíôáé áõôüìáôá, ôï **CTM** Ý÷åé öôéá÷ôåß ãéá óáò. Èá ÷ñåéáóôåß íá ðáßñíåôå ùò ôñßá deltas ôçí çìÝñá ãéá ôá êëáäéÜ ôïõ äÝíôñïõ ðïõ Ý÷ïõí ôçí ðéï åíåñãÞ áíÜðôõîç. Èá ðñÝðåé ùóôüóï íá èåùñÞóåôå ùò êáëýôåñç ëýóç ôçí áõôüìáôç áðïóôïëÞ ôïõò ìÝóù email. Ôá ìåãÝèç ôùí áíáíåþóåùí êñáôïýíôáé ðÜíôá üóï ôï äõíáôüí ðéï ìéêñÜ. ÓõíÞèùò åßíáé ìéêñüôåñá áðü 5Ê, ðåñéóôáóéáêÜ (Ýíá óôá äÝêá) åßíáé áðü 10-50Ê êáé ïñéóìÝíåò öïñÝò åìöáíßæïíôáé êáé êÜðïéá ðïõ åßíáé 100Ê Þ êáé ìåãáëýôåñá.

Èá ðñÝðåé åðßóçò íá åîïéêåéùèåßôå ìå ôéò äéÜöïñåò ðáãßäåò ðïõ ó÷åôßæïíôáé ìå ôçí áðåõèåßáò åñãáóßá óôïí õðü áíÜðôõîç ðçãáßï êþäéêá óå ó÷Ýóç ìå ìéá Ýôïéìç, ðñïêáôáóêåõáóìÝíç Ýêäïóç. Áõôü éó÷ýåé áêüìá ðåñéóóüôåñï áí åðéëÝîåôå íá ÷ñçóéìïðïéÞóåôå ôïí ðçãáßï êþäéêá áðü ôï “current”. Óáò óõíéóôïýìå íá äéáâÜóåôå ðùò íá ÷ñçóéìïðïéÞóåôå ôï current óôï FreeBSD.

A.5.2 Ôé ×ñåéÜæïìáé ãéá íá ×ñçóéìïðïéÞóù ôï CTM;

Èá ÷ñåéáóôåßôå äýï ðñÜãìáôá: Ôçí åöáñìïãÞ **CTM** êáé ôéò áñ÷éêÝò áëëáãÝò (deltas) ãéá íá ôéò åéóÜãåôå óå áõôÞí (þóôå íá öôÜóåôå óôï åðßðåäï ôïõ “current”).

Ôï **CTM** åßíáé ìÝñïò ôïõ FreeBSD áðü ôçí Ýêäïóç 2.0, êáé âñßóêåôáé óôïí êáôÜëïãï `/usr/src/usr.sbin/ctm` åöüóïí Ý÷åôå åãêáôåóôçìÝíï ôïí ðçãáßï êþäéêá.

Ôá “deltas” ìå ôá ïðïßá ôñïöïäïôåßôå ôï **CTM** ìðïñåßôå íá ôá áðïêôÞóåôå ìå äýï ôñüðïõò, ìÝóù FTP Þ ìÝóù email. Áí Ý÷åôå ãåíéêÞ FTP ðñüóâáóç óôï Internet, èá âñåßôå õðïóôÞñéîç ãéá ôï **CTM** óôéò áêüëïõèåò ôïðïèåóßåò FTP:

ftp://ftp.FreeBSD.org/pub/FreeBSD/CTM/

Þ äåßôå ôï ôìÞìá mirrors.

ÊÜíôå FTP óôï ó÷åôéêü êáôÜëïãï êáé äéáâÜóôå ôï áñ÷åßï `README` ãéá íá îåêéíÞóåôå.

Áí èÝëåôå íá ëáìâÜíåôå ôá deltas ìÝóù email:

Ãñáöôåßôå óõíäñïìçôÞò óå ìéá áðü ôéò ëßóôåò äéáíïìÞò ôïõ **CTM**. Ç ëßóôá ctm-cvs-cur (http://lists.FreeBSD.org/mailman/listinfo/ctm-cvs-cur) õðïóôçñßæåé ïëüêëçñï ôï äÝíôñï ôïõ CVS. Ç ëßóôá ctm-src-cur (http://lists.FreeBSD.org/mailman/listinfo/ctm-src-cur) õðïóôçñßæåé ôçí êåöáëÞ (head) ôïõ êëÜäïõ áíÜðôõîçò (development branch). Ç ëßóôá ctm-src-7 (http://lists.FreeBSD.org/mailman/listinfo/ctm-src-7) õðïóôçñßæåé ôçí Ýêäïóç 7.X ê.ï.ê. Áí äåí ãíùñßæåôå ðùò íá åããñáöåßôå óå ìéá ëßóôá, êÜíôå êëéê óôï üíïìá ôçò ëßóôáò ðïõ åìöáíßæåôáé ðáñáðÜíù Þ ðçãáßíåôå óôï http://lists.FreeBSD.org/mailman/listinfo êáé êÜíôå êëéê óôç ëßóôá ðïõ èÝëåôå íá åããñáöåßôå. Ç óåëßäá ôçò ëßóôáò èá ðñÝðåé íá ðåñéÝ÷åé üëåò ôéò áðáñáßôçôåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò óõíäñïìÝò.

¼ôáí áñ÷ßóåôå íá ëáìâÜíåôå áíáíåþóåéò **CTM** ìÝóù mail, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï ðñüãñáììá `ctm_rmail` ãéá íá ôéò áðïóõìðéÝóåôå êáé íá ôéò åöáñìüóåôå. Ìðïñåßôå óôçí ðñáãìáôéêüôçôá íá ÷ñçóéìïðïéÞóåôå ôï ðñüãñáììá `ctm_rmail` áðåõèåßáò ìÝóù ìéáò åããñáöÞò óôï `/etc/aliases` áí èÝëåôå ç äéáäéêáóßá íá åêôåëåßôáé áõôïìáôïðïéçìÝíá. Äåßôå ôç óåëßäá manual ôïõ `ctm_rmail` ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

> **Óçìåßùóç:** ¶ó÷åôá ìå ôç ìÝèïäï ðïõ èá ÷ñçóéìïðïéÞóåôå ãéá íá ëÜâåôå ôá deltas ôïõ **CTM** èá ðñÝðåé íá åããñáöåßôå óôç ëßóôá ctm-announce (http://lists.FreeBSD.org/mailman/listinfo/ctm-announce). Óôï ìÝëëïí, áõôü èá åßíáé êáé ôï ìüíï ìÝñïò óôï ïðïßï èá äçìïóéåýïíôáé ðëçñïöïñßåò ó÷åôéêÜ ìå ôéò ëåéôïõñãßåò ôïõ óõóôÞìáôïò **CTM**. ÊÜíôå êëéê óôï üíïìá ôçò ðáñáðÜíù ëßóôáò, êáé áêïëïõèåßóôå ôéò ïäçãßåò ãéá íá åããñáöåßôå.

A.5.3 ×ñçóéìïðïéþíôáò ôï CTM ãéá Ðñþôç ÖïñÜ

Ðñéí áñ÷ßóåôå íá ÷ñçóéìïðïéåßôå **CTM** deltas, èá ðñÝðåé íá Ý÷åôå Ýíá óçìåßï åêêßíçóçò ãéá ôá delta ðïõ Ý÷ïõí äçìéïõñãçèåß ìåôÜ áðü áõôü.

Èá ðñÝðåé ðñþôá íá êáèïñßóåôå ôé Ý÷åôå Þäç. Ïðïéïóäçðïôå ìðïñåß íá áñ÷ßóåé áðü Ýíá “Üäåéï” êáôÜëïãï. Èá ðñÝðåé íá îåêéíÞóåôå ìå Ýíá áñ÷éêü “Êåíü” delta ãéá íá áñ÷ßóåôå ìå ôï **CTM** äÝíôñï óáò. Áðü êÜðïéï óçìåßï èåùñïýìå üôé Ýíá áðü áõôÜ ôá “áñ÷éêÜ” deltas èá äéáíÝìïíôáé óå CD ãéá ôç äéêÞ óáò äéåõêüëõíóç, ùóôüóï áõôü äåí óõìâáßíåé ôç äåäïìÝíç óôéãìÞ.

Êáèþò ôá äÝíôñá åßíáé áñêåôÝò äåêÜäåò megabytes, åßíáé ðñïôéìüôåñï íá îåêéíÞóåôå áðü êÜôé ðïõ Ý÷åôå Þäç. Áí Ý÷åôå CD êÜðïéáò äéáíïìÞò (RELEASE), ìðïñåßôå íá áíôéãñÜøåôå Þ íá áðïóõìðéÝóåôå áðü åêåß ôïí áñ÷éêü ðçãáßï êþäéêá. ¸ôóé èá ãëõôþóåôå óçìáíôéêü ìÝñïò ôçò ìåôáöïñÜò äåäïìÝíùí.

Ìðïñåßôå íá áíáãíùñßóåôå áõôÜ ôá “áñ÷éêÜ” deltas áðü ôï `X` ðïõ áêïëïõèåß ôïí áñéèìü ôïõò (ãéá ðáñÜäåéãìá `src-cur.3210XEmpty.gz`). Ï ÷áñáêôçñéóìüò ìåôÜ ôï `X` áíôéóôïé÷åß óôçí ðçãÞ ôïõ áñ÷éêïý óáò “seed”. Ôï `Empty` åßíáé Ýíáò Üäåéïò êáôÜëïãïò. ÊáôÜ êáíüíá äçìéïõñãåßôáé ìéá ìåôÜâáóç áðü ôï `Empty` êÜèå 100 deltas. Åðßóçò ôá áñ÷åßá áõôÜ åßíáé ìåãÜëá! ÓõíçèéóìÝíï ìÝãåèïò ãéá `XEmpty` deltas åßíáé ôá 70 ùò 80 MB óõìðéåóìÝíùí ìå `gzip` äåäïìÝíùí.

Ìüëéò åðéëÝîåôå Ýíá âáóéêü delta ãéá íá îåêéíÞóåôå, èá ÷ñåéáóôåßôå åðßóçò üëá ôá deltas ìå ìåãáëýôåñïõò áðü áõôü áñéèìïýò.

A.5.4 ×ñçóéìïðïéþíôáò ôï CTM óôçí ÊáèçìåñéíÞ óáò ÆùÞ

Ãéá íá åöáñìüóåôå ôá deltas, áðëþò ãñÜøôå:

```
# cd /where/ever/you/want/the/stuff
# ctm -v -v /where/you/store/your/deltas/src-xxx.*
```

Ôï **CTM** áíôéëáìâÜíåôáé deltas ôá ïðïßá Ý÷ïõí óõìðéåóôåß ìÝóù `gzip`, êáé Ýôóé äåí ÷ñåéÜæåôáé íá ÷ñçóéìïðïéÞóåôå ôçí `gunzip`, ãëõôþíïíôáò ìå áõôü ôïí ôñüðï ÷þñï óôï äßóêï.

Ôï **CTM** äåí ðñüêåéôáé íá ðåéñÜîåé ôá áñ÷åßá óáò áí äåí åßíáé áðüëõôá óßãïõñï ãéá ôç äéáäéêáóßá áíáíÝùóçò. Ãéá íá åðáëçèåýóåôå Ýíá delta ìðïñåßôå åðßóçò íá ÷ñçóéìïðïéÞóåôå ôçí åðéëïãÞ `-c` êáé ôï **CTM** äåí èá ðåéñÜîåé ôßðïôá, áðëþò èá åðáëçèåýóåé ôçí áêåñáéüôçôá ôïõ delta êáé èá äåé áí ìðïñåß íá ôï åöáñìüóåé ÷ùñßò ðñïâëÞìáôá óôï ôñÝ÷ïí äÝíôñï.

ÕðÜñ÷ïõí êáé Üëëåò åðéëïãÝò óôï **CTM**, äåßôå ôéò áíôßóôïé÷åò óåëßäåò manual Þ êïéôÜîôå ôïí ðçãáßï êþäéêá ãéá ðåñéóóüôåñåò ðëçñïöïñßåò.

Áõôü åßíáé üëï óôçí ðñáãìáôéêüôçôá. ÊÜèå öïñÜ ðïõ ëáìâÜíåôå Ýíá íÝï delta, áðëþò ðåñÜóôå ôï óôï **CTM** þóôå íá Ý÷åôå ðÜíôïôå áíáíåùìÝíï ôïí ðçãáßï óáò êþäéêá.

Ìçí óâÞíåôå ôá deltas áí åßíáé äýóêïëï íá ôá êáôåâÜóåôå îáíÜ. ºóùò èÝëåôå íá ôá öõëÜîåôå ãéá ôçí ðåñßðôùóç ðïõ êÜôé ðÜåé óôñáâÜ. Áêüìá êáé áí ôï ìüíï ìÝóï ðïõ Ý÷åôå åßíáé äéóêÝôåò, êÜíôå áíôßãñáöï ÷ñçóéìïðïéþíôáò ôçí `fdwrite`.

A.5.5 Êñáôþíôáò ôéò ÔïðéêÝò óáò ÁëëáãÝò

Ùò ðñïãñáììáôéóôÞò, èá èÝëåôå íá ðåéñáìáôéóôåßôå êáé íá áëëÜîåôå áñ÷åßá óôï äÝíôñï ôïõ ðçãáßïõ êþäéêá. Ôï **CTM** õðïóôçñßæåé ðåñéïñéóìÝíïõ ôýðïõ ôïðéêÝò áëëáãÝò: ðñéí åëÝãîåé ãéá ôçí ðáñïõóßá åíüò áñ÷åßïõ `foo`, åëÝã÷åé ðñþôá ãéá ôï `foo.ctm`. Áí ôï áñ÷åßï áõôü õðÜñ÷åé, ôï **CTM** èá ÷ñçóéìïðïéÞóåé áõôü áíôß ãéá ôï `foo`.

Ç óõìðåñéöïñÜ áõôÞ ìáò ðáñÝ÷åé Ýíá áðëü ôñüðï íá äéáôçñÞóïõìå ôïðéêÝò áëëáãÝò: áðëþò áíôéãñÜøôå ôá áñ÷åßá ðïõ óêïðåýåôå íá áëëÜîåôå óå áíôßóôïé÷á áñ÷åßá ìå êáôÜëçîç `.ctm`. Ìðïñåßôå êáôüðéí íá êÜíåôå üôé áëëáãÝò èÝëåôå óôïí êþäéêá åíþ ôï **CTM** èá äéáôçñåß áíáíåùìÝíï ôï áñ÷åßï `.ctm`.

A.5.6 ¶ëëåò ÅíäéáöÝñïõóåò ÅðéëïãÝò ôïõ CTM

A.5.6.1 Âñßóêïíôáò ôé Áêñéâþò èá ÁëëÜîåé óå ìéá ÁíáíÝùóç

Ìðïñåßôå íá ðñïóäéïñßóåôå ôéò áëëáãÝò ðïõ èá ðñïêáëÝóåé ôï **CTM** óôï repository ôïõ ðçãáßïõ óáò êþäéêá, ÷ñçóéìïðïéþíôáò ôçí åðéëïãÞ `-l`.

Áõôü èá åßíáé ÷ñÞóéìï áí èÝëåôå íá êñáôÞóåôå çìåñïëüãéï ôùí áëëáãþí, áí èÝëåôå íá åðåîåñãáóôåßôå ôá ôñïðïðïéçìÝíá áñ÷åßá ðñéí Þ ìåôÜ ôçí ôñïðïðïßçóç ôïõò, Þ áí áðëþò áéóèÜíåóôå åëáöñþò ðáñáíïúêüò.

A.5.6.2 Äçìéïõñãþíôáò Áíôßãñáöá Áóöáëåßáò ðñéí ôçí ÁíáíÝùóç

ÌåñéêÝò öïñÝò èá èÝëåôå íá êñáôÞóåôå áíôßãñáöï áóöáëåßáò üëùí ôùí áñ÷åßùí ðïõ ðñüêåéôáé íá áëëá÷èïýí áðü ìéá áíáíÝùóç ìÝóù **CTM**.

Äßíïíôáò ôçí åðéëïãÞ `-B backup-file` ôï **CTM** èá äçìéïõñãÞóåé áíôßãñáöï áóöáëåßáò üëùí ôùí áñ÷åßùí ðïõ ðñüêåéôáé íá áëëá÷èïýí áðü êÜðïéï óõãêåêñéìÝíï delta óôï áñ÷åßï `backup-file`.

A.5.6.3 Ðåñéïñßæïíôáò ôá Áñ÷åßá ðïõ èá Áëëá÷èïýí áðü ÊÜðïéá ÁíáíÝùóç

ÌåñéêÝò öïñÝò ßóùò íá åíäéáöÝñåóôå íá ðåñéïñßóåôå ôçí ðåñéï÷Þ äñÜóçò ìéáò óõãêåêñéìÝíçò áíáíÝùóçò ìÝóù **CTM** Þ ßóùò óáò åíäéáöÝñåé íá ðÜñåôå ìüíï ëßãá áñ÷åßá áðü êÜðïéá óåéñÜ áðü deltas.

Ìðïñåßôå íá åëÝãîåôå ôç ëßóôá ôùí áñ÷åßùí óôá ïðïßá èá ëåéôïõñãÞóåé ôï **CTM** ÷ñçóéìïðïéþíôáò ùòößëôñá, regular expressions ìå ôéò åðéëïãÝò `-e` êáé `-x`.

Ãéá ðáñÜäåéãìá, ãéá íá åîÜãåôå Ýíá åíçìåñùìÝíï áíôßãñáöï ôïõ áñ÷åßïõ `lib/libc/Makefile` áðü ôçí óõëëïãÞ óáò ôùí áðïèçêåõìÝíùí **CTM** deltas, åêôåëÝóôå ôéò åíôïëÝò:

```
# cd /where/ever/you/want/to/extract/it/
# ctm -e ’^lib/libc/Makefile’ ~ctm/src-xxx.*
```

Ãéá êÜèå áñ÷åßï ðïõ êáèïñßæåôáé óå Ýíá **CTM** delta, ïé åðéëïãÝò `-e` êáé `-x` åöáñìüæïíôáé ìå ôç óåéñÜ ðïõ åìöáíßæïíôáé óôç ãñáììÞ åíôïëþí. Óôï áñ÷åßï ãßíåôáé åðåîåñãáóßá áðü ôï **CTM**, ìüíï áí ìáñêáñéóôåß ùò Ýãêõñï ðñïò áíáíÝùóç ìåôÜ ôçí åöáñìïãÞ üëùí ôùí åðéëïãþí `-e` êáé `-x`.

A.5.7 ÌåëëïíôéêÜ Ó÷Ýäéá ãéá ôï CTM

Åßíáé ðÜñá ðïëëÜ:

- ×ñÞóç êÜðïéïõ åßäïõò ðéóôïðïßçóçò óôï óýóôçìá **CTM** þóôå íá áíáãíùñßæïíôáé ôõ÷üí øåýôéêåò áíáíåþóåéò.
- ÎåêáèÜñéóìá ôùí åðéëïãþí ôïõ **CTM**, êáèþò ðñïêáëïýí óýã÷õóç êáé äåí åßíáé ðñïöáíåßò.

A.5.8 ÄéÜöïñá

ÕðÜñ÷åé åðßóçò êáé ìéá óåéñÜ áðü deltas ãéá ôçí óõëëïãÞ ôùí `ports`, áëëÜ äåí Ý÷åé åêäçëùèåß áêüìá áñêåôü åíäéáöÝñïí ãéá áõôÞ.

A.5.9 CTM Mirrors

Ôï CTM/FreeBSD äéáôßèåôáé ìÝóù áíþíõìïõ FTP áðü ôá áêüëïõèá mirrors. Áí åðéëÝîåôå íá êáôåâÜóåôå ôï **CTM** ìÝóù áíþíõìïõ FTP, óáò ðáñáêáëïýìå ðñïóðáèÞóôå íá åðéëÝîåôå ìéá ôïðïèåóßá êïíôÜ óå óáò.

Óå ðåñßðôùóç ðñïâëçìÜôùí, ðáñáêáëïýìå åðéêïéíùíÞóôå ìå ôç ëßóôá ctm-users (http://lists.FreeBSD.org/mailman/listinfo/ctm-users).

Êáëéöüñíéá, Bay Area, åðßóçìç ðçãÞ

- ftp://ftp.FreeBSD.org/pub/FreeBSD/development/CTM/

Íüôéá ÁöñéêÞ, áíôßãñáöá áóöáëåßáò ãéá ðáëéÜ deltas

- ftp://ftp.za.FreeBSD.org/pub/FreeBSD/CTM/

ÔáúâÜí/R.O.C.

- ftp://ctm.tw.FreeBSD.org/pub/FreeBSD/development/CTM/
- ftp://ctm2.tw.FreeBSD.org/pub/FreeBSD/development/CTM/
- ftp://ctm3.tw.FreeBSD.org/pub/FreeBSD/development/CTM/

Áí äåí âñÞêáôå êÜðïéï mirror óôçí ðåñéï÷Þ óáò, Þ áí ôï mirror äåí åßíáé ðëÞñåò, ðñïóðáèÞóôå íá ÷ñçóéìïðïéÞóåôå ìéá ìç÷áíÞ áíáæÞôçóçò üðùò ç alltheweb (http://www.alltheweb.com/).

A.6 ×ñçóéìïðïéþíôáò ôï CVSup

A.6.1 ÅéóáãùãÞ

Ôï **CVSup** åßíáé Ýíá ëïãéóìéêü ãéá ôçí äéáíïìÞ êáé áíáíÝùóç äÝíôñùí ðçãáßïõ êþäéêá áðü Ýíá êåíôñéêü (master) CVS repository ôï ïðïßï âñßóêåôáé óå êÜðïéï áðïìáêñõóìÝíï õðïëïãéóôÞ. Ôï repository ôïõ FreeBSD âñßóêåôáé óå Ýíá êåíôñéêü ìç÷Üíçìá óôçí Êáëéöüñíéá. Ìå ôï **CVSup**, ïé ÷ñÞóôåò ôïõ FreeBSD ìðïñïýí åýêïëá íá äéáôçñÞóïõí áíáíåùìÝíá ôá áíôßãñáöá ôïõ ðçãáßïõ ôïõò êþäéêá.

Ôï **CVSup** ÷ñçóéìïðïéåß Ýíá ìïíôÝëï áíáíÝùóçò ãíùóôü ùò *pull*. Óôï ìïíôÝëï áõôü, êÜèå ðåëÜôçò æçôÜ ôéò áíáíåþóåéò áðü ôïí åîõðçñåôçôÞ, üôáí êáé áí ôéò åðéèõìåß. Ï åîõðçñåôçôÞò ðåñéìÝíåé, ðáèçôéêÜ, ôéò áéôÞóåéò áðü ôïõò ðåëÜôåò. Ìå ôïí ôñüðï áõôü, êÜèå áíáíÝùóç îåêéíÜåé êáôüðéí áðáßôçóçò ôïõ ðåëÜôç. Ï åîõðçñåôçôÞò ðïôÝ äåí óôÝëíåé áíáíåþóåéò ðïõ äåí Ý÷ïõí æçôçèåß. Ïé ÷ñÞóôåò èá ðñÝðåé åßôå íá åêôåëÝóïõí ôï **CVSup** ÷åéñïêßíçôá ãéá íá ëÜâïõí ìéá áíáíÝùóç, åßôå èá ðñÝðåé íá ñõèìßóïõí êáôÜëëçëá ôï `cron` þóôå íá ôï åêôåëåß áõôüìáôá êáôÜ ôáêôÜ ÷ñïíéêÜ äéáóôÞìáôá.

Ï üñïò **CVSup**, ãñáììÝíïò ìå êåöáëáßá êáé ìéêñÜ üðùò öáßíåôáé, áíáöÝñåôáé óå ïëüêëçñï ôï ðáêÝôï ëïãéóìéêïý. Ôá âáóéêÜ ôïõ ôìÞìáôá åßíáé ç åíôïëÞ ðåëÜôç `cvsup` ç ïðïßá åêôåëåßôáé óôï ìç÷Üíçìá ôïõ êÜèå ÷ñÞóôç, êáé ôï ðñüãñáììá ôïõ åîõðçñåôçôÞ `cvsupd` ôï ïðïßï åêôåëåßôáé óå êÜèå Ýíá áðü ôá mirror sites ôïõ FreeBSD.

Êáèþò äéáâÜæåôå ôçí ôåêìçñßùóç êáé ôéò ëßóôåò ôá÷õäñïìåßïõ ôïõ FreeBSD, ìðïñåß íá âñåßôå áíáöïñÝò óôçí åöáñìïãÞ **sup**. Ôï **sup** Þôáí ï ðñüãïíïò ôïõ **CVSup**, êáé åîõðçñåôïýóå ðáñüìïéï óêïðü. Ôï **CVSup** ÷ñçóéìïðïéåßôáé ìå áñêåôÜ üìïéï ôñüðï ìå ôï sup, êáé óôçí ðñáãìáôéêüôçôá, ÷ñçóéìïðïéåß áñ÷åßá ñõèìßóåùí ôá ïðïßá Ý÷ïõí ðßóù óõìâáôüôçôá ìå áõôÜ ôïõ `sup`. Ôï **sup** äåí ÷ñçóéìïðïéåßôáé ðëÝïí óôï FreeBSD Project, åðåéäÞ ôï **CVSup** åßíáé ôá÷ýôåñï êáé ðñïóöÝñåé ìåãáëýôåñç åõåëéîßá.

> **Óçìåßùóç:** Ôï ðñüãñáììá **csup** åßíáé ôï **CVSup** îáíáãñáììÝíï óå ãëþóóá C. Ôï ìåãáëýôåñï ôïõ ðëåïíÝêôçìá åßíáé üôé åßíáé ôá÷ýôåñï, êáé äåí åîáñôÜôáé áðü ôçí ãëþóóá ðñïãñáììáôéóìïý Modula-3, ôçí ïðïßá êáé äåí ÷ñåéÜæåôáé ðëÝïí íá åãêáôáóôÞóåôå. Åðßóçò ìðïñåßôå íá ôï ÷ñçóéìïðïéÞóåôå Üìåóá, êáèþò ðåñéëáìâÜíåôáé óôï âáóéêü óýóôçìá. Áí áðïöáóßóåôå íá ÷ñçóéìïðïéÞóåôå ôï **csup**, áðëþò ðáñáëåßøôå ôá âÞìáôá ãéá ôçí åãêáôÜóôáóç ôïõ **CVSup** êáé áíôéêáôáóôÞóôå êÜèå áíáöïñÜ óôï **CVSup** óå áõôü ôï Üñèñï, ìå **csup**.

A.6.2 ÅãêáôÜóôáóç

Ï åõêïëüôåñïò ôñüðïò ãéá íá åãêáôáóôÞóåôå ôï **CVSup** åßíáé ìÝóù ôïõ Ýôïéìïõ ðáêÝôïõ `net/cvsup` áðü ôçí óõëëïãÞ ðáêÝôùí ôïõ FreeBSD. Áí ðñïôéìÜôå íá ìåôáãëùôôßóåôå ôï **CVSup** áðü ôïí ðçãáßï êþäéêá, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå ôï port `net/cvsup`. Óáò ðñïåéäïðïéïýìå ùóôüóï üôé ôï port `net/cvsup` åîáñôÜôáé áðü ôçí Modula-3, ç ïðïßá ÷ñåéÜæåôáé áñêåôü ÷ñüíï êáé ÷þñï óôï äßóêï ãéá íá êáôÝâåé êáé íá ìåôáãëùôôéóôåß.

> **Óçìåßùóç:** Áí ðñüêåéôáé íá ÷ñçóéìïðïéÞóåôå ôï **CVSup** óå Ýíá ìç÷Üíçìá ôï ïðïßï äåí èá äéáèÝôåé ãñáöéêü ðåñéâÜëëïí ìÝóù ôïõ **Xorg**, üðùò ð.÷. óå Ýíá åîõðçñåôçôÞ, âåâáéùèåßôå üôé ÷ñçóéìïðïéåßôå ôï áíôßóôïé÷ï port ôï ïðïßï äåí ðåñéëáìâÜíåé ãñáöéêü ðåñéâÜëëïí, äçëáäÞ ôï `net/cvsup-without-gui`.

A.6.3 Ñýèìéóç ôïõ CVSup

Ç ëåéôïõñãßá ôïõ **CVSup** åëÝã÷åôáé áðü Ýíá áñ÷åßï ñõèìßóåùí ðïõ êáëåßôáé `supfile`. ÕðÜñ÷ïõí êÜðïéá õðïäåßãìáôá áðü `supfiles` óôïí êáôÜëïãï `/usr/share/examples/cvsup/`.

Ïé ðëçñïöïñßåò óôï `supfile` áðáíôïýí óôéò áêüëïõèåò åñùôÞóåéò ãéá ôï **CVSup**:

- Ðïéá áñ÷åßá èÝëåôå íá ëÜâåôå;
- Ðïéåò åêäüóåéò ôùí áñ÷åßùí èÝëåôå;
- Áðü ðïõ èÝëåôå íá ôá ëÜâåôå;
- Ðïõ èÝëåôå íá ôá áðïèçêåýóåôå óôï ìç÷Üíçìá óáò;
- Ðïõ èÝëåôå íá áðïèçêåýóåôå ôá áñ÷åßá êáôÜóôáóçò;

Óôá åðüìåíá ôìÞìáôá, èá äçìéïõñãÞóïõìå Ýíá ôõðéêü `supfile` áðáíôþíôáò êÜèå ìéá áðü ôéò åñùôÞóåéò áõôÝò ìå ôç óåéñÜ. Ðñþôá, èá ðåñéãñÜøïõìå ôç óõíïëéêÞ äïìÞ åíüò `supfile`.

¸íá `supfile` åßíáé Ýíá áñ÷åßï êåéìÝíïõ. Ôá ó÷üëéá îåêéíÜíå ìå # êáé åðåêôåßíïíôáé ùò ôï ôÝëïò ôçò ãñáìÞò. Ïé êåíÝò ãñáììÝò, êáèþò êáé áõôÝò ðïõ ðåñéÝ÷ïõí ìüíï ó÷üëéá, áãíïïýíôáé.

ÊÜèå ãñáììÞ áðü ôéò õðüëïéðåò ðåñéãñÜöåé Ýíá óåô áñ÷åßùí ôá ïðïßá åðéèõìåß ï ÷ñÞóôçò. Ç ãñáììÞ îåêéíÜåé ìå ôï üíïìá ìéáò “óõëëïãÞò”, åíüò ëïãéêïý ãêñïõð áðü áñ÷åßá ðïõ ïñßæåôáé áðü ôïí åîõðçñåôçôÞ. Ôï üíïìá ôçò óõëëïãÞò äçëþíåé óôïí åîõðçñåôçôÞ ðïéá áñ÷åßá åðéèõìåßôå. ÌåôÜ ôï üíïìá ôçò óõëëïãÞò, ìðïñåß íá õðÜñ÷ïõí áðü ìçäÝí ùò êÜðïéá ðåäßá, ôá ïðïßá ÷ùñßæïíôáé ìåôáîý ôïõò ìå êåíÜ äéáóôÞìáôá. Ôá ðåäßá áõôÜ áðáíôïýí ôéò åñùôÞóåéò ðïõ ôÝèçêáí ðáñáðÜíù. Õðár÷ïõí äýï ôýðïé ðåäßùí: ðåäßá óÞìáíóçò (flags) êáé ðåäßá ôéìþí. ¸íá ðåäßï óÞìáíóçò áðïôåëåßôáé áðü ìéá ìüíï ëÝîç êëåéäß ð.÷. `delete` Þ `compress`. ¸íá ðåäßï ôéìÞò îåêéíÜåé åðßóçò ìå ìéá ëÝîç êëåéäß, áëëÜ áõôÞ áêïëïõèåßôå ÷ùñßò ôçí ðáñåìâïëÞ êåíïý äéáóôÞìáôïò áðü = êáé ìéá äåýôåñç ëÝîç. Ãéá ðáñÜäåéãìá ôï `release=cvs` áðïôåëåß Ýíá ðåäßï ôéìÞò.

¸íá `supfile` ôõðéêÜ êáèïñßæåé ðñïò ëÞøç ðåñéóóüôåñåò áðü ìßá óõëëïãÝò. ¸íá ôñüðïò ãéá íá äïìÞóåôå Ýíá `supfile` åßíáé íá êáèïñßóåôå üëá ôá ó÷åôéêÜ ðåäßá ÷ùñéóôÜ ãéá êÜèå óõëëïãÞ. Ìå ôïí ôñüðï áõôü ùóôüóï ôï `supfile` èá êáôáëÞãåé áñêåôÝò ãñáììÝò êáé èá åßíáé Üâïëï, åðåéäÞ ôá ðåñéóóüôåñá ðåäßá åßíáé ßäéá ãéá üëåò ôéò óõëëïãÝò ðïõ ðåñéÝ÷ïíôáé óå áõôü. Ôï **CVSup** ðáñÝ÷åé Ýíá ìç÷áíéóìü ÷ñÞóçò ðñïåðéëåãìÝíùí ôéìþí, þóôå íá áðïöåýãïíôáé áõôÜ ôá ðñïâëÞìáôá. Ïé ãñáììÝò ðïõ îåêéíÜíå ìå ôï åéäéêü üíïìá øåõôü-óõëëïãÞò `*default` ìðïñïýí íá ÷ñçóéìïðïéçèïýí ãéá íá èÝóïõí ðåäßá óÞìáíóçò êáé ôéìþí ôá ïðïßá èá ÷ñçóéìïðïéçèïýí ùò ðñïåðéëïãÝò ãéá ôéò óõëëïãÝò ôïõ `supfile` ðïõ âñßóêïíôáé ìåôÜ áðü áõôÜ. Ìéá ðñïåðéëåãìÝíç ôéìÞ ìðïñåß íá áëëÜîåé áí êáèïñéóôåß îáíÜ ìå íÝá ôéìÞ ìÝóá óôçí ßäéá ôç óõëëïãÞ. Ïé ðñïåðéëïãÝò ìðïñïýí åðßóçò íá áëëÜîïõí, Þ íá ðñïóôåèïýí íÝåò, âÜæïíôáò ðñüóèåôá `*default` óå ïðïéïäÞðïôå óçìåßï ìÝóá óôï `supfile`.

Ãíùñßæïíôáò ôá ðáñáðÜíù, èá ðñï÷ùñÞóïõìå ôþñá óôç äüìçóç åíüò `supfile` ãéá ëÞøç êáé áíáíÝùóç ôïõ êõñßùò äÝíôñïõ ðçãáßïõ êþäéêá ãéá ôï FreeBSD-CURRENT.

- Ðïéá áñ÷åßá èÝëåôå íá ëÜâåôå;

  Ôá áñ÷åßá ðïõ åßíáé äéáèÝóéìá ìÝóù ôçò **CVSup** åßíáé ïñãáíùìÝíá óå ãêñïõð ðïõ ïíïìÜæïíôáé “óõëëïãÝò”. ÐåñéãñáöÞ ôùí äéáèÝóéìùí óõëëïãþí èá âñåßôå óôï áêüëïõèï ôìÞìá. Óôï ðáñÜäåéãìá ìáò, èÝëïõìå íá ëÜâïõìå ôï ðëÞñåò äÝíôñï ðçãáßïõ êþäéêá ôïõ FreeBSD óõóôÞìáôïò. ÕðÜñ÷åé ìéá ìåãÜëç óõëëïãÞ `src-all` ç ïðïßá èá ìáò ôçí äþóåé üëç. Óáí ðñþôï âÞìá ãéá ôçí äüìçóç ôïõ `supfile`, áðëþò ãñÜöïõìå ôéò óõëëïãÝò, ìßá óå êÜèå ãñáììÞ (óôçí ðåñßðôùóç ìáò Ý÷ïõìå ìüíï ìéá ãñáììÞ):

  ```
  src-all
  ```

- Ðïéåò åêäüóåéò ôùí áñ÷åßùí èÝëåôå íá ëÜâåôå;

  Ìå ôï **CVSup**, ìðïñåßôå ïõóéáóôéêÜ íá ëÜâåôå ïðïéáäÞðïôå Ýêäïóç ôïõ ðçãáßïõ êþäéêá õðÞñîå ðïôÝ. Áõôü åßíáé äõíáôüí åðåéäÞ ï åîõðçñåôçôÞò **cvsupd** ëåéôïõñãåß áðåõèåßáò áðü ôï CVS repository, ôï ïðïßï ðåñéÝ÷åé üëåò ôéò åêäüóåéò. Äçëþíåôå ðïéá áðü áõôÝò èÝëåôå ÷ñçóéìïðïéþíôáò ôá ðåäßá ôéìþí `tag=` êáé `date=`.

  > **Ðñïåéäïðïßçóç:** Èá ðñÝðåé íá äþóåôå éäéáßôåñç ðñïóï÷Þ óôïí êáèïñéóìü ôùí ðåäßùí `tag=` þóôå íá åßíáé óùóôÜ. ÊÜðïéá tags åßíáé Ýãêõñá ìüíï ãéá óõãêåêñéìÝíåò óõëëïãÝò áñ÷åßùí. Áí êáèïñßóåôå ëáíèáóìÝíï tag (Þ êÜíåôå ïñèïãñáöéêü ëÜèïò) ôï **CVSup** èá óâÞóåé áñ÷åßá ôá ïðïßá ðéèáíþò äåí èÝëåôå íá óâçóôïýí. Åéäéêüôåñá, ãéá ôçí óõëëïãÞ ôùí `ports-*`, ÷ñçóéìïðïéÞóôå *ìüíï ôï* `tag=.`.

  Ôï ðåäßï `tag=` äåß÷íåé ðñïò Ýíá óõìâïëéêü tag óôï repository. ÕðÜñ÷ïõí äýï åßäç tags, ôá tags åêäüóåùí (revision tags) êáé ôá tags êëÜäùí (branch tags). ¸íá revision tag áíáöÝñåôáé óå ìéá óõãêåêñéìÝíç Ýêäïóç. Ç óçìáóßá ôïõ äéáôçñåßôáé ßäéá áðü ôç ìéá ìÝñá óôçí Üëëç. Áðü ôçí Üëëç, Ýíá branch tag, áíáöÝñåôáé óôçí ôåëåõôáßá Ýêäïóç ìéá óõãêåêñéìÝíçò ãñáììÞò áíÜðôõîçò, óå êÜèå ÷ñïíéêÞ óôéãìÞ. ÅðåéäÞ Ýíá branch tag äåí áíáöÝñåôáé óå êÜðïéá óõãêåêñéìÝíç Ýêäïóç, ìðïñåß áýñéï íá óçìáßíåé êÜôé äéáöïñåôéêü áðü üôé óçìáßíåé óÞìåñá.

Óôï ÔìÞìá A.7 èá âñåßôå branch tags ôá ïðïßá ìðïñåß íá óáò åíäéáöÝñïõí. ¼ôáí êáèïñßæåôå Ýíá tag óôï áñ÷åßï ñõèìßóåùí ôïõ **CVSup**, èá ðñÝðåé ðñéí áðü áõôü íá âÜæåôå ôç ëÝîç êëåéäß `tag=` (äçë. ôï `RELENG_8` èá ãßíåé `tag=RELENG_8`). Íá Ý÷åôå õðüøéí óáò üôé ãéá ôçí óõëëïãÞ ôùí Ports, ôï `tag=.` åßíáé ôï ìüíï Ýãêõñï.

> **Ðñïåéäïðïßçóç:** Íá åßóôå éäéáßôåñá ðñïóåêôéêüò, þóôå íá ãñÜøåôå ôï tag áêñéâþò üðùò öáßíåôáé. Ôï **CVSup** äåí ìðïñåß íá äéá÷ùñßóåé ìåôáîý Ýãêõñùí êáé ìç-Ýãêõñùí tags. Áí ãñÜøåôå ëÜèïò ôï tag, ôï **CVSup** èá óõìðåñéöåñèåß óáí íá Ý÷åôå äþóåé Ýíá Ýãêõñï tag ôï ïðïßï äåí áíáöÝñåôáé óå êáíÝíá áñ÷åßï. Óôçí ðåñßðôùóç áõôÞ èá äéáãñÜøåé ôá õðÜñ÷ïíôá áñ÷åßá óáò ðçãáßïõ êþäéêá.

¼ôáí êáèïñßóåôå êÜðïéï branch tag, öõóéïëïãéêÜ èá ëÜâåôå ôéò ôåëåõôáßåò åêäüóåéò ôùí áñ÷åßùí ðïõ õðÜñ÷ïõí óå áõôÞ ôç ãñáììÞ áíÜðôõîçò. Áí èÝëåôå íá ëÜâåôå êÜðïéåò ðáëéüôåñåò åêäüóåéò, ìðïñåßôå íá ôï êÜíåôå êáèïñßæïíôáò ìéá çìåñïìçíßá ìÝóù ôïõ ðåäßïõ ôéìþí `date=`. Ç óåëßäá manual csup(1) åîçãåß ðùò ìðïñåßôå íá ôï êÜíåôå.

Óôï ðáñÜäåéãìá ìáò, åðéèõìïýìå íá ëÜâïõìå ôï FreeBSD-CURRENT. ÐñïóèÝôïõìå ôç ãñáììÞ áõôÞ óôçí áñ÷Þ ôïõ `supfile` áñ÷åßïõ ìáò:

```
*default tag=.
```

ÕðÜñ÷åé ìéá óçìáíôéêÞ åéäéêÞ ðåñßðôùóç üôáí äåí êáèïñßóåôå ïýôå ðåäßï `tag=` ïýôå ðåäßï `date=`. Óôçí ðåñßðôùóç áõôÞ èá ëÜâåôå ôá êáíïíéêÜ áñ÷åßá RCS áðåõèåßáò áðü ôï CVS repository ôïõ åîõðçñåôçôÞ, áíôß ãéá íá ëÜâåôå êÜðïéá óõãêåêñéìÝíç Ýêäïóç. Ïé ðñïãñáììáôéóôÝò ãåíéêÜ ðñïôéìïýí áõôü ôïí ôñüðï ëåéôïõñãßáò. Äéáôçñþíôáò ðëÞñåò áíôßãñáöï ôïõ CVS repository óôá óõóôÞìáôá ôïõò Ý÷ïõí ôçí éêáíüôçôá íá âëÝðïõí ôï éóôïñéêü áëëáãþí êÜèå Ýêäïóçò êáé íá åîåôÜæïõí ðáëéüôåñåò åêäüóåéò ôùí áñ÷åßùí. Ôá ðëåïíåêôÞìáôá áõôÜ ùóôüóï Ý÷ïõí ôï êüóôïò ôçò ìåãáëýôåñçò ÷ñÞóçò ÷þñïõ óôï óêëçñü äßóêï.

- Áðü ðïõ èÝëåôå íá ôá ëÜâåôå;

  ×ñçóéìïðïéïýìå ôï ðåäßï `host=` ãéá íá ðïýìå óôï `cvsup` áðü ðïõ íá ëÜâåé ôéò áíáíåþóåéò ôïõ. Ïðïéïäçðïôå áðü ôá CVSup mirror sites åßíáé êáôÜëëçëï, áí êáé èá ðñÝðåé íá ðñïóðáèÞóåôå íá åðéëÝîåôå êÜðïéï ôï ïðïßï íá âñßóêåôáé êïíôÜ óáò. Óôï ðáñÜäåéãìá ìáò, èá ÷ñçóéìïðïéÞóïõìå ìéá öáíôáóôéêÞ ôïðïèåóßá äéáíïìÞò ôïõ FreeBSD, ôï `cvsup99.FreeBSD.org`:

  ```
  *default host=cvsup99.FreeBSD.org
  ```

  Èá ðñÝðåé íá áëëÜîåôå ôï host óå êÜðïéï ðïõ ðñáãìáôéêÜ õðÜñ÷åé ðñéí åêôåëÝóåôå ôï **CVSup**. ÊÜèå öïñÜ ðïõ åêôåëåßôå ôï `cvsup`, Ý÷åôå ôçí äõíáôüôçôá íá áíáôñÝðåôå áõôÞ ôç ñýèìéóç ìÝóù ôçò ãñáììÞò åíôïëþí ìå ôçí åðéëïãÞ `-h` *`hostname`*.

- Ðïõ èÝëåôå íá ôá áðïèçêåýóåôå óôï ìç÷Üíçìá óáò;

  Ôï ðåäßï `prefix=` äçëþíåé óôçí `cvsup` ðïõ íá áðïèçêåýóåé ôá áñ÷åßá ðïõ ëáìâÜíåé. Óôï ðáñÜäåéãìá ìáò, èá âÜëïõìå ôá áñ÷åßá ôïõ ðçãáßïõ êþäéêá, áðåõèåßáò óôï êýñéï äÝíôñï ðçãáßïõ êþäéêá, `/usr/src`. Ï êáôÜëïãïò `src` èåùñåßôáé äåäïìÝíïò ãéá ôéò óõëëïãÝò ðïõ Ý÷ïõìå åðéëÝîåé íá ëÜâïõìå, êáé Ýôóé ï óùóôüò ðñïóäéïñéóìüò åßíáé áõôüò ðïõ öáßíåôáé ðáñáêÜôù:

  ```
  *default prefix=/usr
  ```

- Ðïõ èá áðïèçêåýóåé ôï `cvsup` ôá áñ÷åßá êáôÜóôáóçò ôïõ;

  Ï ðåëÜôçò **CVSup** äéáôçñåß êÜðïéá áñ÷åßá êáôÜóôáóçò (status files) óå áõôü ðïõ áðïêáëåßôáé êáôÜëïãïò “base”. Ôá áñ÷åßá áõôÜ âïçèïýí ôï **CVSup** íá ëåéôïõñãåß ðéï áðïäïôéêÜ êñáôþíôáò ëïãáñéáóìü ôùí áíáíåþóåùí ðïõ Ý÷åôå Þäç ëÜâåé. Èá ÷ñçóéìïðïéÞóïõìå ôïí ðñïåðéëåãìÝíï êáôÜëïãï base, `/var/db`:

  ```
  *default base=/var/db
  ```

Áí ï base êáôÜëïãïò óáò äåí õðÜñ÷åé Þäç, ôþñá åßíáé ìéá êáëÞ óôéãìÞ íá ôïí äçìéïõñãÞóåôå. O ðåëÜôçò `cvsup` äåí èá åêôåëåßôáé áí ï base êáôÜëïãïò äåí õðÜñ÷åé.

- ÄéÜöïñåò ñõèìßóåéò ãéá ôï `supfile`:

  ÕðÜñ÷åé áêüìá ìéá êïéíÞ ãñáììÞ ñõèìßóåùí, ç ïðïßá ôõðéêÜ õðÜñ÷åé óôï `supfile`:

```
*default release=cvs delete use-rel-suffix compress
```

  Ôï `release=cvs` äåß÷íåé üôé ï åîõðçñåôçôÞò èá ðñÝðåé íá ëÜâåé ôéò ðëçñïöïñßåò ôïõ ìÝóù ôïõ êýñéïõ CVS repository ôïõ FreeBSD. Áõôü éó÷ýåé ó÷åäüí ðÜíôá, áëëÜ õðÜñ÷ïõí êáé Üëëåò ðéèáíüôçôåò ðïõ îåöåýãïõí áðü ôï óêïðü áõôÞò ôçò óõæÞôçóçò.

  Ç ëÝîç `delete` äßíåé äéêáéþìáôá óôï **CVSup** íá äéáãñÜöåé áñ÷åßá. Èá ðñÝðåé ðÜíôïôå íá Ý÷åôå ôçí åðéëïãÞ áõôÞ, þóôå ôï **CVSup** íá ìðïñåß íá êñáôÞóåé ôï äÝíôñï ôïõ ðçãáßïõ óáò êþäéêá ðëÞñùò áíáíåùìÝíï. Ôï **CVSup** åßíáé áñêåôÜ ðñïóåêôéêü þóôå íá óâÞíåé ìüíï ôá áñ÷åßá ðïõ âñßóêïíôáé õðü ôçí åõèýíç ôïõ. Áí ôõ÷üí âÜëåôå Ýîôñá áñ÷åßá óôïí ßäéï êáôÜëïãï, äåí èá ôá áããßîåé.

  Ç åðéëïãÞ `use-rel-suffix` åßíáé... áñ÷áéïëïãéêÞ. Áí ðñáãìáôéêÜ èÝëåôå íá ìÜèåôå ó÷åôéêÜ ìå áõôÞí, äéáâÜóôå ôç óåëßäá manual cvsup(1). Áëëéþò, áðëþò ÷ñçóéìïðïéÞóôå ôçí, êáé ìçí áíçóõ÷åßôå éäéáßôåñá ãéá áõôÞ.

  Ç åðéëïãÞ `compress` åíåñãïðïéåß ôç ÷ñÞóç óõìðßåóçò ôýðïõ gzip óôï êáíÜëé åðéêïéíùíßáò. Áí Ý÷åôå óýíäåóç äéêôýïõ ôýðïõ T1 Þ êáé ðéï ãñÞãïñç, ìÜëëïí äåí èá ðñÝðåé íá ÷ñçóéìïðïéÞóåôå óõìðßåóç. Óå äéáöïñåôéêÞ ðåñßðôùóç, èá âïçèÞóåé åîáéñåôéêÜ.

- ¼ëåò ïé åðéëïãÝò ìáæß:

  Åäþ åßíáé ôï ðëÞñåò `supfile` ãéá ôï ðáñÜäåéãìá ìáò:

```
*default tag=.
*default host=cvsup99.FreeBSD.org
*default prefix=/usr
*default base=/var/db
*default release=cvs delete use-rel-suffix compress

src-all
```

A.6.3.1 Ôï Áñ÷åßï `refuse`

¼ðùò áíáöÝñáìå ðáñáðÜíù, ôï **CVSup** ÷ñçóéìïðïéåß *ìÝèïäï pull*. ÂáóéêÜ áõôü óçìáßíåé üôé óõíäÝåóôå óôïí åîõðçñåôçôÞ **CVSup**, áõôüò ëÝåé “ÁõôÜ åßíáé ôá áñ÷åßá ðïõ ìðïñåßôå íá êáôåâÜóåôå áðü ìÝíá..”, êáé ôï äéêü óáò ðñüãñáììá áðáíôÜåé “ÅíôÜîåé, èá ðÜñù áõôü, áõôü, áõôü, êáé áõôü.” Óôçí ðñïåðéëåãìÝíç ñýèìéóç, ï ðåëÜôçò **CVSup** èá ðÜñåé êÜèå áñ÷åßï ðïõ óõíäÝåôáé ìå ôçí óõëëïãÞ êáé ôï tag ðïõ Ý÷åôå êáèïñßóåé óôï áñ÷åßï ñõèìßóåùí. Ùóôüóï ìðïñåß íá ìçí ôï åðéèõìåßôå áõôü ðÜíôá, åéäéêÜ áí óõã÷ñïíßæåôå ôá äÝíôñá `doc`, `ports` Þ `www` — ïé ðåñéóóüôåñïé Üíèñùðïé äåí ìðïñïýí íá äéáâÜóïõí ôÝóóåñéò Þ ðÝíôå ãëþóóåò êáé Ýôóé äåí ÷ñåéÜæåôáé íá êáôåâÜóïõí áñ÷åßá ðïõ áíáöÝñïíôáé åéäéêÜ óå áõôÝò. Áí ÷ñçóéìïðïéåßôå ôï **CVSup** ãéá ôçí óõëëïãÞ ôùí Ports, ìðïñåßôå íá îåðåñÜóåôå áõôÞ ôç óõìðåñéöïñÜ êáèïñßæïíôáò óõãêåêñéìÝíåò óõëëïãÝò (ð.÷. *ports-astrology*, *ports-biology* áíôß ãéá *ports-all*). Ùóôüóï, åðåéäÞ ôá äÝíôñá `doc` êáé `www` äåí äéáèÝôïõí óõëëïãÝò ÷ùñéóìÝíåò áíÜ ãëþóóá, ìðïñåßôå íá ÷ñçóéìïðïéÞóåôå Ýíá áðü ôá âïëéêÜ ÷áñáêôçñéóôéêÜ ôïõ **CVSup**: ôï áñ÷åßï `refuse`.

Ôï áñ÷åßï `refuse` ïõóéáóôéêÜ ëÝåé óôï **CVSup** üôé äåí ðñÝðåé íá ðÜñåé êÜèå áñ÷åßï áðü ìéá óõëëïãÞ. Ìå Üëëá ëüãéá, ëÝåé óôïí ðåëÜôç íá *áñíçèåß* óõãêåêñéìÝíá áñ÷åßá ðïõ ðñïóöÝñåé ï åîõðçñåôçôÞò. Ôï áñ÷åßï `refuse` ìðïñåß íá âñåèåß (Þ íá äçìéïõñãçèåß áí äåí Ý÷åôå Þäç) óôï *`base`*`/sup/`. Ôï *`base`* êáèïñßæåôáé óôï `supfile`. Ôï äéêü ìáò *`base`* åßíáé óôï `/var/db`, ôï ïðïßï óçìáßíåé üôé ôï ðñïåðéëåãìÝíï áñ÷åßï `refuse` èá åßíáé ôï `/var/db/sup/refuse`.

Ôï áñ÷åßï `refuse` Ý÷åé éäéáßôåñá áðëÞ ìïñöÞ. Áðëþò ðåñéÝ÷åé ôá ïíüìáôá ôùí áñ÷åßùí êáé êáôáëüãùí ôá ïðïßá äåí åðéèõìåßôå íá êáôåâÜóåôå. Ãéá ðáñÜäåéãìá, áí äåí ìéëÜôå ãëþóóåò åêôüò áðü ÁããëéêÜ êáé ëßãá ÃåñìáíéêÜ, êáé äåí áéóèÜíåóôå ôçí áíÜãêç íá äéáâÜóåôå ôçí ÃåñìáíéêÞ ìåôÜöñáóç ôçò ôåêìçñßùóçò, ìðïñåßôå íá âÜëåôå ôá áêüëïõèá óôï äéêü óáò áñ÷åßï `refuse`:

```
doc/bn_*
doc/da_*
doc/de_*
doc/el_*
doc/es_*
doc/fr_*
doc/it_*
doc/ja_*
doc/nl_*
doc/no_*
doc/pl_*
doc/pt_*
doc/ru_*
doc/sr_*
doc/tr_*
doc/zh_*
```

ê.ï.ê. ãéá ôéò õðüëïéðåò ãëþóóåò (ìðïñåßôå íá âñåßôå ôçí ðëÞñç ëßóôá óôï FreeBSD CVS repository (http://www.FreeBSD.org/cgi/cvsweb.cgi/)).

Ìå áõôÞ ôç ÷ñÞóéìç äõíáôüôçôá, ïé ÷ñÞóôåò ðïõ Ý÷ïõí áñãÞ óýíäåóç Þ ðëçñþíïõí ôï Internet ìå ÷ñïíï÷ñÝùóç áíÜ ëåðôü, èá ìðïñÝóïõí íá åîïéêïíïìÞóïõí ðïëýôéìï ÷ñüíï êáèþò äåí èá ÷ñåéÜæåôáé ðëÝïí íá êáôåâÜóïõí áñ÷åßá ðïõ äåí ðñüêåéôáé íá ÷ñçóéìïðïéÞóïõí ðïôÝ. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò ó÷åôéêÜ ìå ôá áñ÷åßá `refuse` êáé Üëëá ÷ñÞóéìá ÷áñáêôçñéóôéêÜ ôïõ **CVSup**, ðáñáêáëïýìå äéáâÜóôå ôçí áíôßóôïé÷ç óåëßäá ôïõ manual.

A.6.4 Åêôåëþíôáò ôï CVSup

Åßóôå ôþñá Ýôïéìïé íá äïêéìÜóåôå ìéá áíáíÝùóç. Ç ãñáììÞ åíôïëÞò ãéá ôï óêïðü áõôü åßíáé éäéáßôåñá áðëÞ:

```
# cvsup supfile
```

üðïõ ôï *`supfile`* åßíáé öõóéêÜ ôï üíïìá ôïõ áñ÷åßïõ `supfile` ðïõ ìüëéò äçìéïõñãÞóáôå. ÕðïèÝôïíôáò üôé ÷ñçóéìïðïéåßôå ôá X11, ç åíôïëÞ `cvsup` èá óáò åìöáíßóåé Ýíá ãñáöéêü ðáñÜèõñï ìå êÜðïéá ðëÞêôñá óõíçèéóìÝíùí ëåéôïõñãéþí. ÐéÝóôå ôï ðëÞêôñï go, êáé ðáñáêïëïõèÞóôå ôçí åêôÝëåóç.

Êáèþò óôçí ðåñßðôùóç ìáò áíáíåþíåôáé ôï ðñáãìáôéêü äÝíôñï `/usr/src`, èá ÷ñåéáóôåß íá åêôåëÝóåôå ôï ðñüãñáììá ùò `root` þóôå ç `cvsup` íá Ý÷åé ôá äéêáéþìáôá ðïõ ÷ñåéÜæåôáé ãéá íá áíáíåþóåé ôá áñ÷åßá óáò. Êáèþò ìüëéò Ý÷åôå äçìéïõñãÞóåé ôï áñ÷åßï ñõèìßóåùí, êáé äåí Ý÷åôå ðïôÝ ðñéí ÷ñçóéìïðïéÞóåé ôï ðñüãñáììá, ßóùò áéóèÜíåóôå ëßãï Üâïëá. ÕðÜñ÷åé åýêïëïò ôñüðïò íá êÜíåôå äïêéìáóôéêÞ åêôÝëåóç ÷ùñßò íá ðåéñÜîåôå ôá ðïëýôéìá áñ÷åßá óáò. Áðëþò äçìéïõñãÞóôå Ýíá Üäåéï êáôÜëïãï óå Ýíá âïëéêü ìÝñïò, êáé äþóôå ôï óáí Ýîôñá ðáñÜìåôñï óôçí ãñáììÞ åíôïëþí:

```
# mkdir /var/tmp/dest
# cvsup supfile /var/tmp/dest
```

Ï êáôÜëïãïò ðïõ êáèïñßóáôå èá ÷ñçóéìïðïéçèåß ùò ðñïïñéóìüò ãéá üëåò ôéò áíáíåþóåéò áñ÷åßùí. Ôï **CVSup** èá åîåôÜóåé ôá êáíïíéêÜ áñ÷åßá óáò óôï `/usr/src`, áëëÜ äåí èá ôñïðïðïéÞóåé ïýôå èá äéáãñÜøåé êáíÝíá áðü áõôÜ.

ÊÜèå áíáíÝùóç áñ÷åßïõ èá ãßíåé óôïí êáôÜëïãï `/var/tmp/dest/usr/src`. Ôï **CVSup** üôáí åêôåëåßôáé ìå áõôü ôïí ôñüðï áöÞíåé åðßóçò áíÝðáöá ôá áñ÷åßá êáôÜóôáóçò ôïõ óôïí êáôÜëïãï base. Ïé íÝåò åêäüóåéò ôùí áñ÷åßùí áõôþí èá ãñáöïýí óôïí êáèïñéóìÝíï êáôÜëïãï. Áí Ý÷åôå áðëþò ðñüóâáóç áíÜãíùóçò óôï `/usr/src`, äåí ÷ñåéÜæåóôå íá åßóôå êáí `root` ãéá íá êÜíåôå áõôÞ ôç äïêéìáóôéêÞ åêôÝëåóç.

Áí äåí åêôåëåßôå ôá X11 Þ áðëþò äåí óáò áñÝóïõí ôá ãñáöéêÜ ðåñéâÜëëïíôá, ìðïñåßôå íá äþóåôå êÜðïéåò åðéëïãÝò óôçí ãñáììÞ åíôïëþí üôáí åêôåëåßôå ôçí `cvsup`:

```
# cvsup -g -L 2 supfile
```

Ç åðéëïãÞ `-g` ëÝåé óôï **CVSup** íá ìç ÷ñçóéìïðïéÞóåé ôï ãñáöéêü ôïõ ðåñéâÜëëïí. Áõôü ãßíåôáé áõôüìáôá áí äåí åêôåëïýíôáé ôá X11, áëëÜ äéáöïñåôéêÜ èá ðñÝðåé íá ôï êáèïñßóåôå.

Ç åðéëïãÞ `-L 2` ëÝåé óôï **CVSup** íá åìöáíßóåé üëåò ôéò ëåðôïìÝñåéåò ãéá üëåò ôéò áíáíåþóåéò áñ÷åßùí ðïõ åêôåëåß. ÕðÜñ÷ïõí ôñßá åðßðåäá ðåñéãñáöÞò, áðü ôï `-L 0` ùò ôï `-L 2`. Ç ðñïåðéëïãÞ åßíáé ôï 0, ðïõ óçìáßíåé áðüëõôç óéùðÞ åêôüò áðü ìçíýìáôá ëÜèïõò.

ÕðÜñ÷ïõí äéáèÝóéìåò áñêåôÝò áêüìá åðéëïãÝò. Ãéá ìéá ðåñéëçðôéêÞ ëßóôá, ãñÜøôå `cvsup -H`. Ãéá ðåñéóóüôåñï ëåðôïìåñåßò ðåñéãñáöÝò, äåßôå ôç óåëßäá ôïõ manual.

¼ôáí ìåßíåôå éêáíïðïéçìÝíïò áðü ôïí ôñüðï ðïõ ãßíïíôáé ïé áíáíåþóåéò, ìðïñåßôå íá êáíïíßóåôå ôçí óå ôáêôÜ äéáóôÞìáôá åêôÝëåóç ôïõ **CVSup** ìå ôçí ÷ñÞóç ôïõ cron(8). Ðñïöáíþò äåí èá ðñÝðåé íá áöÞóåôå ôï **CVSup** íá ÷ñçóéìïðïéåß ôï ãñáöéêü ôïõ ðåñéâÜëëïí üôáí ôï åêôåëåßôå ìÝóù ôïõ cron(8).

A.6.5 ÓõëëïãÝò Áñ÷åßùí ôïõCVSup

Ïé óõëëïãÝò áñ÷åßùí ðïõ äéáôßèåíôáé ìÝóù ôïõ **CVSup** åßíáé ïñãáíùìÝíåò éåñáñ÷éêÜ. ÕðÜñ÷ïõí ëßãåò ìåãÜëåò óõëëïãÝò, êáé áõôÝò ÷ùñßæïíôáé óå ìéêñüôåñåò õðï-óõëëïãÝò. Ç ëÞøç ìéáò ìåãÜëçò óõëëïãÞò, éóïäõíáìåß ìå ôçí ëÞøç êÜèå ìéáò áðü ôéò õðï-óõëëïãÝò ôéò. Ïé éåñáñ÷éêÝò ó÷Ýóåéò ìåôáîý ôùí óõëëïãþí, áíôéêáôïðôñßæïíôáé ðáñáêÜôù ìå ôçí ÷ñÞóç ôùí åóï÷þí.

Ïé ðéï óõ÷íÜ ÷ñçóéìïðïéïýìåíåò óõëëïãÝò åßíáé ç `src-all`, êáé ç `ports-all`. Ïé Üëëåò óõëëïãÝò ÷ñçóéìïðïéïýíôáé ìüíï áðü ìéêñÝò ïìÜäåò áíèñþðùí ãéá åéäéêïýò óêïðïýò, êáé êÜðïéá mirror sites ìðïñåß íá ìçí ôéò Ý÷ïõí êáèüëïõ.

`cvs-all release=cvs`

Ôï êýñéï CVS repository ôïõ FreeBSD, ðïõ ðåñéëáìâÜíåé êáé ôïí êþäéêá êñõðôïãñáößáò.

> `distrib release=cvs`
>
> Áñ÷åßá ðïõ áíáöÝñïíôáé óôçí äéáíïìÞ êáé ôï mirroring ôïõ FreeBSD.
>
> `doc-all release=cvs`
>
> Ðçãáßïò êþäéêáò ãéá ôï FreeBSD Handbook êáé ôçí õðüëïéðç ôåêìçñßùóç. Äåí ðåñéëáìâÜíåé áñ÷åßá ãéá ôï web site ôïõ FreeBSD.
>
> `ports-all release=cvs`
>
> Ç óõëëïãÞ Ports ôïõ FreeBSD.
>
> > **Óçìáíôéêü:** Áí äåí èÝëåôå íá áíáíåþóåôå üëï ôï `ports-all` (ôï ðëÞñåò äÝíôñï ôùí ports), áëëÜ íá ÷ñçóéìïðïéÞóåôå ìéá áðü ôéò õðïóõëëïãÝò ðïõ öáßíïíôáé ðáñáêÜôù, âåâáéùèåßôå üôé *ðÜíôá* áíáíåþíåôå ôçí õðïóõëëïãÞ `ports-base`! ¼ôáí êÜôé áëëÜæåé óôï óýóôçìá ìåôáãëþôôéóçò ôùí ports

ðïõ áíôéðñïóùðåýåôáé áðü ôï `ports-base`, åßíáé ðñáêôéêÜ âÝâáéï üôé ïé áëëáãÝò áõôÝò ðïëý óýíôïìá èá ÷ñçóéìïðïéçèïýí áðü “ðñáãìáôéêÜ” ports. ¸ôóé, áí áíáíåþíåôå ìüíï ôá “ðñáãìáôéêÜ” ports êáé áõôÜ ÷ñçóéìïðïéïýí êÜðïéåò áðü ôéò íÝåò äõíáôüôçôåò, õðÜñ÷åé ìåãÜëç ðéèáíüôçôá ç ìåôáãëþôôéóç ôïõò íá áðïôý÷åé ìå êÜðïéï ìõóôçñéþäåò ìÞíõìá ëÜèïõò. Ôï *ðñþôï* ðñÜãìá ðïõ ðñÝðåé íá êÜíåôå óå áõôÞ ôçí ðåñßðôùóç åßíáé íá âåâáéùèåßôå üôé åßíáé åíçìåñùìÝíç ç óõëëïãÞ óáò `ports-base`.

Óçìáíôéêü: Áí óêïðåýåôå íá äçìéïõñãÞóåôå ôï äéêü óáò ôïðéêü áíôßãñáöï ôïõ `ports/INDEX`, èá *ðñÝðåé* íá äå÷ôåßôå ôç óõëëïãÞ `ports-all` (ïëüêëçñï ôï äÝíôñï ôùí ports). H äçìéïõñãßá ôïõ `ports/INDEX` áðü ìç-ðëÞñåò äÝíôñï äåí õðïóôçñßæåôáé. Äåßôå ôï FAQ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/books/faq/applications.html#MAKE-INDEX).

`ports-accessibility release=cvs`

Ëïãéóìéêü ãéá ôçí âïÞèåéá ÷ñçóôþí ìå áíáðçñßåò.

`ports-arabic release=cvs`

ÕðïóôÞñéîç Áñáâéêþò Ãëþóóáò.

`ports-archivers release=cvs`

Åñãáëåßá áðïèÞêåõóçò êáé óõìðßåóçò.

`ports-astro release=cvs`

Ports ó÷åôéêÜ ìå áóôñïíïìßá.

`ports-audio release=cvs`

ÕðïóôÞñéîç Þ÷ïõ.

`ports-base release=cvs`

ÂáóéêÜ áñ÷åßá ôùí ports ãéá õðïóôÞñéîç ôïõ óõóôÞìáôïò ìåôáãëþôôéóçò. ÄéÜöïñá áñ÷åßá ðïõ âñßóêïíôáé óôïõò õðïêáôáëüãïõò `Mk/` êáé `Tools/` ôïõ `/usr/ports`.

> **Óçìåßùóç:** Ðáñáêáëïýìå äåßôå ôçí óçìáíôéêÞ ðñïåéäïðïßçóç ðáñáðÜíù: èá ðñÝðåé *ðÜíôïôå* íá åíçìåñþíåôå áõôÞ ôçí õðïóõëëïãÞ, üôáí åíçìåñþíåôå ïðïéïäÞðïôå ôìÞìá ôçò óõëëïãÞò Ports ôïõ FreeBSD.

`ports-benchmarks release=cvs`

ÐñïãñÜììáôá ìÝôñçóçò áðüäïóçò (Benchmarks).

`ports-biology release=cvs`

Âéïëïãßá.

`ports-cad release=cvs`

Åñãáëåßá ó÷åäßáóçò ìå ôç âïÞèåéá õðïëïãéóôÞ.

`ports-chinese release=cvs`

ÕðïóôÞñéîç ÊéíåæéêÞò Ãëþóóáò.

`ports-comms release=cvs`

Ëïãéóìéêü åðéêïéíùíéþí.

`ports-converters release=cvs`

Ìåôáôñïðåßò ÷áñáêôÞñùí.

`ports-databases release=cvs`

ÂÜóåéò ÄåäïìÝíùí.

`ports-deskutils release=cvs`

Áíôéêåßìåíá ðïõ âñßóêïíôáí óõíÞèùò óå Ýíá ãñáöåßï ðñéí ôçí åöåýñåóç ôùí õðïëïãéóôþí.

`ports-devel release=cvs`

ÂïçèçôéêÜ ðñïãñÜììáôá ãéá ôçí áíÜðôõîç ëïãéóìéêïý.

`ports-dns release=cvs`

Ëïãéóìéêü ó÷åôéêü ìå DNS.

`ports-editors release=cvs`

ÓõíôÜêôåò êåéìÝíïõ.

`ports-emulators release=cvs`

ÅîïìïéùôÝò Üëëùí ëåéôïõñãéêþí óõóôçìÜôùí.

`ports-finance release=cvs`

×ñçìáôïïéêïíïìéêÜ ðñïãñÜììáôá.

`ports-ftp release=cvs`

ÐñïãñÜììáôá FTP (ðåëÜôåò êáé åîõðçñåôçôÝò).

`ports-games release=cvs`

Ðáé÷íßäéá.

`ports-german release=cvs`

ÕðïóôÞñéîç ÃåñìáíéêÞò ãëþóóáò.

`ports-graphics release=cvs`

Åñãáëåßá ãñáöéêþí.

`ports-hebrew release=cvs`

ÕðïóôÞñéîç åâñáúêÞò ãëþóóáò.

`ports-hungarian release=cvs`

ÕðïóôÞñéîç ÏõããáñÝæéêçò ãëþóóáò.

`ports-irc release=cvs`

ÐñïãñÜììáôá ãéá ôï IRC.

`ports-japanese release=cvs`

ÕðïóôÞñéîç ÉáðùíéêÞò ãëþóóáò.

`ports-java release=cvs`

Åñãáëåßá ãéá ôçí Java.

`ports-korean release=cvs`

ÕðïóôÞñéîç ÊïñåáôéêÞò ãëþóóáò.

`ports-lang release=cvs`

Ãëþóóåò ðñïãñáììáôéóìïý.

`ports-mail release=cvs`

ÐñïãñÜììáôá çëåêôñïíéêïý ôá÷õäñïìåßïõ.

`ports-math release=cvs`

Ëïãéóìéêü ìáèçìáôéêþí õðïëïãéóìþí.

`ports-misc release=cvs`

ÄéÜöïñá âïçèçôéêÜ ðñïãñÜììáôá.

`ports-multimedia release=cvs`

Ëïãéóìéêü ðïëõìÝóùí.

`ports-net release=cvs`

Ëïãéóìéêü äéêôýùí.

`ports-net-im release=cvs`

Ëïãéóìéêü Üìåóùí ìçíõìÜôùí (instant messaging).

`ports-net-mgmt release=cvs`

Ëïãéóìéêü äéá÷åßñéóçò äéêôýùí.

`ports-net-p2p release=cvs`

Äéêôýùóç peer-to-peer.

`ports-news release=cvs`

Ëïãéóìéêü ãéá ôï USENET.

`ports-palm release=cvs`

Ëïãéóìéêü ãéá ôçí õðïóôÞñéîç óõóêåõþí ôýðïõ Palm™.

`ports-polish release=cvs`

ÕðïóôÞñéîç ÐïëùíéêÞò ãëþóóáò.

`ports-ports-mgmt release=cvs`

Åñãáëåßá ãéá ôç äéá÷åßñéóç ðáêÝôùí êáé ports.

`ports-portuguese release=cvs`

ÕðïóôÞñéîç ÐïñôïãáëéêÞò ãëþóóáò.

`ports-print release=cvs`

Ëïãéóìéêü åêôõðþóåùí.

`ports-russian release=cvs`

ÕðïóôÞñéîç ÑùóéêÞò ãëþóóáò.

`ports-science release=cvs`

ÅðéóôçìïíéêÜ ðñïãñÜììáôá.

`ports-security release=cvs`

Åñãáëåßá áóöáëåßáò.

`ports-shells release=cvs`

Shells ãéá ôçí ãñáììÞ åíôïëþí.

`ports-sysutils release=cvs`

ÂïçèçôéêÜ ðñïãñÜììáôá óõóôÞìáôïò.

`ports-textproc release=cvs`

Åñãáëåßá åðåîåñãáóßáò êåéìÝíïõ (äåí ðåñéëáìâÜíåé åðéôñáðÝæéá ôõðïãñáößá).

`ports-ukrainian release=cvs`

ÕðïóôÞñéîç ÏõêñáíéêÞò ãëþóóáò.

`ports-vietnamese release=cvs`

ÕðïóôÞñéîç ÂéåôíáìÝæéêçò ãëþóóáò.

`ports-www release=cvs`

Ëïãéóìéêü ðïõ ó÷åôßæåôáé ìå ôïí ðáãêüóìéï éóôü (World Wide Web).

`ports-x11 release=cvs`

Ports ãéá õðïóôÞñéîç ôïõ óõóôÞìáôïò X Windows.

`ports-x11-clocks release=cvs`

Ñïëüãéá ãéá ôï X11.

`ports-x11-drivers release=cvs`

ÐñïãñÜììáôá ïäÞãçóçò ãéá ôá X11.

`ports-x11-fm release=cvs`

Äéá÷åéñéóôÝò áñ÷åßùí ãéá ôá X11.

`ports-x11-fonts release=cvs`

ÃñáììáôïóåéñÝò êáé åñãáëåßá ãñáììáôïóåéñþí ãéá X11.

`ports-x11-toolkits release=cvs`

ÅñãáëåéïèÞêåò X11.

`ports-x11-servers release=cvs`

ÅîõðçñåôçôÝò X11.

`ports-x11-themes release=cvs`

ÈÝìáôá ãéá X11.

`ports-x11-wm release=cvs`

Äéá÷åéñéóôÝò ðáñáèýñùí (window managers) ãéá X11.

`projects-all release=cvs`

Ðçãáßïò êþäéêáò ãéá ôï projects repository ôïõ FreeBSD.

`src-all release=cvs`

Ï âáóéêüò ðçãáßïò êþäéêáò ôïõ FreeBSD, óõìðåñéëáìâáíïìÝíïõ ôïõ êþäéêá êñõðôïãñáößáò.

`src-base release=cvs`

ÄéÜöïñá áñ÷åßá óôçí êïñõöÞ ôïõ `/usr/src`.

`src-bin release=cvs`

Åñãáëåßá ðïõ ðéèáíüí íá áðáéôïýíôáé óå êáôÜóôáóç ëåéôïõñãßáò åíüò ÷ñÞóôç (single-user) (`/usr/src/bin`).

`src-cddl release=cvs`

Åñãáëåßá êáé âéâëéïèÞêåò ðïõ êáëýðôïíôáé áðü ôçí Üäåéá ÷ñÞóçò CDDL (`/usr/src/cddl`).

`src-contrib release=cvs`

Åñãáëåßá êáé âéâëéïèÞêåò ðïõ äåí áíÞêïõí óôï FreeBSD Project, êáé ôá ïðïßá ÷ñçóéìïðïéïýíôáé ïõóéáóôéêÜ áíáëëïßùôá (`/usr/src/contrib`).

`src-crypto release=cvs`

Åñãáëåßá êáé âéâëéïèÞêåò êñõðôïãñÜöçóçò ðïõ äåí áíÞêïõí óôï FreeBSD project êáé ôá ïðïßá ÷ñçóéìïðïéïýíôáé ïõóéáóôéêÜ áíáëëïßùôá (`/usr/src/crypto`).

`src-eBones release=cvs`

Kerberos êáé DES (`/usr/src/eBones`). Äåí ÷ñçóéìïðïéïýíôáé óôéò ôñÝ÷ïõóåò åêäüóåéò ôïõ FreeBSD.

`src-etc release=cvs`

Áñ÷åßá ñõèìßóåùí ôïõ óõóôÞìáôïò (`/usr/src/etc`).

`src-games release=cvs`

Ðáé÷íßäéá (`/usr/src/games`).

`src-gnu release=cvs`

Åñãáëåßá ðïõ êáëýðôïíôáé áðü ôçí Üäåéá ÷ñÞóçò GNU Public License (`/usr/src/gnu`).

`src-include release=cvs`

Áñ÷åßá åðéêåöáëßäùí (`/usr/src/include`).

`src-kerberos5 release=cvs`

ÐáêÝôï áóöáëåßáò Kerberos5 (`/usr/src/kerberos5`).

`src-kerberosIV release=cvs`

ÐáêÝôï áóöáëåßáò KerberosIV (`/usr/src/kerberosIV`).

`src-lib release=cvs`

ÂéâëéïèÞêåò (`/usr/src/lib`).

`src-libexec release=cvs`

ÐñïãñÜììáôá óõóôÞìáôïò ôá ïðïßá öõóéïëïãéêÜ åêôåëïýíôáé áðü Üëëá ðñïãñÜììáôá (`/usr/src/libexec`).

`src-release release=cvs`

Áñ÷åßá ðïõ áðáéôïýíôáé ãéá ôçí ðáñáãùãÞ ìéáò Ýêäïóçò ôïõ FreeBSD (`/usr/src/release`).

`src-rescue release=cvs`

ÐñïãñÜììáôá ìå óôáôéêÞ ìåôáãëþôôéóç ãéá ÷ñÞóç óå Ýêôáêôåò ðåñéðôþóåéò åðáíáöïñÜò ôïõ óõóôÞìáôïò. Äåßôå ôï rescue(8) (`/usr/src/rescue`).

`src-sbin release=cvs`

Åñãáëåßá óõóôÞìáôïò ãéá ëåéôïõñãßá óå êáôÜóôáóç åíüò ÷ñÞóôç (single user mode) (`/usr/src/sbin`).

`src-secure release=cvs`

ÂéâëéïèÞêåò ãéá åíôïëÝò êñõðôïãñÜöçóçò (`/usr/src/secure`).

`src-share release=cvs`

Áñ÷åßá ôá ïðïßá ìðïñåß íá åßíáé êïéíÜ áíÜìåóá óå ðïëëáðëÜ óõóôÞìáôá (`/usr/src/share`).

`src-sys release=cvs`

Ï ðõñÞíáò (`/usr/src/sys`).

`src-sys-crypto release=cvs`

Êþäéêáò êñõðôïãñáößáò ôïõ ðõñÞíá (`/usr/src/sys/crypto`).

`src-tools release=cvs`

ÄéÜöïñá åñãáëåßá ãéá ôç óõíôÞñçóç ôïõ FreeBSD (`/usr/src/tools`).

`src-usrbin release=cvs`

Åñãáëåßá ÷ñÞóôç (`/usr/src/usr.bin`).

`src-usrsbin release=cvs`

Åñãáëåßá óõóôÞìáôïò (`/usr/src/usr.sbin`).

`www release=cvs`

Ï ðçãáßïò êþäéêáò ãéá ôçí éóôïóåëßäá WWW ôïõ FreeBSD.

`distrib release=self`

Ôá áñ÷åßá ñõèìßóåùí ôïõ ßäéïõ ôïõ åîõðçñåôçôÞ **CVSup**. ×ñçóéìïðïéåßôáé áðü **CVSup** mirror sites.

`gnats release=current`

H âÜóç äåäïìÝíùí ôïõ óõóôÞìáôïò ðáñáêïëïýèçóçò ðñïâëçìÜôùí GNATS.

`mail-archive release=current`

Ôá áñ÷åßá ôçò ëßóôáò ôá÷õäñïìåßïõ ôïõ FreeBSD.

`www release=current`

Ðñï-åðåîåñãáóìÝíá áñ÷åßá ôçò äéêôõáêÞò ôïðïèåóßáò (WWW) ôïõ FreeBSD (ü÷é ï ðçãáßïò êþäéêáò). ×ñçóéìïðïéåßôáé áðü WWW mirror sites.

A.6.6 Ãéá Ðåñéóóüôåñåò Ðëçñïöïñßåò

Ãéá ôï FAQ ôïõ **CVSup** êáé Üëëåò ðëçñïöïñßåò ó÷åôéêÜ ìå áõôü, äåßôå ôç Óåëßäá ôïõ CVSup (http://www.cvsup.org).

ÓõæçôÞóåéò ó÷åôéêÜ ìå ôç ÷ñÞóç ôïõ **CVSup** óôï FreeBSD ëáìâÜíïõí ÷þñá óôçí çëåêôñïíéêÞ ëßóôá ôå÷íéêþí óõæçôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hackers). Óôç ëßóôá áõôÞ, êáèþò êáé óôçí çëåêôñïíéêÞ ëßóôá áíáêïéíþóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-announce) áíáêïéíþíïíôáé êáé ïé íÝåò åêäüóåéò ôïõ ðñïãñÜììáôïò.

Ãéá åñùôÞóåéò Þ áíáöïñÝò óöáëìÜôùí ó÷åôéêÜ ìå ôï **CVSup** ñßîôå ìéá ìáôéÜ óôï CVSup FAQ (http://www.cvsup.org/faq.html#bugreports).

A.6.7 Ôïðïèåóßåò CVSup

Ìðïñåßôå íá âñåßôå åîõðçñåôçôÝò CVSup ãéá ôï FreeBSD óôéò áêüëïõèåò ôïðïèåóßåò:

Central Servers, Primary Mirror Sites, Armenia, Australia, Austria, Brazil, Canada, China, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Kyrgyzstan, Latvia, Lithuania, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Romania, Russia, San Marino, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Kingdom, USA.

(as of UTC)

Central Servers

- cvsup.FreeBSD.org

Primary Mirror Sites

- cvsup1.FreeBSD.org
- cvsup2.FreeBSD.org
- cvsup3.FreeBSD.org
- cvsup4.FreeBSD.org
- cvsup5.FreeBSD.org
- cvsup6.FreeBSD.org
- cvsup7.FreeBSD.org
- cvsup8.FreeBSD.org
- cvsup9.FreeBSD.org
- cvsup10.FreeBSD.org
- cvsup11.FreeBSD.org
- cvsup12.FreeBSD.org

- cvsup13.FreeBSD.org
- cvsup14.FreeBSD.org
- cvsup15.FreeBSD.org
- cvsup16.FreeBSD.org
- cvsup18.FreeBSD.org

Armenia

- cvsup1.am.FreeBSD.org

Australia

- cvsup.au.FreeBSD.org

Austria

- cvsup.at.FreeBSD.org

Brazil

- cvsup.br.FreeBSD.org
- cvsup2.br.FreeBSD.org
- cvsup3.br.FreeBSD.org
- cvsup4.br.FreeBSD.org
- cvsup5.br.FreeBSD.org

Canada

- cvsup1.ca.FreeBSD.org

China

- cvsup.cn.FreeBSD.org

- cvsup2.cn.FreeBSD.org

Costa Rica

- cvsup1.cr.FreeBSD.org

Czech Republic

- cvsup.cz.FreeBSD.org

Denmark

- cvsup.dk.FreeBSD.org
- cvsup2.dk.FreeBSD.org

Estonia

- cvsup.ee.FreeBSD.org

Finland

- cvsup.fi.FreeBSD.org
- cvsup2.fi.FreeBSD.org

France

- cvsup.fr.FreeBSD.org
- cvsup1.fr.FreeBSD.org
- cvsup2.fr.FreeBSD.org
- cvsup3.fr.FreeBSD.org
- cvsup4.fr.FreeBSD.org
- cvsup5.fr.FreeBSD.org
- cvsup8.fr.FreeBSD.org

Germany

- cvsup.de.FreeBSD.org
- cvsup2.de.FreeBSD.org
- cvsup3.de.FreeBSD.org
- cvsup4.de.FreeBSD.org
- cvsup5.de.FreeBSD.org
- cvsup6.de.FreeBSD.org
- cvsup7.de.FreeBSD.org
- cvsup8.de.FreeBSD.org

Greece

- cvsup.gr.FreeBSD.org
- cvsup2.gr.FreeBSD.org

Hungary

- cvsup.hu.FreeBSD.org

Iceland

- cvsup.is.FreeBSD.org

Ireland

- cvsup.ie.FreeBSD.org
- cvsup2.ie.FreeBSD.org

Israel

- cvsup.il.FreeBSD.org

Italy

- cvsup.it.FreeBSD.org

Japan

- cvsup.jp.FreeBSD.org
- cvsup2.jp.FreeBSD.org
- cvsup3.jp.FreeBSD.org
- cvsup4.jp.FreeBSD.org
- cvsup5.jp.FreeBSD.org
- cvsup6.jp.FreeBSD.org

Korea

- cvsup.kr.FreeBSD.org
- cvsup2.kr.FreeBSD.org
- cvsup3.kr.FreeBSD.org

Kuwait

- cvsup1.kw.FreeBSD.org

Kyrgyzstan

- cvsup.kg.FreeBSD.org

Latvia

- cvsup.lv.FreeBSD.org
- cvsup2.lv.FreeBSD.org

Lithuania

- cvsup.lt.FreeBSD.org
- cvsup2.lt.FreeBSD.org
- cvsup3.lt.FreeBSD.org

Netherlands

- cvsup.nl.FreeBSD.org
- cvsup2.nl.FreeBSD.org
- cvsup3.nl.FreeBSD.org

New Zealand

- cvsup.nz.FreeBSD.org

Norway

- cvsup.no.FreeBSD.org

Philippines

- cvsup1.ph.FreeBSD.org

Poland

- cvsup.pl.FreeBSD.org
- cvsup2.pl.FreeBSD.org
- cvsup3.pl.FreeBSD.org

Portugal

- cvsup.pt.FreeBSD.org

- cvsup2.pt.FreeBSD.org
- cvsup3.pt.FreeBSD.org

Romania

- cvsup.ro.FreeBSD.org
- cvsup1.ro.FreeBSD.org
- cvsup2.ro.FreeBSD.org
- cvsup3.ro.FreeBSD.org

Russia

- cvsup.ru.FreeBSD.org
- cvsup2.ru.FreeBSD.org
- cvsup3.ru.FreeBSD.org
- cvsup4.ru.FreeBSD.org
- cvsup5.ru.FreeBSD.org
- cvsup6.ru.FreeBSD.org
- cvsup7.ru.FreeBSD.org

San Marino

- cvsup.sm.FreeBSD.org

Slovak Republic

- cvsup.sk.FreeBSD.org

Slovenia

- cvsup.si.FreeBSD.org
- cvsup2.si.FreeBSD.org

South Africa

- cvsup.za.FreeBSD.org
- cvsup2.za.FreeBSD.org

Spain

- cvsup.es.FreeBSD.org
- cvsup2.es.FreeBSD.org
- cvsup3.es.FreeBSD.org

Sweden

- cvsup.se.FreeBSD.org
- cvsup2.se.FreeBSD.org

Switzerland

- cvsup.ch.FreeBSD.org

Taiwan

- cvsup.tw.FreeBSD.org
- cvsup3.tw.FreeBSD.org
- cvsup4.tw.FreeBSD.org
- cvsup5.tw.FreeBSD.org
- cvsup6.tw.FreeBSD.org
- cvsup7.tw.FreeBSD.org
- cvsup8.tw.FreeBSD.org
- cvsup9.tw.FreeBSD.org
- cvsup10.tw.FreeBSD.org
- cvsup11.tw.FreeBSD.org
- cvsup12.tw.FreeBSD.org
- cvsup13.tw.FreeBSD.org

- cvsup14.tw.FreeBSD.org

Thailand

- cvsup.th.FreeBSD.org

Turkey

- cvsup.tr.FreeBSD.org
- cvsup2.tr.FreeBSD.org

Ukraine

- cvsup2.ua.FreeBSD.org
- cvsup3.ua.FreeBSD.org
- cvsup5.ua.FreeBSD.org
- cvsup6.ua.FreeBSD.org
- cvsup7.ua.FreeBSD.org

United Kingdom

- cvsup.uk.FreeBSD.org
- cvsup2.uk.FreeBSD.org
- cvsup3.uk.FreeBSD.org
- cvsup4.uk.FreeBSD.org

USA

- cvsup1.us.FreeBSD.org
- cvsup2.us.FreeBSD.org
- cvsup3.us.FreeBSD.org
- cvsup4.us.FreeBSD.org
- cvsup5.us.FreeBSD.org

- cvsup6.us.FreeBSD.org
- cvsup7.us.FreeBSD.org
- cvsup8.us.FreeBSD.org
- cvsup9.us.FreeBSD.org
- cvsup10.us.FreeBSD.org
- cvsup11.us.FreeBSD.org
- cvsup12.us.FreeBSD.org
- cvsup13.us.FreeBSD.org
- cvsup14.us.FreeBSD.org
- cvsup15.us.FreeBSD.org
- cvsup16.us.FreeBSD.org
- cvsup18.us.FreeBSD.org

A.7 ÅôéêÝôåò (Tags) ãéá ôï CVS

¼ôáí êáôåâÜæåôå Þ áíáíåþíåôå ôïí ðçãáßï êþäéêá ìÝóù ôçò **cvs** ç ôçò **CVSup**, èá ðñÝðåé íá êáèïñßóåôå ìéá åôéêÝôá Ýêäïóçò (revision tag). ¿á revision tag áíáöÝñåôáé åßôå óå ìéá óõãêåêñéìÝíç ðïñåßá áíÜðôõîçò ôïõ FreeBSD, åßôå óå Ýíá óõãêåêñéìÝíï ÷ñïíéêü óçìåßï. Ï ðñþôïò ôýðïò ïíïìÜæåôáé “åôéêÝôá êëÜäïõ (branch tag)”, êáé ï äåýôåñïò ïíïìÜæåôáé “åôéêÝôá Ýêäïóçò (release tag)”.

A.7.1 ÅôéêÝôåò ÊëÜäùí (Branch Tags)

¼ëåò áõôÝò, ìå ôçí åîáßñåóç ôïõ `HEAD` (ôï ïðïßï åßíáé ðÜíôá Ýãêõñç åôéêÝôá), éó÷ýïõí ìüíï ãéá ôï äÝíôñï `src/`. Ôá äÝíôñá `ports/`, `doc/`, êáé `www/` äåí Ý÷ïõí êëÜäïõò.

HEAD

Ðñüêåéôáé ãéá ôï óõìâïëéêü üíïìá ôçò êýñéáò ãñáììÞò áíÜðôõîçò, Þ FreeBSD-CURRENT. Åßíáé åðßóçò ôï ðñïåðéëåãìÝíï tag áí äåí êáèïñéóôåß êÜðïéï óõãêåêñéìÝíï revision.

Óôï **CVSup**, ôï tag áõôü áíôéðñïóùðåýåôáé áðü ìéá `.` (äåí ðñüêåéôáé ãéá óçìåßï óôßîçò ôçò ðñüôáóçò, áëëÜ ãéá ôïí ðñáãìáôéêü ÷áñáêôÞñá `.`).

> **Óçìåßùóç:** Óôï CVS, áõôÞ åßíáé êáé ç ðñïåðéëïãÞ áí äåí êáèïñéóôåß revision tag. ÓõíÞèùò *äåí* åßíáé êáëÞ éäÝá íá êÜíåôå checkout êáé áíáíÝùóç óôïí ðçãáßï êþäéêá ôïõ CURRENT óå Ýíá ìç÷Üíçìá STABLE, åêôüò áí áõôÞ åßíáé ðñáãìáôéêÜ ç ðñüèåóç óáò.

RELENG_9

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-9.X, ãíùóôÞ åðßóçò êáé ùò FreeBSD 9-STABLE

RELENG_9_0

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-9.0, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_8

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-8.X, ãíùóôÞ åðßóçò êáé ùò FreeBSD 8-STABLE

RELENG_8_2

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-8.2, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_8_1

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-8.1, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_8_0

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-8.0, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_7

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-7.X, ãíùóôÞ åðßóçò êáé ùò FreeBSD 7-STABLE

RELENG_7_4

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-7.4, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_7_3

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-7.3, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_7_2

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-7.2, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_7_1

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-7.1, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_7_0

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-7.0, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_6

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-6.X, ãíùóôÞ åðßóçò êáé ùò FreeBSD 6-STABLE

RELENG_6_4

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-6.4, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_6_3

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-6.3, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_6_2

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-6.2, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_6_1

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-6.1, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_6_0

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-6.0, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-5.X, ãíùóôÞ åðßóçò ùò FreeBSD 5-STABLE.

RELENG_5_5

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-5.5, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5_4

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-5.4, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5_3

Ç ãñáììÞ Ýêäïóçò ôïõ FreeBSD-5.3, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5_2

Ç ãñáììÞ Ýêäïóçò FreeBSD-5.2 êáé FreeBSD-5.2.1, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5_1

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-5.1, ÷ñçóéìïðïéåßôáé ìüíï ãéá ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_5_0

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-5.0, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-4.X, ãíùóôÞ åðßóçò êáé ùò FreeBSD 4-STABLE.

RELENG_4_11

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.11, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_10

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.10, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_9

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.9, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_8

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.8, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_7

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.7, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_6

Ç ãñáììÞ Ýêäïóçò ãéá ôá FreeBSD-4.6 êáé FreeBSD-4.6.2, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_5

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.5, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_4

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.4, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_4_3

Ç ãñáììÞ Ýêäïóçò ãéá ôï FreeBSD-4.3, ÷ñçóéìïðïéåßôáé ìüíï ãéá åíçìåñþóåéò áóöáëåßáò êáé Üëëåò êñßóéìåò äéïñèþóåéò.

RELENG_3

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-3.X, ãíùóôÞ åðßóçò êáé ùò 3.X-STABLE.

RELENG_2_2

Ç ãñáììÞ áíÜðôõîçò ãéá ôï FreeBSD-2.2.X, ãíùóôÞ åðßóçò êáé ùò 2.2-STABLE. Ç ãñáììÞ áõôÞ èåùñåßôáé ïõóéáóôéêÜ ðáñù÷çìÝíç.

A.7.2 ÅôéêÝôåò Åêäüóåùí (Release Tags)

Ïé åôéêÝôåò áõôÝò áíáöÝñïíôáé óå ìéá óõãêåêñéìÝíç ÷ñïíéêÞ óôéãìÞ êáôÜ ôçí ïðïßá Ýãéíå ìéá êáíïíéêÞ Ýêäïóç (release) ôïõ FreeBSD. Ç äéáäéêáóßá ôçò Ýêäïóçò ôåêìçñéþíåôáé ìå ðåñéóóüôåñåò ëåðôïìÝñåéåò óôá Ýããñáöá Ðëçñïöïñßåò Äéáäéêáóßáò ¸êäïóçò (http://www.FreeBSD.org/releng/) êáé Äéáäéêáóßá ¸êäïóçò (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/releng/release-proc.html). Ôï äÝíôñï `src` ÷ñçóéìïðïéåß ïíüìáôá åôéêåôþí ðïõ îåêéíïýí ìå ôç ëÝîç `RELENG_`. Ôá äÝíôñá `ports` êáé `doc` ÷ñçóéìïðïéïýí åôéêÝôåò ðïõ îåêéíïýí ìå ôç ëÝîç `RELEASE`. ÔÝëïò, óôï äÝíôñï `www` äåí äßíåôáé êÜðïéá åéäéêÞ åôéêÝôá ðïõ íá Ý÷åé ó÷Ýóç ìå ôéò åêäüóåéò.

RELENG_9_0_0_RELEASE

FreeBSD 9.0

RELENG_8_2_0_RELEASE

FreeBSD 8.2

RELENG_8_1_0_RELEASE

FreeBSD 8.1

RELENG_8_0_0_RELEASE

FreeBSD 8.0

RELENG_7_4_0_RELEASE

FreeBSD 7.4

RELENG_7_3_0_RELEASE

FreeBSD 7.3

RELENG_7_2_0_RELEASE

FreeBSD 7.2

RELENG_7_1_0_RELEASE

FreeBSD 7.1

RELENG_7_0_0_RELEASE

FreeBSD 7.0

RELENG_6_4_0_RELEASE

FreeBSD 6.4

RELENG_6_3_0_RELEASE

FreeBSD 6.3

RELENG_6_2_0_RELEASE
FreeBSD 6.2

RELENG_6_1_0_RELEASE
FreeBSD 6.1

RELENG_6_0_0_RELEASE
FreeBSD 6.0

RELENG_5_5_0_RELEASE
FreeBSD 5.5

RELENG_5_4_0_RELEASE
FreeBSD 5.4

RELENG_4_11_0_RELEASE
FreeBSD 4.11

RELENG_5_3_0_RELEASE
FreeBSD 5.3

RELENG_4_10_0_RELEASE
FreeBSD 4.10

RELENG_5_2_1_RELEASE
FreeBSD 5.2.1

RELENG_5_2_0_RELEASE
FreeBSD 5.2

RELENG_4_9_0_RELEASE
FreeBSD 4.9

RELENG_5_1_0_RELEASE
FreeBSD 5.1

RELENG_4_8_0_RELEASE
FreeBSD 4.8

RELENG_5_0_0_RELEASE
FreeBSD 5.0

RELENG_4_7_0_RELEASE
FreeBSD 4.7

RELENG_4_6_2_RELEASE
FreeBSD 4.6.2

RELENG_4_6_1_RELEASE
FreeBSD 4.6.1

RELENG_4_6_0_RELEASE
FreeBSD 4.6

RELENG_4_5_0_RELEASE
FreeBSD 4.5

RELENG_4_4_0_RELEASE
FreeBSD 4.4

RELENG_4_3_0_RELEASE
FreeBSD 4.3

RELENG_4_2_0_RELEASE
FreeBSD 4.2

RELENG_4_1_1_RELEASE
FreeBSD 4.1.1

RELENG_4_1_0_RELEASE
FreeBSD 4.1

RELENG_4_0_0_RELEASE
FreeBSD 4.0

RELENG_3_5_0_RELEASE
FreeBSD-3.5

RELENG_3_4_0_RELEASE
FreeBSD-3.4

RELENG_3_3_0_RELEASE
FreeBSD-3.3

RELENG_3_2_0_RELEASE
FreeBSD-3.2

RELENG_3_1_0_RELEASE
FreeBSD-3.1

RELENG_3_0_0_RELEASE

FreeBSD-3.0

RELENG_2_2_8_RELEASE

FreeBSD-2.2.8

RELENG_2_2_7_RELEASE

FreeBSD-2.2.7

RELENG_2_2_6_RELEASE

FreeBSD-2.2.6

RELENG_2_2_5_RELEASE

FreeBSD-2.2.5

RELENG_2_2_2_RELEASE

FreeBSD-2.2.2

RELENG_2_2_1_RELEASE

FreeBSD-2.2.1

RELENG_2_2_0_RELEASE

FreeBSD-2.2.0

A.8 Ôïðïèåóßåò AFS

ÅîõðçñåôçôÝò AFS ãéá ôï FreeBSD èá âñåßôå óôéò áêüëïõèåò ôïðïèåóßåò:

Óïõçäßá

Ç äéáäñïìÞ ãéá ôá áñ÷åßá åßíáé: `/afs/stacken.kth.se/ftp/pub/FreeBSD/`

```
stacken.kth.se          # Stacken Computer Club, KTH, Sweden
130.237.234.43          #hot.stacken.kth.se
130.237.237.230         #fishburger.stacken.kth.se
130.237.234.3           #milko.stacken.kth.se
```

Õðåýèõíïò ÓõíôÞñçóçò: <`ftp@stacken.kth.se`>

A.9 Ôïðïèåóßåò rsync

Ôï FreeBSD åßíáé äéáèÝóéìï ìÝóù ôïõ ðñùôïêüëëïõ rsync óôéò áêüëïõèåò ôïðïèåóßåò. Ôï âïçèçôéêü ðñüãñáììá **rsync** ëåéôïõñãåß ìå ðåñßðïõ ôïí ßäéï ôñüðï ìå ôçí åíôïëÞ rcp(1), áëëÜ Ý÷åé ðåñéóóüôåñåò åðéëïãÝò êáé ÷ñçóéìïðïéåß ôï ðñùôüêïëëï áðïìáêñõóìÝíçò áíáíÝùóçò ôï ïðïßï ìåôáöÝñåé ìüíï ôéò äéáöïñÝò ìåôáîý äýï óåô áñ÷åßùí, åðéôá÷ýíïíôáò Ýôóé éäéáßôåñá ôï óõã÷ñïíéóìü ìÝóù ôïõ äéêôýïõ. Áõôü åßíáé ðåñéóóüôåñï ÷ñÞóéìï áí äéáôçñåßôå mirror ôïõ äéáêïìéóôÞ FTP Þ ôïõ CVS Repository ôïõ FreeBSD. Ç óõëëïãÞ åöáñìïãþí **rsync** äéáôßèåôáé ãéá ðïëëÜ ëåéôïõñãéêÜ óõóôÞìáôá, óôï FreeBSD äåßôå ôï port `net/rsync` Þ ÷ñçóéìïðïéÞóôå ôï áíôßóôïé÷ï ðáêÝôï.

Äçìïêñáôßá ôçò Ôóå÷ßáò

rsync://ftp.cz.FreeBSD.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- ftp: Ìåñéêü mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.
- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.

Ïëëáíäßá

rsync://ftp.nl.FreeBSD.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.

Ñùóßá

rsync://ftp.mtu.ru/

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.
- FreeBSD-gnats: Ç âÜóç äåäïìÝíùí ôïõ óõóôÞìáôïò ðáñáêïëïýèçóçò óöáëìÜôùí GNATS.
- FreeBSD-Archive: Mirror ôïõ äéáêïìéóôÞ FTP ðáëáéüôåñùí åêäüóåùí (archive) ôïõ FreeBSD.

Óïõçäßá

rsync://ftp4.se.freebsd.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD

ÔáÀâÜí

rsync://ftp.tw.FreeBSD.org/

rsync://ftp2.tw.FreeBSD.org/

rsync://ftp6.tw.FreeBSD.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.

ÇíùìÝíï Âáóßëåéï

rsync://rsync.mirrorservice.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- sites/ftp.freebsd.org: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.

ÇíùìÝíåò Ðïëéôåßåò ÁìåñéêÞò

rsync://ftp-master.FreeBSD.org/

Ï äéáêïìéóôÞò áõôüò ìðïñåß íá ÷ñçóéìïðïéçèåß ìüíï áðü êýñéá mirror sites ôïõ FreeBSD.

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: To êýñéï (master) óýóôçìá áñ÷åßùí ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.
- acl: Ç êýñéá ëßóôá ACL ôïõ FreeBSD.

rsync://ftp13.FreeBSD.org/

ÄéáèÝóéìåò ÓõëëïãÝò:

- FreeBSD: ÐëÞñåò mirror ôïõ äéáêïìéóôÞ FTP ôïõ FreeBSD.

ÐáñÜñôçìá B. Âéâëéïãñáößá

Áí êáé ôá manual pages ðáñÝ÷ïõí ìßá åðßóçìç áíáöïñÜ ãéá îå÷ùñéóôÜ ôìÞìáôá ôïõ FreeBSD ëåéôïõñãéêïý óõóôÞìáôïò, Ý÷ïõí êáêÞ öÞìç ãéá ôï üôé äåí åðåîçãïýí ðùò íá åíþóåéò ôá ôìÞìáôá ìáæß ãéá íá êÜíåéò üëï ôï ëåéôïõñãéêü óýóôçìá íá ëåéôïõñãåß ïìáëÜ. Ãéá áõôü, äåí õðÜñ÷åé õðïêáôÜóôáôï áðü Ýíá êáëü âéâëßï óôçí äéá÷åßñéóç óõóôçìÜôùí UNIX êáé Ýíá êáëü åã÷åéñßäéï ÷ñÞóôç.

B.1 Âéâëßá & ÐåñéïäéêÜ ó÷åôéêÜ ìå ôï FreeBSD

ÄéåèíÞ âéâëßá & ðåñéïäéêÜ:

- Using FreeBSD (http://jdli.tw.FreeBSD.org/publication/book/freebsd2/index.htm) (óå ÐáñáäïóéáêÜ ÊéíÝæéêá).
- FreeBSD Unleashed (ÌåôÜöñáóç óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí China Machine Press (http://www.hzbook.com/). ISBN 7-111-10201-0.
- FreeBSD From Scratch First Edition (óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí China Machine Press. ISBN 7-111-07482-3.
- FreeBSD From Scratch Second Edition (óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí China Machine Press. ISBN 7-111-10286-X.
- FreeBSD Handbook Second Edition (ÌåôÜöñáóç óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí Posts & Telecom Press (http://www.ptpress.com.cn/). ISBN 7-115-10541-3.
- FreeBSD 3.x Internet (óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí Tsinghua University Press (http://www.tup.tsinghua.edu.cn/). ISBN 7-900625-66-6.
- FreeBSD & Windows (óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí China Railway Publishing House (http://www.tdpress.com/). ISBN 7-113-03845-X
- FreeBSD Internet Services HOWTO (óå Áðëïðïéçìí Êéíέæéêá), åêäüèçêå áðü ôçí China Railway Publishing House. ISBN 7-113-03423-3
- FreeBSD for PC 98'ers (óôá ÃéáðùíÝæéêá), åêäüèçêå áðü ôçí SHUWA System Co, LTD. ISBN 4-87966-468-5 C3055 P2900E.
- FreeBSD (óôá ÃéáðùíÝæéêá), åêäüèçêå áðü ôçí CUTT. ISBN 4-906391-22-2 C3055 P2400E.
- Complete Introduction to FreeBSD (http://www.shoeisha.com/book/Detail.asp?bid=650) (óôá ÃéáðùíÝæéêá), åêäüèçêå áðü ôçí Shoeisha Co., Ltd (http://www.shoeisha.co.jp/). ISBN 4-88135-473-6 P3600E.
- Personal UNIX Starter Kit FreeBSD (http://www.ascii.co.jp/pb/book1/shinkan/detail/1322785.html) (óôá ÃéáðùíÝæéêá), åêäüèçêå áðü ôçí ASCII (http://www.ascii.co.jp/). ISBN 4-7561-1733-3 P3000E.
- FreeBSD Handbook (ÃéáðùíÝæéêç ìåôÜöñáóç), åêäüèçêå áðü ôçí ASCII (http://www.ascii.co.jp/). ISBN 4-7561-1580-2 P3800E.
- FreeBSD mit Methode (óôá ÃåñìáíéêÜ), åêäüèçêå áðü ôçí Computer und Literatur Verlag (http://www.cul.de)/Vertrieb Hanser, 1998. ISBN 3-932311-31-0.
- FreeBSD 4 - Installieren, Konfigurieren, Administrieren (http://www.cul.de/freebsd.html) (óôá ÃåñìáíéêÜ), åêäüèçêå áðü ôçí Computer und Literatur Verlag (http://www.cul.de), 2001. ISBN 3-932311-88-4.

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- FreeBSD Install and Utilization Manual (http://www.pc.mycom.co.jp/FreeBSD/install-manual.html) (óôá ÃéáðùíÝæéêá), åêäüèçêå áðü ôçí Mainichi Communications Inc. (http://www.pc.mycom.co.jp/).
- Onno W Purbo, Dodi Maryanto, Syahrial Hubbany, Widjil Widodo *Building Internet Server with FreeBSD (http://maxwell.itb.ac.id/)* (óôçí ÉíäïíçóéáêÞ ãëþóóá), åêäüèçêå áðü ôçí Elex Media Komputindo (http://www.elexmedia.co.id/).
- Absolute BSD: The Ultimate Guide to FreeBSD (ÌåôÜöñáóç óå ÐáñáäïóéáêÜ ÊéíÝæéêá), åêäüèçêå áðü ôçí GrandTech Press (http://www.grandtech.com.tw/), 2003. ISBN 986-7944-92-5.
- The FreeBSD 6.0 Book (http://www.twbsd.org/cht/book/) (óå ÐáñáäïóéáêÜ ÊéíÝæéêá), åêäüèçêå áðü ôçí Drmaster, 2006. ISBN 9-575-27878-X.

Âéâëßá & ðåñéïäéêÜ óôçí ÁããëéêÞ ãëþóóá:

- Absolute FreeBSD, 2nd Edition: The Complete Guide to FreeBSD (http://www.absoluteFreeBSD.com/), åêäüèçêå áðü ôçí No Starch Press (http://www.nostarch.com/), 2007. ISBN: 978-1-59327-151-0
- The Complete FreeBSD (http://www.freebsdmall.com/cgi-bin/fm/bsdcomp), åêäüèçêå áðü ôçí O'Reilly (http://www.oreilly.com/), 2003. ISBN: 0596005164
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- *UNIX in a Nutshell*. O'Reilly & Associates, Inc., 1990. ISBN 093717520X
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- Ôï Ohio State University (http://www.osu.edu/) Ýãñáøå ôá Åéóáãùãéêü ìáèÞìáôá UNIX (http://8help.osu.edu/wks/unix_course/unix.html) ðïõ äéáôßèåíôáé óå HTML êáé óå ìïñöÞ PostScript.

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- Jpman Project, Japan FreeBSD Users Group (http://www.jp.FreeBSD.org/). FreeBSD User's Reference Manual (http://www.pc.mycom.co.jp/FreeBSD/urm.html) (Japanese translation). Mainichi Communications Inc. (http://www.pc.mycom.co.jp/), 1998. ISBN4-8399-0088-4 P3800E.
- Ôï Edinburgh University (http://www.ed.ac.uk/) Ýãñáøå Ýíá Online ïäçãü (http://unixhelp.ed.ac.uk/) ãéá íÝïõò óôï ðåñéâÜëëïí ôïõ UNIX.

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- Ferraro, Richard F. *Programmer’s Guide to the EGA, VGA, and Super VGA Cards*. 3rd ed. Reading, Mass. : Addison-Wesley, 1995. ISBN 0-201-62490-7
- Ç Intel Corporation äçìïóéåýåé ôåêìçñßùóç ãéá ôéò CPUs, ôá chipsets êáé ðñüôõðá óôï developer web site (http://developer.intel.com/), óõíÞèùò ùò áñ÷åßá PDF.
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- *The BSD family tree*. http://www.FreeBSD.org/cgi/cvsweb.cgi/src/share/misc/bsd-family-tree ç ôï `/usr/share/misc/bsd-family-tree` óå Ýíá FreeBSD ìç÷Üíçìá.
- *Networked Computer Science Technical Reports Library*. http://www.ncstrl.org/

- *ÐáëáéÝò BSD åêäüóåéò áðü ôï Computer Systems Research group (CSRG)*. http://www.mckusick.com/csrg/: Ôï 4CD set Ý÷åé üëåò ôéò BSD åêäüóåéò áðü ôçí 1BSD ìÝ÷ñé ôçí 4.4BSD êáé ôçí 4.4BSD-Lite2 (áëëÜ ü÷é ôçí 2.11BSD, äõóôõ÷þò). Ôï ôåëåõôáßï äéóêÜêé ðåñéÝ÷åé åðßóçò ôïí ôåëéêü ðçãáßï êþäéêá óõí ôá áñ÷åßá SCCS.

B.9 ÐåñéïäéêÜ êáé åöçìåñßäåò

- *The C/C++ Users Journal*. R&D Publications Inc. ISSN 1075-2838
- *Sys Admin — The Journal for UNIX System Administrators* Miller Freeman, Inc., ISSN 1061-2688
- *freeX — Das Magazin für Linux - BSD - UNIX* (óôá ÃåñìáíéêÜ) Computer- und Literaturverlag GmbH, ISSN 1436-7033

ÐáñÜñôçìá C. ÐçãÝò Ðëçñïöüñçóçò óôï Äéáäßêôõï

Ç ñáãäáßá åîÝëéîç ôïõ FreeBSD êáèéóôÜ ôá Ýíôõðá ìÝóá áíßêáíá íá áêïëïõèÞóïõí ôéò ôåëåõôáßåò åîåëßîåéò. Ïé çëåêôñïíéêÝò ðçãÝò åßíáé ï êáëýôåñïò (áí ü÷é ï ìüíïò) ôñüðïò ãéá íá ðáñáìåßíåôå åíÞìåñïò ãéá ôéò ôåëåõôáßåò åîåëßîåéò. Êáèþò ôï FreeBSD åßíáé Ýíá åèåëïíôéêü ðñüãñáììá, ç êïéíüôçôá ôùí ÷ñçóôþí ëåéôïõñãåß êáé ùò “ôìÞìá ôå÷íéêÞò õðïóôÞñéîçò”, ìå ôï çëåêôñïíéêü ôá÷õäñïìåßï, ôá web forums, êáé ôá USENET news íá åßíáé ïé ðëÝïí áðïôåëåóìáôéêïß ôñüðïé ãéá íá Ýñèåôå óå åðáöÞ ìå áõôÞ ôçí êïéíüôçôá.

Óôéò ðáñáêÜôù åíüôçôåò, èá âñåßôå ôá óçìáíôéêüôåñá óçìåßá åðéêïéíùíßáò ìå ôçí êïéíüôçôá ÷ñçóôþí ôïõ FreeBSD. Áí ãíùñßæåôå êáé Üëëåò ðçãÝò, ïé ïðïßåò äåí áíáöÝñïíôáé åäþ, ðáñáêáëïýìå íá ôéò óôåßëåôå óôçí çëåêôñïíéêÞ ëßóôá ïìÜäáò ôåêìçñßùóçò ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-doc) þóôå íá åíôá÷èïýí êáé áõôÝò.

C.1 Ëßóôåò Çëåêôñïíéêïý Ôá÷õäñïìåßïõ

Ïé ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ åßíáé ï ðéï Üìåóïò ôñüðïò ãéá íá áðåõèýíåôå ôéò åñùôÞóåéò óáò Þ íá áíïßîåôå ìéá ôå÷íéêÞ óõæÞôçóç ðïõ íá áðåõèýíåôáé óå êïéíü åîåéäéêåõìÝíï óôï FreeBSD. ÕðÜñ÷åé ìåãÜëç ðïéêéëßá áðü ëßóôåò, ïé ïðïßåò êáëýðôïõí åõñý öÜóìá èåìÜôùí ôïõ FreeBSD. Êáôåõèýíïíôáò ôéò åñùôÞóåéò óáò óôç óùóôÞ ëßóôá, èá åîáóöáëßóåôå ôá÷ýôåñç êáé áêñéâÝóôåñç áðüêñéóç.

Óôï ôÝëïò áõôïý ôïõ êåéìÝíïõ èá âñåßôå Ýíá ðßíáêá ìå ôç èåìáôïëïãßá ôçò êÜèå ëßóôáò. *Ðáñáêáëïýìå íá ôïí äéáâÜóåôå ðñéí áñ÷ßóåôå íá óõììåôÝ÷åôå Þ íá óôÝëíåôå ìçíýìáôá óå ïðïéáäÞðïôå ëßóôá*. Ïé ðåñéóóüôåñïé áðü ôïõò óõíäñïìçôÝò ìáò äÝ÷ïíôáé êáèçìåñéíÜ åêáôïíôÜäåò ìçíýìáôá ó÷åôéêÜ ìå ôï FreeBSD. Ïé êáíüíåò ðïõ Ý÷ïõìå êáèéåñþóåé, âïçèÜíå íá ãßíåôáé óùóôÞ ÷ñÞóç êáé íá äéáôçñåßôáé óå õøçëü åðßðåäï ç áíáëïãßá óÞìáôïò ðñïò èüñõâï óôç êÜèå ëßóôá. ÅÜí Þìáóôáí ðéï ÷áëáñïß, ïé ëßóôåò ìáò èá Ý÷áíáí ôçí áðïôåëåóìáôéêüôçôá ôïõò ùò ìÝóï åðéêïéíùíßáò ãéá ôï Project.

> **Óçìåßùóç:** *Áí èÝëåôå íá äïêéìÜóåôå ôçí éêáíüôçôá óáò íá óôÝëíåôå ìçíýìáôá óôéò ëßóôåò ôïõ FreeBSD, óôåßëôå Ýíá äïêéìáóôéêü ìÞíõìá óôçí ëßóôá freebsd-test (http://lists.FreeBSD.org/mailman/listinfo/freebsd-test).* Ðáñáêáëïýìå ìç óôÝëíåôå äïêéìáóôéêÜ ìçíýìáôá óå ïðïéáäÞðïôå Üëëç ëßóôá.

Áí âñßóêåóôå óå äßëçììá ó÷åôéêÜ ìå ôï ðïéá ëßóôá íá óôåßëåôå ìéá åñþôçóç, äåßôå ôï Ðùò íá ÷ñçóéìïðïéåßôå ìå åðéôõ÷ßá ôçí ëßóôá çëåêôñïíéêïý ôá÷õäñïìåßïõ FreeBSD-questions (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/freebsd-questions).

Ðñéí óôåßëåôå êÜôé óå ïðïéáäÞðïôå ëßóôá, ìÜèåôå ðùò íá ÷ñçóéìïðïéåßôå êáëýôåñá ôéò ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ. Ãéá ðáñÜäåéãìá, äåßôå ðùò ìðïñåßôå íá âïçèÞóåôå þóôå íá áðïöýãïíôáé óõ÷íÜ åðáíáëáìâáíüìåíåò óõæçôÞóåéò, äéáâÜæïíôáò ôï êåßìåíï Óõ÷íÝò ÅñùôÞóåéò Ó÷åôéêÜ ìå ôéò Ëßóôåò Ôá÷õäñïìåßïõ (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/mailing-list-faq) (FAQ).

Ãéá üëåò ôéò ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ äéáôçñåßôáé áñ÷åßï ìå ôéò ðáëéÝò äçìïóéåýóåéò, óôï ïðïßï ìðïñåß íá ãßíåé áíáæÞôçóç ÷ñçóéìïðïéþíôáò ôçí ÄéêôõáêÞ Ôïðïèåóßá ôïõ FreeBSD (http://www.FreeBSD.org/search/index.html). Åßíáé äõíáôÞ ç áíáæÞôçóç óôï áñ÷åßï ìÝóù ëÝîåùí-êëåéäéþí, ôï ïðïßï áðïôåëåß Ýíá Üñéóôï ôñüðï ãéá íá âñåßôå áðáíôÞóåéò óå óõ÷íÝò åñùôÞóåéò. Ðñéí óôåßëåôå ìéá åñþôçóç, êáëü èá åßíáé íá ðñáãìáôïðïéÞóåôå ìéá ôÝôïéá áíáæÞôçóç. Óçìåéþóôå åðßóçò üôé ôá ìçíýìáôá ðïõ óôÝëíïíôáé óå áõôÝò ôéò ëßóôåò áðïèçêåýïíôáé ãéá ðÜíôá. Áí óáò ðñïâëçìáôßæåé ç ðñïóôáóßá ôùí ðñïóùðéêþí óáò äåäïìÝíùí, óáò óõíéóôïýìå íá ÷ñçóéìïðïéÞóåôå ìéá äåõôåñåýïõóá äéåýèõíóç email, êáé íá ìçí ãñÜöåôå ðïôÝ ðñïóùðéêÝò óáò ðëçñïöïñßåò.

C.1.1 Óýíïøç Ëéóôþí

ÃåíéêÝò ëßóôåò: Ïé áêüëïõèåò åßíáé ãåíéêÝò ëßóôåò üðïõ ï êáèÝíáò åßíáé åëåýèåñïò (êáé åíèáññýíåôáé) íá óõììåôÝ÷åé:

Ëßóôá	Óêïðüò
freebsd-advocacy (http://lists.FreeBSD.org/mailman/listinfo/freebsd-advocacy)	ÄéáöÞìéóç êáé ðñïþèçóç ôïõ FreeBSD
freebsd-announce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-announce)	ÓçìáíôéêÜ ãåãïíüôá êáé áíáêïéíþóåéò
freebsd-arch (http://lists.FreeBSD.org/mailman/listinfo/freebsd-arch)	ÓõæçôÞóåéò áñ÷éôåêôïíéêÞò êáé ó÷åäéáóìïý
freebsd-bugbusters (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bugbusters)	ÓõæçôÞóåéò ðïõ áíáöÝñïíôáé óôçí óõíôÞñçóç ôçò âÜóçò äåäïìÝíùí áíáöïñÜò ðñïâëçìÜôùí ôïõ FreeBSD, êáé ôùí ó÷åôéêþí åñãáëåßùí ôçò
freebsd-bugs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bugs)	ÁíáöïñÝò óöáëìÜôùí
freebsd-chat (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chat)	Ìç-ôå÷íéêÜ èÝìáôá ðïõ ó÷åôßæïíôáé ìå ôçí êïéíüôçôá ôïõ FreeBSD
freebsd-chromium (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chromium)	ÈÝìáôá ó÷åôéêÜ ìå ôï Chromium óôï FreeBSD
freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current)	ÓõæçôÞóåéò ðïõ ó÷åôßæïíôáé ìå ôç ÷ñÞóç FreeBSD-CURRENT
freebsd-isp (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isp)	ÈÝìáôá ãéá Ðáñï÷åßò Õðçñåóéþí Äéáäéêôýïõ ðïõ ÷ñçóéìïðïéïýí ôï FreeBSD
freebsd-jobs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-jobs)	ÓõìâïõëåõôéêÝò õðçñåóßåò êáé èÝóåéò åñãáóßáò ó÷åôéêÝò ìå FreeBSD
freebsd-policy (http://lists.FreeBSD.org/mailman/listinfo/freebsd-policy)	ÊáôåõèõíôÞñéåò áðïöÜóåéò (policy) ôçò ïìÜäáò FreeBSD Core. Ëßóôá ìå ìéêñÞ êßíçóç, êáé ìüíï ãéá áíÜãíùóç

Ëßóôá	**Óêïðüò**
freebsd-questions (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions)	Áðïñßåò ÷ñçóôþí êáé ôå÷íéêÞ õðïóôÞñéîç
freebsd-security-notifications (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security-notifications)	ÅéäïðïéÞóåéò áóöáëåßáò
freebsd-stable (http://lists.FreeBSD.org/mailman/listinfo/freebsd-stable)	ÓõæçôÞóåéò ðïõ ó÷åôßæïíôáé ìå ôçí ÷ñÞóç ôïõ FreeBSD-STABLE
freebsd-test (http://lists.FreeBSD.org/mailman/listinfo/freebsd-test)	Óôåßëôå åäþ ôá äïêéìáóôéêÜ óáò ìçíýìáôá áíôß ãéá ìéá áðü ôéò ðñáãìáôéêÝò ëßóôåò

Ôå÷íéêÝò ëßóôåò: Ïé áêüëïõèåò ëßóôåò åßíáé ãéá ôå÷íéêÝò óõæçôÞóåéò. Ðñéí áñ÷ßóåôå íá óõììåôÝ÷åôå êáé íá óôÝëíåôå ìçíýìáôá óå áõôÝò, èá ðñÝðåé íá äéáâÜóåôå ðñïóåêôéêÜ ôçí ðåñéãñáöÞ ôïõò. ÕðÜñ÷ïõí áõóôçñÝò ïäçãßåò ãéá ôç ÷ñÞóç êáé ôï ðåñéå÷üìåíï ôïõò.

Ëßóôá	**Óêïðüò**
freebsd-acpi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi)	ÁíÜðôõîç ôçò äéá÷åßñéóçò åíÝñãåéáò êáé ôïõ ACPI
freebsd-afs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-afs)	ÌåôáöïñÜ ôïõ AFS óôï FreeBSD
freebsd-aic7xxx (http://lists.FreeBSD.org/mailman/listinfo/aic7xxx)	ÁíÜðôõîç ïäçãþí ãéá êÜñôåò Adaptec AIC 7xxx
freebsd-amd64 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-amd64)	ÌåôáöïñÜ ôïõ FreeBSD óå óõóôÞìáôá AMD64
freebsd-apache (http://lists.FreeBSD.org/mailman/listinfo/freebsd-apache)	ÓõæÞôçóç ãéá ports ó÷åôéêÜ ìå ôïí **Apache**
freebsd-arm (http://lists.FreeBSD.org/mailman/listinfo/freebsd-arm)	ÌåôáöïñÜ ôïõ FreeBSD óå åðåîåñãáóôÝò ARM®
freebsd-atm (http://lists.FreeBSD.org/mailman/listinfo/freebsd-atm)	×ñÞóç äéêôýùóçò ATM óôï FreeBSD
freebsd-audit (http://lists.FreeBSD.org/mailman/listinfo/freebsd-audit)	Project åëÝã÷ïõ ðçãáßïõ êþäéêá
freebsd-binup (http://lists.FreeBSD.org/mailman/listinfo/freebsd-binup)	Ó÷åäßáóç êáé áíÜðôõîç ôïõ óõóôÞìáôïò Ýôïéìùí åíçìåñþóåùí (binary updates)

Ëßóôá	**Óêïðüò**
freebsd-bluetooth (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bluetooth)	×ñÞóç ôçò ôå÷íïëïãßáò Bluetooth óôï FreeBSD
freebsd-cluster (http://lists.FreeBSD.org/mailman/listinfo/freebsd-cluster)	×ñÞóç ôïõ FreeBSD óå ðáñÜëëçëá óõóôÞìáôá
freebsd-cvsweb (http://lists.FreeBSD.org/mailman/listinfo/freebsd-cvsweb)	ÓõíôÞñçóç ôïõ CVSweb
freebsd-database (http://lists.FreeBSD.org/mailman/listinfo/freebsd-database)	ÓõæÞôçóç ãéá ôçí ÷ñÞóç êáé áíÜðôõîç âÜóåùí äåäïìÝíùí óôï FreeBSD
freebsd-doc (http://lists.FreeBSD.org/mailman/listinfo/freebsd-doc)	Äçìéïõñãßá ôåêìçñßùóçò ãéá ôï FreeBSD
freebsd-desktop (http://lists.FreeBSD.org/mailman/listinfo/freebsd-desktop)	×ñÞóç êáé âåëôßùóç ôïõ FreeBSD ùò desktop
freebsd-drivers (http://lists.FreeBSD.org/mailman/listinfo/freebsd-drivers)	Äçìéïõñãßá ïäçãþí óõóêåõþí ãéá ôï FreeBSD
freebsd-eclipse (http://lists.FreeBSD.org/mailman/listinfo/freebsd-eclipse)	ÓõæÞôçóç ãéá ôç ÷ñÞóç ôïõ Eclipse IDE, ôùí åñãáëåßùí ôïõ, êáèþò êáé rich client åöáñìïãþí êáé ports óôï FreeBSD.
freebsd-embedded (http://lists.FreeBSD.org/mailman/listinfo/freebsd-embedded)	×ñÞóç ôïõ FreeBSD óå embedded åöáñìïãÝò
freebsd-eol (http://lists.FreeBSD.org/mailman/listinfo/freebsd-eol)	Ïìüôéìç õðïóôÞñéîç ãéá ëïãéóìéêü ó÷åôéêü ìå FreeBSD, ðïõ äåí õðïóôçñßæåôáé ðëÝïí áðü ôï FreeBSD Project.
freebsd-emulation (http://lists.FreeBSD.org/mailman/listinfo/freebsd-emulation)	Åîïìïßùóç Üëëùí óõóôçìÜôùí, üðùò åßíáé ôá Linux/MS-DOS/Windows
freebsd-firewire (http://lists.FreeBSD.org/mailman/listinfo/freebsd-firewire)	Ôå÷íéêÞ óõæÞôçóç ãéá FreeBSD FireWire (iLink, IEEE 1394)

Ëßóôá	**Óêïðüò**
freebsd-fs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-fs)	ÓõóôÞìáôá áñ÷åßùí
freebsd-gecko (http://lists.FreeBSD.org/mailman/listinfo/freebsd-gecko)	ÓõæÞôçóç ó÷åôéêÜ ìå ôï **Gecko Rendering Engine**
freebsd-geom (http://lists.FreeBSD.org/mailman/listinfo/freebsd-geom)	ÓõæçôÞóåéò ó÷åôéêÝò ìå ôï GEOM êáé ôéò õëïðïéÞóåéò ôïõ
freebsd-gnome (http://lists.FreeBSD.org/mailman/listinfo/freebsd-gnome)	ÌåôáöïñÜ ôïõ **GNOME** êáé ôùí åöáñìïãþí ôïõ
freebsd-hackers (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hackers)	ÃåíéêÝò ôå÷íéêÝò óõæçôÞóåéò
freebsd-hardware (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hardware)	ÃåíéêÞ óõæÞôçóç ãéá óõìâáôüôçôá õëéêïý ìå ôï FreeBSD
freebsd-i18n (http://lists.FreeBSD.org/mailman/listinfo/freebsd-i18n)	Äéåèíïðïßçóç ôïõ FreeBSD
freebsd-ia32 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ia32)	Ôï FreeBSD óôçí áñ÷éôåêôïíéêÞ IA-32 (Intel x86)
freebsd-ia64 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ia64)	ÌåôáöïñÜ ôïõ FreeBSD óôá íÝá óõóôÞìáôá IA64 ôçò Intel
freebsd-ipfw (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ipfw)	Ôå÷íéêÞ óõæÞôçóç ðïõ åðéêåíôñþíåôáé óôïí åðáíó÷åäéáóìü ôïõ êþäéêá IP ôïõ firewall
freebsd-isdn (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isdn)	ÏìÜäá áíÜðôõîçò ôïõ ISDN
freebsd-jail (http://lists.FreeBSD.org/mailman/listinfo/freebsd-jail)	ÓõæÞôçóç ó÷åôéêÜ ìå ôéò äõíáôüôçôåò ôïõ jail(8)
freebsd-java (http://lists.FreeBSD.org/mailman/listinfo/freebsd-java)	ÏìÜäá áíÜðôõîçò Java êáé Üôïìá ðïõ ìåôáöÝñïõí ôá JDKs óôï FreeBSD
freebsd-kde (http://freebsd.kde.org/mailman/listinfo/kde-freebsd)	ÌåôáöïñÜ ôïõ **KDE** êáé ôùí åöáñìïãþí ôïõ
freebsd-lfs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-lfs)	ÌåôáöïñÜ ôïõ LFS óôï FreeBSD
freebsd-mips (http://lists.FreeBSD.org/mailman/listinfo/freebsd-mips)	ÌåôáöïñÜ ôïõ FreeBSD óå åðåîåñãáóôÝò MIPS®

Ëßóôá	**Óêïðüò**
freebsd-mobile (http://lists.FreeBSD.org/mailman/listinfo/freebsd-mobile)	ÓõæçôÞóåéò ó÷åôéêÝò ìå öïñçôÜ õðïëïãéóôéêÜ óõóôÞìáôá
freebsd-mono (http://lists.FreeBSD.org/mailman/listinfo/freebsd-mono)	ÅöáñìïãÝò Mono êáé C# óôï FreeBSD
freebsd-mozilla (http://lists.FreeBSD.org/mailman/listinfo/freebsd-mozilla)	ÌåôáöïñÜ ôïõ **Mozilla** óôï FreeBSD
freebsd-multimedia (http://lists.FreeBSD.org/mailman/listinfo/freebsd-multimedia)	ÅöáñìïãÝò ðïëõìÝóùí
freebsd-new-bus (http://lists.FreeBSD.org/mailman/listinfo/freebsd-new-bus)	Ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÝò ìå ôçí áñ÷éôåêôïíéêÞ äéáýëùí
freebsd-net (http://lists.FreeBSD.org/mailman/listinfo/freebsd-net)	ÓõæçôÞóåéò äéêôýùóçò êáé ðçãáßïò êþäéêáò TCP/IP
freebsd-office (http://lists.FreeBSD.org/mailman/listinfo/freebsd-office)	ÅöáñìïãÝò ãñáöåßïõ óôï FreeBSD
freebsd-performance (http://lists.FreeBSD.org/mailman/listinfo/freebsd-performance)	ÅñùôÞóåéò ó÷åôéêÝò ìå âåëôéóôïðïßçóç áðüäïóçò ãéá åãêáôáóôÜóåéò õøçëÞò áðüäïóçò êáé ìåãÜëïõ öïñôßïõ
freebsd-perl (http://lists.FreeBSD.org/mailman/listinfo/freebsd-perl)	ÕðïóôÞñéîç åíüò áñéèìïý áðü ports ó÷åôéêÜ ìå Perl
freebsd-pf (http://lists.FreeBSD.org/mailman/listinfo/freebsd-pf)	ÓõæÞôçóç êáé åñùôÞóåéò ó÷åôéêÝò ìå ôï óýóôçìá packet filter firewall
freebsd-platforms (http://lists.FreeBSD.org/mailman/listinfo/freebsd-platforms)	ÓõæÞôçóç ãéá ìåôáöïñÜ óå ìç-Intel áñ÷éôåêôïíéêÝò
freebsd-ports (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports)	ÓõæÞôçóç ãéá ôçí ÓõëëïãÞ ôùí Ports
freebsd-ports-announce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports-announce)	ÓçìáíôéêÝò åéäÞóåéò êáé ïäçãßåò ó÷åôéêÝò ìå ôçí ÓõëëïãÞ ôùí Ports

Ëßóôá	**Óêïðüò**
freebsd-ports-bugs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports-bugs)	ÓõæÞôçóç ãéá óöÜëìáôá êáé áíáöïñÝò óöáëìÜôùí (PRs) ðïõ áöïñïýí ports
freebsd-ppc (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ppc)	ÌåôáöïñÜ ôïõ FreeBSD óôï PowerPC
freebsd-proliant (http://lists.FreeBSD.org/mailman/listinfo/freebsd-proliant)	Ôå÷íéêÞ óõæÞôçóç ãéá ÷ñÞóç ôïõ FreeBSD óå äéáêïìéóôÝò HP ProLiant
freebsd-python (http://lists.FreeBSD.org/mailman/listinfo/freebsd-python)	ÈÝìáôá ó÷åôéêÜ ìå Python óôï FreeBSD
freebsd-rc (http://lists.FreeBSD.org/mailman/listinfo/freebsd-rc)	ÓõæÞôçóç ó÷åôéêÜ ìå ôï óýóôçìá `rc.d` êáé ôçí áíÜðôõîÞ ôïõ
freebsd-realtime (http://lists.FreeBSD.org/mailman/listinfo/freebsd-realtime)	ÁíÜðôõîç åðåêôÜóåùí ðñáãìáôéêïý ÷ñüíïõ ôïõ FreeBSD
freebsd-ruby (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ruby)	ÓõæÞôçóç ó÷åôéêÜ ìå ôç Ruby óôï FreeBSD
freebsd-scsi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-scsi)	Ôï õðïóýóôçìá SCSI
freebsd-security (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security)	ÈÝìáôá áóöáëåßáò ðïõ åðçñåÜæïõí ôï FreeBSD
freebsd-small (http://lists.FreeBSD.org/mailman/listinfo/freebsd-small)	×ñÞóç ôïõ FreeBSD óå embedded óõóôÞìáôá (Äåí ÷ñçóéìïðïéåßôáé ðëÝïí: áíôß ãéá áõôÞ ôç ëßóôá, ÷ñçóéìïðïéÞóôå ôçí freebsd-embedded (http://lists.FreeBSD.org/mailman/listinfo/freebsd-embedded))
freebsd-sparc64 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-sparc64)	ÌåôáöïñÜ ôïõ FreeBSD óå SPARC® óõóôÞìáôá
freebsd-standards (http://lists.FreeBSD.org/mailman/listinfo/freebsd-standards)	Óõììüñöùóç ôïõ FreeBSD ìå ôá ðñüôõðá C99 êáé POSIX

Ëßóôá	**Óêïðüò**
freebsd-sysinstall (http://lists.FreeBSD.org/mailman/listinfo/freebsd-sysinstall)	ÓõæÞôçóç ãéá ôçí áíÜðôõîç ôïõ sysinstall(8)
freebsd-threads (http://lists.FreeBSD.org/mailman/listinfo/freebsd-threads)	ÐïëõíçìáôéêÞ åðåîåñãáóßá óôï FreeBSD
freebsd-testing (http://lists.FreeBSD.org/mailman/listinfo/freebsd-testing)	ÄïêéìÝò áðüäïóçò êáé óôáèåñüôçôáò ôïõ FreeBSD
freebsd-tilera (http://lists.FreeBSD.org/mailman/listinfo/freebsd-tilera)	ÌåôáöïñÜ ôïõ FreeBSD óôçí ïéêïãÝíåéá CPU Tilera
freebsd-tokenring (http://lists.FreeBSD.org/mailman/listinfo/freebsd-tokenring)	ÕðïóôÞñéîç ôïõ Token Ring óôï FreeBSD
freebsd-toolchain (http://lists.FreeBSD.org/mailman/listinfo/freebsd-toolchain)	ÓõíôÞñçóç ôùí åñãáëåßùí ôïõ FreeBSD
freebsd-usb (http://lists.FreeBSD.org/mailman/listinfo/freebsd-usb)	ÓõæÞôçóç õðïóôÞñéîçò ôïõ USB óôï FreeBSD
freebsd-virtualization (http://lists.FreeBSD.org/mailman/listinfo/freebsd-virtualization)	ÓõæÞôçóç ó÷åôéêÜ ìå äéÜöïñåò ôå÷íéêÝò åéêïíéêïðïßçóçò ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD
freebsd-vuxml (http://lists.FreeBSD.org/mailman/listinfo/freebsd-vuxml)	ÓõæÞôçóç ãéá ôçí õðïäïìÞ VuXML
freebsd-x11 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-x11)	ÓõíôÞñçóç êáé õðïóôÞñéîç ôïõ X11 óôï FreeBSD
freebsd-xen (http://lists.FreeBSD.org/mailman/listinfo/freebsd-xen)	ÓõæÞôçóç ãéá ôç ìåôáöïñÜ ôïõ FreeBSD óôï Xen™ — õëïðïßçóç êáé ÷ñÞóç
freebsd-xfce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-xfce)	**XFCE** óôï FreeBSD — ÌåôáöïñÜ êáé óõíôÞñçóç

ÐåñéïñéóìÝíåò ëßóôåò: Ïé áêüëïõèåò ëßóôåò åßíáé ãéá ðéï åéäéêü (êáé áðáéôçôéêü) êïéíü êáé ðéèáíþò äåí åíäéáöÝñïõí ôï ãåíéêü êïéíü. Ðñéí áñ÷ßóåôå íá óõììåôÝ÷åôå óå êÜðïéá áðü áõôÝò, êáëü èá åßíáé íá Ý÷åôå ðáñáêïëïõèÞóåé ôéò ôå÷íéêÝò ëßóôåò, þóôå íá áíôéëáìâÜíåóôå ôïí êþäéêá åðéêïéíùíßáò êáé óõìðåñéöïñÜò ðïõ éó÷ýåé óå áõôÝò.

Ëßóôá	Óêïðüò
freebsd-hubs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hubs)	¶ôïìá ðïõ äéáôçñïýí mirror sites (õðïóôÞñéîç õðïäïìþí)
freebsd-user-groups (http://lists.FreeBSD.org/mailman/listinfo/freebsd-user-groups)	ÏñãÜíùóç ôùí óõëëüãùí ÷ñçóôþí
freebsd-vendors (http://lists.FreeBSD.org/mailman/listinfo/freebsd-vendors)	ÏñãÜíùóç ìåôáðùëçôþí ðñéí áðü åðßóçìåò åêäüóåéò
freebsd-wip-status (http://lists.FreeBSD.org/mailman/listinfo/freebsd-wip-status)	ÊáôÜóôáóç åñãáóéþí ôïõ FreeBSD ðïõ âñßóêïíôáé óå åîÝëéîç (Work-in-Progress).
freebsd-wireless (http://lists.FreeBSD.org/mailman/listinfo/freebsd-wireless)	ÓõæÞôçóç ó÷åôéêÜ ìå ôç óôïßâá 802.11, ôá åñãáëåßá áóýñìáôïõ äéêôýïõ êáé ôçí áíÜðôõîç ðñïãñáììÜôùí ïäÞãçóçò.
freebsd-www (http://lists.FreeBSD.org/mailman/listinfo/freebsd-www)	ÓõíôçñçôÝò ôïõ www.FreeBSD.org (http://www.FreeBSD.org/index.html)

Ëßóôåò digest: ¼ëåò ïé ðáñáðÜíù ëßóôåò äéáôßèåíôáé êáé óå ìïñöÞ digest (ðåñßëçøçò). Ìüëéò åããñáöåßôå óå ìßá ëßóôá, ìðïñåßôå íá áëëÜîåôå ôéò åðéëïãÝò digest óôï ôìÞìá ñõèìßóåùí ôïõ ëïãáñéáóìïý óáò.

Ëßóôåò CVS & SVN: Ïé áêüëïõèåò ëßóôåò åßíáé ãéá üóïõò åíäéáöÝñïíôáé íá âëÝðïõí ôá ìçíýìáôá (log) ðïõ äçìéïõñãïýíôáé ìå ôéò áëëáãÝò óå äéÜöïñåò ðåñéï÷Ýò ôïõ ðçãáßïõ êþäéêá. Åßíáé ëßóôåò *ìüíï ãéá áíÜãíùóç* êáé äåí ðñÝðåé íá óôÝëíåôå ìçíýìáôá óå áõôÝò.

Ëßóôá	Ðåñéï÷Þ ðçãáßïõ êþäéêá	ÐåñéãñáöÞ ðåñéï÷Þò (êþäéêáò ãéá)
cvs-all (http://lists.FreeBSD.org/mailman/listinfo/cvs-all)	`/usr/(CVSROOT|doc|ports)`	¼ëåò ïé áëëáãÝò óå êÜèå ìÝñïò ôïõ äÝíôñïõ (ðåñéÝ÷åé üëåò ôéò Üëëåò ëßóôåò CVS)
cvs-doc (http://lists.FreeBSD.org/mailman/listinfo/cvs-doc)	`/usr/(doc|www)`	¼ëåò ïé áëëáãÝò óôá äÝíôñá doc êáé www
cvs-ports (http://lists.FreeBSD.org/mailman/listinfo/cvs-ports)	`/usr/ports`	¼ëåò ïé áëëáãÝò óôï äÝíôñï ôùí ports

Ëßóôá	**Ðåñéï÷Þ ðçãáßïõ êþäéêá**	**ÐåñéãñáöÞ ðåñéï÷Þò (êþäéêáò ãéá)**
cvs-projects (http://lists.FreeBSD.org/mailman/listinfo/cvs-projects)	`/usr/projects`	¼ëåò ïé áëëáãÝò óôï äÝíôñï ôùí projects
cvs-src (http://lists.FreeBSD.org/mailman/listinfo/cvs-src)	`/usr/src`	¼ëåò ïé áëëáãÝò óôï äÝíôñï src (äçìéïõñãåßôáé áðü ôá commit ôïõ ðñïãñÜììáôïò ìåôáôñïðÞò svn-to-cvs)
svn-src-all (http://lists.FreeBSD.org/mailman/listinfo/svn-src-all)	`/usr/src`	¼ëåò ïé áëëáãÝò óôï Subversion repository (åêôüò áðü ôéò ðåñéï÷Ýò `user` êáé `projects`)
svn-src-head (http://lists.FreeBSD.org/mailman/listinfo/svn-src-head)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïí êëÜäï “head” ôïõ Subversion repository (ðñüêåéôáé ãéá ôïí êëÜäï FreeBSD-CURRENT)
svn-src-projects (http://lists.FreeBSD.org/mailman/listinfo/svn-src-projects)	`/usr/projects`	¼ëåò ïé áëëáãÝò óôçí ðåñéï÷Þ ðçãáßïõ êþäéêá `projects` ôïõ Subversion repository
svn-src-release (http://lists.FreeBSD.org/mailman/listinfo/svn-src-release)	`/usr/src`	¼ëåò ïé áëëáãÝò óôçí ðåñéï÷Þ ðçãáßïõ êþäéêá `releases` ôïõ Subversion repository
svn-src-releng (http://lists.FreeBSD.org/mailman/listinfo/svn-src-releng)	`/usr/src`	¼ëåò ïé áëëáãÝò óå üëïõò ôïõò êëÜäïõò ðçãáßïõ êþäéêá `releng` ôïõ Subversion repository (ðñüêåéôáé ãéá ôïõò êëÜäïõò security / release engineering)
svn-src-stable (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable)	`/usr/src`	¼ëåò ïé áëëáãÝò óå üëïõò ôïõò êëÜäïõò ðçãáßïõ êþäéêá stable ôïõ Subversion repository
svn-src-stable-6 (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-6)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïí êëÜäï ðçãáßïõ êþäéêá `stable/6` ôïõ Subversion repository
svn-src-stable-7 (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-7)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïí êëÜäï ðçãáßïõ êþäéêá `stable/7` ôïõ Subversion repository

Ëßóôá	**Ðåñéï÷Þ ðçãáßïõ êþäéêá**	**ÐåñéãñáöÞ ðåñéï÷Þò (êþäéêáò ãéá)**
svn-src-stable-8 (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-8)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïí êëÜäï ðçãáßïõ êþäéêá `stable/8` ôïõ Subversion repository
svn-src-stable-9 (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-9)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïí êëÜäï ðçãáßïõ êþäéêá `stable/9` ôïõ Subversion repository
svn-src-stable-other (http://lists.FreeBSD.org/mailman/listinfo/svn-src-stable-other)	`/usr/src`	¼ëåò ïé áëëáãÝò óôïõò ðáëéïýò `stable` êëÜäïõò ðçãáßïõ êþäéêá ôïõ Subversion repository
svn-src-svnadmin (http://lists.FreeBSD.org/mailman/listinfo/svn-src-svnadmin)	`/usr/src`	¼ëåò ïé áëëáãÝò óôá scripts äéá÷åßñéóçò, ôá hooks, êáé Üëëá äåäïìÝíá ðïõ áöïñïýí ôéò ñõèìßóåéò ôïõ Subversion repository
svn-src-user (http://lists.FreeBSD.org/mailman/listinfo/svn-src-user)	`/usr/src`	¼ëåò ïé áëëáãÝò óôçí ðåéñáìáôéêÞ ðåñéï÷Þ ðçãáßïõ êþäéêá `user` ôïõ Subversion repository
svn-src-vendor (http://lists.FreeBSD.org/mailman/listinfo/svn-src-vendor)	`/usr/src`	¼ëåò ïé áëëáãÝò óôçí ðåñéï÷Þ åñãáóßáò ðçãáßïõ êþäéêá vendor ôïõ Subversion repository

C.1.2 Ðùò íá Åããñáöåßôå

Ãéá íá åããñáöåßôå óå ìßá ëßóôá, åðéëÝîôå ôï üíïìá ôçò áðü ôïõò ðáñáðÜíù äåóìïýò Þ ðçãáßíåôå óôï http://lists.FreeBSD.org/mailman/listinfo êáé åðéëÝîôå ôçí ëßóôá ãéá ôçí ïðïßá åíäéáöÝñåóôå. Ç óåëßäá ôçò ëßóôáò ðñÝðåé íá ðåñéÝ÷åé üëåò ôéò áðáñáßôçôåò ðëçñïöïñßåò åããñáöÞò.

Ãéá íá ãñÜøåôå óå ìéá ëßóôá, áðëþò óôåßëôå ôï ìÞíõìá óáò óôï <*üíïìá-ëßóôáò*`@FreeBSD.org`>. Ôï ìÞíõìá óáò èá äéáíåìçèåß óå üëá ôá ìÝëç ôçò ëßóôáò, óå ïðïéïäÞðïôå óçìåßï ôïõ êüóìïõ êáé áí âñßóêïíôáé.

Ãéá íá äéáãñáöåßôå áðü ìéá ëßóôá, åðéëÝîôå ôï URL ðïõ âñßóêåôáé óôï ôÝëïò êÜèå ìçíýìáôïò ðïõ ëáìâÜíåôå áðü ôçí ëßóôá. Ìðïñåßôå åðßóçò íá óôåßëåôå Ýíá ìÞíõìá óôï <*üíïìá-ëßóôáò*`-unsubscribe@FreeBSD.org`> ãéá íá äéáãñáöåßôå ìüíïò óáò.

Ãéá áêüìá ìéá öïñÜ, èá èÝëáìå íá óáò æçôÞóïõìå íá äéáôçñÞóåôå ôç óõæÞôçóç ôùí ôå÷íéêþí ëéóôþí óôá áíôßóôïé÷á ôå÷íéêÜ èÝìáôá. Áí åíäéáöÝñåóôå ìüíï ãéá óçìáíôéêÝò áíáêïéíþóåéò, ôüôå ðñïôåßíïõìå íá åããñáöåßôå óôçí çëåêôñïíéêÞ ëßóôá áíáêïéíþóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-announce), ç ïðïßá Ý÷åé ìéêñÞ êßíçóç.

C.1.3 Ðßíáêåò Ëéóôþí

¼ëåò ïé FreeBSD ëßóôåò Ý÷ïõí óõãêåêñéìÝíïõò âáóéêïýò êáíüíåò ïé ïðïßïé ðñÝðåé íá áêïëïõèïýíôáé áðü ïðïéïíäÞðïôå ôéò ÷ñçóéìïðïéåß. ¼ðïéïò áðïôý÷åé íá áêïëïõèÞóåé áõôïýò ôïõò êáíüíåò èá ëÜâåé äýï (2) ãñáðôÝò ðñïåéäïðïéÞóåéò áðü ôïí FreeBSD Postmaster <postmaster@FreeBSD.org>. Óå ðåñßðôùóç ôñßôçò ðáñáâßáóçò, ôï Üôïìï áõôü èá áðïìáêñõíèåß áðü üëåò ôéò ëßóôåò ôïõ FreeBSD êáé ôá ìçíýìáôá ôïõ ðñïò áõôÝò èá öéëôñÜñïíôáé. Ëõðüìáóôå ðïõ ÷ñåéÜæåôáé íá åðéâÜëëïõìå áõôïýò ôïõò êáíüíåò êáé ìÝôñá, áëëÜ ôï óçìåñéíü Äéáäßêôõï åßíáé êáèþò öáßíåôáé Ýíá ðïëý óêëçñü ðåñéâÜëëïí, êáé ðïëëïß äåí êáôáëáâáßíïõí ðüóï åýèñáõóôïé åßíáé ìåñéêïß ìç÷áíéóìïß ôïõ.

Êáíüíåò:

- Ôï èÝìá êÜèå ìçíýìáôïò ðñÝðåé íá åßíáé ó÷åôéêü ìå ôïí âáóéêü óêïðü ôçò ëßóôáò ðïõ óôÜëèçêå, ð.÷. áí ç ëßóôá ó÷åôßæåôáé ìå ôå÷íéêÜ èÝìáôá ôüôå ôï ìÞíõìá óáò ðñÝðåé íá ðåñéÝ÷åé ôå÷íéêü ðåñéå÷üìåíï. Ç Üó÷åôç öëõáñßá Þ ôï flaming ìåéþíåé ôçí áîßá ôçò ëßóôáò ãéá üëïõò ðïõ ôçí ðáñáêïëïõèïýí êáé äåí ìðïñïýìå íá áíå÷ôïýìå áõôÞ ôç óõìðåñéöïñÜ. Ãéá åëåýèåñåò óõæçôÞóåéò ÷ùñßò êÜðïéï óõãêåêñéìÝíï èÝìá, äéáôßèåôáé ç çëåêôñïíéêÞ ëßóôá ãåíéêþí óõæçôÞóåùí ôïõ FreeBSD (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chat) ôçí ïðïßá êáé èá ðñÝðåé íá ÷ñçóéìïðïéåßôå.
- ÊáíÝíá ìÞíõìá äåí èá ðñÝðåé íá óôáëåß óå ðåñéóóüôåñåò áðü 2 ëßóôåò, êáé óå 2 ìüíï üôáí õðÜñ÷åé îåêÜèáñïò êáé ðñïöáíÞò ëüãïò ãéá êÜôé ôÝôïéï. Ðïëëïß óõíäñïìçôÝò åßíáé Ýôóé êáé áëëéþò ãñáììÝíïé óå ðåñéóóüôåñåò áðü ìßá ëßóôåò. ¸ôóé, áí äåí ðñüêåéôáé íá êÜíåôå êÜðïéï ðåñßåñãï óõíäõáóìü (ð.÷. “-stable & -scsi”), äåí õðÜñ÷åé ëüãïò íá óôåßëåôå ìÞíõìá óå ðåñéóóüôåñåò áðü ìßá ëßóôá êÜèå öïñÜ. Áí ëÜâåôå êÜðïéï ìÞíõìá óôï ïðïßï öáßíïíôáé ðïëëáðëÝò ëßóôåò óôçí ãñáììÞ `Cc`, êáëü èá åßíáé íá ðåñéêüøåôå êÜðïéåò áðü áõôÝò ðñéí óôåßëåôå áðÜíôçóç. *Èåùñåßóôå õðåýèõíïò ãéá ôá äéêÜ óáò cross-postings, áíåîÜñôçôá ðïéïò åßíáé ï äçìéïõñãüò ôïõò.*
- ÐñïóùðéêÝò åðéèÝóåéò êáé áóÝâåéá (óôï ðåñéå÷üìåíï ìéáò áíôéðáñÜèåóçò) äåí åðéôñÝðïíôáé, êáé áõôü áöïñÜ ôüóï ôïõò ÷ñÞóôåò üóï êáé ôïõò developers. ÌåãÜëåò ðáñáâÜóåéò ôùí êáíüíùí (netiquette), üðùò ÷ñÞóç ôìçìÜôùí Þ ïëüêëçñùí ðñïóùðéêþí ìçíõìÜôùí üôáí äåí Ý÷åé äïèåß Üäåéá ãéá íá ãßíåé áõôü êáé äåí Þôáí áíáìåíüìåíï, áðïäïêéìÜæïíôáé áëëÜ äåí áðáãïñåýïíôáé ñçôÜ. *¼ìùò*, õðÜñ÷ïõí ìåñéêÝò ðåñéðôþóåéò üðïõ ôÝôïéï ðåñéå÷üìåíï åìðßðôåé óôïõò êáíïíéóìïýò êÜðïéáò ëßóôáò êáé ìðïñåß íá ïäçãÞóåé óå ðñïåéäïðïßçóç (Þ áêüìá êáé áðïêëåéóìü) áðü áõôÞí.
- ÄéáöÞìéóç ðñïúüíôùí Þ õðçñåóéþí ðïõ äåí ó÷åôßæïíôáé ìå ôï FreeBSD áðáãïñåýåôáé áõóôçñÜ êáé èá ïäçãÞóåé óå Üìåóï áðïêëåéóìü áí åßíáé öáíåñü üôé ï ðôáßóôçò äéáöçìßæåôáé ìå spam.

Áôïìéêïß ðßíáêåò ëéóôþí:

freebsd-acpi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-acpi)

ÁíÜðôõîç ôçò äéá÷åßñéóçò åíÝñãåéáò êáé ôïõ ACPI

freebsd-afs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-afs)

Andrew File System

Áõôü ç ëßóôá åßíáé ãéá óõæÞôçóç ôçò ìåôáöïñÜò êáé ôçò ÷ñÞóçò ôïõ AFS áðü ôï CMU/Transarc

freebsd-announce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-announce)

ÓçìáíôéêÜ ãåãïíüôá êáé áíáêïéíþóåéò

Áõôü ç ëßóôá åßíáé ãéá Üôïìá ðïõ åíäéáöÝñïíôáé ìüíï ãéá ðåñéóôáóéáêÝò áíáêïéíþóåéò óçìáíôéêþí ãåãïíüôùí ôïõ FreeBSD. ÐåñéëáìâÜíåé áíáêïéíþóåéò ó÷åôéêÜ ìå snapshots êáé Üëëá releases. Åðßóçò äçìïóéåýïíôáé óå áõôÞí áíáêïéíþóåéò ãéá íÝåò éêáíüôçôåò ôïõ FreeBSD. Ìðïñåß íá ðåñéÝ÷åé åêêëÞóåéò ãéá åèåëïíôÝò êôë. Ðñüêåéôáé ãéá ìßá ëßóôá ìå ìéêñÞ êßíçóç, êáé ïé äçìïóéåýóåéò åëÝã÷ïíôáé áõóôçñÜ.

freebsd-arch (http://lists.FreeBSD.org/mailman/listinfo/freebsd-arch)

ÓõæçôÞóåéò áñ÷éôåêôïíéêÞò êáé ó÷åäéáóìïý

Óå áõôÞ ôçí ëßóôá óõæçôåßôáé ç áñ÷éôåêôïíéêÞ ôïõ FreeBSD. Ôá ìçíýìáôá åßíáé êáôÜ êýñéï ëüãï áõóôçñÜ ôå÷íéêÜ. Ðáñáäåßãìáôá ó÷åôéêþí èåìÜôùí åßíáé:

- Ðùò íá åðáíáó÷åäéáóôåß ôï óýóôçìá ìåôáãëþôôéóçò þóôå íá åêôåëåß ôáõôü÷ñïíá ðïëëÝò ðñïóáñìïóìÝíåò ìåôáãëùôôßóåéò.
- Ôé ðñÝðåé íá åðéóêåõáóôåß óôï VFS þóôå íá ëåéôïõñãïýí ôá Heidemann layers.
- Ðþò ðñÝðåé íá ìåôáôñÝøïõìå ôç äéåðáöÞ (interface) ôùí ïäçãþí óõóêåõþí þóôå íá ìðïñïýìå íá ÷ñçóéìïðïéÞóïõìå ôá ßäéá ðñïãñÜììáôá ïäÞãçóçò óå ðïëëïýò äéáýëïõò êáé áñ÷éôåêôïíéêÝò.
- Ðùò íá ãñÜøåôå Ýíá ïäçãü äéêôýïõ.

freebsd-audit (http://lists.FreeBSD.org/mailman/listinfo/freebsd-audit)

Project åëÝã÷ïõ ðçãáßïõ êþäéêá

ÁõôÞ ç ëßóôá ÷ñçóéìïðïéåßôáé ãéá ôï project åëÝã÷ïõ ôïõ ðçãáßïõ êþäéêá ôïõ FreeBSD. Áí êáé áñ÷éêÜ ðñïïñßæïíôáí ãéá óõæçôÞóåéò áëëáãþí ðïõ ó÷åôßæïíôáí ìå ôçí áóöÜëåéá, äéåõñýíèçêå þóôå íá áó÷ïëåßôáé ìå ïðïéáäÞðïôå áëëáãÞ êþäéêá.

Ç ëßóôá åßíáé ãåìÜôç ìå “patches”, êáé ðéèáíüôáôá äåí èá åíäéáöÝñåé Ýíáí áðëü ÷ñÞóôç ôïõ FreeBSD. ÓõæçôÞóåéò áóöáëåßáò ðïõ äåí ó÷åôßæïíôáé ìå óõãêåêñéìÝíç áëëáãÞ óôïí êþäéêá, ãßíïíôáé óôçí ëßóôá freebsd-security. Áíôßèåôá, üëïé ïé developers ðáñïôñýíïíôáé íá óôÝëíïõí åäþ ôá “patches” ôïõò ãéá Ýëåã÷ï, åéäéêÜ áí ó÷åôßæïíôáé ìå Ýíá ìÝñïò ôïõ óõóôÞìáôïò üðïõ Ýíá óöÜëìá ìðïñåß íá åðçñåÜóåé ïëüêëçñç ôçí áêåñáéüôçôá ôïõ.

freebsd-binup (http://lists.FreeBSD.org/mailman/listinfo/freebsd-binup)

Project áíáâÜèìéóçò ôïõ FreeBSD ìÝóù Ýôïéìùí (äõáäéêþí) áñ÷åßùí

Óå áõôÞ ôçí ëßóôá óõæçôåßôáé ôï óýóôçìá áíáâÜèìéóçò ìÝóù Ýôïéìùí (binary) áñ÷åßùí, Þ **binup**. Óå áõôÞ ôç ëßóôá áíÞêïõí èÝìáôá ó÷åäéáóìïý, ëåðôïìÝñåéåò õëïðïßçóçò, “patches”, áíáöïñÝò óöáëìÜôùí, áíáöïñÝò êáôÜóôáóçò, áéôÞóåéò ãéá ðñüóèåôá ÷áñáêôçñéóôéêÜ, commit logs, êáé üôé Üëëï ó÷åôßæåôáé ìå ôï **binup**.

freebsd-bluetooth (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bluetooth)

×ñÞóç ôçò ôå÷íïëïãßáò Bluetooth óôï FreeBSD

Óå áõôÞ ôç ëßóôá óõíáèñïßæïíôáé ïé ÷ñÞóôåò ôïõ Bluetooth óôï FreeBSD. Ç ëßóôá áó÷ïëåßôáé ìå èÝìáôá ó÷åäéáóìïý, ëåðôïìÝñåéåò õëïðïßçóçò, “patches”, áíáöïñÝò óöáëìÜôùí, áíáöïñÝò êáôÜóôáóçò, áéôÞóåéò ãéá ðñüóèåôá ÷áñáêôçñéóôéêÜ, êáé üôé Üëëï ó÷åôßæåôáé ìå ôï Bluetooth.

freebsd-bugbusters (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bugbusters)

ÐñïóðÜèåéá ïñãÜíùóçò ôïõ ÷åéñéóìïý ôùí áíáöïñþí ðñïâëçìÜôùí

Óêïðüò áõôÞò ôçò ëßóôáò åßíáé íá ëåéôïõñãåß ùò ÷þñïò ïñãÜíùóçò êáé óõæÞôçóçò ãéá ôïí Bugmeister, ôïõò Bugbusters, êáé üóïõò Üëëïõò åíäéáöÝñïíôáé ãéá ôçí âÜóç äåäïìÝíùí PR. ÁõôÞ Þ ëßóôá äåí åßíáé ãéá óõæçôÞóåéò ó÷åôéêÜ ìå éäéáßôåñá óöÜëìáôá, “patches” Þ PRs.

freebsd-bugs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-bugs)

ÁíáöïñÝò óöáëìÜôùí

ÁõôÞ ç ëßóôá åßíáé ãéá áíáöïñÝò óöáëìÜôùí ôïõ FreeBSD. ¼ðïôå åßíáé äõíáôü, ôá óöÜëìáôá ðñÝðåé íá óôÝëíïíôáé ìå ôçí åíôïëÞ send-pr(1) Þ ìÝóù ôçò áíôßóôïé÷çò äéåðáöÞ WEB (http://www.FreeBSD.org/send-pr.html).

freebsd-chat (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chat)

Ìç ôå÷íéêÜ èÝìáôá ðïõ ó÷åôßæïíôáé ìå ôçí êïéíüôçôá ôïõ FreeBSD

ÁõôÞ ç ëßóôá ðåñéÝ÷åé êïéíùíéêÝò óõæçôÞóåéò, êáé ãåíéêüôåñá üôé äåí ó÷åôßæåôáé ìå ôå÷íéêÝò ðëçñïöïñßåò ìå ôéò ïðïßåò áó÷ïëïýíôáé ïé õðüëïéðåò ëßóôåò. ÐåñéÝ÷åé óõæçôÞóåéò ãéá ôï áí ï Jordan ìïéÜæåé ìå ìéêñü êïõíÜâé Þ ü÷é, ãéá ôï áí ðñÝðåé Þ ü÷é íá ãñÜöïõìå ìå êåöáëáßá, ðïéïò ðßíåé ðïëý êáöÝ, ðïõ öôéÜ÷íïõí ç êáëýôåñç ìðýñá, ðïéïò öôéÜ÷íåé ìðýñá óôï õðüãåéï ôïõ, êáé Üëëá. ÐåñéóôáóéáêÝò áíáêïéíþóåéò óçìáíôéêþí ãåãïíüôùí (üðùò ðÜñôõ, ãÜìïé, ãåííÞóåéò, êáéíïýñãéåò äïõëåéÝò êëð) ìðïñïýí íá ãßíïõí óôéò ôå÷íéêÝò ëßóôåò, áëëÜ ïé áðáíôÞóåéò ôïõò ðñÝðåé íá óôÝëíïíôáé óôçí ëßóôá -chat.

freebsd-chromium (http://lists.FreeBSD.org/mailman/listinfo/freebsd-chromium)

ÈÝìáôá ó÷åôéêÜ ìå ôï Chromium óôï FreeBSD

Ëßóôá óõæçôÞóåùí ãéá ôçí õðïóôÞñéîç ôïõ Chromium óôï FreeBSD. Ðñüêåéôáé ãéá ôå÷íéêÞ ëßóôá ó÷åôéêÞ ìå ôçí áíÜðôõîç êáé åãêáôÜóôáóç ôïõ Chromium.

freebsd-core

ÏìÜäá core ôïõ FreeBSD

ÁõôÞ åßíáé ìéá åóùôåñéêÞ ëßóôá ãéá ÷ñÞóç áðü ôá ìÝëç ôïõ core. Óå áõôÞ ôç ëßóôá ìðïñåßôå íá óôåßëåôå ìçíýìáôá, üôáí ðñïêýøåé êÜðïéï èÝìá ó÷åôéêü ìå ôï FreeBSD ôï ïðïßï áðáéôåß äéáéôçóßá Þ ëåðôïìåñÞ åîÝôáóç.

freebsd-current (http://lists.FreeBSD.org/mailman/listinfo/freebsd-current)

ÓõæçôÞóåéò ó÷åôéêÜ ìå ôçí ÷ñÞóç ôïõ FreeBSD-CURRENT

ÁõôÞ ç ëßóôá åßíáé ãéá ÷ñÞóôåò ôïõ FreeBSD-CURRENT. ÐåñéÝ÷åé ðñïåéäïðïéÞóåéò ãéá íÝá ÷áñáêôçñéóôéêÜ ðïõ ðñüêåéôáé íá ðñïóôåèïýí óôï -CURRENT êáé ôá ïðïßá èá åðçñåÜóïõí ôïõò ÷ñÞóôåò, êáé ïäçãßåò ãéá ôéò êéíÞóåéò ðïõ ðñÝðåé íá ãßíïõí þóôå íá ðáñáìåßíåôå óôï -CURRENT. ¼ðïéïò åêôåëåß ôï “CURRENT” ðñÝðåé íá åããñáöåß óå áõôÞí ôçí ëßóôá. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-cvsweb (http://lists.FreeBSD.org/mailman/listinfo/freebsd-cvsweb)

FreeBSD CVSweb Project

Ôå÷íéêÝò óõæçôÞóåéò ãéá ôçí ÷ñÞóç, ôçí áíÜðôõîç êáé ôçí óõíôÞñçóç ôïõ FreeBSD-CVSweb.

freebsd-desktop (http://lists.FreeBSD.org/mailman/listinfo/freebsd-desktop)

×ñÞóç êáé âåëôßùóç ôïõ FreeBSD ùò desktop

^{1} ëßóôá áõôÞ ðñïïñßæåôáé ãéá óõæçôÞóåéò ó÷åôéêÝò ìå ôç ÷ñÞóç ôïõ FreeBSD ùò desktop. Áðåõèýíåôáé êõñßùò óå ÷ñÞóôåò êáé ðñïãñáììáôéóôÝò ðïõ åðéèõìïýí íá ðñïâëÞìáôá ðïõ ðáñïõóéÜæåé ôï FreeBSD óå desktop åöáñìïãÝò, êáèþò êáé áíôßóôïé÷åò âåëôéþóåéò.

freebsd-doc (http://lists.FreeBSD.org/mailman/listinfo/freebsd-doc)

Project ôåêìçñßùóçò ôïõ FreeBSD

ÁõôÞ ç ëßóôá åßíáé ãéá óõæÞôçóç èåìÜôùí êáé projects ðïõ ó÷åôßæïíôáé ìå ôçí äçìéïõñãßá ôåêìçñßùóçò ãéá ôï FreeBSD. Ôá ìÝëç áõôÞò ôçò ëßóôáò áðïêáëïýíôáé óõíïëéêÜ ùò “The FreeBSD Documentation Project”. Åßíáé ìéá áíïéêôÞ ëßóôá êáé åßóôå åëåýèåñïò íá óõììåôÝ÷åôå êáé íá óõíåéóöÝñåôå!

freebsd-drivers (http://lists.FreeBSD.org/mailman/listinfo/freebsd-drivers)

Äçìéïõñãßá ïäçãþí óõóêåõþí ãéá ôï FreeBSD

ÁõôÞ ç ëßóôá ðñïïñßæåôáé ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÝò ìå ïäçãïýò óõóêåõþí óôï FreeBSD. ×ñçóéìïðïéåßôáé êõñßùò áðü ôïõò äçìéïõñãïýò ïäçãþí óõóêåõþí ãéá åñùôÞóåéò ó÷åôéêÝò ìå ôç óõããñáöÞ ïäçãþí, ÷ñçóéìïðïéþíôáò ôá APIs ðïõ ðáñÝ÷åé ï ðõñÞíáò ôïõ FreeBSD.

freebsd-eclipse (http://lists.FreeBSD.org/mailman/listinfo/freebsd-eclipse)

FreeBSD ÷ñÞóôåò ôïõ Eclipse IDE, ôùí åñãáëåßùí ôïõ, rich client åöáñìïãþí, êáé ports.

Ðñüèåóç ôçò ëßóôáò áõôÞò åßíáé íá ðñïóöÝñåé áìïéâáßá õðïóôÞñéîç ãéá üôé Ý÷åé íá êÜíåé ìå ôçí åðéëïãÞ, åãêáôÜóôáóç, ÷ñÞóç, áíÜðôõîç êáé óõíôÞñçóç ôïõ Eclipse IDE, ôùí åñãáëåßùí ôïõ, åöáñìïãþí rich client óôçí ðëáôöüñìá ôïõ FreeBSD êáé ãéá âïÞèåéá ó÷åôéêÜ ìå ôçí ìåôáöïñÜ ôïõ Eclipse IDE êáé ôùí ðñüóèåôùí ôïõ óôï ðåñéâÜëëïí ôïõ FreeBSD.

Ðñüèåóç ôçò åßíáé åðßóçò íá äéåõêïëýíåé ôçí áíôáëëáãÞ ðëçñïöïñéþí áíÜìåóá óôçí êïéíüôçôá ôïõ Eclipse êáé óôçí êïéíüôçôá ôïõ FreeBSD, ðñïò üöåëïò êáé ôùí äýï.

Áí êáé ç ëßóôá åðéêåíôñþíåôáé êõñßùò óôéò áíÜãêåò ôùí ÷ñçóôþí ôïõ Eclipse, ðñïóöÝñåé åðßóçò Ýíá ÷þñï óõæÞôçóçò ãéá üóïõò èÝëïõí íá áíáðôýîïõí åöáñìïãÝò ó÷åôéêÝò ìå ôï FreeBSD ÷ñçóéìïðïéþíôáò ôï Eclipse.

freebsd-embedded (http://lists.FreeBSD.org/mailman/listinfo/freebsd-embedded)

×ñÞóç ôïõ FreeBSD óå embedded åöáñìïãÝò

Ç ëßóôá óõæçôÜ èÝìáôá ó÷åôéêÜ ìå ôçí ÷ñÞóç ôïõ FreeBSD óå embedded óõóôÞìáôá. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá. Ãéá ôïí óêïðü ôçò ëßóôáò áõôÞò, ïñßæïõìå ùò embedded óõóôÞìáôá ôéò õðïëïãéóôéêÝò óõóêåõÝò ðïõ äåí ðñïïñßæïíôáé ãéá desktop åöáñìïãÝò, êáé ðïõ óõíÞèùò êáëýðôïõí ìéá ìüíï áíÜãêç, áíôßèåôá ìå ôá ãåíéêÜ õðïëïãéóôéêÜ ðåñéâÜëëïíôá. Óõìðåñéëáìâáíïíôáé, åêôüò ôùí Üëëùí, üëá ôá ôçëÝöùíá, äéêôõáêüò åîïðëéóìüò üðùò routers, switches êáé PBXs, åîïðëéóìüò ìåôñÞóåùí áðü áðüóôáóç, PDAs, óõóôÞìáôá Point Of Sale, êáé ðÜåé ëÝãïíôáò.

freebsd-emulation (http://lists.FreeBSD.org/mailman/listinfo/freebsd-emulation)

Åîïìïßùóç Üëëùí óõóôçìÜôùí üðùò åßíáé ôá Linux/MS-DOS/Windows

Åßíáé ìéá ëßóôá ãéá ôå÷íéêÝò óõæçôÞóåéò, ó÷åôéêÝò ìå ôçí åêôÝëåóç óôï FreeBSD ðñïãñáììÜôùí ðïõ äçìéïõñãÞèçêáí ãéá Üëëá ëåéôïõñãéêÜ.

freebsd-eol (http://lists.FreeBSD.org/mailman/listinfo/freebsd-eol)

Ïìüôéìç õðïóôÞñéîç ãéá ëïãéóìéêü ó÷åôéêü ìå ôï FreeBSD ðïõ äåí õðïóôçñßæåôáé ðëÝïí áðü ôï FreeBSD Project.

ÁõôÞ ç ëßóôá åßíáé ãéá üóïõò åíäéáöÝñïíôáé íá ðáñÝ÷ïõí Þ íá ÷ñçóéìïðïéÞóïõí ôçí ïìüôéìç õðïóôÞñéîç ãéá ëïãéóìéêü ó÷åôéêü ìå ôï FreeBSD ðïõ äåí õðïóôçñßæåôáé ðëÝïí áðü ôï FreeBSD Project (ð.÷., ìå ôçí ìïñöÞ “patches” êáé áíáêïéíþóåùí áóöáëåßáò).

freebsd-firewire (http://lists.FreeBSD.org/mailman/listinfo/freebsd-firewire)

FireWire (iLink, IEEE 1394)

ÁõôÞ ç ëßóôá åßíáé ãéá ôçí óõæÞôçóç ôçò ó÷åäßáóçò êáé õëïðïßçóçò åíüò õðïóõóôÞìáôïò FireWire (ãíùóôü êáé ùò IEEE 1394 Þ iLink) ãéá ôï FreeBSD. Ó÷åôéêÜ èÝìáôá åßíáé ôá ðñüôõðá, ïé óõóêåõÝò äéáýëïõ êáé ôá ðñùôüêïëëÜ ôïõò, êÜñôåò, ðñïóáñìïãåßò êáé chipsets, êáé ç áñ÷éôåêôïíéêÞ êáé ç õëïðïßçóç ôïõ êþäéêá ãéá ôçí óùóôÞ õðïóôÞñéîç ôïõò.

freebsd-fs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-fs)

ÓõóôÞìáôá áñ÷åßùí

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôá óõóôÞìáôá áñ÷åßùí ôïõ FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-gecko (http://lists.FreeBSD.org/mailman/listinfo/freebsd-gecko)

Gecko Rendering Engine

ÓõæçôÞóåéò ó÷åôéêÝò ìå åöáñìïãÝò ðïõ ÷ñçóéìïðïéïýí ôçí ìç÷áíÞ Gecko óôï FreeBSD.

Ç óõæÞôçóç åðéêåíôñþíåôáé óå åöáñìïãÝò ôçò ÓõëëïãÞò ôùí Ports ðïõ ÷ñçóéìïðïéïýí ôç ìç÷áíÞ Gecko, êáé åéäéêüôåñá ôçí åãêáôÜóôáóç, áíÜðôõîç êáé õðïóôÞñéîç ôïõò óôï FreeBSD.

freebsd-geom (http://lists.FreeBSD.org/mailman/listinfo/freebsd-geom)

GEOM

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôï GEOM êáé ðáñüìïéåò õëïðïéÞóåéò. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-gnome (http://lists.FreeBSD.org/mailman/listinfo/freebsd-gnome)

GNOME

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôï ðåñéâÜëëïí **GNOME** ãéá óõóôÞìáôá FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-ipfw (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ipfw)

IP Firewall

ÁõôÞ ç ëßóôá åßíáé ãéá ôå÷íéêÝò óõæçôÞóåéò ðïõ áöïñïýí ôïí åðáíáó÷åäéáóìü ôïõ êþäéêá IP firewall óôï FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-ia64 (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ia64)

ÌåôáöïñÜ ôïõ FreeBSD óôçí áñ÷éôåêôïíéêÞ IA64

Ðñüêåéôáé ãéá ìéá ôå÷íéêÞ ëßóôá, ãéá Üôïìá ðïõ äïõëåýïõí åíåñãÜ óôçí ìåôáöïñÜ ôïõ FreeBSD óôçí ðëáôöüñìá IA-64 ôçò Intel, ãéá íá áíáöÝñïõí ðñïâëÞìáôá Þ íá óõæçôÞóïõí åíáëëáêôéêÝò ëýóåéò. ¶ôïìá ðïõ åíäéáöÝñïíôáé íá ðáñáêïëïõèÞóïõí ôçí ôå÷íéêÞ óõæÞôçóç åßíáé åðßóçò åõðñüóäåêôá.

freebsd-isdn (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isdn)

ÁíÜðôõîç ôïõ ISDN

ÁõôÞ ç ëßóôá åßíáé ãéá Üôïìá ðïõ óõæçôïýí ôçí áíÜðôõîç ôçò õðïóôÞñéîçò ISDN óôï FreeBSD.

freebsd-java (http://lists.FreeBSD.org/mailman/listinfo/freebsd-java)

ÁíÜðôõîç ôçò Java

ÁõôÞ ç ëßóôá åßíáé ãéá Üôïìá ðïõ óõæçôïýí ôçí áíÜðôõîç óçìáíôéêþí åöáñìïãþí Java ãéá ôï FreeBSD êáé ôçí ìåôáöïñÜ êáé óõíôÞñçóç ôùí JDKs.

freebsd-jobs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-jobs)

ÆÞôçóç êáé ðñïóöïñÜ åñãáóßáò

Áõôüò åßíáé Ýíáò ÷þñïò ãéá äçìïóßåõóç áíáêïéíþóåùí ãéá ðñïóöïñÜ êáé æÞôçóç åñãáóßáò ðïõ ó÷åôßæåôáé ìå ôï FreeBSD, êáèþò êáé âéïãñáöéêþí ó÷åôéêþí ìå ôï FreeBSD. Áí ãéá ðáñÜäåéãìá áíáæçôÜôå åñãáóßá ó÷åôéêÞ ìå ôï FreeBSD, Þ ðñïóöÝñåôå ìéá èÝóç åñãáóßáò ó÷åôéêÞ ìå ôï FreeBSD, áõôü åßíáé ôï óùóôü ìÝñïò ãéá íá ôç äéáöçìßóåôå. Ç ëßóôá áõôÞ *äåí* åßíáé ãéá ãåíéêÜ èÝìáôá åñãáóßáò, ãéá ôá ïðïßá õðÜñ÷åé ðëçèþñá áðü Üëëåò ëßóôåò óôï Äéáäßêôõï.

ÁõôÞ ç ëßóôá, üðùò êáé ïé õðüëïéðåò ëßóôåò ôïõ `FreeBSD.org`, äéáíÝìïíôáé ðáãêüóìéá. ¸ôóé, ðñÝðåé íá åßóôå óáöÞò ãéá ôçí ôïðïèåóßá êáé ôçí äõíáôüôçôá ôçëåñãáóßáò Þ âïÞèåéáò óôçí ìåôïßêçóç.

Ôï ìÞíõìá óáò èá ðñÝðåé íá ÷ñçóéìïðïéåß ìüíï áíïé÷ôÜ ðñüôõðá — êáôÜ ðñïôßìçóç áðëü êåßìåíï, áí êáé âáóéêÞò ìïñöÞò Portable Document Format (PDF), HTML, êáé ìåñéêÜ Üëëá åßíáé áðïäåêôÜ áðü ðïëëïýò ÷ñÞóôåò. ÊëåéóôÜ ðñüôõðá üðùò ôï Microsoft Word (`.doc`) èá áðïññéöèïýí áðü ôïí äéáêïìéóôÞ ôçò ëßóôáò.

freebsd-kde (http://freebsd.kde.org/mailman/listinfo/kde-freebsd)

KDE

ÓõæçôÞóåéò ðïõ áöïñïýí ôï **KDE** óå óõóôÞìáôá FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-hackers (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hackers)

Ôå÷íéêÝò óõæçôÞóåéò

Åßíáé Ýíáò ÷þñïò ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÝò ìå ôï FreeBSD. ÁõôÞ åßíáé ç êýñéá ôå÷íéêÞ ëßóôá. Åßíáé ãéá Üôïìá ðïõ áíáðôýóóïõí åíåñãÜ ôï FreeBSD, ãéá íá áíáöÝñïõí ðñïâëÞìáôá Þ íá óõæçôÞóïõí åíáëëáêôéêÝò ëýóåéò. ¶ôïìá ðïõ åíäéáöÝñïíôáé íá ðáñáêïëïõèÞóïõí ôçí ôå÷íéêÞ óõæÞôçóç åßíáé åõðñüóäåêôá. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-hardware (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hardware)

ÃåíéêÞ óõæÞôçóç ãéá õëéêü êé åîáñôÞìáôá õðïëïãéóôþí óôï FreeBSD

ÃåíéêÝò óõæçôÞóåéò ãéá ôýðïõò õëéêïý ðïõ ëåéôïõñãïýí óôï FreeBSD, äéÜöïñá ðñïâëÞìáôá êáé ðñïôÜóåéò ó÷åôéêÜ ìå ôï ôé íá áãïñÜóåôå Þ íá áðïöýãåôå.

freebsd-hubs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-hubs)

Mirror sites

Áíáêïéíþóåéò êáé óõæçôÞóåéò ãéá Üôïìá ðïõ óõíôçñïýí mirror sites ôïõ FreeBSD.

freebsd-isp (http://lists.FreeBSD.org/mailman/listinfo/freebsd-isp)

ÈÝìáôá ãéá Ðáñï÷åßò Õðçñåóéþí Äéáäéêôýïõ

ÁõôÞ ç ëßóôá åßíáé ãéá óõæçôÞóç èåìÜôùí ó÷åôéêþí ìå Ðáñï÷åßò Õðçñåóéþí Äéáäéêôýïõ (ISPs) ðïõ ÷ñçóéìïðïéïýí FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-mono (http://lists.FreeBSD.org/mailman/listinfo/freebsd-mono)

ÅöáñìïãÝò Mono êáé C# óôï FreeBSD

ÁõôÞ ç ëßóôá åßíáé ãéá óõæÞôçóç èåìÜôùí ó÷åôéêþí ìå ôï óýóôçìá áíÜðôõîçò åöáñìïãþí Mono óôï FreeBSD. Ðñüêåéôáé ãéá ìéá ôå÷íéêÞ ëßóôá. Ðñïïñßæåôáé ãéá ïðïéïíäÞðïôå áó÷ïëåßôáé åíåñãÜ ìå ôçí áíÜðôõîç Þ ôç ìåôáöïñÜ åöáñìïãþí Mono Þ C# óôï FreeBSD. Ç óõæÞôçóç áöïñÜ ôçí åðßëõóç ðñïâëçìÜôùí ç ôçí åýñåóç åíáëëáêôéêþí ëýóåùí. ¶ôïìá ðïõ åíäéáöÝñïíôáé íá ðáñáêïëïõèÞóïõí ôçí ôå÷íéêÞ óõæÞôçóç åßíáé åðßóçò åõðñüóäåêôá.

freebsd-office (http://lists.FreeBSD.org/mailman/listinfo/freebsd-office)

ÅöáñìïãÝò ãñáöåßïõ óôï FreeBSD

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôçí åãêáôÜóôáóç, áíÜðôõîç êáé õðïóôÞñéîç åöáñìïãþí ãñáöåßïõ óôï FreeBSD.

freebsd-performance (http://lists.FreeBSD.org/mailman/listinfo/freebsd-performance)

ÓõæçôÞóåéò ãéá ôçí ñýèìéóç êáé ôçí âåëôéóôïðïßçóç ôïõ FreeBSD

ÁõôÞ ç ëßóôá õðÜñ÷åé ãéá íá ðáñÝ÷åé Ýíá ìÝñïò üðïõ ïé hackers, ïé äéá÷åéñéóôÝò, êáé üóïé Üëëïé åíäéáöÝñïíôáé, íá óõæçôïýí èÝìáôá ó÷åôéêÜ ìå ôçí áðüäïóç ôïõ FreeBSD. ÁðïäåêôÜ èÝìáôá åßíáé ïé óõæçôÞóåéò ðïõ áíáöÝñïíôáé óå åãêáôáóôÜóåéò FreeBSD ðïõ õðüêåéíôáé óå ìåãÜëï öüñôï, Ý÷ïõí ðñïâëÞìáôá áðüäïóçò, Þ öôÜíïõí ôï FreeBSD óôá üñéá ôïõ. Óõíéóôïýìå áíåðéöýëáêôá íá ãñáöôïýí óôç ëßóôá üóïé åíäéáöÝñïíôáé íá âåëôéþóïõí ôçí áðüäïóç ôïõ FreeBSD. Åßíáé ìßá ôå÷íéêÞ ëßóôá ðïõ áðåõèýíåôáé óå Ýìðåéñïõò ÷ñÞóôåò ôïõ FreeBSD, hackers, Þ äéá÷åéñéóôÝò ðïõ åíäéáöÝñïíôáé íá êÜíïõí ôï FreeBSD ãñÞãïñï êáé áîéüðéóôï. Äåí ðñüêåéôáé ãéá ìéá ëßóôá åñùôÞóåùí êáé áðáíôÞóåùí ðïõ ìðïñåß íá áíôéêáôáóôÞóåé ôçí ìåëÝôç ôçò ôåêìçñßùóçò, áëëÜ Ýíá ìÝñïò ãéá óõíåéóöïñÝò Þ ãéá áðáíôÞóåéò óå áíáðÜíôçôá èÝìáôá ó÷åôéêÜ ìå ôçí áðüäïóç.

freebsd-pf (http://lists.FreeBSD.org/mailman/listinfo/freebsd-pf)

ÓõæçôÞóåéò êáé åñùôÞóåéò ãéá ôï óýóôçìá packet filter firewall

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôï packet filter (pf) firewall system óôï FreeBSD. Ôå÷íéêÝò óõæçôÞóåéò êáé åñùôÞóåéò ÷ñçóôþí åßíáé åõðñüóäåêôåò. Ç ëßóôá åßíáé åðßóçò Ýíá ìÝñïò ãéá óõæÞôçóç ôïõ ALTQ QoS framework.

freebsd-platforms (http://lists.FreeBSD.org/mailman/listinfo/freebsd-platforms)

ÌåôáöïñÜ ôïõ FreeBSD óå ìç-Intel ðëáôöüñìåò

ÐñïâëÞìáôá ôïõ FreeBSD ðïõ åìöáíßæïíôáé óå ðåñéóóüôåñåò áðü ìßá ðëáôöüñìåò, êáèþò êáé ãåíéêÝò óõæçôÞóåéò êáé ðñïôÜóåéò ãéá ìåôáöïñÜ ôïõ FreeBSD óå ìç-Intel ðëáôöüñìåò. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-policy (http://lists.FreeBSD.org/mailman/listinfo/freebsd-policy)

ÊáôåõèõíôÞñéåò áðïöÜóåéò (policy) ôçò ïìÜäáò Core ôïõ FreeBSD

ÁõôÞ åßíáé ìßá ëßóôá ìå ìéêñÞ êßíçóç, ìüíï ãéá áíÜãíùóç, ãéá ôéò áðïöÜóåéò ôçò Core ïìÜäáò ôïõ FreeBSD ó÷åôéêÜ ìå êÜðïéá èÝìáôá êáôåýèõíóçò ôïõ Project (policies).

freebsd-ports (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports)

ÓõæÞôçóç ãéá ôá “ports”

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôçí “ÓõëëïãÞ ôùí Ports” ôïõ FreeBSD (`/usr/ports`), ôçí õðïäïìÞ ôùí ports, êáé ãåíéêÜ ôéò ðñïóðÜèåéåò óõíôïíéóìïý ôùí ports. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-ports-announce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports-announce)

ÓçìáíôéêÝò åéäÞóåéò êáé ïäçãßåò ó÷åôéêÝò ìå ôçí “ÓõëëïãÞ ôùí Ports” ôïõ FreeBSD.

Óçìáíôéêç Ýò åéäÞóåéò ó÷åôéêÝò ìå ôçí “ÓõëëïãÞ ôùí Ports” (`/usr/ports`) ðïõ áðåõèýíïíôáé óå üóïõò áíáðôýóóïõí Þ ìåôáöÝñïõí ëïãéóìéêü óôï FreeBSD áëëÜ êáé óôïõò ôåëéêïýò ÷ñÞóôåò. ÐåñéëáìâÜíïíôáé åéäÞóåéò ó÷åôéêÝò ìå áëëáãÝò óôçí áñ÷éôåêôïíéêÞ êáé ôçí õðïäïìÞ, íÝåò äõíáôüôçôåò áëëÜ êáé óçìáíôéêÝò ðëçñïöïñßåò áíáâÜèìéóçò êáé íÝùí åêäüóåùí. Ðñüêåéôáé ãéá ëßóôá ìå ìéêñÞ êßíçóç ðïõ ðñïïñßæåôáé ãéá áíáêïéíþóåéò.

freebsd-ports-bugs (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ports-bugs)

ÓõæÞôçóç ãéá ôá óöÜëìáôá ôùí “ports”

Óõæçôçóåéò ðïõ ó÷åôßæïíôáé ìå ôéò áíáöïñÝò ðñïâëçìÜôùí ôçò “ÓõëëïãÞò ôùí Ports” (`/usr/ports`) ôïõ FreeBSD, ðñïôÜóåéò ãéá íÝá ports Þ ãéá áëëáãÝò óå õðÜñ÷ïíôá ports. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-proliant (http://lists.FreeBSD.org/mailman/listinfo/freebsd-proliant)

Ôå÷íéêÞ óõæÞôçóç ãéá ôï FreeBSD óå äéáêïìéóôÝò HP ProLiant

ÁõôÞ ç ëßóôá åßíáé ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÜ ìå ôçí ÷ñÞóç ôïõ FreeBSD óå äéáêïìéóôÝò HP ProLiant. Ç óõæÞôçóç ðåñéëáìâÜíåé èÝìáôá ðñïãñáììÜôùí ïäÞãçóçò ãéá ProLiant, ëïãéóìéêü äéá÷åßñéóçò, åñãáëåßá ñõèìßóåùí, êáé áíáíåþóåéò ôïõ BIOS. Ç ëßóôá áõôÞ åßíáé ôï êáôáëëçëüôåñï ìÝñïò ãéá óõæÞôçóç ó÷åôéêÜ ìå ôá áñèñþìáôá hpasmd, hpasmcli, êáé hpacucli.

freebsd-python (http://lists.FreeBSD.org/mailman/listinfo/freebsd-python)

Ç Python óôï FreeBSD

ÁõôÞ ç ëßóôá åßíáé ãéá óõæçôÞóåéò ó÷åôéêÝò ìå ôçí âåëôéóôïðïßçóç ôçò õðïóôÞñéîçò ôçò Python óôï FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá. Ðñïïñßæåôáé ãéá Üôïìá ðïõ áó÷ïëïýíôáé ìå ôçí ìåôáöïñÜ ôçò Python, ôùí áñèñùìÜôùí ôçò (modules) êáé ôïõ **Zope** óôï FreeBSD. ¼óïé åíäéáöÝñïíôáé íá ðáñáêïëïõèÞóïõí ôçí ôå÷íéêÞ óõæÞôçóç, åßíáé åõðñüóäåêôïé.

freebsd-questions (http://lists.FreeBSD.org/mailman/listinfo/freebsd-questions)

ÅñùôÞóåéò ÷ñçóôþí

ÁõôÞ ç ëßóôá åßíáé ãéá åñùôÞóåéò ó÷åôéêÝò ìå ôï FreeBSD. Äåí ðñÝðåé íá óôÝëíåôå åñùôÞóåéò ôýðïõ “how to” óå ôå÷íéêÝò ëßóôåò åêôüò áí èåùñåßôå üôé ç åñþôçóç óáò åßíáé ðïëý åîåéäéêåõìÝíç.

freebsd-ruby (http://lists.FreeBSD.org/mailman/listinfo/freebsd-ruby)

ÓõæÞôçóç ó÷åôéêÜ ìå ôç Ruby óôï FreeBSD

Ç ëßóôá áõôÞ åßíáé ãéá óõæçôÞóåéò ðïõ ó÷åôßæïíôáé ìå ôçí õðïóôÞñéîç ôçò Ruby óôï FreeBSD. Ðñüêåéôáé ãéá ìéá ëßóôá ôå÷íéêþí åñùôÞóåùí. Áðåõèýíåôáé óå Üôïìá ðïõ äïõëåýïõí óå Ports ôçò Ruby, óå âéâëéïèÞêåò ôñßôùí êáôáóêåõáóôþí, êáé óå Üëëá ðëáßóéá ëåéôïõñãéþí.

Åßíáé åðßóçò åõðñüóäåêôïé üóïé åíäéáöÝñïíôáé ãéá áõôïý ôïõ åßäïõò ôçí ôå÷íéêÞ óõæÞôçóç.

freebsd-scsi (http://lists.FreeBSD.org/mailman/listinfo/freebsd-scsi)

Ôï õðïóýóôçìá SCSI

ÁõôÞ ç ëßóôá åßíáé ãéá Üôïìá ðïõ åñãÜæïíôáé óôï SCSI õðïóýóôçìá ôïõ FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-security (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security)

ÈÝìáôá áóöáëåßáò

ÁöïñÜ èÝìáôá áóöáëåßáò õðïëïãéóôþí ðïõ åêôåëïýí FreeBSD (DES, Kerberos, ãíùóôÜ èÝìáôá áóöáëåßáò êáé äéïñèþóåéò, êôë). Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá. Óçìåéþóôå üôé äåí ðñüêåéôáé ãéá ëßóôá åñùôÞóåùí êáé áðáíôÞóåùí, áëëÜ ç óõíåéóöïñÜ (ôüóï åñùôÞóåùí üóï ÊÁÉ áðáíôÞóåùí) óôï FAQ åßíáé åõðñüóäåêôç.

freebsd-security-notifications (http://lists.FreeBSD.org/mailman/listinfo/freebsd-security-notifications)

ÅéäïðïéÞóåéò áóöáëåßáò

ÅéäïðïéÞóåéò ãéá ðñïâëÞìáôá áóöáëåßáò êáé äéïñèþóåéò óôï FreeBSD. Äåí ðñüêåéôáé ãéá ëßóôá óõæçôÞóåùí. Ç ëßóôá óõæçôÞóåùí åßíáé ç FreeBSD-security.

freebsd-small (http://lists.FreeBSD.org/mailman/listinfo/freebsd-small)

×ñÞóç ôïõ FreeBSD óå embedded åöáñìïãÝò

ÁõôÞ ç ëßóôá óõæçôÜ èÝìáôá ó÷åôéêÜ ìå áóõíÞèéóôá ìéêñÝò êáé embedded åãêáôáóôÜóåéò ôïõ FreeBSD. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

> **Óçìåßùóç:** Ç ëßóôá áõôÞ Ý÷åé áíôéêáôáóôáèåß áðü ôçí freebsd-embedded (http://lists.FreeBSD.org/mailman/listinfo/freebsd-embedded).

freebsd-stable (http://lists.FreeBSD.org/mailman/listinfo/freebsd-stable)

ÓõæçôÞóåéò ó÷åôéêÝò ìå ôçí ÷ñÞóç ôïõ FreeBSD-STABLE

ÁõôÞ ç ëßóôá åßíáé ãéá ôïõò ÷ñÞóôåò ôïõ FreeBSD-STABLE. ÐåñéÝ÷åé ðñïåéäïðïéÞóåéò ãéá íÝá ÷áñáêôçñéóôéêÜ ðïõ ðñüêåéôáé íá åíóùìáôùèïýí óôï -STABLE êáé ôá ïðïßá åíäå÷ïìÝíùò íá åðçñåÜóïõí ôïõò ÷ñÞóôåò ôïõ. Åðßóçò ðåñéÝ÷åé ïäçãßåò ãéá ôá âÞìáôá ðïõ ðñÝðåé íá áêïëïõèÞóåôå þóôå íá ðáñáìåßíåôå óôï -STABLE. Èá ðñÝðåé íá åããñáöåßôå óå áõôÞ ôç ëßóôá, áí áêïëïõèåßôå ôï “STABLE”. Åßíáé ìéá ôå÷íéêÞ ëßóôá êáé óõæçôïýíôáé ìüíï áõóôçñÜ ôå÷íéêÜ èÝìáôá.

freebsd-standards (http://lists.FreeBSD.org/mailman/listinfo/freebsd-standards)

Óõììüñöùóç ìå ôá ðñüôõðá C99 & POSIX

ÁõôÞ ç ëßóôá åßíáé ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÜ ìå ôçí óõììüñöùóç ôïõ FreeBSD ìå ôá ðñüôõðá C99 êáé POSIX.

freebsd-toolchain (http://lists.FreeBSD.org/mailman/listinfo/freebsd-toolchain)

ÓõíôÞñçóç ôùí åíóùìáôùìÝíùí åñãáëåßùí ôïõ FreeBSD

ÁõôÞ ç ëßóôá åßíáé ãéá óõæçôÞóåéò ðïõ ó÷åôßæïíôáé ìå ôçí óåéñÜ åñãáëåßùí (toolchain) ðïõ Ýñ÷ïíôáé ìå ôï FreeBSD. Ç óõæÞôçóç ìðïñåß íá ðåñéëáìâÜíåé èÝìáôá ó÷åôéêÜ ìå ôçí êáôÜóôáóç ôïõ Clang êáé ôïõ GCC, áëëÜ êáé èÝìáôá ó÷åôéêÜ ìå ðñïãñÜììáôá üðùò ìåôáãëùôôéóôÝò, assemblers, linkers êáé debuggers.

freebsd-usb (http://lists.FreeBSD.org/mailman/listinfo/freebsd-usb)

ÓõæÞôçóç ãéá ôçí õðïóôÞñéîç ôïõ äéáýëïõ USB óôï FreeBSD

ÁõôÞ ç ëßóôá åßíáé ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÜ ìå ôçí õðïóôÞñéîç ôïõ äéáýëïõ USB óôï FreeBSD.

freebsd-user-groups (http://lists.FreeBSD.org/mailman/listinfo/freebsd-user-groups)

ÏñãÜíùóç ôùí óõëëüãùí ÷ñçóôþí

ÁõôÞ ç ëßóôá åßíáé ãéá ôïõò óõíôïíéóôÝò ôùí åðéìÝñïõò ôïðéêþí óõëëüãùí ÷ñçóôþí ãéá óõæÞôçóç èåìÜôùí ìåôáîý ôïõò êáé ìå êÜðïéï ìÝëïò ôçò ïìÜäáò Core. ÁõôÞ ç ëßóôá èá ðñÝðåé íá áíáöÝñåé ìüíï ôéò óõíáíôÞóåéò êáé ôçí ïñãÜíùóç projects ðïõ áíáöÝñïíôáé óå ðåñéóóüôåñïõò áðü Ýíá óõëëüãïõò ÷ñçóôþí.

freebsd-vendors (http://lists.FreeBSD.org/mailman/listinfo/freebsd-vendors)

ÐùëçôÝò

ÏñãÜíùóç óõæçôÞóåùí ìåôáîý ôïõ FreeBSD Project êáé ôùí ðùëçôþí ëïãéóìéêïý êáé õëéêïý ó÷åôéêïý ìå ôï FreeBSD.

freebsd-virtualization (http://lists.FreeBSD.org/mailman/listinfo/freebsd-virtualization)

ÓõæÞôçóç äéÜöïñùí ôå÷íéêþí åéêïíéêïðïßçóçò ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD.

Ìéá ëßóôá ãéá ôç óõæÞôçóç ôùí äéÜöïñùí ôå÷íéêþí åéêïíéêïðïßçóçò ðïõ õðïóôçñßæïíôáé áðü ôï FreeBSD. Áðü ôç ìéá ìåñéÜ åóôéÜæåé óôçí õëïðïßçóç ôùí âáóéêþí ëåéôïõñãéþí áëëÜ êáé ôçí ðñïóèÞêç íÝùí äõíáôïôÞôùí. Áðü ôçí Üëëç, ïé ÷ñÞóôåò èá Ý÷ïõí ìéá ïìÜäá óõæçôÞóåùí üðïõ ìðïñïýí íá æçôïýí âïÞèåéá óå ðåñßðôùóç ðñïâëçìÜôùí, Þ íá óõæçôïýí ôéò äéêÝò ôïõò ÷ñÞóåéò.

freebsd-wip-status (http://lists.FreeBSD.org/mailman/listinfo/freebsd-wip-status)

ÊáôÜóôáóç åñãáóéþí óå åîÝëéîç óôï FreeBSD

Óôç ëßóôá áõôÞ ìðïñåßôå íá áíáêïéíþóåôå ôçí Ýíáñîç êáé ôçí ðñüïäï êÜðïéáò åñãáóßáò óáò ðïõ ó÷åôßæåôáé ìå ôï FreeBSD. Ôá ìçíýìáôá óå áõôÞ ôç ëßóôá åëÝã÷ïíôáé. Óõíßóôáôáé íá óôåßëåôå ôï ìÞíõìá óáò ìå ðáñáëÞðôç ìéá ðéï ôïðéêÞ óáò ëßóôá ôïõ FreeBSD, êáé áðëþò íá êïéíïðïéÞóåôå ôï ìÞíõìá óáò óå áõôÞ ôç ëßóôá. Ìå ôïí ôñüðï áõôü, ìðïñåßôå åðßóçò íá óõæçôÞóåôå ãéá ôçí åñãáóßá óáò óôçí ôïðéêÞ ëßóôá, êáèþò ç óõæÞôçóç óå áõôÞ ôç ëßóôá äåí åðéôñÝðåôáé.

Äåßôå ôá áñ÷åßá ôçò ëßóôáò ãéá íá ðÜñåôå ìéá éäÝá ôçò ìïñöÞò ôùí ìçíõìÜôùí ðïõ ìðïñåßôå íá óôåßëåôå.

Ìéá ðåñßëçøç ôùí ðåñéå÷ïìÝíùí ôçò ëßóôáò åíäÝ÷åôáé íá äçìïóéåýåôáé êáôÜ ôáêôÜ äéáóôÞìáôá óôç äéêôõáêÞ ôïðïèåóßá ôïõ FreeBSD, ùò ìÝñïò ôùí Áíáöïñþí ÊáôÜóôáóçò (Status Reports) [1]. Óôçí ßäéá ôïðïèåóßá, ìðïñåßôå åðßóçò íá âñåßôå ðåñéóóüôåñá ðáñáäåßãìáôá êáé ðñïçãïýìåíåò áíáöïñÝò.

freebsd-wireless (http://lists.FreeBSD.org/mailman/listinfo/freebsd-wireless)

ÓõæÞôçóç ó÷åôéêÜ ìå ôç óôïßâá 802.11, ôá åñãáëåßá áóýñìáôïõ äéêôýïõ êáé ôçí áíÜðôõîç ðñïãñáììÜôùí ïäÞãçóçò

H ëßóôá áõôÞ åóôéÜæåé óôç óôïßâá äéêôýïõ 802.11 (sys/net80211), ôçí áíÜðôõîç ðñïãñáììÜôùí ïäÞãçóçò êáé åñãáëåßùí. ÐåñéëáìâÜíåé áíáöïñÝò ðñïâëçìÜôùí, íÝá ÷áñáêôçñéóôéêÜ êáé ðëçñïöïñßåò óõíôÞñçóçò.

freebsd-xen (http://lists.FreeBSD.org/mailman/listinfo/freebsd-xen)

ÓõæÞôçóç ãéá ôç ìåôáöïñÜ ôïõ FreeBSD óôï Xen — õëïðïßçóç êáé ÷ñÞóç

Ðñüêåéôáé ãéá ìéá ëßóôá ðïõ åóôéÜæåé óôçí ìåôáöïñÜ ôïõ FreeBSD óôï Xen. Ç êßíçóç óå áõôÞ ôç ëßóôá áíáìÝíåôáé íá åßíáé ìéêñÞ, êáé Ýôóé èá ÷ñçóéìïðïéçèåß ôüóï ãéá ôå÷íéêÝò óõæçôÞóåéò ó÷åôéêÜ ìå ôï ó÷åäéáóìü êáé ôçí õëïðïßçóç, üóï êáé ìå ðñïâëÞìáôá åãêáôÜóôáóçò êáé äéá÷åßñéóçò.

freebsd-xfce (http://lists.FreeBSD.org/mailman/listinfo/freebsd-xfce)

XFCE

ÓõæÞôçóç ãéá ôç ìåôáöïñÜ ôïõ **XFCE** óôï FreeBSD. Ðñüêåéôáé ãéá ìéá ëßóôá ôå÷íéêþí óõæçôÞóåùí. Ðñïïñßæåôáé ãéá üóïõò áó÷ïëïýíôáé åíåñãÜ ìå ôç ìåôáöïñÜ ôïõ **XFCE** óôï FreeBSD þóôå íá óõæçôïýí ðñïâëÞìáôá êáé åíáëëáêôéêÝò ëýóåéò. Ç ëßóôá åßíáé åðßóçò áíïéêôÞ óå üóïõò åíäéáöÝñïíôáé ãéá ôå÷íéêÞ óõæÞôçóç áõôïý ôïõ åßäïõò.

C.1.4 ÖéëôñÜñéóìá óôéò Ëßóôåò Çëåêôñïíéêïý Ôá÷õäñïìåßïõ

Ïé ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ ôïõ FreeBSD öéëôñÜñïíôáé ìå ðïëëáðëïýò ôñüðïõò ãéá íá áðïöåõ÷èåß ç äéáíïìÞ spam, éþí, êáé Üëëùí áíåðéèýìçôùí ìçíõìÜôùí. Ôï öéëôñÜñéóìá ðïõ ðåñéãñÜöåôáé óå áõôÞ ôçí åíüôçôá, áðïôåëåß Ýíá ìüíï ìÝñïò ôùí óõíïëéêþí ìÝôñùí ðïõ ëáìâÜíïíôáé ãéá ôçí ðñïóôáóßá ôùí ëéóôþí çëåêôñïíéêïý ôá÷õäñïìåßïõ.

Óôéò ëßóôåò åðéôñÝðïíôáé ìüíï óõãêåêñéìÝíïé ôýðïé óõíçììÝíùí áñ÷åßùí. ¼ëá ôá óõíçììÝíá áñ÷åßá ìå ôýðï MIME ðïõ äåí âñßóêåôáé óôçí ðáñáêÜôù ëßóôá, äéáãñÜöïíôáé ðñéí äéáíåìçèåß ôï ìÞíõìá óôéò ëßóôåò.

- application/octet-stream
- application/pdf
- application/pgp-signature
- application/x-pkcs7-signature
- message/rfc822
- multipart/alternative
- multipart/related
- multipart/signed
- text/html
- text/plain
- text/x-diff
- text/x-patch

Óçìåßùóç: ÌåñéêÝò ëßóôåò ìðïñåß íá åðéôñÝðïõí óõíçììÝíá áñ÷åßá êáé Üëëùí ôýðùí MIME, áëëÜ ïé ðáñáðÜíù ôýðïé éó÷ýïõí óôéò ðåñéóóüôåñåò ëßóôåò.

ÅÜí ôï êåßìåíï åíüò ìçíýìáôïò ðåñéÝ÷åôáé ôüóï óå ìïñöÞ HTML üóï êáé áðëïý êåéìÝíïõ, ôï ôìÞìá HTML èá áöáéñåèåß. ÅÜí Ýíá ìÞíõìá ðåñéÝ÷åé ìüíï HTML, èá ìåôáôñáðåß óå áðëü êåßìåíï.

C.2 Usenet Newsgroups

Åêôüò áðü äýï newsgroups ðïõ áó÷ïëïýíôáé ìå ôï FreeBSD, õðÜñ÷ïõí ðïëëÜ áêüìá óôá ïðïßá ãßíåôáé óõæÞôçóç ãéá ôï FreeBSD Þ Üëëá èÝìáôá ðïõ åíäå÷ïìÝíùò åíäéáöÝñïõí ôïõò ÷ñÞóôåò ôïõ. Ãéá êÜðïéá áðü áõôÜ ôá newsgroups, ìðïñåßôå íá êÜíåôå áíáæÞôçóç ìå ëÝîåéò-êëåéäéÜ óôéò ðáëéÝò äçìïóéåýóåéò (http://minnie.tuhs.org/BSD-info/bsdnews_search.html), ÷Üñç óôçí õðçñåóßá ðïõ ðñïóöÝñåé ï Warren Toomey <`wkt@cs.adfa.edu.au`>.

C.2.1 Newsgroups Ó÷åôéêÜ ìå ôï BSD

- comp.unix.bsd.freebsd.announce (news:comp.unix.bsd.freebsd.announce)
- comp.unix.bsd.freebsd.misc (news:comp.unix.bsd.freebsd.misc)
- de.comp.os.unix.bsd (news:de.comp.os.unix.bsd) (Óôá ÃåñìáíéêÜ)
- fr.comp.os.bsd (news:fr.comp.os.bsd) (Óôá ÃáëëéêÜ)
- it.comp.os.freebsd (news:it.comp.os.freebsd) (Óôá ÉôáëéêÜ)
- tw.bbs.comp.386bsd (news:tw.bbs.comp.386bsd) (Óå ÐáñáäïóéáêÜ ÊéíÝæéêá)

C.2.2 ¶ëëá ÅíäéáöÝñïíôá UNIX Newsgroups

- comp.unix (news:comp.unix)
- comp.unix.questions (news:comp.unix.questions)
- comp.unix.admin (news:comp.unix.admin)
- comp.unix.programmer (news:comp.unix.programmer)
- comp.unix.shell (news:comp.unix.shell)
- comp.unix.user-friendly (news:comp.unix.user-friendly)
- comp.security.unix (news:comp.security.unix)
- comp.sources.unix (news:comp.sources.unix)
- comp.unix.advocacy (news:comp.unix.advocacy)
- comp.unix.misc (news:comp.unix.misc)
- comp.bugs.4bsd (news:comp.bugs.4bsd)
- comp.bugs.4bsd.ucb-fixes (news:comp.bugs.4bsd.ucb-fixes)
- comp.unix.bsd (news:comp.unix.bsd)

C.2.3 Óýóôçìá X Window

- comp.windows.x.i386unix (news:comp.windows.x.i386unix)
- comp.windows.x (news:comp.windows.x)

- comp.windows.x.apps (news:comp.windows.x.apps)
- comp.windows.x.announce (news:comp.windows.x.announce)
- comp.windows.x.intrinsics (news:comp.windows.x.intrinsics)
- comp.windows.x.motif (news:comp.windows.x.motif)
- comp.windows.x.pex (news:comp.windows.x.pex)
- comp.emulators.ms-windows.wine (news:comp.emulators.ms-windows.wine)

C.3 ÄéáêïìéóôÝò Éóôïóåëßäùí

C.3.1 Forums, Blogs, êáé ÊïéíùíéêÜ Äßêôõá

- Ôá Forums ôïõ FreeBSD (http://forums.freebsd.org/) âáóßæïíôáé óå äéåðáöÞ web êáé åßíáé êáôÜëëçëá ãéá ôå÷íéêÝò óõæçôÞóåéò êáé åñùôÞóåéò ðïõ áöïñïýí ôï FreeBSD.
- Ôï Planet FreeBSD (http://planet.freebsdish.org/) óõãêåíôñþíåé óå Ýíá óçìåßï ôéò ñïÝò áðü äåêÜäåò éóôïëüãéá ìåëþí ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD. ÐïëëÜ áðü ôá ìÝëç, ÷ñçóéìïðïéïýí áõôÞ ôç äõíáôüôçôá ãéá íá ãíùóôïðïéÞóïõí ôçí åñãáóßá ðïõ êÜíïõí ôç äåäïìÝíç óôéãìÞ, ôéò íÝåò äéïñèþóåéò, êáèþò êáé ôá ìåëëïíôéêÜ ôïõò ó÷Ýäéá.
- Ôï êáíÜëé BSDConferences óôï Youtube (http://www.youtube.com/bsdconferences) ðáñÝ÷åé ìéá óõëëïãÞ âßíôåï õøçëÞò ðïéüôçôáò, áðü äéÜöïñá BSD óõíÝäñéá óå üëï ôïí êüóìï. Ðñüêåéôáé ãéá Ýíá èáõìÜóéï ôñüðï íá ðáñáêïëïõèÞóåôå óçìáíôéêÜ ìÝëç ôçò ïìÜäáò áíÜðôõîçò íá ðáñïõóéÜæïõí ôç íÝá ôïõò äïõëåéÜ óôï FreeBSD.

C.3.2 Åðßóçìá Mirrors

Central Servers, Armenia, Australia, Austria, Belgium, Brazil, Canada, China, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Italy, Japan, Korea, Kuwait, Kyrgyzstan, Latvia, Lithuania, Netherlands, Norway, Philippines, Portugal, Romania, Russia, San Marino, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Kingdom, USA.

(as of UTC)

-

  Central Servers

  - http://www.FreeBSD.org/

-

  Armenia

  - http://www1.am.FreeBSD.org/ (IPv6)

- Australia
  - http://www.au.FreeBSD.org/
  - http://www2.au.FreeBSD.org/
- Austria
  - http://www.at.FreeBSD.org/ (IPv6)
- Belgium
  - http://freebsd.unixtech.be/
- Brazil
  - http://www.br.FreeBSD.org/ (IPv6)
  - http://www2.br.FreeBSD.org/www.freebsd.org/
  - http://www3.br.FreeBSD.org/
- Canada
  - http://www.ca.FreeBSD.org/
  - http://www2.ca.FreeBSD.org/
- China
  - http://www.cn.FreeBSD.org/
- Costa Rica
  - http://www1.cr.FreeBSD.org/
- Czech Republic
  - http://www.cz.FreeBSD.org/ (IPv6)

- Denmark
  - http://www.dk.FreeBSD.org/ (IPv6)
- Estonia
  - http://www.ee.FreeBSD.org/
- Finland
  - http://www.fi.FreeBSD.org/
  - http://www2.fi.FreeBSD.org/
- France
  - http://www.fr.FreeBSD.org/
  - http://www1.fr.FreeBSD.org/
- Germany
  - http://www.de.FreeBSD.org/
- Greece
  - http://www.gr.FreeBSD.org/
- Hong Kong
  - http://www.hk.FreeBSD.org/
- Hungary
  - http://www.hu.FreeBSD.org/
  - http://www2.hu.FreeBSD.org/

- Iceland
  - http://www.is.FreeBSD.org/
- Italy
  - http://www.it.FreeBSD.org/
  - http://www.gufi.org/mirrors/www.freebsd.org/data/
- Japan
  - http://www.jp.FreeBSD.org/www.FreeBSD.org/ (IPv6)
- Korea
  - http://www.kr.FreeBSD.org/
  - http://www2.kr.FreeBSD.org/
- Kuwait
  - http://www.kw.FreeBSD.org/
- Kyrgyzstan
  - http://www.kg.FreeBSD.org/
- Latvia
  - http://www.lv.FreeBSD.org/
  - http://www2.lv.FreeBSD.org/
- Lithuania
  - http://www.lt.FreeBSD.org/

- Netherlands
  - http://www.nl.FreeBSD.org/
  - http://www2.nl.FreeBSD.org/
- Norway
  - http://www.no.FreeBSD.org/
- Philippines
  - http://www.FreeBSD.org.ph/
- Portugal
  - http://www.pt.FreeBSD.org/
  - http://www1.pt.FreeBSD.org/
  - http://www4.pt.FreeBSD.org/
  - http://www5.pt.FreeBSD.org/
- Romania
  - http://www.ro.FreeBSD.org/
  - http://www1.ro.FreeBSD.org/
  - http://www2.ro.FreeBSD.org/
  - http://www3.ro.FreeBSD.org/
- Russia
  - http://www.ru.FreeBSD.org/
  - http://www2.ru.FreeBSD.org/
  - http://www3.ru.FreeBSD.org/
  - http://www4.ru.FreeBSD.org/
  - http://www5.ru.FreeBSD.org/

- San Marino
  - http://www.sm.FreeBSD.org/
- Slovak Republic
  - http://www.sk.FreeBSD.org/
- Slovenia
  - http://www.si.FreeBSD.org/
  - http://www2.si.FreeBSD.org/
- South Africa
  - http://www.za.FreeBSD.org/
  - http://www2.za.FreeBSD.org/
- Spain
  - http://www.es.FreeBSD.org/
  - http://www2.es.FreeBSD.org/
  - http://www3.es.FreeBSD.org/
- Sweden
  - http://www.se.FreeBSD.org/
  - http://www2.se.FreeBSD.org/
- Switzerland
  - http://www.ch.FreeBSD.org/ (IPv6)
  - http://www2.ch.FreeBSD.org/ (IPv6)

- Taiwan
  - http://www.tw.FreeBSD.org/ (IPv6)
  - http://www2.tw.FreeBSD.org/
  - http://www3.tw.FreeBSD.org/
  - http://www4.tw.FreeBSD.org/
  - http://www5.tw.FreeBSD.org/ (IPv6)
  - http://www6.tw.FreeBSD.org/
  - http://www7.tw.FreeBSD.org/
- Thailand
  - http://www.th.FreeBSD.org/
- Turkey
  - http://www.tr.FreeBSD.org/
  - http://www2.tr.FreeBSD.org/
  - http://www3.tr.FreeBSD.org/ (IPv6)
- Ukraine
  - http://www.ua.FreeBSD.org/
  - http://www2.ua.FreeBSD.org/
  - http://www5.ua.FreeBSD.org/
  - http://www4.ua.FreeBSD.org/
- United Kingdom
  - http://www1.uk.FreeBSD.org/
  - http://www3.uk.FreeBSD.org/
- USA
  - http://www2.us.FreeBSD.org/

- http://www5.us.FreeBSD.org/ (IPv6)

C.4 Äéåõèýíóåéò Çëåêôñïíéêïý Ôá÷õäñïìåßïõ

Ïé áêüëïõèåò åíþóåéò ÷ñçóôþí ðáñÝ÷ïõí óôá ìÝëç ôïõò äéåõèýíóåéò çëåêôñïíéêïý ôá÷õäñïìåßïõ ðïõ ó÷åôßæïíôáé ìå ôï FreeBSD. Ï äéá÷åéñéóôÞò ðïõ áíáöÝñåôáé ðáñáêÜôù, äéáôçñåß ôï äéêáßùìá íá áíáêáëÝóåé ôçí äéåýèõíóç, áí ãßíåé êáôÜ÷ñçóç ôçò ìå ïðïéïäÞðïôå ôñüðï.

ÔïìÝáò	Õðçñåóßåò	¸ìóç ×ñçóôþí	Äéá÷åéñéóôÞò
ukug.uk.FreeBSD.org	Ìüíï ðñïþèçóç	`<ukfreebsd@uk.FreeBSD.org>`	Lee Johnston `<lee@uk.FreeBSD.org>`

Óçìåéþóåéò

1. http://www.freebsd.org/news/status/

ÐáñÜñôçìá D. ÊëåéäéÜ PGP

Óôï ðáñÜñôçìá áõôü, èá âñåßôå ôá äçìüóéá PGP êëåéäéÜ ôùí officers êáé ôùí ìåëþí ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD. Ìðïñåßôå íá ôá ÷ñçóéìïðïéÞóåôå ãéá íá åëÝãîåôå ìéá øçöéáêÞ õðïãñáöÞ Þ ãéá íá óôåßëåôå êñõðôïãñáöçìÝíï email óå êÜðïéï ìÝëïò ôçò ïìÜäáò. Ìðïñåßôå íá êáôåâÜóåôå ôçí ðëÞñç ëßóôá áðü êëåéäéÜ ÷ñçóôþí ôïõ `FreeBSD.org`, áðü ôçí ôïðïèåóßá http://www.FreeBSD.org/doc/pgpkeyring.txt.

D.1 Officers

D.1.1 ÏìÜäá ÁóöÜëåéáò <`security-officer@FreeBSD.org`>

```
pub  1024D/CA6CDFB2 2002-08-27 FreeBSD Security Officer <security-officer@FreeBSD.org>
     Key fingerprint = C374 0FC5 69A6 FBB1 4AED  B131 15D6 8804 CA6C DFB2
sub  2048g/A3071809 2002-08-27
```

D.1.2 ÃñáììáôÝáò ôçò ÏìÜäáò Core <`core-secretary@FreeBSD.org`>

```
pub   2048R/2CA49776 2012-07-23
      Key fingerprint = 89F6 C031 B4E3 D472 E4CE  8372 4D58 FDCD 2CA4 9776
uid                  FreeBSD Core Team Secretary <core-secretary@freebsd.org>
sub   2048R/BBAD1C98 2012-07-23
```

D.1.3 ÃñáììáôÝáò ÏìÜäáò Äéá÷åßñéóçò ôùí Ports <`portmgr-secretary@FreeBSD.org`>

```
pub   1024D/7414629C 2005-11-30
      Key fingerprint = D50C BA61 8DC6 C42E 4C05  BF9A 79F6 E071 7414 629C
uid                  FreeBSD portmgr secretary <portmgr-secretary@FreeBSD.org>
sub   2048g/80B696E6 2005-11-30
```

D.2 ÌÝëç ôçò ÏìÜäáò Core

D.2.1 Thomas Abthorpe <`tabthorpe@FreeBSD.org`>

```
pub   2048R/A473C990 2010-05-28
      Key fingerprint = D883 2D7C EB78 944A 69FC  36A6 D937 1097 A473 C990
uid                  Thomas Abthorpe (FreeBSD Committer) <tabthorpe@FreeBSD.org>
uid                  Thomas Abthorpe <thomas@goodking.ca>
uid                  Thomas Abthorpe <tabthorpe@goodking.org>
sub   2048R/8CA60EE0 2010-05-28
```

D.2.2 Gavin Atkinson <`gavin@FreeBSD.org`>

```
pub   1024D/A093262B 2005-02-18
      Key fingerprint = 313A A79F 697D 3A5C 216A  EDF5 935D EF44 A093 262B
uid                  Gavin Atkinson <gavin@16squared.co.uk>
uid                  Gavin Atkinson (FreeBSD key) <gavin@FreeBSD.org>
uid                  Gavin Atkinson (Work e-mail) <ga9@york.ac.uk>
uid                  Gavin Atkinson <gavin.atkinson@ury.york.ac.uk>
sub   2048g/58F40B3D 2005-02-18
```

D.2.3 John Baldwin <`jhb@FreeBSD.org`>

```
pub  1024R/C10A874D 1999-01-13 John Baldwin <jbaldwin@weather.com>
     Key fingerprint = 43 33 1D 37 72 B1 EF 5B  9B 5F 39 F8 BD C1 7C B5
uid                            John Baldwin <john@baldwin.cx>
uid                            John Baldwin <jhb@FreeBSD.org>
uid                            John Baldwin <jobaldwi@vt.edu>
```

D.2.4 Konstantin Belousov <`kib@FreeBSD.org`>

```
pub   1024D/DD4C6F88 2004-07-29
      Key fingerprint = 39DA E615 A45C 111D 777B  3AD0 0B7F 8C04 DD4C 6F88
uid                  Konstantin Belousov <kib@freebsd.org>
uid                  Konstantin Belousov <konstantin.belousov@zoral.com.ua>
uid                  Kostik Belousov <kostikbel@ukr.net>
uid                  Kostik Belousov <kostikbel@gmail.com>
sub   2048g/18488597 2004-07-29
```

D.2.5 David Chisnall <`theraven@FreeBSD.org`>

```
pub   2048R/4D302EBF 2011-11-06
      Key fingerprint = 650B 1F1D 20F7 F139 77BD  25C4 E07B 6A41 4D30 2EBF
uid                  David Chisnall <theraven@FreeBSD.org>
uid                  David Chisnall <theraven@theravensnest.org>
sub   2048R/C6103EC2 2011-11-06
```

D.2.6 Hiroki Sato <`hrs@FreeBSD.org`>

```
pub   1024D/2793CF2D 2001-06-12
      Key fingerprint = BDB3 443F A5DD B3D0 A530  FFD7 4F2C D3D8 2793 CF2D
uid                  Hiroki Sato <hrs@allbsd.org>
uid                  Hiroki Sato <hrs@eos.ocn.ne.jp>
uid                  Hiroki Sato <hrs@ring.gr.jp>
uid                  Hiroki Sato <hrs@FreeBSD.org>
uid                  Hiroki Sato <hrs@jp.FreeBSD.org>
uid                  Hiroki Sato <hrs@vlsi.ee.noda.tus.ac.jp>
uid                  Hiroki Sato <hrs@jp.NetBSD.org>
uid                  Hiroki Sato <hrs@NetBSD.org>
uid                  Hiroki Sato <hrs@ec.ss.titech.ac.jp>
uid                  Hiroki Sato <hrs@ieee.org>
uid                  Hiroki Sato <hrs@acm.org>
sub   1024g/8CD251FF 2001-06-12
```

D.2.7 Peter Wemm <`peter@FreeBSD.org`>

```
pub  1024D/7277717F 2003-12-14 Peter Wemm <peter@wemm.org>
     Key fingerprint = 622B 2282 E92B 3BAB 57D1  A417 1512 AE52 7277 717F
uid                            Peter Wemm <peter@FreeBSD.ORG>
sub  1024g/8B40D9D1 2003-12-14
pub  1024R/D89CE319 1995-04-02 Peter Wemm <peter@netplex.com.au>
     Key fingerprint = 47 05 04 CA 4C EE F8 93  F6 DB 02 92 6D F5 58 8A
uid                            Peter Wemm <peter@perth.dialix.oz.au>
uid                            Peter Wemm <peter@haywire.dialix.com>
```

D.2.8 Martin Wilke <`miwi@FreeBSD.org`>

```
pub   1024D/B1E6FCE9 2009-01-31
      Key fingerprint = C022 7D60 F598 8188 2635  0F6E 74B2 4884 B1E6 FCE9
uid                  Martin Wilke <miwi@FreeBSD.org>
sub   4096g/096DA69D 2009-01-31
```

D.3 ÌÝëç ôçò ÏìÜäáò ÁíÜðôõîçò

D.3.1 Ariff Abdullah <`ariff@FreeBSD.org`>

```
pub   1024D/C5304CDA 2005-10-01
      Key fingerprint = 5C7C 6BF4 8293 DE76 27D9  FD57 96BF 9D78 C530 4CDA
uid                  Ariff Abdullah <skywizard@MyBSD.org.my>
uid                  Ariff Abdullah <ariff@MyBSD.org.my>
uid                  Ariff Abdullah <ariff@FreeBSD.org>
sub   2048g/8958C1D3 2005-10-01
```

D.3.2 Thomas Abthorpe <`tabthorpe@FreeBSD.org`>

```
pub   2048R/A473C990 2010-05-28
      Key fingerprint = D883 2D7C EB78 944A 69FC  36A6 D937 1097 A473 C990
uid                  Thomas Abthorpe (FreeBSD Committer) <tabthorpe@FreeBSD.org>
uid                  Thomas Abthorpe <thomas@goodking.ca>
uid                  Thomas Abthorpe <tabthorpe@goodking.org>
sub   2048R/8CA60EE0 2010-05-28
```

D.3.3 Eitan Adler `<eadler@FreeBSD.org>`

```
pub   4096R/8FC8196C 2011-02-11
      Key fingerprint = 49C7 29DF E09C 0FC7 A1C4  6ECB A338 A6FC 8FC8 196C
uid                  Eitan Adler <lists@eitanadler.com>
sub   4096R/18763D51 2011-02-11
sub   4096R/DAB9CF9B 2011-02-11
```

D.3.4 Shaun Amott `<shaun@FreeBSD.org>`

```
pub   1024D/6B387A9A 2001-03-19
      Key fingerprint = B506 E6C7 74A1 CC11 9A23  5C13 9268 5D08 6B38 7A9A
uid                  Shaun Amott <shaun@inerd.com>
uid                  Shaun Amott <shaun@FreeBSD.org>
sub   2048g/26FA8703 2001-03-19
sub   2048R/7FFF5151 2005-11-06
sub   2048R/27C54137 2005-11-06
```

D.3.5 Henrik Brix Andersen `<brix@FreeBSD.org>`

```
pub   1024D/54E278F8 2003-04-09
      Key fingerprint = 7B63 EF32 7831 A704 220D  7E61 BFE4 387E 54E2 78F8
uid                  Henrik Brix Andersen <henrik@brixandersen.dk>
uid                  Henrik Brix Andersen <brix@FreeBSD.org>
uid                  Henrik Brix Andersen <hbn@terma.com>
uid                  Henrik Brix Andersen <brix@osaa.dk>
sub   1024g/3B13C209 2003-04-09
```

D.3.6 Matthias Andree `<mandree@FreeBSD.org>`

```
pub   1024D/052E7D95 2003-08-28
      Key fingerprint = FDD0 0C43 6E33 07E1 0758  C6A8 BE61 8339 052E 7D95
uid                  Matthias Andree <mandree@freebsd.org>
uid                  Matthias Andree <matthias.andree@gmx.de>
sub   1536g/E65A83DA 2003-08-28
```

D.3.7 Will Andrews `<will@FreeBSD.org>`

```
pub  1024D/F81672C5 2000-05-22 Will Andrews (Key for official matters) <will@FreeBSD.org>
     Key fingerprint = 661F BBF7 9F5D 3D02 C862  5F6C 178E E274 F816 72C5
uid                            Will Andrews <will@physics.purdue.edu>
uid                            Will Andrews <will@puck.firepipe.net>
uid                            Will Andrews <will@c-60.org>
uid                            Will Andrews <will@csociety.org>
uid                            Will Andrews <will@csociety.ecn.purdue.edu>
uid                            Will Andrews <will@telperion.openpackages.org>
```

```
sub  1024g/55472804 2000-05-22
```

D.3.8 Dimitry Andric <`dim@FreeBSD.org`>

```
pub   1024D/2E2096A3 1997-11-17
      Key fingerprint = 7AB4 62D2 CE35 FC6D 4239  4FCD B05E A30A 2E20 96A3
uid                  Dimitry Andric <dimitry@andric.com>
uid                  Dimitry Andric <dim@xs4all.nl>
uid                  Dimitry Andric <dimitry.andric@tomtom.com>
uid                  [jpeg image of size 5132]
uid                  Dimitry Andric <dim@nah6.com>
uid                  Dimitry Andric <dim@FreeBSD.org>
sub   4096g/6852A5C5 1997-11-17
```

D.3.9 Eric Anholt <`anholt@FreeBSD.org`>

```
pub   1024D/6CF0EAF7 2003-09-08
      Key fingerprint = 76FE 2475 820B B75F DCA4  0F3E 1D47 6F60 6CF0 EAF7
uid                  Eric Anholt <eta@lclark.edu>
uid                  Eric Anholt <anholt@FreeBSD.org>
sub   1024g/80B404C1 2003-09-08
```

D.3.10 Marcus von Appen <`mva@FreeBSD.org`>

```
pub   1024D/B267A647 2009-02-14
      Key fingerprint = C7CC 1853 D8C5 E580 7795  B654 8BAF 3F12 B267 A647
uid                  Marcus von Appen <freebsd@sysfault.org>
uid                  Marcus von Appen <mva@freebsd.org>
sub   2048g/D34A3BAF 2009-02-14
```

D.3.11 Marcelo Araujo <`araujo@FreeBSD.org`>

```
pub   1024D/53E4CFA8 2007-04-27
      Key fingerprint = 9D6A 2339 925C 4F61 ED88  ED8B A2FC 4977 53E4 CFA8
uid                  Marcelo Araujo (Ports Committer) <araujo@FreeBSD.org>
sub   2048g/63CC012D 2007-04-27
```

D.3.12 Mathieu Arnold <`mat@FreeBSD.org`>

```
pub   1024D/FE6D850F 2005-04-25
      Key fingerprint = 2771 11F4 0A7E 73F9 ADDD  A542 26A4 7C6A FE6D 850F
uid                  Mathieu Arnold <mat@FreeBSD.org>
uid                  Mathieu Arnold <mat@mat.cc>
uid                  Mathieu Arnold <mat@cpan.org>
uid                  Mathieu Arnold <m@absolight.fr>
uid                  Mathieu Arnold <m@absolight.net>
uid                  Mathieu Arnold <mat@club-internet.fr>
uid                  Mathieu Arnold <marnold@april.org>
uid                  Mathieu Arnold <paypal@mat.cc>
sub   2048g/EAD18BD9 2005-04-25
```

D.3.13 Satoshi Asami `<asami@FreeBSD.org>`

```
pub  1024R/1E08D889 1997-07-23 Satoshi Asami <asami@cs.berkeley.edu>
     Key fingerprint = EB 3C 68 9E FB 6C EB 3F  DB 2E 0F 10 8F CE 79 CA
uid                            Satoshi Asami <asami@FreeBSD.ORG>
```

D.3.14 Gavin Atkinson `<gavin@FreeBSD.org>`

```
pub   1024D/A093262B 2005-02-18
      Key fingerprint = 313A A79F 697D 3A5C 216A  EDF5 935D EF44 A093 262B
uid                  Gavin Atkinson <gavin@16squared.co.uk>
uid                  Gavin Atkinson (FreeBSD key) <gavin@FreeBSD.org>
uid                  Gavin Atkinson (Work e-mail) <ga9@york.ac.uk>
uid                  Gavin Atkinson <gavin.atkinson@ury.york.ac.uk>
sub   2048g/58F40B3D 2005-02-18
```

D.3.15 Joseph S. Atkinson `<jsa@FreeBSD.org>`

```
pub   2048R/21AA7B06 2010-07-14
      Key fingerprint = 5B38 63B0 9CCA 12BE 3919  9412 CC9D FC84 21AA 7B06
uid                  Joseph S. Atkinson <jsa@FreeBSD.org>
uid                  Joseph S. Atkinson <jsa.bsd@gmail.com>
uid                  Joseph S. Atkinson <jsa@wickedmachine.net>
sub   2048R/5601C3E3 2010-07-14
```

D.3.16 Philippe Audeoud `<jadawin@FreeBSD.org>`

```
pub   1024D/C835D40E 2005-04-13
      Key fingerprint = D090 8C96 3612 15C9 4E3E  7A4A E498 FC2B C835 D40E
uid                  Philippe Audeoud <jadawin@tuxaco.net>
uid                  Philippe Audeoud <philippe@tuxaco.net>
uid                  Philippe Audeoud <philippe.audeoud@sitadelle.com>
uid                  Philippe Audeoud <jadawin@freebsd.org>
sub   2048g/EF8EA329 2005-04-13
```

D.3.17 Timur I. Bakeyev <`timur@FreeBSD.org`>

```
pub   1024D/60BA1F47 2002-04-27
      Key fingerprint = 84BF EAD1 607D 362F 210E  69B3 0BF0 6412 60BA 1F47
uid                  Timur I. Bakeyev (BaT) <timur@bat.ru>
uid                  Timur I. Bakeyev <timur@gnu.org>
uid                  Timur I. Bakeyev (BaT) <bat@cpan.org>
uid                  Timur I. Bakeyev (BaT) <timur@FreeBSD.org>
uid                  Timur I. Bakeyev (BaT) <timur@gnome.org>
uid                  Timur I. Bakeyev <timur@gnome.org>
sub   2048g/8A5B0042 2002-04-27
```

D.3.18 Glen Barber <`gjb@FreeBSD.org`>

```
pub   2048R/A0B946A3 2010-08-03 [expires: 2017-04-25]
      Key fingerprint = 78B3 42BA 26C7 B2AC 681E  A7BE 524F 0C37 A0B9 46A3
uid                  Glen Barber <gjb@FreeBSD.org>
uid                  Glen Barber <glen.j.barber@gmail.com>
uid                  Glen Barber <gjb@glenbarber.us>
sub   2048R/6C0527E5 2010-08-03
```

D.3.19 Nick Barkas <`snb@FreeBSD.org`>

```
pub   2048R/DDADB9DC 2010-07-27
      Key fingerprint = B678 6ECB 303D F580 A050  098F BDFF 4F3D DDAD B9DC
uid                  S. Nicholas Barkas <snb@freebsd.org>
sub   2048R/36E181FB 2010-07-27
sub   2048R/BDA4BED3 2010-07-29
sub   2048R/782A8737 2010-07-29
```

D.3.20 Simon Barner <`barner@FreeBSD.org`>

```
pub   1024D/EBADA82A 2000-11-10
      Key fingerprint = 67D1 3562 9A2F 3177 E46A  35ED 0A49 FEFD EBAD A82A
uid                  Simon Barner <barner@FreeBSD.org>
uid                  Simon Barner <barner@in.tum.de>
uid                  Simon Barner <barner@informatik.tu-muenchen.de>
uid                  Simon Barner <barner@gmx.de>
sub   2048g/F63052DE 2000-11-10
```

D.3.21 Doug Barton <`dougb@FreeBSD.org`>

```
pub   2048R/1A1ABC84 2010-03-23
      Key fingerprint = E352 0E14 9D05 3533 C33A  67DB 5CC6 86F1 1A1A BC84
uid                  Douglas Barton <dougb@dougbarton.us>
uid                  Douglas Barton <dougb@FreeBSD.org>
uid                  [jpeg image of size 6140]
sub   3072R/498795B4 2010-03-23
      Key fingerprint = C0BE C1E3 8DC8 D7F4 8E6C  732B 0C14 D9CF 4987 95B4
```

D.3.22 Artem Belevich <`art@FreeBSD.org`>

```
pub   2048R/9ED4C836 2011-03-28
      Key fingerprint = 7400 D541 07ED 3DF3 3E97  F2D5 8BDF 101C 9ED4 C836
uid                  Artem Belevich <artemb@gmail.com>
uid                  Artem Belevich <art@freebsd.org>
sub   2048R/55B0E4EB 2011-03-28
```

D.3.23 Anton Berezin <`tobez@FreeBSD.org`>

```
pub  1024D/7A7BA3C0 2000-05-25 Anton Berezin <tobez@catpipe.net>
     Key fingerprint = CDD8 560C 174B D8E5 0323  83CE 22CA 584C 7A7B A3C0
uid                            Anton Berezin <tobez@tobez.org>
uid                            Anton Berezin <tobez@FreeBSD.org>
sub  1024g/ADC71E87 2000-05-25
```

D.3.24 Damien Bergamini <`damien@FreeBSD.org`>

```
pub   2048R/D129F093 2005-03-02
      Key fingerprint = D3AB 28C3 1A4A E219 3145  54FE 220A 7486 D129 F093
uid                  Damien Bergamini <damien.bergamini@free.fr>
uid                  Damien Bergamini <damien@FreeBSD.org>
sub   2048R/9FBA73A4 2005-03-02
```

D.3.25 Tim Bishop <`tdb@FreeBSD.org`>

```
pub   1024D/5AE7D984 2000-10-07
      Key fingerprint = 1453 086E 9376 1A50 ECF6  AE05 7DCE D659 5AE7 D984
uid                  Tim Bishop <tim@bishnet.net>
uid                  Tim Bishop <T.D.Bishop@kent.ac.uk>
uid                  Tim Bishop <tdb@i-scream.org>
uid                  Tim Bishop <tdb@FreeBSD.org>
sub   4096g/7F886031 2000-10-07
```

D.3.26 Martin Blapp <`mbr@FreeBSD.org`>

```
pub  1024D/D300551E 2001-12-20 Martin Blapp <mb@imp.ch>
     Key fingerprint = B434 53FC C87C FE7B 0A18  B84C 8686 EF22 D300 551E
sub  1024g/998281C8 2001-12-20
```

D.3.27 Warren Block <`wblock@FreeBSD.org`>

```
pub   2048R/A1F360A3 2011-09-14
      Key fingerprint = 3A44 4DEC B304 5191 8A41  C317 5117 4BB6 A1F3 60A3
uid                  Warren Block <wblock@FreeBSD.org>
uid                  Warren Block <wblock@wonkity.com>
sub   2048R/51F483F3 2011-09-14
```

D.3.28 Vitaly Bogdanov <`bvs@FreeBSD.org`>

```
pub  1024D/B32017F7 2005-10-02 Vitaly Bogdanov <gad@gad.glazov.net>
     Key fingerprint = 402E B8E4 53CB 22FF BE62  AE35 A0BF B077 B320 17F7
uid                             Vitaly Bogdanov <bvs@freebsd.org>
sub  1024g/0E88C62E 2005-10-02
```

D.3.29 Roman Bogorodskiy <`novel@FreeBSD.org`>

```
pub   2048R/08C2226A 2010-12-03
      Key fingerprint = 8BA4 DF2A D14F 99B6 37E0  0070 C96D 5FFE 08C2 226A
uid                  Roman Bogorodskiy <bogorodskiy@gmail.com>
uid                  Roman Bogorodskiy <novel@FreeBSD.org>
uid                  Roman Bogorodskiy <rbogorodskiy@apache.org>
uid                  Roman Bogorodskiy <rbogorodskiy@griddynamics.com>
sub   2048R/EC4ED237 2010-12-03
```

D.3.30 Renato Botelho <`garga@FreeBSD.org`>

```
pub   1024D/2244EDA9 2003-12-16 [expires: 2015-10-18]
      Key fingerprint = 4006 C844 BC51 AD75 CE60  6E24 E824 5B89 2244 EDA9
uid                  Renato Botelho <garga@FreeBSD.org>
uid                  Renato Botelho <rbgarga@gmail.com>
uid                  Renato Botelho <garga@freebsdbrasil.com.br>
uid                  Renato Botelho <renato@galle.com.br>
uid                  Renato Botelho <freebsd@galle.com.br>
uid                  Renato Botelho <garga@brainsoft.com.br>
uid                  Renato Botelho <garga.bsd@gmail.com>
sub   1024g/7B295760 2003-12-16
```

D.3.31 Alexander Botero-Lowry <`alexbl@FreeBSD.org`>

```
pub   1024D/12A95A7B 2006-09-13
      Key fingerprint = D0C3 47F8 AE87 C829 0613  3586 24DF F52B 12A9 5A7B
uid                  Alexander Botero-Lowry <alexbl@FreeBSD.org>
sub   2048g/CA287923 2006-09-13
```

D.3.32 Sofian Brabez <`sbz@FreeBSD.org`>

```
pub   1024D/2487E57E 2011-03-15 [expires: 2016-03-14]
      Key fingerprint = 05BA DC7E F628 DE3F B241  BFBB 7363 51F4 2487 E57E
uid                  Sofian Brabez <sbrabez@gmail.com>
uid                  Sofian Brabez <sbz@FreeBSD.org>
uid                  Sofian Brabez <sbz@6dev.net>
```

D.3.33 Hartmut Brandt <`harti@FreeBSD.org`>

```
pub  1024D/5920099F 2003-01-29 Hartmut Brandt <brandt@fokus.fraunhofer.de>
     Key fingerprint = F60D 09A0 76B7 31EE 794B  BB91 082F 291D 5920 099F
uid                            Hartmut Brandt <harti@freebsd.org>
sub  1024g/21D30205 2003-01-29
```

D.3.34 Oliver Braun <`obraun@FreeBSD.org`>

```
pub  1024D/EF25B1BA 2001-05-06 Oliver Braun <obraun@unsane.org>
     Key fingerprint = 6A3B 042A 732E 17E4 B6E7  3EAF C0B1 6B7D EF25 B1BA
uid                            Oliver Braun <obraun@obraun.net>
uid                            Oliver Braun <obraun@freebsd.org>
uid                            Oliver Braun <obraun@haskell.org>
sub  1024g/09D28582 2001-05-06
```

D.3.35 Max Brazhnikov <`makc@FreeBSD.org`>

```
pub   1024D/ACB3CD12 2008-08-18
      Key fingerprint = 4BAA 200E 720A 0BD1 7BB0  9DFD FBD9 08C2 ACB3 CD12
uid                  Max Brazhnikov <makc@FreeBSD.org>
uid                  Max Brazhnikov <makc@issp.ac.ru>
sub   1024g/5FAA4088 2008-08-18
```

D.3.36 Jonathan M. Bresler <`jmb@FreeBSD.org`>

```
pub  1024R/97E638DD 1996-06-05 Jonathan M. Bresler <jmb@Bresler.org>
     Key fingerprint = 31 57 41 56 06 C1 40 13  C5 1C E3 E5 DC 62 0E FB
uid                            Jonathan M. Bresler <jmb@FreeBSD.ORG>
uid                            Jonathan M. Bresler
uid                            Jonathan M. Bresler <Jonathan.Bresler@USi.net>
uid                            Jonathan M. Bresler <jmb@Frb.GOV>
```

D.3.37 Antoine Brodin <`antoine@FreeBSD.org`>

```
pub   1024D/50CC2671 2008-02-03
      Key fingerprint = F3F7 72F0 9C4C 9E56 4BE9  44EA 1B80 31F3 50CC 2671
uid                  Antoine Brodin <antoine@FreeBSD.org>
sub   2048g/6F4AFBE5 2008-02-03
```

D.3.38 Diane Bruce <`db@FreeBSD.org`>

```
pub   2048R/8E9CAA7B 2012-05-16
      Key fingerprint = 8B08 E022 705D 0083 64C4  5E60 5148 0C74 8E9C AA7B
uid                  Diane Bruce <db@db.net>
uid                  Diane Bruce <db@FreeBSD.org>
sub   2048R/932E5985 2012-05-16
```

D.3.39 Christian Brüffer <`brueffer@FreeBSD.org`>

```
pub  1024D/A0ED982D 2002-10-14 Christian Brueffer <chris@unixpages.org>
     Key fingerprint = A5C8 2099 19FF AACA F41B  B29B 6C76 178C A0ED 982D
uid                            Christian Brueffer <brueffer@hitnet.rwth-aachen.de>
uid                            Christian Brueffer <brueffer@FreeBSD.org>
sub  4096g/1DCC100F 2002-10-14
```

D.3.40 Markus Brüffer <`markus@FreeBSD.org`>

```
pub   1024D/78F8A8D4 2002-10-21
      Key fingerprint = 3F9B EBE8 F290 E5CC 1447  8760 D48D 1072 78F8 A8D4
uid                  Markus Brueffer <markus@brueffer.de>
uid                  Markus Brueffer <buff@hitnet.rwth-aachen.de>
uid                  Markus Brueffer <mbrueffer@mi.rwth-aachen.de>
uid                  Markus Brueffer <markus@FreeBSD.org>
sub   4096g/B7E5C7B6 2002-10-21
```

D.3.41 Sean Bruno <`sbruno@FreeBSD.org`>

```
pub   2048R/9F4CBB4E 2011-10-19
      Key fingerprint = BD78 EB48 FD8C D981 D959  AAE9 BD94 1F06 9F4C BB4E
uid                  Sean Bruno (sbruno) <sbruno@freebsd.org>
sub   2048R/3A48F987 2011-10-19
```

D.3.42 Oleg Bulyzhin `<oleg@FreeBSD.org>`

```
pub   1024D/78CE105F 2004-02-06
      Key fingerprint = 98CC 3E66 26DE 50A8 DBC4  EB27 AF22 DCEF 78CE 105F
uid                  Oleg Bulyzhin <oleg@FreeBSD.org>
uid                  Oleg Bulyzhin <oleg@rinet.ru>
sub   1024g/F747C159 2004-02-06
```

D.3.43 Michael Bushkov `<bushman@FreeBSD.org>`

```
pub   1024D/F694C6E4 2007-03-11 [expires: 2008-03-10]
      Key fingerprint = 4278 4392 BF6B 2864 C48E  0FA9 7216 C73C F694 C6E4
uid                  Michael Bushkov <bushman@rsu.ru>
uid                  Michael Bushkov <bushman@freebsd.org>
sub   2048g/5A783997 2007-03-11 [expires: 2008-03-10]
```

D.3.44 Jayachandran C. `<jchandra@FreeBSD.org>`

```
pub   1024D/3316E465 2010-05-19
      Key fingerprint = 320B DB08 4FE3 BCFD 60AF  E4DB F486 015F 3316 E465
uid                  Jayachandran C. <jchandra@freebsd.org>
sub   2048g/1F7755F9 2010-05-19
```

D.3.45 Jesus R. Camou `<jcamou@FreeBSD.org>`

```
pub   1024D/C2161947 2005-03-01
      Key fingerprint = 274C B265 48EC 42AE A2CA  47D9 7D98 588A C216 1947
uid                  Jesus R. Camou <jcamou@FreeBSD.org>
sub   2048g/F8D2A8DF 2005-03-01
```

D.3.46 José Alonso Cárdenas Márquez `<acm@FreeBSD.org>`

```
pub   1024D/9B21BC19 2006-07-18
      Key fingerprint = 4156 2EAC A11C 9651 713B  3FC1 195F D4A8 9B21 BC19
uid                  Jose Alonso Cardenas Marquez <acm@FreeBSD.org>
sub   2048g/ADA16C52 2006-07-18
```

D.3.47 Pietro Cerutti `<gahr@FreeBSD.org>`

```
pub   1024D/9571F78E 2006-05-17
      Key fingerprint = 1203 92B5 3919 AF84 9B97  28D6 C0C2 6A98 9571 F78E
uid                  Pietro Cerutti <gahr@gahr.ch>
uid                  Pietro Cerutti (The FreeBSD Project) <gahr@FreeBSD.org>
sub   2048g/F24227D5 2006-05-17 [expires: 2011-05-16]
```

D.3.48 Dmitry Chagin <`dchagin@FreeBSD.org`>

```
pub   1024D/738EFCED 2009-02-27
      Key fingerprint = 3F3F 8B87 CE09 9E10 3606  6ACA D2DD 936F 738E FCED
uid                  Dmitry Chagin <dchagin@freebsd.org>
uid                  Dmitry Chagin (dchagin key) <chagin.dmitry@gmail.com>
sub   2048g/6A3FDFF9 2009-02-27
```

D.3.49 Hye-Shik Chang <`perky@FreeBSD.org`>

```
pub  1024D/CFDB4BA4 1999-04-23 Hye-Shik Chang <perky@FreeBSD.org>
     Key fingerprint = 09D9 57D6 58BA 44DD CAEC  71CD 0D65 2C59 CFDB 4BA4
uid                            Hye-Shik Chang <hyeshik@gmail.com>
sub  1024g/A94A8ED1 1999-04-23
```

D.3.50 Jonathan Chen <`jon@FreeBSD.org`>

```
pub  1024D/2539468B 1999-10-11 Jonathan Chen <jon@spock.org>
     Key fingerprint = EE31 CDA1 A105 C8C9 5365  3DB5 C2FC 86AA 2539 468B
uid                            Jonathan Chen <jon@freebsd.org>
uid                            Jonathan Chen <chenj@rpi.edu>
uid                            Jonathan Chen <spock@acm.rpi.edu>
uid                            Jonathan Chen <jon@cs.rpi.edu>
sub  3072g/B81EF1DB 1999-10-11
```

D.3.51 Jonathan Anderson <`jonathan@FreeBSD.org`>

```
pub   1024D/E3BBCA48 2006-06-17
      Key fingerprint = D7C6 9096 874F 707E 48F8  FAB7 22A6 6E53 E3BB CA48
uid                  Jonathan Anderson <jonathan@FreeBSD.org>
uid                  Jonathan Anderson <jonathan.anderson@ieee.org>
uid                  Jonathan Anderson <anderson@engr.mun.ca>
uid                  Jonathan Anderson <jonathan.anderson@mun.ca>
sub   2048g/A703650D 2006-06-17
```

D.3.52 Fukang Chen <`loader@FreeBSD.org`>

```
pub   1024D/40AB1752 2007-08-01 [expires: 2010-07-31]
      Key fingerprint = 98C4 6E6B 1C21 15E4 5042  01FC C7B7 E152 40AB 1752
uid                  loader <loader@FreeBSD.org>
sub   4096g/9E53A5C7 2007-08-01 [expires: 2010-07-31]
```

D.3.53 Luoqi Chen <`luoqi@FreeBSD.org`>

```
pub  1024D/2926F3BE 2002-02-22 Luoqi Chen <luoqi@FreeBSD.org>
     Key fingerprint = B470 A815 5917 D9F4 37F3  CE2A 4D75 3BD1 2926 F3BE
uid                            Luoqi Chen <luoqi@bricore.com>
uid                            Luoqi Chen <lchen@onetta.com>
sub  1024g/5446EB72 2002-02-22
```

D.3.54 Andrey A. Chernov <`ache@FreeBSD.org`>

```
pub   1024D/964474DD 2006-12-26
      Key fingerprint = 0F63 1B61 D76D AA23 1591  EA09 560E 582B 9644 74DD
uid                  Andrey Chernov <ache@freebsd.org>
uid                  [jpeg image of size 4092]
sub   2048g/08331894 2006-12-26
```

D.3.55 Alexander V. Chernikov <`melifaro@FreeBSD.org`>

```
pub   1024D/2675AB69 2008-02-17
      Key fingerprint = 00D2 E063 2FB0 2990 C602  50FD C1C2 7889 2675 AB69
uid                  Alexander V. Chernikov <melifaro@yandex-team.ru>
uid                  Alexander V. Chernikov <melifaro@ipfw.ru>
uid                  Alexander V. Chernikov <melifaro@freebsd.org>
sub   4096g/BC64F40C 2008-02-17
```

D.3.56 Sean Chittenden <`seanc@FreeBSD.org`>

```
pub  1024D/EE278A28 2004-02-08 Sean Chittenden <sean@chittenden.org>
     Key fingerprint = E41F F441 7E91 6CBA 1844  65CF B939 3C78 EE27 8A28
sub  2048g/55321853 2004-02-08
```

D.3.57 Junho CHOI <`cjh@FreeBSD.org`>

```
pub  1024D/E60260F5 2002-10-14 CHOI Junho (Work) <cjh@wdb.co.kr>
     Key fingerprint = 1369 7374 A45F F41A F3C0  07E3 4A01 C020 E602 60F5
uid                            CHOI Junho (Personal) <cjh@kr.FreeBSD.org>
uid                            CHOI Junho (FreeBSD) <cjh@FreeBSD.org>
sub  1024g/04A4FDD8 2002-10-14
```

D.3.58 Crist J. Clark <`cjc@FreeBSD.org`>

```
pub  1024D/FE886AD3 2002-01-25 Crist J. Clark <cjclark@jhu.edu>
     Key fingerprint = F04E CCD7 3834 72C2 707F  0A8F 259F 8F4B FE88 6AD3
uid                            Crist J. Clark <cjclark@alum.mit.edu>
uid                            Crist J. Clark <cjc@freebsd.org>
sub  1024g/9B6BAB99 2002-01-25
```

D.3.59 Joe Marcus Clarke <`marcus@FreeBSD.org`>

```
pub  1024D/FE14CF87 2002-03-04 Joe Marcus Clarke (FreeBSD committer address) <marcus@FreeBSD.org>
     Key fingerprint = CC89 6407 73CC 0286 28E4  AFB9 6F68 8F8A FE14 CF87
uid                            Joe Marcus Clarke <marcus@marcuscom.com>
sub  1024g/B9ACE4D2 2002-03-04
```

D.3.60 Nik Clayton <`nik@FreeBSD.org`>

```
pub  1024D/2C37E375 2000-11-09 Nik Clayton <nik@freebsd.org>
     Key fingerprint = 15B8 3FFC DDB4 34B0 AA5F  94B7 93A8 0764 2C37 E375
uid                            Nik Clayton <nik@slashdot.org>
uid                            Nik Clayton <nik@crf-consulting.co.uk>
uid                            Nik Clayton <nik@ngo.org.uk>
uid                            Nik Clayton <nik@bsdi.com>
sub  1024g/769E298A 2000-11-09
```

D.3.61 Benjamin Close <`benjsc@FreeBSD.org`>

```
pub   1024D/4842B5B4 2002-04-10
      Key fingerprint = F00D C83D 5F7E 5561 DF91  B74D E602 CAA3 4842 B5B4
uid                  Benjamin Simon Close <Benjamin.Close@clearchain.com>
uid                  Benjamin Simon Close <benjsc@FreeBSD.org>
uid                  Benjamin Simon Close <benjsc@clearchain.com>
sub   2048g/3FA8A57E 2002-04-10
```

D.3.62 Tijl Coosemans <`tijl@FreeBSD.org`>

```
pub   2048D/20A0B62B 2010-07-13
      Key fingerprint = 39AA F580 6B44 5161 9F86  ED49 7E80 92D8 20A0 B62B
uid                  Tijl Coosemans <tijl@coosemans.org>
uid                  Tijl Coosemans <tijl@freebsd.org>
sub   2048g/7D71BA74 2010-07-13
```

D.3.63 Raphael Kubo da Costa <`rakuco@FreeBSD.org`>

```
pub   4096R/18DCEED6 2011-10-03
      Key fingerprint = 6911 54FE BA6E 6106 5789  7099 8DD0 7D21 18DC EED6
uid                  Raphael Kubo da Costa (Personal key) <rakuco@FreeBSD.org>
```

D.3.64 Bruce Cran <`brucec@FreeBSD.org`>

```
pub   2048R/6AF6F99E 2010-01-29
      Key fingerprint = 9A3C AE57 2706 B0E3 4B8A  8374 5787 A72B 6AF6 F99E
uid                  Bruce Cran <brucec@FreeBSD.org>
uid                  Bruce Cran <bruce@cran.org.uk>
sub   2048R/1D665CEE 2010-01-29
```

D.3.65 Frederic Culot <`culot@FreeBSD.org`>

```
pub   1024D/34876C5B 2006-08-26
      Key fingerprint = 50EE CE94 E43E BA85 CB67  262B B739 1A26 3487 6C5B
uid                  Frederic Culot <culot@FreeBSD.org>
uid                  Frederic Culot <frederic@culot.org>
sub   2048g/F1EF901F 2006-08-26
```

D.3.66 Aaron Dalton <`aaron@FreeBSD.org`>

```
pub   1024D/8811D2A4 2006-06-21 [expires: 2011-06-20]
      Key fingerprint = 8DE0 3CBB 3692 992F 53EF  ACC7 BE56 0A4D 8811 D2A4
uid                  Aaron Dalton <aaron@freebsd.org>
sub   2048g/304EE8E5 2006-06-21 [expires: 2011-06-20]
```

D.3.67 Baptiste Daroussin <`bapt@FreeBSD.org`>

```
pub   1024D/49A4E84C 2008-11-19
      Key fingerprint = A14B A5FC B860 86DE 73E2  B24C F244 ED31 49A4 E84C
uid                  Baptiste Daroussin <bapt@etoilebsd.net>
uid                  Baptiste Daroussin <baptiste.daroussin@gmail.com>
uid                  Baptiste Daroussin <bapt@FreeBSD.org>
sub   2048g/54AB46B4 2008-11-19
```

D.3.68 Ceri Davies <`ceri@FreeBSD.org`>

```
pub   1024D/34B7245F 2002-03-08
      Key fingerprint = 9C88 EB05 A908 1058 A4AE  9959 A1C7 DCC1 34B7 245F
uid                  Ceri Davies <ceri@submonkey.net>
uid                  Ceri Davies <ceri@FreeBSD.org>
uid                  Ceri Davies <ceri@opensolaris.org>
sub   1024g/0C482CBC 2002-03-08
```

D.3.69 Brad Davis <`brd@FreeBSD.org`>

```
pub   1024D/ED0A754D 2005-05-14 [expires: 2014-02-21]
      Key fingerprint = 5DFD D1A6 BEEE A6D4 B3F5  4236 D362 3291 ED0A 754D
uid                  Brad Davis <so14k@so14k.com>
uid                  Brad Davis <brd@FreeBSD.org>
sub   2048g/1F29D404 2005-05-14 [expires: 2014-02-21]
```

D.3.70 Pawel Jakub Dawidek <`pjd@FreeBSD.org`>

```
pub  1024D/B1293F34 2004-02-02 Pawel Jakub Dawidek <Pawel@Dawidek.net>
     Key fingerprint = A3A3 5B4D 9CF9 2312 0783  1B1D 168A EF5D B129 3F34
uid                            Pawel Jakub Dawidek <pjd@FreeBSD.org>
uid                            Pawel Jakub Dawidek <pjd@FreeBSD.pl>
sub  2048g/3EEC50A7 2004-02-02 [expires: 2006-02-01]
```

D.3.71 Brian S. Dean <`bsd@FreeBSD.org`>

```
pub  1024D/723BDEE9 2002-01-23 Brian S. Dean <bsd@FreeBSD.org>
     Key fingerprint = EF49 7ABE 47ED 91B3 FC3D  7EA5 4D90 2FF7 723B DEE9
sub  1024g/4B02F876 2002-01-23
```

D.3.72 Vasil Dimov <`vd@FreeBSD.org`>

```
pub   1024D/F6C1A420 2004-12-08
      Key fingerprint = B1D5 04C6 26CC 0D20 9525  14B8 170E 923F F6C1 A420
uid                  Vasil Dimov <vd@FreeBSD.org>
uid                  Vasil Dimov <vd@datamax.bg>
sub   4096g/A0148C94 2004-12-08
```

D.3.73 Roman Divacky <`rdivacky@FreeBSD.org`>

```
pub   1024D/3DC2044C 2006-11-15
      Key fingerprint = 6B61 25CA 49BC AAC5 21A9  FA7A 2D51 23E8 3DC2 044C
uid                  Roman Divacky <rdivacky@freebsd.org>
sub   2048g/39BDCE16 2006-11-15
```

D.3.74 Alexey Dokuchaev <`danfe@FreeBSD.org`>

```
pub  1024D/3C060B44 2004-08-23 Alexey Dokuchaev <danfe@FreeBSD.org>
     Key fingerprint = D970 08A4 922C 8D63 0C19  8D27 F421 76EE 3C06 0B44
sub  1024g/70BAE967 2004-08-23
```

D.3.75 Dima Dorfman <`dd@FreeBSD.org`>

```
pub   1024D/69FAE582 2001-09-04
      Key fingerprint = B340 8338 7DA3 4D61 7632  098E 0730 055B 69FA E582
uid                  Dima Dorfman <dima@trit.org>
uid                  Dima Dorfman <dima@unixfreak.org>
uid                  Dima Dorfman <dd@freebsd.org>
sub   2048g/65AF3B89 2003-08-19 [expires: 2005-08-18]
sub   2048g/8DB0CF2C 2005-05-29 [expires: 2007-05-29]
```

D.3.76 Olivier Duchateau <`olivierd@FreeBSD.org`>

```
pub   2048R/22431859 2012-05-28 [expires: 2017-05-27]
      Key fingerprint = C057 112A 4A27 B5F2 CD8F  6C9A FC5A 0167 2243 1859
uid                  Olivier Duchateau <duchateau.olivier@gmail.com>
sub   2048R/63A85BDF 2012-05-28 [expires: 2017-05-27]
```

D.3.77 Bruno Ducrot <`bruno@FreeBSD.org`>

```
pub   1024D/7F463187 2000-12-29
      Key fingerprint = 7B79 E1D6 F5A1 6614 792F  D906 899B 4D28 7F46 3187
uid                  Ducrot Bruno (Poup Master) <ducrot@poupinou.org>
sub   1024g/40282874 2000-12-29
```

D.3.78 Alex Dupre <`ale@FreeBSD.org`>

```
pub  1024D/CE5F554D 1999-06-27 Alex Dupre <sysadmin@alexdupre.com>
     Key fingerprint = DE23 02EA 5927 D5A9 D793  2BA2 8115 E9D8 CE5F 554D
uid                            Alex Dupre <ale@FreeBSD.org>
uid                            [jpeg image of size 5544]
uid                            Alex Dupre <ICQ:5431856>
sub  2048g/FD5E2D21 1999-06-27
```

D.3.79 Peter Edwards <`peadar@FreeBSD.org`>

```
pub  1024D/D80B4B3F 2004-03-01 Peter Edwards <peadar@FreeBSD.org>
     Key fingerprint = 7A8A 9756 903E BEF2 4D9E  3C94 EE52 52F7 D80B 4B3F
uid                            Peter Edwards <pmedwards@eircom.net>
```

D.3.80 Josef El-Rayes <`josef@FreeBSD.org`>

```
pub  2048R/A79DB53C 2004-01-04 Josef El-Rayes <josef@FreeBSD.org>
     Key fingerprint = 58EB F5B7 2AB9 37FE 33C8  716B 59C5 22D9 A79D B53C
uid                            Josef El-Rayes <josef@daemon.li>
```

D.3.81 Lars Engels <`lme@FreeBSD.org`>

```
pub   1024D/C0F769F8 2004-08-27
      Key fingerprint = 17FC 08E1 5E09 BD21 489E  2050 29CE 75DA C0F7 69F8
uid                  Lars Engels <lars.engels@0x20.net>
sub   1024g/8AD5BF9D 2004-08-27
```

D.3.82 Udo Erdelhoff <`ue@FreeBSD.org`>

```
pub  1024R/E74FA871 1994-07-19 Udo Erdelhoff <uer@de.uu.net>
     Key fingerprint = 8C B1 80 CA 2C 52 73 81  FB A7 B4 03 C5 32 C8 67
uid                            Udo Erdelhoff <ue@nathan.ruhr.de>
uid                            Udo Erdelhoff <ue@freebsd.org>
uid                            Udo Erdelhoff <uerdelho@eu.uu.net>
uid                            Udo Erdelhoff <uerdelho@uu.net>
```

D.3.83 Ruslan Ermilov <`ru@FreeBSD.org`>

```
pub  1024D/996E145E 2004-06-02 Ruslan Ermilov (FreeBSD) <ru@FreeBSD.org>
     Key fingerprint = 274E D201 71ED 11F6 9CCB  0194 A917 E9CC 996E 145E
uid                            Ruslan Ermilov (FreeBSD Ukraine) <ru@FreeBSD.org.ua>
uid                            Ruslan Ermilov (IPNet) <ru@ip.net.ua>
sub  1024g/557E3390 2004-06-02 [expires: 2007-06-02]
```

D.3.84 Lukas Ertl <`le@FreeBSD.org`>

```
pub  1024D/F10D06CB 2000-11-23 Lukas Ertl <le@FreeBSD.org>
     Key fingerprint = 20CD C5B3 3A1D 974E 065A  B524 5588 79A9 F10D 06CB
uid                            Lukas Ertl <a9404849@unet.univie.ac.at>
uid                            Lukas Ertl <l.ertl@univie.ac.at>
uid                            Lukas Ertl <le@univie.ac.at>
sub  1024g/5960CE8E 2000-11-23
```

D.3.85 Brendan Fabeny <`bf@FreeBSD.org`>

```
pub   2048R/9806EBC1 2010-06-08 [expires: 2012-06-07]
      Key fingerprint = 2075 ADD3 7634 A4F9 5357  D934 08E7 06D9 9806 EBC1
uid                  b. f. <bf@freebsd.org>
sub   2048R/1CD0AD79 2010-06-08 [expires: 2012-06-07]
```

D.3.86 Guido Falsi <`madpilot@FreeBSD.org`>

```
pub   2048R/56CBD293 2012-04-12
      Key fingerprint = F317 2057 E17E 4E3A 3DA5  9E1D 1AE6 860E 56CB D293
uid                  Guido Falsi <madpilot@FreeBSD.org>
uid                  Guido Falsi <mad@madpilot.net>
sub   2048R/1F9772C5 2012-04-12
```

D.3.87 Rong-En Fan <`rafan@FreeBSD.org`>

```
pub   1024D/86FD8C68 2004-06-04
      Key fingerprint = DC9E 5B4D 2DDA D5C7 B6F8  6E69 D78E 1091 86FD 8C68
uid                  Rong-En Fan <rafan@infor.org>
uid                  Rong-En Fan <rafan@csie.org>
uid                  Rong-En Fan <rafan@FreeBSD.org>
sub   2048g/42A8637E 2009-01-25 [expires: 2012-07-08]
```

D.3.88 Stefan Farfeleder <`stefanf@FreeBSD.org`>

```
pub  1024D/8BEFD15F 2004-03-14 Stefan Farfeleder <stefan@fafoe.narf.at>
     Key fingerprint = 4220 FE60 A4A1 A490 5213  27A6 319F 8B28 8BEF D15F
uid                            Stefan Farfeleder <stefanf@complang.tuwien.ac.at>
uid                            Stefan Farfeleder <stefanf@FreeBSD.org>
uid                            Stefan Farfeleder <stefanf@ten15.org>
sub  2048g/418753E9 2004-03-14 [expires: 2007-03-14]
```

D.3.89 Babak Farrokhi <`farrokhi@FreeBSD.org`>

```
pub   1024D/7C810476 2005-12-22
      Key fingerprint = AABD 388F A207 58B4 2EE3  5DFD 4FC1 32C3 7C81 0476
uid                  Babak Farrokhi <farrokhi@FreeBSD.org>
uid                  Babak Farrokhi <babak@farrokhi.net>
sub   2048g/2A5F93C7 2005-12-22
```

D.3.90 Chris D. Faulhaber <`jedgar@FreeBSD.org`>

```
pub  1024D/FE817A50 2000-12-20 Chris D. Faulhaber <jedgar@FreeBSD.org>
     Key fingerprint = A47D A838 9216 F921 A456  54FF 39B6 86E0 FE81 7A50
uid                            Chris D. Faulhaber <jedgar@fxp.org>
sub  2048g/93452698 2000-12-20
```

D.3.91 Brian F. Feldman <`green@FreeBSD.org`>

```
pub  1024D/41C13DE3 2000-01-11 Brian Fundakowski Feldman <green@FreeBSD.org>
     Key fingerprint = 6A32 733A 1BF6 E07B 5B8D  AE14 CC9D DCA2 41C1 3DE3
sub  1024g/A98B9FCC 2000-01-11 [expires: 2001-01-10]

pub  1024D/773905D6 2000-09-02 Brian Fundakowski Feldman <green@FreeBSD.org>
     Key fingerprint = FE23 7481 91EA 5E58 45EA  6A01 B552 B043 7739 05D6
sub  2048g/D2009B98 2000-09-02
```

D.3.92 Mário Sérgio Fujikawa Ferreira <`lioux@FreeBSD.org`>

```
pub   1024D/75A63712 2006-02-23 [expires: 2007-02-23]
      Key fingerprint = 42F2 2F74 8EF9 5296 898F  C981 E9CF 463B 75A6 3712
uid                  Mario Sergio Fujikawa Ferreira (lioux) <lioux@FreeBSD.org>
uid                  Mario Sergio Fujikawa Ferreira <lioux@uol.com.br>
sub   4096g/BB7D80F2 2006-02-23 [expires: 2007-02-23]
```

D.3.93 Tony Finch <`fanf@FreeBSD.org`>

```
pub  1024D/84C71B6E 2002-05-03 Tony Finch <dot@dotat.at>
     Key fingerprint = 199C F25B 2679 6D04 63C5  2159 FFC0 F14C 84C7 1B6E
uid                            Tony Finch <fanf@FreeBSD.org>
uid                            Tony Finch <fanf@apache.org>
uid                            Tony Finch <fanf2@cam.ac.uk>
sub  2048g/FD101E8B 2002-05-03
```

D.3.94 Marc Fonvieille <`blackend@FreeBSD.org`>

```
pub  1024D/4F8E74E8 2004-12-25 Marc Fonvieille <blackend@FreeBSD.org>
     Key fingerprint = 55D3 4883 4A04 828A A139  A5CF CD0F 51C0 4F8E 74E8
uid                            Marc Fonvieille <marc@blackend.org>
uid                            Marc Fonvieille <marc@freebsd-fr.org>
sub  1024g/37AD4E7D 2004-12-25
```

D.3.95 Pete Fritchman <`petef@FreeBSD.org`>

```
pub  1024D/74B91CFD 2001-01-30 Pete Fritchman <petef@FreeBSD.org>
     Key fingerprint = 9A9F 8A13 DB0D 7777 8D8E  1CB2 C5C9 A08F 74B9 1CFD
uid                            Pete Fritchman <petef@databits.net>
uid                            Pete Fritchman <petef@csh.rit.edu>
sub  1024g/0C02AF0C 2001-01-30
```

D.3.96 Bernhard Fröhlich <`decke@FreeBSD.org`>

```
pub   1024D/CF5840D4 2008-01-07 [expires: 2015-05-05]
      Key fingerprint = 47F6 BDF1 DF9E 81E2 2C54  8A06 E796 7A5A CF58 40D4
uid                  Bernhard Fröhlich <decke@FreeBSD.org>
uid                  Bernhard Fröhlich <decke@bluelife.at>
sub   2048g/4E51CE79 2008-01-07
```

D.3.97 Bill Fumerola <`billf@FreeBSD.org`>

```
pub  1024D/7F868268 2000-12-07 Bill Fumerola (FreeBSD Developer) <billf@FreeBSD.org>
     Key fingerprint = 5B2D 908E 4C2B F253 DAEB  FC01 8436 B70B 7F86 8268
uid                            Bill Fumerola (Security Yahoo) <fumerola@yahoo-inc.com>
sub  1024g/43980DA9 2000-12-07
```

D.3.98 Andriy Gapon <`avg@FreeBSD.org`>

```
pub   2048R/A651FE2F 2009-02-16
      Key fingerprint = F234 4D58 DEFF 5E3A 4E0F  13BC 74A5 2D27 A651 FE2F
uid                  Andriy Gapon (FreeBSD) <avg@FreeBSD.org>
uid                  Andriy Gapon (FreeBSD) <avg@freebsd.org>
uid                  Andriy Gapon (FreeBSD) <avg@icyb.net.ua>
sub   4096R/F9A4D312 2009-02-16
```

D.3.99 Beat Gätzi <`beat@FreeBSD.org`>

```
pub   1024D/774249DB 2009-01-28 [expires: 2014-01-27]
      Key fingerprint = C410 3187 5B29 DD02 745F  0890 40C5 BCF7 7742 49DB
uid                  Beat Gaetzi <beat@FreeBSD.org>
sub   2048g/173CFFCA 2009-01-28 [expires: 2014-01-27]
```

D.3.100 Daniel Geržo <`danger@FreeBSD.org`>

```
pub   1024D/DA913352 2007-08-30 [expires: 2008-08-29]
      Key fingerprint = 7372 3F15 F839 AFF5 4052  CAC7 1ADA C204 DA91 3352
uid                  Daniel Gerzo <gerzo@rulez.sk>
uid                  Daniel Gerzo <danger@rulez.sk>
uid                  Daniel Gerzo (The FreeBSD Project) <danger@FreeBSD.org>
uid                  Daniel Gerzo (Micronet, a.s.) <gerzo@micronet.sk>
sub   2048g/C5D57BDC 2007-08-30 [expires: 2008-08-29]
```

D.3.101 Justin T. Gibbs <`gibbs@FreeBSD.org`>

```
pub   2048R/45A4FC2F 2012-02-10
      Key fingerprint = B98A C3AB 412B 094B D6FE  E713 FA5A 1E30 45A4 FC2F
uid                  Justin T. Gibbs <gibbs@FreeBSD.org>
uid                  Justin T. Gibbs <gibbs@FreeBSDFoundation.org>
uid                  Justin T. Gibbs <gibbs@scsiguy.com>
sub   2048R/AF6927F8 2012-02-10
```

D.3.102 Pedro Giffuni <`pfg@FreeBSD.org`>

```
pub   2048D/422BDFE4 2011-12-06
      Key fingerprint = A12B 7C6B 54C0 921B C64F  7B35 58DF 6813 422B DFE4
uid                  Pedro Giffuni (FreeBSD key signature) <pfg@FreeBSD.org>
sub   2048g/43A91DE0 2011-12-06
```

D.3.103 Philip M. Gollucci <`pgollucci@FreeBSD.org`>

```
pub   1024D/DB9B8C1C 2008-04-15
      Key fingerprint = B90B FBC3 A3A1 C71A 8E70  3F8C 75B8 8FFB DB9B 8C1C
uid                  Philip M. Gollucci (FreeBSD Foundation) <pgollucci@freebsd.org>
uid                  Philip M. Gollucci (Riderway Inc.) <pgollucci@riderway.com>
uid                  Philip M. Gollucci <pgollucci@p6m7g8.com>
uid                  Philip M. Gollucci (ASF) <pgollucci@apache.org>
sub   2048g/73943732 2008-04-15
```

D.3.104 Daichi GOTO <`daichi@FreeBSD.org`>

```
pub  1024D/09EBADD6 2002-09-25 Daichi GOTO <daichi@freebsd.org>
     Key fingerprint = 620A 9A34 57FB 5E93 0828  28C7 C360 C6ED 09EB ADD6
sub  1024g/F0B1F1CA 2002-09-25
```

D.3.105 Marcus Alves Grando <`mnag@FreeBSD.org`>

```
pub   1024D/CDCC273F 2005-09-15 [expires: 2010-09-14]
      Key fingerprint = 57F9 DEC1 5BBF 06DE 44A5  9A4A 8BEE 5F3A CDCC 273F
uid                  Marcus Alves Grando <marcus@sbh.eng.br>
uid                  Marcus Alves Grando <marcus@corp.grupos.com.br>
uid                  Marcus Alves Grando <mnag@FreeBSD.org>
sub   2048g/698AC00C 2005-09-15 [expires: 2010-09-14]
```

D.3.106 Peter Grehan <`grehan@FreeBSD.org`>

```
pub  1024D/EA45EA7D 2004-07-13 Peter Grehan <grehan@freebsd.org>
     Key fingerprint = 84AD 73DC 370E 15CA 7556  43C8 F5C8 4450 EA45 EA7D
sub  2048g/0E122D70 2004-07-13
```

D.3.107 Jamie Gritton <`jamie@FreeBSD.org`>

```
pub   1024D/8832CB7F 2009-01-29
      Key fingerprint = 34F8 1E62 C7A5 7CB9 A91F  7864 8C5A F85E 8832 CB7F
uid                  James Gritton <jamie@FreeBSD.org>
sub   2048g/94E3594D 2009-01-29
```

D.3.108 John-Mark Gurney <`jmg@FreeBSD.org`>

```
pub  1024R/3F9951F5 1997-02-11 John-Mark Gurney <johnmark@gladstone.uoregon.edu>
     Key fingerprint = B7 EC EF F8 AE ED A7 31  96 7A 22 B3 D8 56 36 F4
uid                            John-Mark Gurney <gurney_j@efn.org>
uid                            John-Mark Gurney <jmg@cs.uoregon.edu>
uid                            John-Mark Gurney <gurney_j@resnet.uoregon.edu>
```

D.3.109 Mateusz Guzik <`mjg@FreeBSD.org`>

```
pub   2048R/21489259 2012-06-03
      Key fingerprint = 3A9F 25FF ABF6 BB23 5C70  C61B 96D3 5178 2148 9259
uid                  Mateusz Guzik <mjg@freebsd.org>
sub   2048R/EA19FE8D 2012-06-03
```

D.3.110 Daniel Harris <`dannyboy@FreeBSD.org`>

```
pub  1024D/84D0D7E7 2001-01-15 Daniel Harris <dannyboy@worksforfood.com>
     Key fingerprint = 3C61 B8A1 3F09 D194 3259  7173 6C63 DA04 84D0 D7E7
uid                            Daniel Harris <dannyboy@freebsd.org>
uid                            Daniel Harris <dh@askdh.com>
uid                            Daniel Harris <dh@wordassault.com>
sub  1024g/9DF0231A 2001-01-15
```

D.3.111 Daniel Hartmeier <`dhartmei@FreeBSD.org`>

```
pub  1024R/6A3A7409 1994-08-15 Daniel Hartmeier <dhartmei@freebsd.org>
     Key fingerprint = 13 7E 9A F3 36 82 09 FE  FD 57 B8 5C 2B 81 7E 1F
```

D.3.112 Olli Hauer <`ohauer@FreeBSD.org`>

```
pub   2048R/5D008F1A 2010-07-26
      Key fingerprint = E9EE C9A5 EB4C BD29 74D7  9178 E56E 06B3 5D00 8F1A
uid                  olli hauer <ohauer@FreeBSD.org>
uid                  olli hauer <ohauer@gmx.de>
sub   2048R/5E25776E 2010-07-26
```

D.3.113 Emanuel Haupt <`ehaupt@FreeBSD.org`>

```
pub   2048R/C06D09BE 2010-09-24 [expires: 2011-09-24]
      Key fingerprint = CC88 5081 78D1 39C3 B467  865A 348E F6CC C06D 09BE
uid                  Emanuel Haupt <ehaupt@FreeBSD.org>
sub   2048R/F658659F 2010-09-24 [expires: 2011-09-24]
```

D.3.114 John Hay <`jhay@FreeBSD.org`>

```
pub  2048R/A9275B93 2000-05-10 John Hay <jhay@icomtek.csir.co.za>
     Key fingerprint = E7 95 F4 B9 D4 A7 49 6A  83 B9 77 49 28 9E 37 70
uid                            John Hay <jhay@mikom.csir.co.za>
uid                            Thawte Freemail Member <jhay@mikom.csir.co.za>
uid                            John Hay <jhay@csir.co.za>
uid                            John Hay <jhay@FreeBSD.ORG>
```

D.3.115 Sheldon Hearn <`sheldonh@FreeBSD.org`>

```
pub  1024D/74A06ACD 2002-06-20 Sheldon Hearn <sheldonh@starjuice.net>
     Key fingerprint = 01A3 EF91 9C5A 3633 4E01  8085 A462 57F1 74A0 6ACD
sub  1536g/C42F8AC8 2002-06-20
```

D.3.116 Mike Heffner <`mikeh@FreeBSD.org`>

```
pub  1024D/CDECBF99 2001-02-02 Michael Heffner <mheffner@novacoxmail.com>
     Key fingerprint = AFAB CCEB 68C7 573F 5110  9285 1689 1942 CDEC BF99
uid                            Michael Heffner <mheffner@vt.edu>
uid                            Michael Heffner <mikeh@FreeBSD.org>
uid                            Michael Heffner <spock@techfour.net>
uid                            Michael Heffner (ACM sysadmin) <mheffner@acm.vt.edu>
sub  1024g/3FE83FB5 2001-02-02
```

D.3.117 Martin Heinen <mheinen@FreeBSD.org>

```
pub  1024D/116C5C85 2002-06-17 Martin Heinen <mheinen@freebsd.org>
     Key fingerprint = C898 3FCD EEA0 17ED BEA9  564D E5A6 AFF2 116C 5C85
uid                            Martin Heinen <martin@sumuk.de>
sub  1024g/EA67506B 2002-06-17
```

D.3.118 Niels Heinen <niels@FreeBSD.org>

```
pub  1024D/5FE39B80 2004-12-06 Niels Heinen <niels.heinen@ubizen.com>
     Key fingerprint = 75D8 4100 CF5B 3280 543F  930C 613E 71AA 5FE3 9B80
uid                            Niels Heinen <niels@defaced.be>
uid                            Niels Heinen <niels@heinen.ws>
uid                            Niels Heinen <niels@FreeBSD.org>
sub  2048g/057F4DA7 2004-12-06
```

D.3.119 Jaakko Heinonen <jh@FreeBSD.org>

```
pub   1024D/53CCB781 2009-10-01 [expires: 2014-09-30]
      Key fingerprint = 3AED A2B6 B63D D771 1AFD  25FA DFDF 5B89 53CC B781
uid                  Jaakko Heinonen (FreeBSD) <jh@FreeBSD.org>
sub   4096g/BB97397E 2009-10-01 [expires: 2014-09-30]
```

D.3.120 Jason Helfman <jgh@FreeBSD.org>

```
pub   2048R/4150D3DC 2011-12-18 [expires: 2021-12-15]
      Key fingerprint = 8E0D C457 9A0F C91C 23F3  0454 2059 9A63 4150 D3DC
uid                  Jason Helfman <jgh@FreeBSD.org>
sub   2048R/695B1B92 2011-12-18 [expires: 2021-12-15]
```

D.3.121 Guy Helmer <ghelmer@FreeBSD.org>

```
pub   2048R/8F1CEBC4 2012-05-22
      Key fingerprint = 483E 9E6C C644 2520 C9FE  4E87 9989 CCAF 8F1C EBC4
uid                  Guy Helmer <guy.helmer@palisadesystems.com>
uid                  Guy Helmer <guy.helmer@gmail.com>
uid                  Guy Helmer <ghelmer@freebsd.org>
sub   2048R/2073E3F8 2012-05-22

pub  1024R/35F4ED2D 1997-01-26 Guy G. Helmer <ghelmer@freebsd.org>
     Key fingerprint = A2 59 4B 92 02 5B 9E B1  B9 4E 2E 03 29 D5 DC 3A
uid                            Guy G. Helmer <ghelmer@cs.iastate.edu>
uid                            Guy G. Helmer <ghelmer@palisadesys.com>
```

D.3.122 Maxime Henrion <`mux@FreeBSD.org`>

```
pub  1024D/881D4806 2003-01-09 Maxime Henrion <mux@FreeBSD.org>
     Key fingerprint = 81F1 BE2D 12F1 184A 77E4  ACD0 5563 7614 881D 4806
sub  2048g/D0B510C0 2003-01-09
```

D.3.123 Dennis Herrmann <`dhn@FreeBSD.org`>

```
pub   1024D/65181EA0 2008-09-07 [expires: 2009-03-06]
      Key fingerprint = D4DB A438 EB5E 1B26 C782  F969 820B 66B3 6518 1EA0
uid                  Dennis Herrmann (Vi veri universum vivus vici) <adox@mcx2.org>
sub   4096g/C003C5DD 2008-09-07 [expires: 2009-03-06]
```

D.3.124 Justin Hibbits <`jhibbits@FreeBSD.org`>

```
pub   2048R/37BE2DB9 2011-12-01
      Key fingerprint = 8A12 7064 4F3D 339A 191D  AD52 30C7 858E 37BE 2DB9
uid                  Justin Hibbits <chmeeedalf@gmail.com>
uid                  Justin Hibbits <jhibbits@freebsd.org>
uid                  Justin Hibbits <jrh29@alumni.cwru.edu>
sub   2048R/A8DA156F 2011-12-01
```

D.3.125 Peter Holm <`pho@FreeBSD.org`>

```
pub   1024D/CF244E81 2008-11-17
      Key fingerprint = BE9B 32D8 89F1 F285 00E4  E4C5 EF3F B4B5 CF24 4E81
uid                  Peter Holm <pho@FreeBSD.org>
sub   2048g/E20A409F 2008-11-17
```

D.3.126 Michael L. Hostbaek <`mich@FreeBSD.org`>

```
pub  1024D/0F55F6BE 2001-08-07 Michael L. Hostbaek <mich@freebsdcluster.org>
     Key fingerprint = 4D62 9396 B19F 38D3 5C99  1663 7B0A 5212 0F55 F6BE
uid                            Michael L. Hostbaek <mich@freebsdcluster.dk>
uid                            Michael L. Hostbaek <mich@icommerce-france.com>
uid                            Micahel L. Hostbaek <mich@freebsd.dk>
uid                            Michael L. Hostbaek <mich@the-lab.org>
uid                            Michael L. Hostbaek <mich@freebsd.org>
sub  1024g/8BE4E30F 2001-08-07
```

D.3.127 Po-Chuan Hsieh <`sunpoet@FreeBSD.org`>

```
pub   4096R/CC57E36B 2010-09-21
      Key fingerprint = 8AD8 68F2 7D2B 0A10 7E9B  8CC0 DC44 247E CC57 E36B
uid                  Po-Chuan Hsieh (FreeBSD) <sunpoet@FreeBSD.org>
uid                  Po-Chuan Hsieh (sunpoet) <sunpoet@sunpoet.net>
sub   4096R/ADE9E203 2010-09-21
```

D.3.128 Li-Wen Hsu <`lwhsu@FreeBSD.org`>

```
pub   1024D/2897B228 2005-01-16
      Key fingerprint = B6F7 170A 6DC6 5D1A BD4B  D86A 416B 0E39 2897 B228
uid                  Li-wen Hsu <lwhsu@lwhsu.org>
uid                  Li-wen Hsu <lwhsu@lwhsu.ckefgisc.org>
uid                  Li-wen Hsu <lwhsu@lwhsu.csie.net>
uid                  Li-wen Hsu <lwhsu@ckefgisc.org>
uid                  Li-wen Hsu <lwhsu@csie.nctu.edu.tw>
uid                  Li-wen Hsu <lwhsu@ccca.nctu.edu.tw>
uid                  Li-wen Hsu <lwhsu@iis.sinica.edu.tw>
uid                  Li-wen Hsu <lwhsu@cs.nctu.edu.tw>
uid                  Li-Wen Hsu <lwhsu@FreeBSD.org>
sub   2048g/16F82238 2005-01-16
```

D.3.129 Howard F. Hu <`foxfair@FreeBSD.org`>

```
pub  1024D/4E9BCA59 2003-09-01 Foxfair Hu <foxfair@FreeBSD.org>
     Key fingerprint = 280C A846 CA1B CAC9 DDCF  F4CB D553 4BD5 4E9B CA59
uid                            Foxfair Hu <foxfair@drago.fomokka.net>
uid                            Howard Hu <howardhu@yahoo-inc.com>
sub  1024g/3356D8C1 2003-09-01
```

D.3.130 Chin-San Huang <`chinsan@FreeBSD.org`>

```
pub   1024D/350EECFA 2006-10-04
      Key fingerprint = 1C4D 0C9E 0E68 DB74 0688  CE43 D2A5 3F82 350E ECFA
uid                  Chin-San Huang (lab) <chinsan@chinsan2.twbbs.org>
uid                  Chin-San Huang (FreeBSD committer) <chinsan@FreeBSD.org>
uid                  Chin-San Huang (Gmail) <chinsan.tw@gmail.com>
sub   2048g/35F75A30 2006-10-04
```

D.3.131 Davide Italiano <`davide@FreeBSD.org`>

```
pub   2048R/4CB47484 2012-01-17
      Key fingerprint = B5C9 77F5 1E67 D110 8D19  7587 EB95 EA82 4CB4 7484
uid                  Davide Italiano <davide@FreeBSD.org>
sub   2048R/91F7443D 2012-01-17
```

D.3.132 Jordan K. Hubbard <`jkh@FreeBSD.org`>

```
pub  1024R/8E542D5D 1996-04-04 Jordan K. Hubbard <jkh@FreeBSD.org>
     Key fingerprint = 3C F2 27 7E 4A 6C 09 0A  4B C9 47 CD 4F 4D 0B 20
```

D.3.133 Konrad Jankowski <`versus@FreeBSD.org`>

```
pub   1024D/A01C218A 2008-10-28
      Key fingerprint = A805 21DC 859F E941 D2EA  9986 2264 8E5D A01C 218A
uid                  Konrad Jankowski <versus@freebsd.org>
sub   2048g/56AE1959 2008-10-28
```

D.3.134 Weongyo Jeong <`weongyo@FreeBSD.org`>

```
pub   1024D/22354D7A 2007-12-28
      Key fingerprint = 138E 7115 A86F AA40 B509  5883 B387 DCE9 2235 4D7A
uid                  Weongyo Jeong <weongyo.jeong@gmail.com>
uid                  Weongyo Jeong <weongyo@freebsd.org>
sub   2048g/9AE6DAEE 2007-12-28
```

D.3.135 Tatuya JINMEI <`jinmei@FreeBSD.org`>

```
pub   1024D/ABA82228 2002-08-15
      Key fingerprint = BB70 3050 EE39 BE00 48BB  A5F3 5892 F203 ABA8 2228
uid                  JINMEI Tatuya <jinmei@FreeBSD.org>
uid                  JINMEI Tatuya <jinmei@jinmei.org>
uid                  JINMEI Tatuya (the KAME project) <jinmei@isl.rdc.toshiba.co.jp>
sub   1024g/8B43CF66 2002-08-15
```

D.3.136 Michael Johnson <`ahze@FreeBSD.org`>

```
pub  1024D/3C046FD6 2004-10-29 Michael Johnson (FreeBSD key) <ahze@FreeBSD.org>
     Key fingerprint = 363C 6ABA ED24 C23B 5F0C  3AB4 9F8B AA7D 3C04 6FD6
uid                            Michael Johnson (pgp key) <ahze@ahze.net>
sub  2048g/FA334AE3 2004-10-29
```

D.3.137 Trevor Johnson <`trevor@FreeBSD.org`>

```
pub  1024D/3A3EA137 2000-04-20 Trevor Johnson <trevor@jpj.net>
     Key fingerprint = 7ED1 5A92 76C1 FFCB E5E3  A998 F037 5A0B 3A3E A137
sub  1024g/46C24F1E 2000-04-20
```

D.3.138 Tom Judge <`tj@FreeBSD.org`>

```
pub   2048R/81E22216 2012-05-27 [expires: 2017-05-26]
      Key fingerprint = 8EF8 36C8 44A6 9576 6ADB  EB0E 4252 33DC 81E2 2216
uid                  Tom Judge <tom@tomjudge.com>
uid                  Tom Judge <tjudge@sourcefire.com>
uid                  Tom Judge <tj@freebsd.org>
sub   2048R/2CA4AA0D 2012-05-27 [expires: 2017-05-26]
```

D.3.139 Benjamin Kaduk <`bjk@FreeBSD.org`>

```
pub   4096R/8302FE9F 2011-08-20 [expires: 2013-07-21]
      Key fingerprint = 9FD9 F966 D914 5101 BE59  FE13 2D29 EEED 8302 FE9F
uid                  Benjamin Kaduk <bjk@FreeBSD.org>
sub   4096R/28698ABE 2011-08-20 [expires: 2013-08-19]
```

D.3.140 Poul-Henning Kamp <`phk@FreeBSD.org`>

```
pub  1024R/0358FCBD 1995-08-01 Poul-Henning Kamp <phk@FreeBSD.org>
     Key fingerprint = A3 F3 88 28 2F 9B 99 A2  49 F4 E2 FA 5A 78 8B 3E
```

D.3.141 Sergey Kandaurov <`pluknet@FreeBSD.org`>

```
pub   2048R/10607419 2010-10-04
      Key fingerprint = 020B EC25 7E1F 8BC5 C42C  513B 3F4E 97BA 1060 7419
uid                  Sergey Kandaurov (freebsd) <pluknet@freebsd.org>
uid                  Sergey Kandaurov <pluknet@gmail.com>
sub   2048R/5711F73B 2010-10-04
```

D.3.142 Coleman Kane <`cokane@FreeBSD.org`>

```
pub   1024D/C5DAB797 2007-07-22
      Key fingerprint = FC09 F326 4318 E714 DE45  6CB0 70C4 B141 C5DA B797
uid                  Coleman Kane (Personal PGP Key) <cokane@cokane.org>
uid                  Coleman Kane (Personal PGP Key) <cokane@FreeBSD.org>
sub   2048g/5C680129 2007-07-22
```

D.3.143 Josef Karthauser <`joe@FreeBSD.org`>

```
pub  1024D/E6B15016 2000-10-19 Josef Karthauser <joe@FreeBSD.org>
     Key fingerprint = 7266 8EAF 82C2 D439 5642  AC26 5D52 1C8C E6B1 5016
uid                            Josef Karthauser <joe@tao.org.uk>
uid                            Josef Karthauser <joe@uk.FreeBSD.org>
uid                            [revoked] Josef Karthauser <josef@bsdi.com>
uid                            [revoked] Josef Karthauser <joe@pavilion.net>
sub  2048g/1178B692 2000-10-19
```

D.3.144 Vinod Kashyap <`vkashyap@FreeBSD.org`>

```
pub  1024R/04FCCDD3 2004-02-19 Vinod Kashyap (gnupg key) <vkashyap@freebsd.org>
     Key fingerprint = 9B83 0B55 604F E491 B7D2  759D DF92 DAA0 04FC CDD3
```

D.3.145 Kris Kennaway <`kris@FreeBSD.org`>

```
pub  1024D/68E840A5 2000-01-14 Kris Kennaway <kris@citusc.usc.edu>
     Key fingerprint = E65D 0E7D 7E16 B212 1BD6  39EE 5ABC B405 68E8 40A5
uid                            Kris Kennaway <kris@FreeBSD.org>
uid                            Kris Kennaway <kris@obsecurity.org>
sub  2048g/03A41C45 2000-01-14 [expires: 2006-01-14]
```

D.3.146 Giorgos Keramidas <`keramida@FreeBSD.org`>

```
pub   1024D/318603B6 2001-09-21
      Key fingerprint = C1EB 0653 DB8B A557 3829  00F9 D60F 941A 3186 03B6
uid                  Giorgos Keramidas <keramida@FreeBSD.org>
uid                  Giorgos Keramidas <keramida@ceid.upatras.gr>
uid                  Giorgos Keramidas <keramida@hellug.gr>
uid                  Giorgos Keramidas <keramida@linux.gr>
uid                  Giorgos Keramidas <gkeramidas@gmail.com>
sub   1024g/50FDBAD1 2001-09-21
```

D.3.147 Max Khon <`fjoe@FreeBSD.org`>

```
pub   1024D/6B87E212 2009-02-17
      Key fingerprint = 124D EC6C 6365 D41A 497A  9C3E FCF3 8708 6B87 E212
uid                  Max Khon <fjoe@FreeBSD.org>
uid                  Max Khon <fjoe@samodelkin.net>
sub   2048g/CB71491D 2009-02-17
```

D.3.148 Manolis Kiagias <`manolis@FreeBSD.org`>

```
pub   1024D/6E0FB494 2006-08-22
      Key fingerprint = F820 5AAF 7112 2CDD 23D8  3BDF 67F3 311A 6E0F B494
uid                  Manolis Kiagias <manolis@FreeBSD.org>
uid                  Manolis Kiagias <sonicy@otenet.gr>
uid                  Manolis Kiagias (A.K.A. sonic, sonicy, sonic2000gr) <sonic@diktia.dyndns.org
sub   2048g/EB94B411 2006-08-22
```

D.3.149 Jung-uk Kim <`jkim@FreeBSD.org`>

```
pub   1024D/BF6A9D53 2004-04-07
      Key fingerprint = F841 0339 93EF D27D 32AD  3261 9A56 B2D5 BF6A 9D53
uid                  Jung-uk Kim <jkim@FreeBSD.org>
uid                  Jung-uk Kim <jkim@niksun.com>
sub   4096g/B01CA5A0 2004-04-07
```

D.3.150 Zack Kirsch <`zack@FreeBSD.org`>

```
pub  1024D/1A725562 2010-11-05 Zack Kirsch <zack@freebsd.org>
     Key fingerprint = A8CC AA5E FB47 A386 E757  A2B8 BDD2 0684 1A72 5562
sub  1024g/6BFE2C06 2010-11-05
```

D.3.151 Jakub Klama <`jceel@FreeBSD.org`>

```
pub   2048R/2AAEA67D 2011-09-27
      Key fingerprint = 40D6 097A 174F 511B 80EB  F3A3 0946 4193 2AAE A67D
uid                  Jakub Klama <jceel@FreeBSD.org>
sub   2048R/5291BC4D 2011-09-27
```

D.3.152 Andreas Klemm <`andreas@FreeBSD.org`>

```
pub  1024D/6C6F6CBA 2001-01-06 Andreas Klemm <andreas.klemm@eu.didata.com>
     Key fingerprint = F028 D51A 0D42 DD67 4109  19A3 777A 3E94 6C6F 6CBA
uid                            Andreas Klemm <andreas@klemm.gtn.com>
uid                            Andreas Klemm <andreas@FreeBSD.org>
uid                            Andreas Klemm <andreas@apsfilter.org>
sub  2048g/FE23F866 2001-01-06
```

D.3.153 Johann Kois <`jkois@FreeBSD.org`>

```
pub  1024D/DD61C2D8 2004-06-27 Johann Kois <J.Kois@web.de>
     Key fingerprint = 8B70 03DB 3C45 E71D 0ED4  4825 FEB0 EBEF DD61 C2D8
uid                            Johann Kois <jkois@freebsd.org>
sub  1024g/568307CB 2004-06-27
```

D.3.154 Sergei Kolobov <`sergei@FreeBSD.org`>

```
pub  1024D/3BA53401 2003-10-10 Sergei Kolobov <sergei@FreeBSD.org>
     Key fingerprint = A2F4 5F34 0586 CC9C 493A  347C 14EC 6E69 3BA5 3401
uid                            Sergei Kolobov <sergei@kolobov.com>
sub  2048g/F8243671 2003-10-10
```

D.3.155 Maxim Konovalov <`maxim@FreeBSD.org`>

```
pub  1024D/2C172083 2002-05-21 Maxim Konovalov <maxim@FreeBSD.org>
     Key fingerprint = 6550 6C02 EFC2 50F1 B7A3  D694 ECF0 E90B 2C17 2083
uid                            Maxim Konovalov <maxim@macomnet.ru>
sub  1024g/F305DDCA 2002-05-21
```

D.3.156 Taras Korenko <`taras@FreeBSD.org`>

```
pub   1024D/8ACCC68B 2010-03-30
      Key fingerprint = 5128 2A8B 9BC1 A664 21E0  1E61 D838 54D3 8ACC C68B
uid                     Taras Korenko <taras@freebsd.org>
uid                     Taras Korenko <ds@ukrhub.net>
uid                     Taras Korenko <tarasishche@gmail.com>
sub   2048g/8D7CC0FA 2010-03-30 [expires: 2015-03-29]
```

D.3.157 Joseph Koshy <`jkoshy@FreeBSD.org`>

```
pub  1024D/D93798B6 2001-12-21 Joseph Koshy (FreeBSD) <jkoshy@freebsd.org>
     Key fingerprint = 0DE3 62F3 EF24 939F 62AA  2E3D ABB8 6ED3 D937 98B6
sub  1024g/43FD68E9 2001-12-21
```

D.3.158 Wojciech A. Koszek <`wkoszek@FreeBSD.org`>

```
pub   1024D/C9F25145 2006-02-15
      Key fingerprint = 6E56 C571 9D33 D23E 9A61  8E50 623C AD62 C9F2 5145
uid                     Wojciech A. Koszek <dunstan@FreeBSD.czest.pl>
uid                     Wojciech A. Koszek <wkoszek@FreeBSD.org>
sub   4096g/3BBD20A5 2006-02-15
```

D.3.159 Alex Kozlov <`ak@FreeBSD.org`>

```
pub   2048R/0D1D29A0 2012-03-01 [expires: 2024-02-27]
      Key fingerprint = 7774 4FCF 6AC9 126B BD0E  DBF3 5EBF 4968 0D1D 29A0
uid                     Alex Kozlov <ak@freebsd.org>
sub   2048R/2DD82C65 2012-03-01 [expires: 2024-02-27]
```

D.3.160 Steven Kreuzer <`skreuzer@FreeBSD.org`>

```
pub   1024D/E0D6F907 2009-03-16 [expires: 2013-04-25]
      Key fingerprint = 8D8F 14D6 ED9F 6BD0 7756  7A46 66BA B4B6 E0D6 F907
uid                     Steven Kreuzer <skreuzer@exit2shell.com>
uid                     Steven Kreuzer <skreuzer@freebsd.org>
```

D.3.161 Gábor Kövesdán <`gabor@FreeBSD.org`>

```
pub   1024D/2373A6B1 2006-12-05
      Key fingerprint = A42A 10D6 834B BEC0 26F0  29B1 902D D04F 2373 A6B1
uid                  Gabor Kovesdan <gabor@FreeBSD.org>
sub   2048g/92B0A104 2006-12-05
```

D.3.162 Ana Kukec <`anchie@FreeBSD.org`>

```
pub   2048R/510D23BB 2010-04-18
      Key fingerprint = 0A9B 0ABB 0E1C B5A4 3408  398F 778A C3B4 510D 23BB
uid                  Ana Kukec <anchie@FreeBSD.org>
sub   2048R/699E4DDA 2010-04-18
```

D.3.163 Roman Kurakin <`rik@FreeBSD.org`>

```
pub   1024D/C8550F4C 2005-12-16 [expires: 2008-12-15]
      Key fingerprint = 25BB 789A 6E07 E654 8E59  0FA9 42B1 937C C855 0F4C
uid                  Roman Kurakin <rik@FreeBSD.org>
sub   2048g/D15F2AB6 2005-12-16 [expires: 2008-12-15]
```

D.3.164 Hideyuki KURASHINA <`rushani@FreeBSD.org`>

```
pub  1024D/439ADC57 2002-03-22 Hideyuki KURASHINA <rushani@bl.mmtr.or.jp>
     Key fingerprint = A052 6F98 6146 6FE3 91E2  DA6B F2FA 2088 439A DC57
uid                            Hideyuki KURASHINA <rushani@FreeBSD.org>
uid                            Hideyuki KURASHINA <rushani@jp.FreeBSD.org>
sub  1024g/64764D16 2002-03-22
```

D.3.165 Jun Kuriyama <`kuriyama@FreeBSD.org`>

```
pub  1024D/FE3B59CD 1998-11-23 Jun Kuriyama <kuriyama@imgsrc.co.jp>
     Key fingerprint = 5219 55CE AC84 C296 3A3B  B076 EE3C 4DBB FE3B 59CD
uid                            Jun Kuriyama <kuriyama@FreeBSD.org>
uid                            Jun Kuriyama <kuriyama@jp.FreeBSD.org>
sub  2048g/1CF20D27 1998-11-23
```

D.3.166 René Ladan <`rene@FreeBSD.org`>

```
pub   1024D/E5642BFC 2008-11-03
      Key fingerprint = ADBC ECCD EB5F A6B4 549F  600D 8C9E 647A E564 2BFC
uid                  Rene Ladan <rene@freebsd.org>
sub   2048g/C54EA560 2008-11-03
```

D.3.167 Julien Laffaye <`jlaffaye@FreeBSD.org`>

```
pub   2048R/6AEBE420 2011-06-06
      Key fingerprint = 031A B449 B383 5C3B B618  E2F4 BAD0 0F0E 6AEB E420
uid                  Julien Laffaye <jlaffaye@FreeBSD.org>
sub   2048R/538B8D5B 2011-06-06
```

D.3.168 Clement Laforet <`clement@FreeBSD.org`>

```
pub  1024D/0723BA1D 2003-12-13 Clement Laforet (FreeBSD committer address) <clement@FreeBSD.org>
     Key fingerprint = 3638 4B14 8463 A67B DC7E  641C B118 5F8F 0723 BA1D
uid                            Clement Laforet <sheepkiller@cultdeadsheep.org>
uid                            Clement Laforet <clement.laforet@cotds.org>
sub  2048g/23D57658 2003-12-13
```

D.3.169 Max Laier <`mlaier@FreeBSD.org`>

```
pub   1024D/3EB6046D 2004-02-09
      Key fingerprint = 917E 7F25 E90F 77A4 F746  2E8D 5F2C 84A1 3EB6 046D
uid                  Max Laier <max@love2party.net>
uid                  Max Laier <max.laier@ira.uka.de>
uid                  Max Laier <mlaier@freebsd.org>
uid                  Max Laier <max.laier@tm.uka.de>
sub   4096g/EDD08B9B 2005-06-28
```

D.3.170 Erwin Lansing <`erwin@FreeBSD.org`>

```
pub   1024D/15256990 1998-07-03
      Key fingerprint = FB58 9797 299A F18E 2D3E  73D6 AB2F 5A5B 1525 6990
uid                  Erwin Lansing <erwin@lansing.dk>
uid                  Erwin Lansing <erwin@FreeBSD.org>
uid                  Erwin Lansing <erwin@droso.dk>
uid                  Erwin Lansing <erwin@droso.org>
uid                  Erwin Lansing <erwin@aauug.dk>
sub   2048g/7C64013D 1998-07-03
```

D.3.171 Ganael Laplanche <`martymac@FreeBSD.org`>

```
pub   1024D/10B87391 2006-01-13
      Key fingerprint = D59D 984D 8988 7BB9 DA37  BA77 757E D5F0 10B8 7391
uid                  Ganael LAPLANCHE <ganael.laplanche@martymac.org>
uid                  Ganael LAPLANCHE <martymac@martymac.com>
uid                  Ganael LAPLANCHE <ganael.laplanche@martymac.com>
uid                  Ganael LAPLANCHE <martymac@martymac.org>
uid                  Ganael LAPLANCHE <martymac@pasteur.fr>
uid                  Ganael LAPLANCHE <ganael.laplanche@pasteur.fr>
uid                  Ganael LAPLANCHE <martymac@FreeBSD.org>
sub   2048g/D65069D5 2006-01-13
```

D.3.172 Greg Larkin <`glarkin@FreeBSD.org`>

```
pub   1024D/1C940290 2003-10-09
      Key fingerprint = 8A4A 80AA F26C 8C2C D01B  94C6 D2C4 68B8 1C94 0290
uid                  Greg Larkin (The FreeBSD Project) <glarkin@FreeBSD.org>
uid                  Gregory C. Larkin (SourceHosting.Net, LLC) <glarkin@sourcehosting.net>
uid                  [jpeg image of size 6695]
sub   2048g/47674316 2003-10-09
```

D.3.173 Frank J. Laszlo <`laszlof@FreeBSD.org`>

```
pub   4096R/012360EC 2006-11-06 [expires: 2011-11-05]
      Key fingerprint = 3D93 21DB B5CC 1339 E4B4  1BC4 AD50 C17C 0123 60EC
uid                  Frank J. Laszlo <laszlof@FreeBSD.org>
```

D.3.174 Sam Lawrance <`lawrance@FreeBSD.org`>

```
pub   1024D/32708C59 2003-08-14
      Key fingerprint = 1056 2A02 5247 64D4 538D  6975 8851 7134 3270 8C59
uid                  Sam Lawrance <lawrance@FreeBSD.org>
uid                  Sam Lawrance <boris@brooknet.com.au>
sub   2048g/0F9CCF92 2003-08-14
```

D.3.175 Nate Lawson <`njl@FreeBSD.org`>

```
pub   1024D/60E5AC11 2007-02-07
      Key fingerprint = 18E2 7E5A FD6A 199B B08B  E9FB 73C8 DB67 60E5 AC11
uid                  Nate Lawson <nate@root.org>
sub   2048g/CDBC7E1B 2007-02-07
```

D.3.176 Jeremie Le Hen <`jlh@FreeBSD.org`>

```
pub   2048D/8BF6CF92 2012-04-18
      Key fingerprint = 66C9 B361 16CA BFF6 5C07  DA0A 28DE 3702 8BF6 CF92
uid                  Jeremie Le Hen <jeremie@le-hen.org>
uid                  Jeremie Le Hen <jeremie@lehen.org>
uid                  Jeremie Le Hen <ttz@chchile.org>
uid                  Jeremie Le Hen <jlh@FreeBSD.org>
sub   2048g/045479A3 2012-04-18
```

D.3.177 Yen-Ming Lee <`leeym@FreeBSD.org`>

```
pub   1024D/93FA8BD6 2007-05-21
      Key fingerprint = DEC4 6E7F 69C0 4AC3 21ED  EE65 6C0E 9257 93FA 8BD6
uid                  Yen-Ming Lee <leeym@leeym.com>
sub   2048g/899A3931 2007-05-21
```

D.3.178 Sam Leffler <`sam@FreeBSD.org`>

```
pub   1024D/BD147743 2005-03-28
      Key fingerprint = F618 F2FC 176B D201 D91C  67C6 2E33 A957 BD14 7743
uid                  Samuel J. Leffler <sam@freebsd.org>
sub   2048g/8BA91D05 2005-03-28
```

D.3.179 Jean-Yves Lefort <`jylefort@FreeBSD.org`>

```
pub   1024D/A3B8006A 2002-09-07
      Key fingerprint = CC99 D1B0 8E44 293D 32F7  D92E CB30 FB51 A3B8 006A
uid                  Jean-Yves Lefort <jylefort@FreeBSD.org>
uid                  Jean-Yves Lefort <jylefort@brutele.be>
sub   4096g/C9271AFC 2002-09-07
```

D.3.180 Alexander Leidinger <`netchild@FreeBSD.org`>

```
pub   1024D/72077137 2002-01-31
      Key fingerprint = AA3A 8F69 B214 6BBD 5E73  C9A0 C604 3C56 7207 7137
uid                  Alexander Leidinger <netchild@FreeBSD.org>
uid                  [jpeg image of size 19667]
sub   2048g/8C9828D3 2002-01-31
```

D.3.181 Andrey V. Elsukov <`ae@FreeBSD.org`>

```
pub   2048R/10C8A17A 2010-05-29
      Key fingerprint = E659 1E1B 41DA 1516 F0C9  BC00 01C5 EA04 10C8 A17A
uid                  Andrey V. Elsukov <ae@freebsd.org>
uid                  Andrey V. Elsukov <bu7cher@yandex.ru>
sub   2048R/0F6D64C5 2010-05-29
```

D.3.182 Dejan Lesjak <`lesi@FreeBSD.org`>

```
pub  1024D/96C5221F 2004-08-18 Dejan Lesjak <lesi@FreeBSD.org>
     Key fingerprint = 2C5C 02EA 1060 1D6D 9982  38C0 1DA7 DBC4 96C5 221F
uid                            Dejan Lesjak <dejan.lesjak@ijs.si>
sub  1024g/E0A69278 2004-08-18
```

D.3.183 Chuck Lever <`cel@FreeBSD.org`>

```
pub   1024D/8FFC2B87 2006-02-13
      Key fingerprint = 6872 923F 5012 F88B 394C  2F69 37B4 8171 8FFC 2B87
uid                  Charles E. Lever <cel@freebsd.org>
sub   2048g/9BCE0459 2006-02-13
```

D.3.184 Greg Lewis <`glewis@FreeBSD.org`>

```
pub  1024D/1BB6D9E0 2002-03-05 Greg Lewis (FreeBSD) <glewis@FreeBSD.org>
     Key fingerprint = 2410 DA6D 5A3C D801 65FE  C8DB DEEA 9923 1BB6 D9E0
uid                            Greg Lewis <glewis@eyesbeyond.com>
sub  2048g/45E67D60 2002-03-05
```

D.3.185 Xin Li <`delphij@FreeBSD.org`>

```
pub   1024D/CAEEB8C0 2004-01-28
      Key fingerprint = 43B8 B703 B8DD 0231 B333  DC28 39FB 93A0 CAEE B8C0
uid                  Xin LI <delphij@FreeBSD.org>
uid                  Xin LI <delphij@frontfree.net>
uid                  Xin LI <delphij@delphij.net>
uid                  Xin LI <delphij@geekcn.org>

pub   1024D/42EA8A4B 2006-01-27 [expired: 2008-01-01]
      Key fingerprint = F19C 2616 FA97 9C13 2581  C6F3 85C5 1CCE 42EA 8A4B
uid                  Xin LI <delphij@geekcn.org>
uid                  Xin LI <delphij@FreeBSD.org>
uid                  Xin LI <delphij@delphij.net>

pub   1024D/18EDEBA0 2008-01-02 [expired: 2010-01-02]
      Key fingerprint = 79A6 CF42 F917 DDCA F1C2  C926 8BEB DB04 18ED EBA0
uid                  Xin LI <delphij@geekcn.org>
uid                  Xin LI <delphij@FreeBSD.org>
uid                  Xin LI <delphij@delphij.net>

pub   2048R/3FCA37C1 2010-01-10 [expired: 2012-01-10]
      Key fingerprint = 27EA 5D6C 9398 BA7F B205  8F70 04CE F812 3FCA 37C1
uid                  Xin LI <delphij@delphij.net>
uid                  Xin LI <delphij@gmail.com>
uid                  Xin LI <delphij@geekcn.org>
uid                  Xin LI <delphij@FreeBSD.org>

pub   4096R/2E54AB2C 2011-12-05
      Key fingerprint = D95C D3C3 8FA8 25C2 C62B  9FEA 0887 6D93 2E54 AB2C
uid                  Xin Li <delphij@geekcn.org>
uid                  Xin Li <delphij@delphij.net>
uid                  Xin Li <delphij@FreeBSD.org>
sub   4096R/7832B740 2011-12-05
sub   2048R/BC50FBB3 2011-12-05 [expires: 2013-12-05]
sub   2048R/C894647D 2011-12-05 [expires: 2013-12-05]
```

D.3.186 Tai-hwa Liang <`avatar@FreeBSD.org`>

```
pub  1024R/F4013AB1 1998-05-13 Tai-hwa Liang <avatar@FreeBSD.org>
     Key fingerprint = 5B 05 1D 37 7F 35 31 4E  5D 38 BD 07 10 32 B9 D0
uid                            Tai-hwa Liang <avatar@mmlab.cse.yzu.edu.tw>
```

D.3.187 Ying-Chieh Liao <`ijliao@FreeBSD.org`>

```
pub  1024D/11C02382 2001-01-09 Ying-Chieh Liao <ijliao@CCCA.NCTU.edu.tw>
     Key fingerprint = 4E98 55CC 2866 7A90 EFD7  9DA5 ACC6 0165 11C0 2382
uid                            Ying-Chieh Liao <ijliao@FreeBSD.org>
uid                            Ying-Chieh Liao <ijliao@csie.nctu.edu.tw>
uid                            Ying-Chieh Liao <ijliao@dragon2.net>
uid                            Ying-Chieh Liao <ijliao@tw.FreeBSD.org>
sub  4096g/C1E16E89 2001-01-09
```

D.3.188 Ulf Lilleengen <`lulf@FreeBSD.org`>

```
pub   1024D/ADE1B837 2009-08-19 [expires: 2014-08-18]
      Key fingerprint = 3822 B4E6 6D1C 6F71 4AA8  7A27 ADDF C400 ADE1 B837
uid                  Ulf Lilleengen <ulf.lilleengen@gmail.com>
uid                  Ulf Lilleengen <lulf@pvv.ntnu.no>
uid                  Ulf Lilleengen <lulf@stud.ntnu.no>
uid                  Ulf Lilleengen <lulf@FreeBSD.org>
uid                  Ulf Lilleengen <lulf@idi.ntnu.no>
sub   2048g/B5409122 2009-08-19 [expires: 2014-08-18]
```

D.3.189 Clive Lin <`clive@FreeBSD.org`>

```
pub  1024D/A008C03E 2001-07-30 Clive Lin <clive@tongi.org>
     Key fingerprint = FA3F 20B6 A77A 6CEC 1856  09B0 7455 2805 A008 C03E
uid                            Clive Lin <clive@CirX.ORG>
uid                            Clive Lin <clive@FreeBSD.org>
sub  1024g/03C2DC87 2001-07-30 [expires: 2005-08-25]
```

D.3.190 Yi-Jheng Lin <`yzlin@FreeBSD.org`>

```
pub   2048R/A34C6A8A 2009-07-20
      Key fingerprint = 7E3A E981 BB7C 5D73 9534  ED39 0222 04D3 A34C 6A8A
uid                  Yi-Jheng Lin (FreeBSD) <yzlin@FreeBSD.org>
sub   2048R/B4D776FE 2009-07-20
```

D.3.191 Mark Linimon <`linimon@FreeBSD.org`>

```
pub   1024D/84C83473 2003-10-09
      Key fingerprint = 8D43 1B55 D127 0BFC 842E  1C96 803C 5A34 84C8 3473
uid                  Mark Linimon <linimon@FreeBSD.org>
uid                  Mark Linimon <linimon@lonesome.com>
sub   1024g/24BFF840 2003-10-09
```

D.3.192 Tilman Keskinöz <`arved@FreeBSD.org`>

```
pub   1024D/807AC53A 2002-06-03 [expires: 2013-09-07]
      Key fingerprint = A92F 344F 31A8 B8DE DDFA  7FB4 7C22 C39F 807A C53A
uid                  Tilman KeskinÃ¶z <arved@arved.at>
uid                  Tilman KeskinÃ¶z <arved@FreeBSD.org>
sub   1024g/FA351986 2002-06-03 [expires: 2013-09-07]
```

D.3.193 Dryice Liu <`dryice@FreeBSD.org`>

```
pub   1024D/77B67874 2005-01-28
      Key fingerprint = 8D7C F82D D28D 07E5 EF7F  CD25 6B5B 78A8 77B6 7874
uid                  Dryice Dong Liu (Dryice) <dryice@FreeBSD.org>
uid                  Dryice Dong Liu (Dryice) <dryice@liu.com.cn>
uid                  Dryice Dong Liu (Dryice) <dryice@hotpop.com>
uid                  Dryice Dong Liu (Dryice) <dryiceliu@gmail.com>
uid                  Dryice Dong Liu (Dryice) <dryice@dryice.name>
sub   2048g/ECFA49E4 2005-01-28
```

D.3.194 Tong Liu <`nemoliu@FreeBSD.org`>

```
pub   1024D/ECC7C907 2007-07-10
      Key fingerprint = B62E 3109 896B B283 E2FA  60FE A1BA F92E ECC7 C907
uid                  Tong LIU <nemoliu@FreeBSD.org>
sub   4096g/B6D7B15D 2007-07-10
```

D.3.195 Zachary Loafman <`zml@FreeBSD.org`>

```
pub   1024D/4D65492D 2009-05-26
      Key fingerprint = E513 4AE9 5D6D 8BF9 1CD3  4389 4860 D79B 4D65 492D
uid                  Zachary Loafman <zml@FreeBSD.org>
sub   2048g/1AD659F0 2009-05-26
```

D.3.196 Juergen Lock `<nox@FreeBSD.org>`

```
pub   1024D/1B6BFBFD 2006-12-22
      Key fingerprint = 33A7 7FAE 51AF 00BC F0D3  ECCE FAFD 34C1 1B6B FBFD
uid                  Juergen Lock <nox@FreeBSD.org>
sub   2048g/251229D1 2006-12-22
```

D.3.197 Remko Lodder `<remko@FreeBSD.org>`

```
pub   2048R/6EB8C8C8 2010-05-28 [expires: 2012-05-27]
      Key fingerprint = D692 91F9 F4EF D363 7F3F  4D17 9C75 DF7B 6EB8 C8C8
uid                  Remko Lodder (Remko Lodder’s Key) <remko@FreeBSD.org>
sub   2048R/011C6AA0 2010-05-28 [expires: 2012-05-27]
```

D.3.198 Alexander Logvinov `<avl@FreeBSD.org>`

```
pub   1024D/1C47D5C0 2009-05-28
      Key fingerprint = 8B5F 880A 382B 075E E707  9DB2 E135 4176 1C47 D5C0
uid                  Alexander Logvinov <alexander@logvinov.com>
uid                  Alexander Logvinov (FreeBSD Ports Committer) <avl@FreeBSD.org>
uid                  Alexander Logvinov <ports@logvinov.com>
uid                  Alexander Logvinov <logvinov@gmail.com>
uid                  Alexander Logvinov <logvinov@yandex.ru>
sub   2048g/60BDD4BB 2009-05-28
```

D.3.199 Isabell Long `<issyl0@FreeBSD.org>`

```
pub   4096R/EB83C2BD 2009-09-26
      Key fingerprint = D55A 42E7 0974 EFD9 3939  56B9 6E6B E425 EB83 C2BD
uid                  Isabell Long <isabell@issyl0.co.uk>
uid                  Isabell Long <me@issyl0.co.uk>
uid                  Isabell Long <isabell121@gmail.com>
uid                  Isabell Long (BitFolk Ltd.) <isabell@bitfolk.com>
uid                  Isabell Long (College) <IL18685@woking.ac.uk>
uid                  Isabell Long (The Open University) <il948@my.open.ac.uk>
uid                  Isabell Long (Mailing lists address.) <lists@issyl0.co.uk>
uid                  Isabell Long (YRS) <isabell@youngrewiredstate.org>
uid                  Isabell Long (FreeBSD) <issyl0@FreeBSD.org>
```

D.3.200 Scott Long `<scottl@FreeBSD.org>`

```
pub  1024D/017C5EBF 2003-01-18 Scott A. Long (This is my official FreeBSD key) <scottl@freebsd.or
     Key fingerprint = 34EA BD06 44F7 F8C3 22BC  B52C 1D3A F6D1 017C 5EBF
sub  1024g/F61C8F91 2003-01-18
```

D.3.201 Rick Macklem <rmacklem@FreeBSD.org>

```
pub   1024D/7FB9C5F1 2009-04-05
      Key fingerprint = B9EA 767A F6F3 3786 E0C7  434A 05C6 70D6 7FB9 C5F1
uid                  Rick Macklem <rmacklem@freebsd.org>
sub   1024g/D0B20E8A 2009-04-05
```

D.3.202 Bruce A. Mah <bmah@FreeBSD.org>

```
pub   1024D/5BA052C3 1997-12-08
      Key fingerprint = F829 B805 207D 14C7 7197  7832 D8CA 3171 5BA0 52C3
uid                  Bruce A. Mah <bmah@acm.org>
uid                  Bruce A. Mah <bmah@ca.sandia.gov>
uid                  Bruce A. Mah <bmah@ieee.org>
uid                  Bruce A. Mah <bmah@cisco.com>
uid                  Bruce A. Mah <bmah@employees.org>
uid                  Bruce A. Mah <bmah@freebsd.org>
uid                  Bruce A. Mah <bmah@packetdesign.com>
uid                  Bruce A. Mah <bmah@kitchenlab.org>
sub   2048g/B4E60EA1 1997-12-08
```

D.3.203 Ruslan Mahmatkhanov <rm@FreeBSD.org>

```
pub   2048R/F60D756F 2011-11-10
      Key fingerprint = 9D18 8A88 304C B78B 8003  0379 4574 0BAF F60D 756F
uid                  Ruslan Mahmatkhanov <rm@FreeBSD.org>
sub   2048R/B658C269 2011-11-10
```

D.3.204 Mike Makonnen <mtm@FreeBSD.org>

```
pub  1024D/7CD41F55 2004-02-06 Michael Telahun Makonnen <mtm@FreeBSD.Org>
     Key fingerprint = AC7B 5672 2D11 F4D0 EBF8  5279 5359 2B82 7CD4 1F55
uid                            Michael Telahun Makonnen <mtm@tmsa-inc.com>
uid                            Mike Makonnen <mtm@identd.net>
uid                            Michael Telahun Makonnen <mtm@acs-et.com>
sub  2048g/E7DC936B 2004-02-06
```

D.3.205 David Malone <dwmalone@FreeBSD.org>

```
pub   512/40378991 1994/04/21 David Malone <dwmalone@maths.tcd.ie>
            Key fingerprint = 86 A7 F4 86 39 2C 47 2C  C1 C2 35 78 8E 2F B8 F5
```

D.3.206 Dmitry Marakasov <`amdmi3@FreeBSD.org`>

```
pub   1024D/F9D2F77D 2008-06-15 [expires: 2010-06-15]
      Key fingerprint = 55B5 0596 FF1E 8D84 5F56  9510 D35A 80DD F9D2 F77D
uid                  Dmitry Marakasov <amdmi3@amdmi3.ru>
uid                  Dmitry Marakasov <amdmi3@FreeBSD.org>
sub   2048g/2042CDD8 2008-06-15
```

D.3.207 Koop Mast <`kwm@FreeBSD.org`>

```
pub  1024D/F95426DA 2004-09-10 Koop Mast <kwm@rainbow-runner.nl>
     Key fingerprint = C66F 1835 0548 3440 8576  0FFE 6879 B7CD F954 26DA
uid                            Koop Mast <kwm@FreeBSD.org>
sub  1024g/A782EEDD 2004-09-10
```

D.3.208 Cherry G. Mathew <`cherry@FreeBSD.org`>

```
pub   2048R/2D066FE1 2007-05-22
      Key fingerprint = FBF1 89FF 81BB E1C7 6C1B  378D 3438 20E9 2D06 6FE1
uid                  Cherry G. Mathew (FreeBSD email) <cherry@FreeBSD.org>
uid                  "Cherry G. Mathew" (NetBSD email) <cherry@NetBSD.org>
sub   2048R/7B2C4166 2007-05-22
```

D.3.209 Makoto Matsushita <`matusita@FreeBSD.org`>

```
pub   1024D/20544576 1999-04-18
      Key fingerprint = 71B6 13BF B262 2DD8 2B7C  6CD0 EB2D 4147 2054 4576
uid                  Makoto Matsushita <matusita@matatabi.or.jp>
uid                  Makoto Matsushita <matusita@FreeBSD.org>
uid                  Makoto Matsushita <matusita@jp.FreeBSD.ORG>
uid                  Makoto Matsushita <matusita@ist.osaka-u.ac.jp>
sub   1024g/F1F3C94D 1999-04-18
```

D.3.210 Martin Matuska <`mm@FreeBSD.org`>

```
pub   1024D/4261B0D1 2007-02-05
      Key fingerprint = 17C4 3F32 B3DE 3ED7 E84E  5592 A76B 8B03 4261 B0D1
uid                  Martin Matuska <martin@matuska.org>
uid                  Martin Matuska <mm@FreeBSD.org>
uid                  Martin Matuska <martin.matuska@wu-wien.ac.at>
sub   2048g/3AC9A5A6 2007-02-05
```

D.3.211 Sergey Matveychuk `<sem@FreeBSD.org>`

```
pub   1024D/B71F605D 1999-10-13
      Key fingerprint = 4704 F374 DB28 BEC6 51C8  1322 4DC9 4BD8 B71F 605D
uid                  Sergey Matveychuk <sem@FreeBSD.org>
uid                  Sergey Matveychuk <sem@ciam.ru>
uid                  Sergey Matveychuk <sem@core.inec.ru>
sub   2048g/DEAF9D91 1999-10-13
```

D.3.212 Tom McLaughlin `<tmclaugh@FreeBSD.org>`

```
pub   1024D/E2F7B3D8 2005-05-24
      Key fingerprint = 7692 B222 8D23 CF94 1993  0138 E339 E225 E2F7 B3D8
uid                  Tom McLaughlin (Personal email address) <tmclaugh@sdf.lonestar.org>
uid                  Tom McLaughlin (Work email address) <tmclaughlin@meditech.com>
uid                  Tom McLaughlin (FreeBSD email address) <tmclaugh@FreeBSD.org>
sub   2048g/16838F62 2005-05-24
```

D.3.213 Jean Milanez Melo `<jmelo@FreeBSD.org>`

```
pub   1024D/AA5114BF 2006-03-03
      Key fingerprint = 826D C2AA 6CF2 E29A EBE7  4776 D38A AB83 AA51 14BF
uid                  Jean Milanez Melo <jmelo@FreeBSD.org>
uid                  Jean Milanez Melo <jmelo@freebsdbrasil.com.br>
sub   4096g/E9E1CBD9 2006-03-03
```

D.3.214 Kenneth D. Merry `<ken@FreeBSD.org>`

```
pub  1024D/54C745B5 2000-05-15 Kenneth D. Merry <ken@FreeBSD.org>
     Key fingerprint = D25E EBC5 F17A 9E52 84B4  BF14 9248 F0DA 54C7 45B5
uid                            Kenneth D. Merry <ken@kdm.org>
sub  2048g/89D0F797 2000-05-15

pub  1024R/2FA0A505 1995-10-30 Kenneth D. Merry <ken@plutotech.com>
     Key fingerprint = FD FA 85 85 95 C4 8E E8  98 1A CA 18 56 F0 00 1F
```

D.3.215 Dirk Meyer `<dinoex@FreeBSD.org>`

```
pub  1024R/331CDA5D 1995-06-04 Dirk Meyer <dinoex@FreeBSD.org>
     Key fingerprint = 44 16 EC 0A D3 3A 4F 28  8A 8A 47 93 F1 CF 2F 12
uid                            Dirk Meyer <dirk.meyer@dinoex.sub.org>
uid                            Dirk Meyer <dirk.meyer@guug.de>
```

D.3.216 Yoshiro Sanpei MIHIRA <`sanpei@FreeBSD.org`>

```
pub  1024R/391C5D69 1996-11-21 sanpei@SEAPLE.ICC.NE.JP
     Key fingerprint = EC 04 30 24 B0 6C 1E 63  5F 5D 25 59 3E 83 64 51
uid                            MIHIRA Yoshiro <sanpei@sanpei.org>
uid                            Yoshiro MIHIRA <sanpei@FreeBSD.org>
uid                            MIHIRA Yoshiro <sanpei@yy.cs.keio.ac.jp>
uid                            MIHIRA Yoshiro <sanpei@cc.keio.ac.jp>
uid                            MIHIRA Yoshiro <sanpei@educ.cc.keio.ac.jp>
uid                            MIHIRA Yoshiro <sanpei@st.keio.ac.jp>
```

D.3.217 Robert Millan <`rmh@FreeBSD.org`>

```
pub   4096R/DEA2C38E 2009-08-14
      Key fingerprint = A537 F029 AAAE 0E9C 39A7  C22C BB9D 98D9 DEA2 C38E
uid                  Robert Millan <rmh@debian.org>
uid                  Robert Millan <rmh@freebsd.org>
uid                  Robert Millan <rmh@gnu.org>
sub   4096R/65A0A9CE 2009-08-14
sub   4096R/41F37946 2009-08-14
```

D.3.218 Stephen Montgomery-Smith <`stephen@FreeBSD.org`>

```
pub   2048R/9A92D807 2011-06-14
      Key fingerprint = 2B61 D82E 168E F08B 6E08  712E 2DF1 2BD1 9A92 D807
uid                  Stephen Montgomery-Smith <stephen@freebsd.org>
sub   2048R/A4BA6560 2011-06-14
```

D.3.219 Marcel Moolenaar <`marcel@FreeBSD.org`>

```
pub  1024D/61EE89F6 2002-02-09 Marcel Moolenaar <marcel@xcllnt.net>
     Key fingerprint = 68BB E2B7 49AA FF69 CA3A  DF71 A605 A52D 61EE 89F6
sub  1024g/6EAAB456 2002-02-09
```

D.3.220 Kris Moore <`kmoore@FreeBSD.org`>

```
pub   1024D/6294612C 2009-05-26
      Key fingerprint = 8B70 9876 346F 1F97 5687  6950 4C92 D789 6294 612C
uid                  Kris Moore <kmoore@freebsd.org>
sub   2048g/A7FFE8FB 2009-05-26
```

D.3.221 Dmitry Morozovsky `<marck@FreeBSD.org>`

```
pub   1024D/6B691B03 2001-07-20
      Key fingerprint = 39AC E336 F03D C0F8 5305  B725 85D4 5045 6B69 1B03
uid                  Dmitry Morozovsky <marck@rinet.ru>
uid                  Dmitry Morozovsky <marck@FreeBSD.org>
sub   2048g/44D656F8 2001-07-20
```

D.3.222 Alexander Motin `<mav@FreeBSD.org>`

```
pub   1024D/0577BACA 2007-04-20 [expires: 2012-04-18]
      Key fingerprint = 0E84 B263 E97D 3E48 161B  98A2 D240 A09E 0577 BACA
uid                  Alexander Motin <mav@freebsd.org>
uid                  Alexander Motin <mav@mavhome.dp.ua>
uid                  Alexander Motin <mav@alkar.net>
sub   2048g/4D59D1C2 2007-04-20 [expires: 2012-04-18]
```

D.3.223 Felippe de Meirelles Motta `<lippe@FreeBSD.org>`

```
pub   1024D/F2CF7DAE 2008-09-02 [expires: 2010-09-02]
      Key fingerprint = 0532 A900 286D DAFD 099D  394D 231B AF20 F2CF 7DAE
uid                  Felippe de Meirelles Motta (FreeBSD Ports Committer) <lippe@FreeBSD.org>
sub   2048g/38E8EEF3 2008-09-02 [expires: 2010-09-02]
```

D.3.224 Rich Murphey `<rich@FreeBSD.org>`

```
pub  1024R/583443A9 1995-03-31 Rich Murphey <rich@lamprey.utmb.edu>
     Key fingerprint = AF A0 60 C4 84 D6 0C 73  D1 EF C0 E9 9D 21 DB E4
```

D.3.225 Akinori MUSHA `<knu@FreeBSD.org>`

```
pub  1024D/9FD9E1EE 2000-03-21 Akinori MUSHA <knu@and.or.jp>
     Key fingerprint = 081D 099C 1705 861D 4B70  B04A 920B EFC7 9FD9 E1EE
uid                            Akinori MUSHA <knu@FreeBSD.org>
uid                            Akinori MUSHA <knu@idaemons.org>
uid                            Akinori MUSHA <knu@ruby-lang.org>
sub  1024g/71BA9D45 2000-03-21
```

D.3.226 Thomas Möstl `<tmm@FreeBSD.org>`

```
pub  1024D/419C776C 2000-11-28 Thomas Moestl <tmm@FreeBSD.org>
     Key fingerprint = 1C97 A604 2BD0 E492 51D0  9C0F 1FE6 4F1D 419C 776C
uid                            Thomas Moestl <tmoestl@gmx.net>
uid                            Thomas Moestl <t.moestl@tu-bs.de>
```

```
sub  2048g/ECE63CE6 2000-11-28
```

D.3.227 Masafumi NAKANE <max@FreeBSD.org>

```
pub  1024D/CE356B59 2000-02-19 Masafumi NAKANE <max@wide.ad.jp>
     Key fingerprint = EB40 BCAB 4CE5 0764 9942  378C 9596 159E CE35 6B59
uid                            Masafumi NAKANE <max@FreeBSD.org>
uid                            Masafumi NAKANE <max@accessibility.org>
uid                            Masafumi NAKANE <kd5pdi@qsl.net>
sub  1024g/FA9BD48B 2000-02-19
```

D.3.228 Maho Nakata <maho@FreeBSD.org>

```
pub   1024D/F28B4069 2009-02-09
      Key fingerprint = 3FE4 99A9 6F41 8161 4F5F  240C 8615 A60C F28B 4069
uid                  Maho NAKATA (NAKATA’s FreeBSD.org alias) <maho@FreeBSD.org>
sub   2048g/6B49098E 2009-02-09
```

D.3.229 Yoichi NAKAYAMA <yoichi@FreeBSD.org>

```
pub  1024D/E0788E46 2000-12-28 Yoichi NAKAYAMA <yoichi@assist.media.nagoya-u.ac.jp>
     Key fingerprint = 1550 2662 46B3 096C 0460  BC03 800D 0C8A E078 8E46
uid                            Yoichi NAKAYAMA <yoichi@eken.phys.nagoya-u.ac.jp>
uid                            Yoichi NAKAYAMA <yoichi@FreeBSD.org>
sub  1024g/B987A394 2000-12-28
```

D.3.230 Edward Tomasz Napierala <trasz@FreeBSD.org>

```
pub   1024D/8E53F00E 2007-04-13
      Key fingerprint = DD8F 91B0 12D9 6237 42D9  DBE1 AFC8 CDE9 8E53 F00E
uid                  Edward Tomasz Napierala <trasz@FreeBSD.org>
sub   2048g/7C1F5D67 2007-04-13
```

D.3.231 Alexander Nedotsukov <bland@FreeBSD.org>

```
pub  1024D/D004116C 2003-08-14 Alexander Nedotsukov <bland@FreeBSD.org>
     Key fingerprint = 35E2 5020 55FC 2071 4ADD  1A4A 86B6 8A5D D004 116C
sub  1024g/1CCA8D46 2003-08-14
```

D.3.232 George V. Neville-Neil <`gnn@FreeBSD.org`>

```
pub   1024D/440A33D2 2002-09-17
      Key fingerprint = AF66 410F CC8D 1FC9 17DB  6225 61D8 76C1 440A 33D2
uid                  George V. Neville-Neil <gnn@freebsd.org>
uid                  George V. Neville-Neil <gnn@neville-neil.com>
sub   2048g/95A74F6E 2002-09-17
```

D.3.233 Simon L. Nielsen <`simon@FreeBSD.org`>

```
pub   1024D/FF7490AB 2007-01-14
      Key fingerprint = 4E92 BA8D E45E 85E2 0380  B264 049C 7480 FF74 90AB
uid                  Simon L. Nielsen <simon@FreeBSD.org>
uid                  Simon L. Nielsen <simon@nitro.dk>
sub   2048g/E3F5A76E 2007-01-14
```

D.3.234 Robert Noland <`rnoland@FreeBSD.org`>

```
pub   1024D/8A9F44E3 2007-07-24
      Key fingerprint = 107A 0C87 E9D0 E581 677B  2A28 3384 EB43 8A9F 44E3
uid                  Robert C. Noland III <rnoland@FreeBSD.org>
uid                  Robert C. Noland III (Personal Key) <rnoland@2hip.net>
sub   2048g/76C3CF00 2007-07-24
```

D.3.235 Anders Nordby <`anders@FreeBSD.org`>

```
pub  1024D/00835956 2000-08-13 Anders Nordby <anders@fix.no>
     Key fingerprint = 1E0F C53C D8DF 6A8F EAAD  19C5 D12A BC9F 0083 5956
uid                            Anders Nordby <anders@FreeBSD.org>
sub  2048g/4B160901 2000-08-13
```

D.3.236 Michael Nottebrock <`lofi@FreeBSD.org`>

```
pub  1024D/6B2974B0 2002-06-06 Michael Nottebrock <michaelnottebrock@gmx.net>
     Key fingerprint = 1079 3C72 0726 F300 B8EC  60F9 5E17 3AF1 6B29 74B0
uid                            Michael Nottebrock <lofi@freebsd.org>
uid                            Michael Nottebrock <lofi@tigress.com>
uid                            Michael Nottebrock <lofi@lofi.dyndns.org>
uid                            Michael Nottebrock <michaelnottebrock@web.de>
uid                            Michael Nottebrock <michaelnottebrock@meitner.wh.uni-dortmund.de>
sub  1024g/EF652E04 2002-06-06 [expires: 2004-06-15]
```

D.3.237 David O’Brien <obrien@FreeBSD.org>

```
pub  1024R/34F9F9D5 1995-04-23 David E. O’Brien <defunct - obrien@Sea.Legent.com>
     Key fingerprint = B7 4D 3E E9 11 39 5F A3  90 76 5D 69 58 D9 98 7A
uid                            David E. O’Brien <obrien@NUXI.com>
uid                            deobrien@ucdavis.edu
uid                            David E. O’Brien <whois Do38>
uid                            David E. O’Brien <obrien@FreeBSD.org>
uid                            David E. O’Brien <dobrien@seas.gwu.edu>
uid                            David E. O’Brien <obrien@cs.ucdavis.edu>
uid                            David E. O’Brien <defunct - obrien@media.sra.com>
uid                            David E. O’Brien <obrien@elsewhere.roanoke.va.us>
uid                            David E. O’Brien <obrien@Nuxi.com>

pub  1024D/7F9A9BA2 1998-06-10 "David E. O’Brien" <obrien@cs.ucdavis.edu>
     Key fingerprint = 02FD 495F D03C 9AF2 5DB7  F496 6FC8 DABD 7F9A 9BA2
uid                            "David E. O’Brien" <obrien@NUXI.com>
uid                            "David E. O’Brien" <obrien@FreeBSD.org>
sub  3072g/BA32C20D 1998-06-10
```

D.3.238 Philip Paeps <philip@FreeBSD.org>

```
pub   4096R/C5D34D05 2006-10-22
      Key fingerprint = 356B AE02 4763 F739 2FA2  E438 2649 E628 C5D3 4D05
uid                  Philip Paeps <philip@paeps.cx>
uid                  Philip Paeps <philip@nixsys.be>
uid                  Philip Paeps <philip@fosdem.org>
uid                  Philip Paeps <philip@freebsd.org>
uid                  Philip Paeps <philip@pub.telenet.be>
sub   1024D/035EFC58 2006-10-22 [expires: 2010-10-13]
sub   2048g/6E5FD7D6 2006-10-22 [expires: 2010-10-14]
```

D.3.239 Josh Paetzel <jpaetzel@FreeBSD.org>

```
pub   1024D/27AFAECB 2007-05-11
      Key fingerprint = 8A48 EF36 5E9F 4EDA 5A8C  11B4 26F9 01F1 27AF AECB
uid                  Josh Paetzel (BSD UNIX) <josh@tcbug.org>
uid                  Josh Paetzel <josh@rephunter.net>
uid                  Josh Paetzel <josh@pcbsd.org>
uid                  Josh Paetzel <jpaetzel@FreeBSD.org>
sub   2048g/E0F5996B 2007-05-11
```

D.3.240 Gábor Páli <pgj@FreeBSD.org>

```
pub   1024D/9E3F9BE6 2008-04-17 [expires: 2013-04-16]
      Key fingerprint = DA0B 2143 0FC8 EE5F E211  D329 7D4B 6E18 9E3F 9BE6
uid                  Gabor PALI <pgj@FreeBSD.org>
uid                  PÁLI Gábor János <pali.gabor@gmail.com>
```

```
sub   2048g/A780C60B 2008-04-17 [expires: 2013-04-16]
```

D.3.241 Hiten Pandya <`hmp@FreeBSD.org`>

```
pub  1024D/938CACA8 2004-02-13 Hiten Pandya (FreeBSD) <hmp@FreeBSD.org>
     Key fingerprint = 84EB C75E C75A 50ED 304E  E446 D974 7842 938C ACA8
uid                            Hiten Pandya <hmp@backplane.com>
sub  2048g/783874B5 2004-02-13
```

D.3.242 Dima Panov <`fluffy@FreeBSD.org`>

```
pub   1024D/93E3B018 2006-11-08
      Key fingerprint = C73E 2B72 1FFD 61BD E206  1234 A626 76ED 93E3 B018
uid                  Dima Panov (FreeBSD.ORG Committer) <fluffy@FreeBSD.ORG>
uid                  Dima Panov (at home) <Fluffy@Fluffy.Khv.RU>
uid                  Dima Panov (at home) <fluffy.khv@gmail.com>
sub   2048g/89047419 2006-11-08

pub   4096R/D5398F29 2009-08-09
      Key fingerprint = 2D30 2CCB 9984 130C 6F87  BAFC FB8B A09D D539 8F29
uid                  Dima Panov (FreeBSD.ORG Committer) <fluffy@FreeBSD.ORG>
uid                  Dima Panov (at Home) <fluffy@Fluffy.Khv.RU>
uid                  Dima Panov (at GMail) <fluffy.khv@gmail.com>
sub   4096R/915A7785 2009-08-09
```

D.3.243 Andrew Pantyukhin <`sat@FreeBSD.org`>

```
pub   1024D/6F38A569 2006-05-06
      Key fingerprint = 4E94 994A C2EF CB86 C144  3B04 3381 67C0 6F38 A569
uid                  Andrew Pantyukhin <infofarmer@gubkin.ru>
uid                  Andrew Pantyukhin <sat@FreeBSD.org>
uid                  Andrew Pantyukhin <infofarmer@gmail.com>
uid                  Andrew Pantyukhin <infofarmer@mail.ru>
sub   2048g/5BD4D469 2006-05-06
```

D.3.244 Navdeep Parhar <`np@FreeBSD.org`>

```
pub   1024D/ACAB8812 2009-06-08
      Key fingerprint = C897 7AFB AFC0 4DA9 7B76  D991 CAB2 2B93 ACAB 8812
uid                  Navdeep Parhar <np@FreeBSD.org>
sub   2048g/AB61D2DC 2009-06-08
```

D.3.245 Rui Paulo <`rpaulo@FreeBSD.org`>

```
pub   4096R/39CB4153 2010-02-03
      Key fingerprint = ABE8 8465 DE8F F04D E9C8  3FF6 AF89 B2E6 39CB 4153
uid                  Rui Paulo <rpaulo@FreeBSD.org>
uid                  Rui Paulo <rpaulo@gmail.com>
sub   4096R/F87D2F34 2010-02-03
```

D.3.246 Mark Peek <`mp@FreeBSD.org`>

```
pub  1024D/330D4D01 2002-01-27 Mark Peek <mp@FreeBSD.org>
     Key fingerprint = 510C 96EE B4FB 1B0A 2CF8  A0AF 74B0 0B0E 330D 4D01
sub  1024g/9C6CAC09 2002-01-27
```

D.3.247 Peter Pentchev <`roam@FreeBSD.org`>

```
pub   1024D/16194553 2002-02-01
      Key fingerprint = FDBA FD79 C26F 3C51 C95E  DF9E ED18 B68D 1619 4553
uid                  Peter Pentchev <roam@ringlet.net>
uid                  Peter Pentchev <roam@cnsys.bg>
uid                  Peter Pentchev <roam@sbnd.net>
uid                  Peter Pentchev <roam@online.bg>
uid                  Peter Pentchev <roam@orbitel.bg>
uid                  Peter Pentchev <roam@FreeBSD.org>
uid                  Peter Pentchev <roam@techlab.office1.bg>
uid                  Peter Pentchev <roam@hoster.bg>
uid                  Peter Pentchev <roam@space.bg>
sub   1024g/7074473C 2002-02-01

pub   4096R/2527DF13 2009-10-16
      Key fingerprint = 2EE7 A7A5 17FC 124C F115  C354 651E EFB0 2527 DF13
uid                  Peter Pentchev <roam@ringlet.net>
uid                  Peter Pentchev <roamer@users.sourceforge.net>
uid                  Peter Pentchev <roam@cpan.org>
uid                  Peter Pentchev <roam@cnsys.bg>
uid                  Peter Pentchev <roam@sbnd.net>
uid                  Peter Pentchev <roam@online.bg>
uid                  Peter Pentchev <roam@orbitel.bg>
uid                  Peter Pentchev <roam@FreeBSD.org>
uid                  Peter Pentchev <roam@techlab.office1.bg>
uid                  Peter Pentchev <roam@hoster.bg>
uid                  Peter Pentchev <roam@space.bg>
uid                  Peter Pentchev <roam-guest@alioth.debian.org>
uid                  Peter Pentchev <ppentchev@alumni.princeton.edu>
sub   4096R/D0B337AA 2009-10-16
```

D.3.248 Denis Peplin <`den@FreeBSD.org`>

```
pub  1024D/485DDDF5 2003-09-11 Denis Peplin <den@FreeBSD.org>
     Key fingerprint = 495D 158C 8EC9 C2C1 80F5  EA96 6F72 7C1C 485D DDF5
sub  1024g/E70BA158 2003-09-11
```

D.3.249 Christian S.J. Peron <`csjp@FreeBSD.org`>

```
pub   1024D/033FA33C 2009-05-16
      Key fingerprint = 74AA 6040 89A7 936E D970  DDC0 CC71 6954 033F A33C
uid                  Christian S.J. Peron <csjp@FreeBSD.ORG>
sub   2048g/856B194A 2009-05-16
```

D.3.250 Gerald Pfeifer <`gerald@FreeBSD.org`>

```
pub  1024D/745C015A 1999-11-09 Gerald Pfeifer <gerald@pfeifer.com>
     Key fingerprint = B215 C163 3BCA 0477 615F  1B35 A5B3 A004 745C 015A
uid                            Gerald Pfeifer <Gerald.Pfeifer@vibe.at>
uid                            Gerald Pfeifer <pfeifer@dbai.tuwien.ac.at>
uid                            Gerald Pfeifer <gerald@pfeifer.at>
uid                            Gerald Pfeifer <gerald@FreeBSD.org>
sub  1536g/F0156927 1999-11-09
```

D.3.251 Giuseppe Pilichi <`jacula@FreeBSD.org`>

```
pub   4096R/8B9F4B8B 2006-03-08
      Key fingerprint = 31AD 73AE 0EC0 16E5 4108  8391 D942 5F20 8B9F 4B8B
uid                  Giuseppe Pilichi (Jacula Modyun) <jacula@FreeBSD.org>
uid                  Giuseppe Pilichi (Jacula Modyun) <jaculamodyun@gmail.com>
uid                  Giuseppe Pilichi (Jacula Modyun) <gpilch@gmail.com>
uid                  Giuseppe Pilichi (Jacula Modyun) <jacula@gmail.com>
sub   4096R/FB4D05A3 2006-03-08
```

D.3.252 John Polstra <`jdp@FreeBSD.org`>

```
pub  1024R/BFBCF449 1997-02-14 John D. Polstra <jdp@polstra.com>
     Key fingerprint = 54 3A 90 59 6B A4 9D 61  BF 1D 03 09 35 8D F6 0D
```

D.3.253 Kirill Ponomarew <`krion@FreeBSD.org`>

```
pub   1024D/AEB426E5 2002-04-07
      Key fingerprint = 58E7 B953 57A2 D9DD 4960  2A2D 402D 46E9 AEB4 26E5
uid                  Kirill Ponomarew <krion@voodoo.bawue.com>
uid                  Kirill Ponomarew <krion@guug.de>
uid                  Kirill Ponomarew <krion@FreeBSD.org>
sub   1024D/05AC7CA0 2006-01-30 [expires: 2008-01-30]
sub   2048g/C3EE5537 2006-01-30 [expires: 2008-01-30]
```

D.3.254 Stephane E. Potvin `<sepotvin@FreeBSD.org>`

```
pub   1024D/3097FE7B 2002-08-06
      Key fingerprint = 6B56 62FA ADE1 6F46 BB62  8B1C 99D3 97B5 3097 FE7B
uid                  Stephane E. Potvin <sepotvin@videotron.ca>
uid                  Stephane E. Potvin <stephane.potvin@telcobridges.com>
uid                  Stephane E. Potvin <stephane_potvin@telcobridges.com>
uid                  Stephane E. Potvin <sepotvin@FreeBSD.org>
sub   2048g/0C427BC9 2002-08-06
```

D.3.255 Mark Pulford `<markp@FreeBSD.org>`

```
pub  1024D/182C368F 2000-05-10 Mark Pulford <markp@FreeBSD.org>
     Key fingerprint = 58C9 C9BF C758 D8D4 7022  8EF5 559F 7F7B 182C 368F
uid                            Mark Pulford <mark@kyne.com.au>
sub  2048g/380573E8 2000-05-10
```

D.3.256 Alejandro Pulver `<alepulver@FreeBSD.org>`

```
pub   1024D/945C3F61 2005-11-13
      Key fingerprint = 085F E8A2 4896 4B19 42A4  4179 895D 3912 945C 3F61
uid                  Alejandro Pulver (Ale’s GPG key pair) <alepulver@FreeBSD.org>
uid                  Alejandro Pulver (Ale’s GPG key pair) <alejandro@varnet.biz>
sub   2048g/6890C6CA 2005-11-13
```

D.3.257 Thomas Quinot `<thomas@FreeBSD.org>`

```
pub  1024D/393D2469 1999-09-23 Thomas Quinot <thomas@cuivre.fr.eu.org>
 Empreinte de la clé = 4737 A0AD E596 6D30 4356  29B8 004D 54B8 393D 2469
uid                            Thomas Quinot <thomas@debian.org>
uid                            Thomas Quinot <thomas@FreeBSD.org>
sub  1024g/8DE13BB2 1999-09-23
```

D.3.258 Herve Quiroz `<hq@FreeBSD.org>`

```
pub  1024D/85AC8A80 2004-07-22 Herve Quiroz <hq@FreeBSD.org>
     Key fingerprint = 14F5 BC56 D736 102D 41AF  A07B 1D97 CE6C 85AC 8A80
uid                            Herve Quiroz <herve.quiroz@esil.univ-mrs.fr>
sub  1024g/8ECCAFED 2004-07-22
```

D.3.259 Doug Rabson <`dfr@FreeBSD.org`>

```
pub   1024D/59F57821 2004-02-07
      Key fingerprint = 9451 C4FE 1A7E 117B B95F  1F8F B123 456E 59F5 7821
uid                  Doug Rabson <dfr@nlsystems.com>
sub   1024g/6207AA32 2004-02-07
```

D.3.260 Lars Balker Rasmussen <`lbr@FreeBSD.org`>

```
pub   1024D/9EF6F27F 2006-04-30
      Key fingerprint = F251 28B7 897C 293E 04F8  71EE 4697 F477 9EF6 F27F
uid                  Lars Balker Rasmussen <lbr@FreeBSD.org>
sub   2048g/A8C1CFD4 2006-04-30
```

D.3.261 Chris Rees <`crees@FreeBSD.org`>

```
pub   2048R/E1EBCAC4 2011-06-11 [expires: 2012-06-10]
      Key fingerprint = 2066 B855 E4B1 226A 8B4C  B6E6 B084 92D1 E1EB CAC4
uid                  Chris Rees <crees@freebsd.org>
sub   2048R/FA45D5D6 2011-06-11 [expires: 2012-06-10]
```

D.3.262 Jim Rees <`rees@FreeBSD.org`>

```
pub   512/B623C791 1995/02/21 Jim Rees <rees@umich.edu>
          Key fingerprint =  02 5F 1B 15 B4 6E F1 3E  F1 C5 E0 1D EA CC 17 88
```

D.3.263 Benedict Reuschling <`bcr@FreeBSD.org`>

```
pub   1024D/4A819348 2009-05-24
      Key fingerprint = 2D8C BDF9 30FA 75A5 A0DF  D724 4D26 502E 4A81 9348
uid                  Benedict Reuschling <bcr@FreeBSD.org>
sub   2048g/8DA16EDD 2009-05-24
```

D.3.264 Tom Rhodes <`trhodes@FreeBSD.org`>

```
pub   1024D/FB7D88E1 2008-05-07
      Key fingerprint = 8279 3100 2DF2 F00E 7FDD  AC2C 5776 23AB FB7D 88E1
uid                  Tom Rhodes (trhodes) <trhodes@FreeBSD.org>
sub   4096g/7B0CD79F 2008-05-07
```

D.3.265 Benno Rice <`benno@FreeBSD.org`>

```
pub  1024D/87C59909 2002-01-16 Benno Rice <benno@FreeBSD.org>
     Key fingerprint = CE27 DADA 08E3 FAA3 88F1  5B31 5E34 705A 87C5 9909
uid                            Benno Rice <benno@jeamland.net>
sub  1024g/4F7C2BAD 2002-01-16 [expires: 2007-01-15]
```

D.3.266 Beech Rintoul <`beech@FreeBSD.org`>

```
pub   1024D/ECBFDC44 2011-08-29
      Key fingerprint = 6921 47CC 8B61 7C02 70EF  4D00 16B4 EAB7 ECBF DC44
uid                  Beech Rintoul <beech@freebsd.org>
sub   1024g/F1FD1C3D 2011-08-29
```

D.3.267 Matteo Riondato <`matteo@FreeBSD.org`>

```
pub   1024D/1EC56BEC 2003-01-05 [expires: 2009-09-07]
      Key fingerprint = F0F3 1B43 035D 65B1 08E9  4D66 D8CA 78A5 1EC5 6BEC
uid                  Matteo Riondato (Rionda) <matteo@FreeBSD.ORG>
uid                  Matteo Riondato (Rionda) <rionda@riondabsd.net>
uid                  Matteo Riondato (Rionda) <rionda@gufi.org>
uid                  Matteo Riondato (Rionda) <matteo@riondato.com>
uid                  Matteo Riondato (Rionda) <rionda@riondato.com>
uid                  Matteo Riondato (Rionda) <rionda@FreeSBIE.ORG>
uid                  Matteo Riondato (Rionda) <rionda@autistici.org>
sub   2048g/87C44A55 2008-09-23 [expires: 2009-09-23]
```

D.3.268 Ollivier Robert <`roberto@FreeBSD.org`>

```
pub   1024D/7DCAE9D3 1997-08-21
      Key fingerprint = 2945 61E7 D4E5 1D32 C100  DBEC A04F FB1B 7DCA E9D3
uid                  Ollivier Robert <roberto@keltia.freenix.fr>
uid                  Ollivier Robert <roberto@FreeBSD.org>
sub   2048g/C267084D 1997-08-21
```

D.3.269 Craig Rodrigues <`rodrigc@FreeBSD.org`>

```
pub   1024D/3998479D 2005-05-20
      Key fingerprint = F01F EBE6 F5C8 6DC2 954F  098F D20A 8A2A 3998 479D
uid                  Craig Rodrigues <rodrigc@freebsd.org>
uid                  Craig Rodrigues <rodrigc@crodrigues.org>
sub   2048g/AA77E09B 2005-05-20
```

D.3.270 Guido van Rooij <`guido@FreeBSD.org`>

```
pub  1024R/599F323D 1996-05-18 Guido van Rooij <guido@gvr.org>
     Key fingerprint = 16 79 09 F3 C0 E4 28 A7  32 62 FA F6 60 31 C0 ED
uid                            Guido van Rooij <guido@gvr.win.tue.nl>

pub  1024D/A95102C1 2000-10-25 Guido van Rooij <guido@madison-gurkha.nl>
     Key fingerprint = 5B3E 51B7 0E7A D170 0574  1E51 2471 117F A951 02C1
uid                            Guido van Rooij <guido@madison-gurkha.com>
sub  1024g/A5F20553 2000-10-25
```

D.3.271 Eygene Ryabinkin <`rea@FreeBSD.org`>

```
pub   3072D/8152ECFB 2010-10-27
      Key fingerprint = 82FE 06BC D497 C0DE 49EC  4FF0 16AF 9EAE 8152 ECFB
uid                  Eygene Ryabinkin <rea-fbsd@codelabs.ru>
uid                  Eygene Ryabinkin <rea@freebsd.org>
uid                  Eygene Ryabinkin <rea@codelabs.ru>
sub   3072g/5FC03749 2010-10-27
```

D.3.272 Aleksandr Rybalko <`ray@FreeBSD.org`>

```
pub   2048R/4B7B7A4E 2011-05-24
      Key fingerprint = BB9F D01D 7327 0B33 B2F5  6C72 EC49 E6ED 4B7B 7A4E
uid                  Aleksandr Rybalko (Aleksandr Rybalko FreeBSD project identification) <ray@fr
sub   2048R/99F9F9EF 2011-05-24
```

D.3.273 Niklas Saers <`niklas@FreeBSD.org`>

```
pub  1024D/C822A476 2004-03-09 Niklas Saers <niklas@saers.com>
     Key fingerprint = C41E F734 AF0E 3D21 7499  9EB1 9A31 2E7E C822 A476
sub  1024g/81E2FF36 2004-03-09
```

D.3.274 Boris Samorodov <`bsam@FreeBSD.org`>

```
pub   1024D/ADFD5C9A 2006-06-21
      Key fingerprint = 81AA FED0 6050 208C 0303  4007 6C03 7263 ADFD 5C9A
uid                  Boris Samorodov (FreeBSD) <bsam@freebsd.org>
sub   2048g/7753A3F1 2006-06-21
```

D.3.275 Mark Santcroos <`marks@FreeBSD.org`>

```
pub   1024D/DBE7EB8E 2005-03-08
      Key fingerprint = C0F0 44F3 3F15 520F 6E32  186B BE0A BA42 DBE7 EB8E
uid                  Mark Santcroos <marks@ripe.net>
uid                  Mark Santcroos <mark@santcroos.net>
uid                  Mark Santcroos <marks@freebsd.org>
sub   2048g/FFF80F85 2005-03-08
```

D.3.276 Bernhard Schmidt <`bschmidt@FreeBSD.org`>

```
pub   1024D/5F754FBC 2009-06-15
      Key fingerprint = 6B87 C8A9 6BA5 6B18 11CF  8C38 A1B7 0731 5F75 4FBC
uid                  Bernhard Schmidt <bschmidt@FreeBSD.org>
uid                  Bernhard Schmidt <bschmidt@techwires.net>
sub   1024g/1945DC1D 2009-06-15
```

D.3.277 Wolfram Schneider <`wosch@FreeBSD.org`>

```
Type Bits/KeyID    Date       User ID
pub  1024/2B7181AD 1997/08/09 Wolfram Schneider <wosch@FreeBSD.org>
            Key fingerprint = CA 16 91 D9 75 33 F1 07  1B F0 B4 9F 3E 95 B6 09
```

D.3.278 Ed Schouten <`ed@FreeBSD.org`>

```
pub   4096R/3491A2BB 2011-03-12 [expires: 2016-03-10]
      Key fingerprint = A110 5982 A887 74A2 F4B1  D70A 6E5E D8FE 3491 A2BB
uid                  Ed Schouten (The FreeBSD Project) <ed@FreeBSD.org>
uid                  Ed Schouten <ed@80386.nl>
sub   4096R/81BB41E6 2011-03-12 [expires: 2016-03-10]
```

D.3.279 David Schultz <`das@FreeBSD.org`>

```
pub  1024D/BE848B57 2001-07-19 David Schultz <das@FreeBSD.ORG>
     Key fingerprint = 0C12 797B A9CB 19D9 FDAF  2A39 2D76 A2DB BE84 8B57
uid  David Schultz <dschultz@uclink.Berkeley.EDU>
uid  David Schultz <das@FreeBSD.ORG>
sub  2048g/69206E8E 2001-07-19
```

D.3.280 Michael Scheidell <`scheidell@FreeBSD.org`>

```
pub   2048R/34622C1D 2011-11-16
      Key fingerprint = 0A0C 9ECA 18EC 47AC C715  2187 91B9 F9FE 3462 2C1D
uid                  Michael Scheidell <scheidell@freebsd.org>
```

```
sub   2048R/8F241971 2011-11-16
```

D.3.281 Jens Schweikhardt <`schweikh@FreeBSD.org`>

```
pub  1024D/0FF231FD 2002-01-27 Jens Schweikhardt <schweikh@FreeBSD.org>
     Key fingerprint = 3F35 E705 F02F 35A1 A23E  330E 16FE EA33 0FF2 31FD
uid                            Jens Schweikhardt <schweikh@schweikhardt.net>
sub  1024g/6E93CACC 2002-01-27 [expires: 2005-01-26]
```

D.3.282 Matthew Seaman <`matthew@FreeBSD.org`>

```
pub   1024D/60AE908C 2005-12-17 [expires: 2012-03-21]
      Key fingerprint = B555 2A96 274E D248 5734  0EB4 F0C8 E4E7 60AE 908C
uid                  Matthew Seaman <m.seaman@infracaninophile.co.uk>
uid                  Matthew Seaman <m.seaman@black-earth.co.uk>
uid                  Matthew Seaman <matthew@freebsd.org>
sub   2048g/58BFDA29 2005-12-17 [expires: 2012-03-21]
sub   1024D/9B19F956 2006-12-18 [expires: 2012-03-21]
```

D.3.283 Stanislav Sedov <`stas@FreeBSD.org`>

```
pub   4096R/092FD9F0 2009-05-23
      Key fingerprint = B83A B15D 929A 364A D8BC  B3F9 BF25 A231 092F D9F0
uid                  Stanislav Sedov <stas@FreeBSD.org>
uid                  Stanislav Sedov <stas@SpringDaemons.com>
uid                  Stanislav Sedov (Corporate email) <stas@deglitch.com>
uid                  Stanislav Sedov (Corporate email) <stas@ht-systems.ru>
uid                  Stanislav Sedov (Corporate email) <ssedov@3playnet.com>
uid                  Stanislav Sedov <ssedov@mbsd.msk.ru>
uid                  Stanislav Sedov (Corporate email) <ssedov@swifttest.com>
sub   4096R/6FD2025F 2009-05-23
```

D.3.284 Johan van Selst <`johans@FreeBSD.org`>

```
pub   4096R/D3AE8D3A 2009-09-01
      Key fingerprint = 31C8 D089 DDB6 96C6 F3C1  29C0 A9C8 6C8D D3AE 8D3A
uid                  Johan van Selst
uid                  Johan van Selst <johans@gletsjer.net>
uid                  Johan van Selst <johans@stack.nl>
uid                  Johan van Selst <johans@FreeBSD.org>
uid                  Johan van Selst (GSWoT:NL50) <johans@gswot.org>
sub   2048R/B002E38C 2009-09-01
sub   2048R/1EBCAECB 2009-09-01
sub   2048R/639A1446 2009-09-01
sub   3072D/6F2708F4 2009-09-01
sub   4096g/D6F89E83 2009-09-01
```

D.3.285 Bakul Shah <`bakul@FreeBSD.org`>

```
pub   1024D/86AEE4CB 2006-04-20
      Key fingerprint = 0389 26E8 381C 6980 AEC0  10A5 E540 A157 86AE E4CB
uid                  Bakul Shah <bakul@freebsd.org>
sub   2048g/5C3DCC24 2006-04-20
```

D.3.286 Gregory Neil Shapiro <`gshapiro@FreeBSD.org`>

```
pub  1024R/4FBE2ADD 2000-10-13 Gregory Neil Shapiro <gshapiro@gshapiro.net>
     Key fingerprint = 56 D5 FF A7 A6 54 A6 B5  59 10 00 B9 5F 5F 20 09
uid                            Gregory Neil Shapiro <gshapiro@FreeBSD.org>

pub  1024D/F76A9BF5 2001-11-14 Gregory Neil Shapiro <gshapiro@FreeBSD.org>
     Key fingerprint = 3B5E DAF1 4B04 97BA EE20  F841 21F9 C5BC F76A 9BF5
uid                            Gregory Neil Shapiro <gshapiro@gshapiro.net>
sub  2048g/935657DC 2001-11-14

pub  1024D/FCE56561 2000-10-14 Gregory Neil Shapiro <gshapiro@FreeBSD.org>
     Key fingerprint = 42C4 A87A FD85 C34F E77F  5EA1 88E1 7B1D FCE5 6561
uid                            Gregory Neil Shapiro <gshapiro@gshapiro.net>
sub  1024g/285DC8A0 2000-10-14 [expires: 2001-10-14]
```

D.3.287 Arun Sharma <`arun@FreeBSD.org`>

```
pub  1024D/7D112181 2003-03-06 Arun Sharma <arun@sharma-home.net>
     Key fingerprint = A074 41D6 8537 C7D5 070E  0F78 0247 1AE2 7D11 2181
uid                            Arun Sharma <arun@freebsd.org>
uid                            Arun Sharma <arun.sharma@intel.com>
sub  1024g/ACAD98DA 2003-03-06 [expires: 2005-03-05]
```

D.3.288 Wesley Shields <`wxs@FreeBSD.org`>

```
pub   1024D/17F0AA37 2007-12-27
      Key fingerprint = 96D1 2E6B F61C 2F3D 83EF  8F0B BE54 310C 17F0 AA37
uid                  Wesley Shields <wxs@FreeBSD.org>
uid                  Wesley Shields <wxs@atarininja.org>
sub   2048g/2EDA1BB8 2007-12-27
```

D.3.289 Norikatsu Shigemura <`nork@FreeBSD.org`>

```
pub   1024D/7104EA4E 2005-02-14
      Key fingerprint = 9580 60A3 B58A 0864 79CB  779A 6FAE 229B 7104 EA4E
uid                  Norikatsu Shigemura <nork@cityfujisawa.ne.jp>
uid                  Norikatsu Shigemura <nork@ninth-nine.com>
uid                  Norikatsu Shigemura <nork@FreeBSD.org>
```

```
sub   4096g/EF56997E 2005-02-14
```

D.3.290 Shteryana Shopova <`syrinx@FreeBSD.org`>

```
pub   1024D/1C139BC5 2006-10-07
      Key fingerprint = B83D 2451 27AB B767 504F  CB85 4FB1 C88B 1C13 9BC5
uid                  Shteryana Shopova (syrinx) <shteryana@FreeBSD.org>
sub   2048g/6D2E9C98 2006-10-07
```

D.3.291 Vanilla I. Shu <`vanilla@FreeBSD.org`>

```
pub  1024D/ACE75853 2001-11-20 Vanilla I. Shu <vanilla@FreeBSD.org>
     Key fingerprint = 290F 9DB8 42A3 6257 5D9A  5585 B25A 909E ACE7 5853
sub  1024g/CE695D0E 2001-11-20
```

D.3.292 Ashish SHUKLA <`ashish@FreeBSD.org`>

```
pub   4096R/E74FA4B0 2010-04-13
      Key fingerprint = F682 CDCC 39DC 0FEA E116  20B6 C746 CFA9 E74F A4B0
uid                  Ashish SHUKLA <wahjava@gmail.com>
uid                  Ashish SHUKLA <wahjava@googlemail.com>
uid                  Ashish SHUKLA <wahjava.ml@gmail.com>
uid                  Ashish SHUKLA <wahjava@members.fsf.org>
uid                  Ashish SHUKLA <wahjava@perl.org.in>
uid                  Ashish SHUKLA <wahjava@users.sourceforge.net>
uid                  Ashish SHUKLA <wah.java@yahoo.com>
uid                  Ashish SHUKLA <wah_java@hotmail.com>
uid                  Ashish SHUKLA <ashish.shukla@airtelmail.in>
uid                  Ashish SHUKLA <wahjava@member.fsf.org>
uid                  [jpeg image of size 4655]
uid                  Ashish SHUKLA (FreeBSD Committer Address) <ashish@FreeBSD.ORG>
sub   4096R/F20D202D 2010-04-13
```

D.3.293 Bruce M. Simpson <`bms@FreeBSD.org`>

```
pub  1024D/860DB53B 2003-08-06 Bruce M Simpson <bms@freebsd.org>
     Key fingerprint = 0D5F 1571 44DF 51B7 8B12  041E B9E5 2901 860D B53B
sub  2048g/A2A32D8B 2003-08-06 [expires: 2006-08-05]
```

D.3.294 Dmitry Sivachenko <`demon@FreeBSD.org`>

```
pub  1024D/13D5DF80 2002-03-18 Dmitry Sivachenko <mitya@cavia.pp.ru>
     Key fingerprint = 72A9 12C9 BB02 46D4 4B13  E5FE 1194 9963 13D5 DF80
uid                            Dmitry S. Sivachenko <demon@FreeBSD.org>
```

```
sub  1024g/060F6DBD 2002-03-18
```

D.3.295 Jesper Skriver <`jesper@FreeBSD.org`>

```
pub  1024D/F9561C31 2001-03-09 Jesper Skriver <jesper@FreeBSD.org>
     Key fingerprint = 6B88 9CE8 66E9 E631 C9C5  5EB4 22AB F0EC F956 1C31
uid                            Jesper Skriver <jesper@skriver.dk>
uid                            Jesper Skriver <jesper@wheel.dk>
sub  1024g/777C378C 2001-03-09
```

D.3.296 Ville Skyttä <`scop@FreeBSD.org`>

```
pub  1024D/BCD241CB 2002-04-07 Ville Skyttä <ville.skytta@iki.fi>
     Key fingerprint = 4E0D EBAB 3106 F1FA 3FA9  B875 D98C D635 BCD2 41CB
uid                            Ville Skyttä <ville.skytta@xemacs.org>
uid                            Ville Skyttä <scop@FreeBSD.org>
sub  2048g/9426F4D1 2002-04-07
```

D.3.297 Andrey Slusar <`anray@FreeBSD.org`>

```
pub   1024D/AE7B5418 2005-12-12
      Key fingerprint = DE70 C24B 55A0 4A06 68A1  D425 3C59 9A9B AE7B 5418
uid                  Andrey Slusar <anray@ext.by>
uid                  Andrey Slusar <anrays@gmail.com>
uid                  Andrey Slusar <anray@FreeBSD.org>
sub   2048g/7D0EB77D 2005-12-12
```

D.3.298 Florian Smeets <`flo@FreeBSD.org`>

```
pub   1024D/C942BF09 2008-10-24
      Key fingerprint = 54BB 157B 8DB2 9E46 4A3C  69AB 6A9A 3C3F C942 BF09
uid                  Florian Smeets <flo@smeets.im>
uid                  Florian Smeets <flo@kasimir.com>
uid                  Florian Smeets <flo@FreeBSD.org>
sub   2048g/4AAF040E 2008-10-24
```

D.3.299 Gleb Smirnoff <`glebius@FreeBSD.org`>

```
pub   1024D/1949DC80 2003-08-25
      Key fingerprint = 872C E14A 2F03 A3E8 D882  026E 5DE4 D7FE 1949 DC80
uid                  Gleb Smirnoff <glebius@FreeBSD.org>
uid                  Gleb Smirnoff <glebius@cell.sick.ru>
uid                  Gleb Smirnoff <glebius@bestcom.ru>
uid                  Gleb Smirnoff <glebius@rambler-co.ru>
uid                  Gleb Smirnoff <glebius@freebsd.org>
uid                  Gleb Smirnoff <glebius@freebsd.int.ru>
sub   1024g/A05118BD 2003-08-25
```

D.3.300 Ken Smith <kensmith@FreeBSD.org>

```
pub  1024D/29AEA7F6 2003-12-02 Ken Smith <kensmith@cse.buffalo.edu>
     Key fingerprint = 4AB7 D302 0753 8215 31E7  F1AD FC6D 7855 29AE A7F6
uid                            Ken Smith <kensmith@freebsd.org>
sub  1024g/0D509C6C 2003-12-02
```

D.3.301 Ben Smithurst <ben@FreeBSD.org>

```
pub  1024D/2CEF442C 2001-07-11 Ben Smithurst <ben@LSRfm.com>
     Key fingerprint = 355D 0FFF B83A 90A9 D648  E409 6CFC C9FB 2CEF 442C
uid                            Ben Smithurst <ben@vinosystems.com>
uid                            Ben Smithurst <ben@smithurst.org>
uid                            Ben Smithurst <ben@FreeBSD.org>
uid                            Ben Smithurst <csxbcs@comp.leeds.ac.uk>
uid                            Ben Smithurst <ben@scientia.demon.co.uk>
sub  1024g/347071FF 2001-07-11
```

D.3.302 Dag-Erling C. Smørgrav <des@FreeBSD.org>

```
pub   1024D/64EBE220 2006-11-11 [expires: 2012-12-31]
      Key fingerprint = 3A1C 8E68 952C 3305 6984  6486 30D4 3A6E 64EB E220
uid                  Dag-Erling SmÃ̧rgrav <des@des.no>
uid                  Dag-Erling SmÃ̧rgrav <des@freebsd.org>
uid                  Dag-Erling SmÃ̧rgrav <des@usit.uio.no>
uid                  [jpeg image of size 3315]
sub   2048g/920C3313 2006-11-11 [expires: 2012-12-31]
```

D.3.303 Maxim Sobolev <sobomax@FreeBSD.org>

```
pub  1024D/888205AF 2001-11-21 Maxim Sobolev <sobomax@FreeBSD.org>
     Key fingerprint = 85C9 DCB0 6828 087C C977  3034 A0DB B9B7 8882 05AF
uid                            Maxim Sobolev <sobomax@mail.ru>
uid                            Maxim Sobolev <sobomax@altavista.net>
uid                            Maxim Sobolev <vegacap@i.com.ua>

pub  1024D/468EE6D8 2003-03-21 Maxim Sobolev <sobomax@portaone.com>
     Key fingerprint = 711B D315 3360 A58F 9A0E  89DB 6D40 2558 468E E6D8
uid                            Maxim Sobolev <sobomax@FreeBSD.org>
uid                            Maxim Sobolev <sobomax@mail.ru>
uid                            Maxim Sobolev <vegacap@i.com.ua>
```

```
pub  1024D/6BEC980A 2004-02-13 Maxim Sobolev <sobomax@portaone.com>
     Key fingerprint = 09D5 47B4 8D23 626F B643  76EB DFEE 3794 6BEC 980A
uid                            Maxim Sobolev <sobomax@FreeBSD.org>
uid                            Maksym Sobolyev (It’s how they call me in official documents. Pret
uid                            Maksym Sobolyev (It’s how they call me in official documents. Pret
sub  2048g/16D049AB 2004-02-13 [expires: 2005-02-12]
```

D.3.304 Brian Somers `<brian@FreeBSD.org>`

```
pub  1024R/666A7421 1997-04-30 Brian Somers <brian@freebsd-services.com>
     Key fingerprint = 2D 91 BD C2 94 2C 46 8F  8F 09 C4 FC AD 12 3B 21
uid                            Brian Somers <brian@awfulhak.org>
uid                            Brian Somers <brian@FreeBSD.org>
uid                            Brian Somers <brian@OpenBSD.org>
uid                            Brian Somers <brian@uk.FreeBSD.org>
uid                            Brian Somers <brian@uk.OpenBSD.org>
```

D.3.305 Stacey Son `<sson@FreeBSD.org>`

```
pub   1024D/CE8319F3 2008-07-08
      Key fingerprint = 64C7 8D92 C1DF B940 1171  5ED3 186A 758A CE83 19F3
uid                  Stacey Son <sson@FreeBSD.org>
uid                  Stacey Son <stacey@son.org>
uid                  Stacey Son <sson@byu.net>
uid                  Stacey Son <sson@secure.net>
uid                  Stacey Son <sson@dev-random.com>
sub   2048g/0F724E52 2008-07-08
```

D.3.306 Nicolas Souchu `<nsouch@FreeBSD.org>`

```
pub  1024D/C744F18B 2002-02-13 Nicholas Souchu <nsouch@freebsd.org>
     Key fingerprint = 992A 144F AC0F 40BA 55AE  DE6D 752D 0A6C C744 F18B
sub  1024g/90BD3231 2002-02-13
```

D.3.307 Suleiman Souhlal `<ssouhlal@FreeBSD.org>`

```
pub  1024D/2EA50469 2004-07-24 Suleiman Souhlal <ssouhlal@FreeBSD.org>
     Key fingerprint = DACF 89DB 54C7 DA1D 37AF  9A94 EB55 E272 2EA5 0469
sub  2048g/0CDCC535 2004-07-24
```

D.3.308 Ulrich Spörlein <`uqs@FreeBSD.org`>

```
pub   2048R/4AAF82CE 2010-01-27 [expires: 2015-01-26]
      Key fingerprint = 08DF A6A0 B1EB 98A5 EDDA  9005 A3A6 9864 4AAF 82CE
uid                  Ulrich SpÃ¶rlein <uqs@spoerlein.net>
uid                  Ulrich Spoerlein <uspoerlein@gmail.com>
uid                  Ulrich SpÃ¶rlein (The FreeBSD Project) <uqs@FreeBSD.org>
uid                  Ulrich SpÃ¶rlein <ulrich.spoerlein@web.de>
sub   2048R/162E8BD2 2010-01-27 [expires: 2015-01-26]
```

D.3.309 Rink Springer <`rink@FreeBSD.org`>

```
pub   1024D/ECEDBFFF 2003-09-19
      Key fingerprint = A8BE 9C82 9B81 4289 A905  418D 6F73 BAD2 ECED BFFF
uid                  Rink Springer <rink@il.fontys.nl>
uid                  Rink Springer (FreeBSD Project) <rink@FreeBSD.org>
uid                  Rink Springer <rink@stack.nl>
sub   2048g/3BC3E67E 2003-09-19
```

D.3.310 Vsevolod Stakhov <`vsevolod@FreeBSD.org`>

```
pub   4096R/90081437 2012-05-16 [expires: 2017-05-15]
      Key fingerprint = DD9A 126C E675 1EA5 2A97  04A3 0764 7B67 9008 1437
uid                  Vsevolod Stakhov <vsevolod@FreeBSD.org>
sub   4096R/4A5A0B54 2012-05-16 [expires: 2017-05-15]
```

D.3.311 Ryan Steinmetz <`zi@FreeBSD.org`>

```
pub   1024D/7AD7FAF2 2004-01-21
      Key fingerprint = EF36 D45A 5CA9 28B1 A550  18CD A43C D111 7AD7 FAF2
uid                  Ryan Steinmetz <zi@FreeBSD.org>
uid                  Ryan Steinmetz <rpsfa@rit.edu>
uid                  Ryan Steinmetz <zi@zi0r.com>
sub   1024g/058BC057 2004-01-21
sub   4096g/0EB108D2 2006-02-27
sub   1024D/FEF36DD7 2006-02-27
```

D.3.312 Randall R. Stewart <`rrs@FreeBSD.org`>

```
pub   1024D/0373B8B2 2006-09-01
      Key fingerprint = 74A6 810E 6DEA D69B 6496  5FA9 8AEF 4166 0373 B8B2
uid                  Randall R Stewart <randall@lakerest.net>
uid                  Randall R Stewart <rrs@cisco.com>
uid                  Randall R Stewart <rrs@FreeBSD.org>
sub   2048g/88027C0B 2006-09-01
```

D.3.313 Murray Stokely <`murray@FreeBSD.org`>

```
pub  1024D/0E451F7D 2001-02-12 Murray Stokely <murray@freebsd.org>
     Key fingerprint = E2CA 411D DD44 53FD BB4B  3CB5 B4D7 10A2 0E45 1F7D
sub  1024g/965A770C 2001-02-12
```

D.3.314 Volker Stolz <`vs@FreeBSD.org`>

```
pub  1024R/3FD1B6B5 1998-06-16 Volker Stolz <vs@freebsd.org>
     Key fingerprint = 69 6F BD A0 2E FE 19 66  CF B9 68 6E 41 7D F9 B9
uid                            Volker Stolz <stolz@i2.informatik.rwth-aachen.de> (LSK)
uid                            Volker Stolz <vs@foldr.org>
```

D.3.315 Ryan Stone <`rstone@FreeBSD.org`>

```
pub   1024D/3141B73A 2010-04-13
      Key fingerprint = 4A6D DC04 DDC5 0822 2687  A086 FD3F 16CB 3141 B73A
uid                  Ryan Stone (FreeBSD) <rstone@freebsd.org>
sub   2048g/A8500B5F 2010-04-13
```

D.3.316 Søren Straarup <`xride@FreeBSD.org`>

```
pub   1024D/E683AD40 2006-09-28
      Key fingerprint = 8A0E 7E57 144B BC25 24A9  EC1A 0DBC 3408 E683 AD40
uid                  Soeren Straarup <xride@xride.dk>
uid                  Soeren Straarup <xride@FreeBSD.org>
uid                  Soeren Straarup <xride@x12.dk>
sub   2048g/2B18B3B8 2006-09-28
```

D.3.317 Marius Strobl <`marius@FreeBSD.org`>

```
pub   1024D/E0AC6F8D 2004-04-16
      Key fingerprint = 3A6C 4FB1 8BB9 4F2E BDDC  4AB6 D035 799C E0AC 6F8D
uid                  Marius Strobl <marius@FreeBSD.org>
uid                  Marius Strobl <marius@alchemy.franken.de>
sub   1024g/08BBD875 2004-04-16
```

D.3.318 Carlo Strub <`cs@FreeBSD.org`>

```
pub   4096R/48C0D3F8 2012-06-05 [expires: 2017-06-04]
      Key fingerprint = A2DD 6235 93E4 6520 1AF9  2B14 E925 8207 48C0 D3F8
uid                  Carlo Strub <cs@FreeBSD.org>
sub   4096R/99AC2A67 2012-06-05 [expires: 2017-06-04]
```

```
pub   4096R/2C23E493 2012-06-08 [expires: 2017-06-07]
      Key fingerprint = 26E0 89EA B9BE 5FC5 D740  CBB4 EABC 7343 2C23 E493
uid                  Carlo Strub (Mail) <cs@carlostrub.ch>
sub   4096R/DF86FD3E 2012-06-08 [expires: 2017-06-07]
```

D.3.319 Cheng-Lung Sung <clsung@FreeBSD.org>

```
pub  1024D/956E8BC1 2003-09-12 Cheng-Lung Sung <clsung@FreeBSD.org>
     Key fingerprint = E0BC 57F9 F44B 46C6 DB53  8462 F807 89F3 956E 8BC1
uid                            Cheng-Lung Sung (Software Engineer) <clsung@dragon2.net>
uid                            Cheng-Lung Sung (Alumnus of CSIE, NCTU, Taiwan) <clsung@sungsung.cs
uid                            Cheng-Lung Sung (AlanSung) <clsung@tiger2.net>
uid                            Cheng-Lung Sung (FreeBSD@Taiwan) <clsung@freebsd.csie.nctu.edu.tw>
uid                            Cheng-Lung Sung (Ph.D. Student of NTU.EECS) <d92921016@ntu.edu.tw>
uid                            Cheng-Lung Sung (FreeBSD Freshman) <clsung@tw.freebsd.org>
uid                            Cheng-Lung Sung (ports committer) <clsung@FreeBSD.org>
sub  1024g/1FB800C2 2003-09-12
```

D.3.320 Gregory Sutter <gsutter@FreeBSD.org>

```
pub  1024D/845DFEDD 2000-10-10 Gregory S. Sutter <gsutter@zer0.org>
     Key fingerprint = D161 E4EA 4BFA 2427 F3F9  5B1F 2015 31D5 845D FEDD
uid                            Gregory S. Sutter <gsutter@freebsd.org>
uid                            Gregory S. Sutter <gsutter@daemonnews.org>
uid                            Gregory S. Sutter <gsutter@pobox.com>
sub  2048g/0A37BBCE 2000-10-10
```

D.3.321 Koichi Suzuki <metal@FreeBSD.org>

```
pub  1024D/AE562682 2004-05-23 SUZUKI Koichi <metal@FreeBSD.org>
     Key fingerprint = 92B9 A202 B5AB 8CB6 89FC  6DD1 5737 C702 AE56 2682
sub  4096g/730E604B 2004-05-23
```

D.3.322 Ryusuke SUZUKI <ryusuke@FreeBSD.org>

```
pub   1024D/63D29724 2009-12-18
      Key fingerprint = B108 7109 2E62 BECB 0F78  FE65 1B9A D1BE 63D2 9724
uid                  Ryusuke SUZUKI <ryusuke@FreeBSD.org>
uid                  Ryusuke SUZUKI <ryusuke@jp.FreeBSD.org>
sub   1024g/5E4DD044 2009-12-18
```

D.3.323 Gary W. Swearingen <`garys@FreeBSD.org`>

```
pub   1024D/FAA48AD5 2005-08-22 [expires: 2007-08-22]
      Key fingerprint = 8292 CC3E 81B5 E54F E3DD  F987 FA52 E643 FAA4 8AD5
uid                  Gary W. Swearingen <garys@freebsd.org>
sub   2048g/E34C3CA0 2005-08-22 [expires: 2007-08-22]
```

D.3.324 Yoshihiro Takahashi <`nyan@FreeBSD.org`>

```
pub  1024D/8394B81F 2001-10-15 Yoshihiro TAKAHASHI <nyan@jp.FreeBSD.org>
     Key fingerprint = D4FA D8CA 2AED FCF4 90A3  3569 8666 0500 8394 B81F
uid                            Yoshihiro TAKAHASHI <nyan@furiru.org>
uid                            Yoshihiro TAKAHASHI <nyan@FreeBSD.org>
sub  1024g/B796F020 2001-10-15
```

D.3.325 Sahil Tandon <`sahil@FreeBSD.org`>

```
pub   2048R/C016D977 2010-04-08
      Key fingerprint = 6AD2 BA99 8E3A 8DA6 DFC1  53CF DBD0 6001 C016 D977
uid                  Sahil Tandon <sahil@tandon.net>
uid                  Sahil Tandon <sahil@FreeBSD.org>
sub   2048R/F7776FBC 2010-04-08
```

D.3.326 TAKATSU Tomonari <`tota@FreeBSD.org`>

```
pub   1024D/67F58F29 2009-05-17
      Key fingerprint = 6940 B575 FC4A FA26 C094  279A 4B9B 6326 67F5 8F29
uid                  TAKATSU Tomonari <tota@FreeBSD.org>
sub   2048g/18B112CD 2009-05-17
```

D.3.327 Romain Tartière <`romain@FreeBSD.org`>

```
pub   3072R/5112336F 2010-04-09
      Key fingerprint = 8234 9A78 E7C0 B807 0B59  80FF BA4D 1D95 5112 336F
uid                  Romain TartiÃ¨re <romain@blogreen.org>
uid                  Romain TartiÃ¨re (FreeBSD) <romain@FreeBSD.org>
sub   3072R/C1B2B656 2010-04-09
sub   3072R/8F8125F4 2010-04-09
```

D.3.328 Sylvio Cesar Teixeira <`sylvio@FreeBSD.org`>

```
pub   2048R/AA7395A1 2009-10-28
      Key fingerprint = B319 6AAF 0016 4308 6D93  E652 3C5F 21A2 AA73 95A1
uid                  Sylvio Cesar Teixeira (My key) <sylvio@FreeBSD.org>
```

```
sub   2048R/F758F556 2009-10-28
```

D.3.329 Ion-Mihai Tetcu <`itetcu@FreeBSD.org`>

```
pub   1024D/21FFA1E5 2008-05-08 [expires: 2010-05-08]
      Key fingerprint = A880 42DD BD71 BAA5 AED7  AEA2 27B1 88BA 21FF A1E5
uid                  Ion-Mihai "IOnut" Tetcu <itetcu@FreeBSD.org>
sub   2048g/0B30E680 2008-05-08 [expires: 2010-05-08]
```

D.3.330 Mikhail Teterin <`mi@FreeBSD.org`>

```
pub  1024R/3FC71479 1995-09-08 Mikhail Teterin <mi@aldan.star89.galstar.com>
     Key fingerprint = 5F 15 EA 78 A5 40 6A 0F  14 D7 D9 EA 6E 2B DA A4
```

D.3.331 Gordon Tetlow <`gordon@FreeBSD.org`>

```
pub  1024D/357D65FB 2002-05-14 Gordon Tetlow <gordont@gnf.org>
     Key fingerprint = 34EF AD12 10AF 560E C3AE  CE55 46ED ADF4 357D 65FB
uid                            Gordon Tetlow <gordon@FreeBSD.org>
sub  1024g/243694AB 2002-05-14
```

D.3.332 Lars Thegler <`lth@FreeBSD.org`>

```
pub  1024D/56B0CA08 2004-05-31 Lars Thegler <lth@FreeBSD.org>
     Key fingerprint = ABAE F98C EA78 1C8D 6FDD  CB27 1CA9 5A63 56B0 CA08
uid                            Lars Thegler <lars@thegler.dk>
sub  1024g/E8C58EF3 2004-05-31
```

D.3.333 Jase Thew <`jase@FreeBSD.org`>

```
pub   3072R/3EEAF1EB 2012-05-30
      Key fingerprint = F5FB 959F CF1B 6550 054E  2819 A484 BCDB 3EEA F1EB
uid                  Jase Thew (FreeBSD) <jase@FreeBSD.org>
uid                  Jase Thew <freebsd@beardz.net>
```

D.3.334 David Thiel <`lx@FreeBSD.org`>

```
pub   1024D/A887A9B4 2006-11-30 [expires: 2011-11-29]
      Key fingerprint = F08F 6A12 738F C9DF 51AC  8C62 1E30 7CBE A887 A9B4
uid                  David Thiel <lx@FreeBSD.org>
sub   2048g/B9BD92C5 2006-11-30 [expires: 2011-11-29]
```

D.3.335 Fabien Thomas <`fabient@FreeBSD.org`>

```
pub   1024D/07745930 2009-03-16
      Key fingerprint = D8AC EFA2 2FBD 7788 9628  4E8D 3F35 3B88 0774 5930
uid                  Fabien Thomas <fabient@FreeBSD.org>
sub   2048g/BC173395 2009-03-16
```

D.3.336 Thierry Thomas <`thierry@FreeBSD.org`>

```
pub   1024D/C71405A2 1997-10-11
      Key fingerprint = 3BB8 F358 C2F1 776C 65C9  AE51 73DE 698C C714 05A2
uid                  Thierry Thomas <thierry@pompo.net>
uid                  Thierry Thomas <tthomas@mail.dotcom.fr>
uid                  Thierry Thomas (FreeBSD committer) <thierry@FreeBSD.org>
sub   1024R/C5529925 2003-11-26
sub   2048g/05CF3992 2008-02-05
```

D.3.337 Andrew Thompson <`thompsa@FreeBSD.org`>

```
pub   1024D/BC6B839B 2005-05-05
      Key fingerprint = DE74 3F49 B97C A170 C8F1  8423 CAB6 9D57 BC6B 839B
uid                  Andrew Thompson <thompsa@freebsd.org>
uid                  Andrew Thompson <andy@fud.org.nz>
sub   2048g/92E370FB 2005-05-05
```

D.3.338 Florent Thoumie <`flz@FreeBSD.org`>

```
pub   1024D/5147DCF4 2004-12-04
      Key fingerprint = D203 AF5F F31A 63E2 BFD5  742B 3311 246D 5147 DCF4
uid                  Florent Thoumie (FreeBSD committer address) <flz@FreeBSD.org>
uid                  Florent Thoumie (flz) <florent@thoumie.net>
uid                  Florent Thoumie (flz) <flz@xbsd.org>
uid                  [jpeg image of size 1796]
sub   2048g/15D930B9 2004-12-04
```

D.3.339 Yar Tikhiy <`yar@FreeBSD.org`>

```
pub   1024D/EA04CF5A 2008-08-31
      Key fingerprint = C063 6788 AFF2 A62F 06B7  516D 200F 06AF EA04 CF5A
uid                  Yar Tikhiy <yar@freebsd.org>
sub   2048g/20443F06 2008-08-31
```

D.3.340 Jilles Tjoelker <`jilles@FreeBSD.org`>

```
pub   4096R/D5AE6220 2011-07-02
      Key fingerprint = 4AF5 F1CC BDD7 700B F005  79A4 A2C4 C4D4 D5AE 6220
uid                  Jilles Tjoelker <jilles@stack.nl>
uid                  Jilles Tjoelker <tjoelker@zonnet.nl>
uid                  Jilles Tjoelker (FreeBSD) <jilles@FreeBSD.org>
sub   4096R/14CB5775 2011-07-02
```

D.3.341 Ganbold Tsagaankhuu <`ganbold@FreeBSD.org`>

```
pub   1024D/78F6425E 2008-02-26 [expires: 2013-02-24]
      Key fingerprint = 9B8E DC41 D3F4 F7FC D8EA  417C D4F7 2AEF 78F6 425E
uid                  Ganbold <ganbold@freebsd.org>
sub   2048g/716FCBF9 2008-02-26 [expires: 2013-02-24]
```

D.3.342 Michael Tuexen <`tuexen@FreeBSD.org`>

```
pub   1024D/04EEDABE 2009-06-08
      Key fingerprint = 493A CCB8 60E6 5510 A01D  360E 8497 B854 04EE DABE
uid                  Michael Tuexen <tuexen@FreeBSD.org>
sub   2048g/F653AA03 2009-06-08
```

D.3.343 Andrew Turner <`andrew@FreeBSD.org`>

```
pub   2048R/31B31614 2010-07-01
      Key fingerprint = 08AC 2C57 F14F FDD1 2232  B5CD AA16 EFB8 31B3 1614
uid                  Andrew Turner <andrew@freebsd.org>
uid                  Andrew Turner <andrew@fubar.geek.nz>
sub   2048R/9ACBF138 2010-07-01
```

D.3.344 Hajimu UMEMOTO <`ume@FreeBSD.org`>

```
pub   1024D/BF9071FE 2005-03-17
      Key fingerprint = 1F00 0B9E 2164 70FC 6DC5  BF5F 04E9 F086 BF90 71FE
uid                  Hajimu UMEMOTO <ume@mahoroba.org>
uid                  Hajimu UMEMOTO <ume@FreeBSD.org>
uid                  Hajimu UMEMOTO <ume@jp.FreeBSD.org>
sub   2048g/748DB3B0 2005-03-17
```

D.3.345 Stephan Uphoff <`ups@FreeBSD.org`>

```
pub  2048R/D684B04A 2004-10-06 Stephan Uphoff <ups@freebsd.org>
     Key fingerprint = B5D2 04AE CA8F 7055 7474  3C85 F908 7F55 D684 B04A
uid                             Stephan Uphoff <ups@tree.com>
sub  2048R/A15F921B 2004-10-06
```

D.3.346 Jacques Vidrine <`nectar@FreeBSD.org`>

```
pub  2048R/33C1627B 2001-07-05 Jacques A. Vidrine <nectar@celabo.org>
     Key fingerprint = CB CE 7D A0 6E 01 DC 61  E5 91 0A BE 79 17 D3 82
uid                             Jacques A. Vidrine <jvidrine@verio.net>
uid                             Jacques A. Vidrine <n@nectar.com>
uid                             Jacques A. Vidrine <jacques@vidrine.cc>
uid                             Jacques A. Vidrine <nectar@FreeBSD.org>
uid                             Jacques A. Vidrine <n@nectar.cc>

pub  1024D/1606DB95 2001-07-05 Jacques A. Vidrine <nectar@celabo.org>
     Key fingerprint = 46BC EA5B F70A CC81 5332  0832 8C32 8CFF 1606 DB95
uid                             Jacques A. Vidrine <jvidrine@verio.net>
uid                             Jacques A. Vidrine <n@nectar.com>
uid                             Jacques A. Vidrine <jacques@vidrine.cc>
uid                             Jacques A. Vidrine <nectar@FreeBSD.org>
uid                             Jacques A. Vidrine <n@nectar.cc>
sub  2048g/57EDEA6F 2001-07-05
```

D.3.347 Alberto Villa <`avilla@FreeBSD.org`>

```
pub   1024R/44350A8B 2010-01-24
      Key fingerprint = F740 CE4E EDDD DA9B 4A1B  1445 DF18 82EA 4435 0A8B
uid                  Alberto Villa <avilla@FreeBSD.org>
sub   1024R/F7C8254C 2010-01-24
```

D.3.348 Nicola Vitale <`nivit@FreeBSD.org`>

```
pub   1024D/F11699E5 2006-12-05
      Key fingerprint = 2C17 C591 2C6D 82BD F3DB  F1BF 8FC9 6763 F116 99E5
uid                  Nicola Vitale (Public key for nivit@FreeBSD.org) <nivit@FreeBSD.org>
sub   2048g/4C90805D 2006-12-05
```

D.3.349 Ivan Voras <`ivoras@FreeBSD.org`>

```
pub   1024D/569C05C8 2000-05-24
      Key fingerprint = AB9A A555 C47C B61D BF83  154C 95D9 C041 569C 05C8
uid                  Ivan Voras <ivoras@fer.hr>
uid                  Ivan Voras <ivan.voras@fer.hr>
uid                  Ivan Voras <ivoras@geri.cc.fer.hr>
uid                  [jpeg image of size 4567]
uid                  Ivan Voras <ivoras@sharanet.org>
uid                  Ivan Voras <ivoras@gmail.com>
uid                  Ivan Voras <ivoras@yahoo.com>
uid                  Ivan Voras <ivoras@freebsd.org>
uid                  Ivan Voras <ivan.voras@zg.t-com.hr>
sub   1536g/149FDD60 2000-05-24
```

D.3.350 Stefan Walter <`stefan@FreeBSD.org`>

```
pub   3072R/12B9E0B3 2003-03-06
      Key fingerprint = 85D8 6A49 22C7 6CD9 B011  5D6A 5691 111B 12B9 E0B3
uid                  Stefan Walter <stefan@freebsd.org>
uid                  Stefan Walter <sw@gegenunendlich.de>
sub   3072R/6D35457A 2003-03-06
```

D.3.351 Kai Wang <`kaiw@FreeBSD.org`>

```
pub   1024D/AEB910EB 2006-09-27
      Key fingerprint = 3534 10A3 F143 B760 EF3E  BEDF 8509 6A06 AEB9 10EB
uid                  Kai Wang <kaiw@FreeBSD.org>
uid                  Kai Wang <kaiw@student.chalmers.se>
uid                  Kai Wang <kaiwang27@gmail.com>
uid                  Kai Wang <kaiw27@gmail.com>
sub   2048g/1D5AA4DD 2006-09-27
```

D.3.352 Adam Weinberger <`adamw@FreeBSD.org`>

```
pub  1024D/42C743FD 2002-10-12 Adam Weinberger <adam@vectors.cx>
     Key fingerprint = A980 3F2E 80A8 9619 9D1C  82E8 A3C2 8CD9 42C7 43FD
sub  1024g/15D67628 2002-10-12
```

D.3.353 Peter Wemm <`peter@FreeBSD.org`>

```
pub  1024D/7277717F 2003-12-14 Peter Wemm <peter@wemm.org>
     Key fingerprint = 622B 2282 E92B 3BAB 57D1  A417 1512 AE52 7277 717F
uid                            Peter Wemm <peter@FreeBSD.ORG>
sub  1024g/8B40D9D1 2003-12-14
pub  1024R/D89CE319 1995-04-02 Peter Wemm <peter@netplex.com.au>
     Key fingerprint = 47 05 04 CA 4C EE F8 93  F6 DB 02 92 6D F5 58 8A
uid                            Peter Wemm <peter@perth.dialix.oz.au>
uid                            Peter Wemm <peter@haywire.dialix.com>
```

D.3.354 Nathan Whitehorn <`nwhitehorn@FreeBSD.org`>

```
pub   1024D/FC118258 2008-07-03
      Key fingerprint = A399 BEA0 8D2B 63B3 47B5  056D 8513 5B96 FC11 8258
uid                  Nathan Whitehorn <nwhitehorn@freebsd.org>
uid                  Nathan Whitehorn <nwhitehorn@icecube.wisc.edu>
uid                  Nathan Whitehorn <nwhitehorn@physics.wisc.edu>
uid                  Nathan Whitehorn <whitehorn@wisc.edu>
sub   2048g/EDB55363 2008-07-03
```

D.3.355 Martin Wilke <`miwi@FreeBSD.org`>

```
pub   1024D/B1E6FCE9 2009-01-31
      Key fingerprint = C022 7D60 F598 8188 2635  0F6E 74B2 4884 B1E6 FCE9
uid                  Martin Wilke <miwi@FreeBSD.org>
sub   4096g/096DA69D 2009-01-31
```

D.3.356 Nate Williams <`nate@FreeBSD.org`>

```
pub  1024D/C2AC6BA4 2002-01-28 Nate Williams (FreeBSD) <nate@FreeBSD.org>
     Key fingerprint = 8EE8 5E72 8A94 51FA EA68  E001 FFF9 8AA9 C2AC 6BA4
sub  1024g/03EE46D2 2002-01-28
```

D.3.357 Steve Wills <`swills@FreeBSD.org`>

```
pub   2048R/207B1BA1 2010-09-02 [expires: 2011-09-02]
      Key fingerprint = 98FA 414A 5C2A 0EF9 CFD0  AD0D F5CF 62B3 207B 1BA1
uid                  Steve Wills <swills@freebsd.org>
uid                  Steve Wills <steve@mouf.net>
sub   2048R/E9B254FD 2010-09-02 [expires: 2011-09-02]
```

D.3.358 Thomas Wintergerst <`twinterg@FreeBSD.org`>

```
pub   1024D/C45CB978 2006-01-08
      Key fingerprint = 04EE 8114 7C6D 22CE CDC8  D7F8 112D 01DB C45C B978
uid                  Thomas Wintergerst <twinterg@gmx.de>
uid                  Thomas Wintergerst <twinterg@freebsd.org>
uid                  Thomas Wintergerst
uid                  Thomas Wintergerst <thomas.wintergerst@nord-com.net>
uid                  Thomas Wintergerst <thomas.wintergerst@materna.de>
sub   2048g/3BEBEF8A 2006-01-08
sub   1024D/8F631374 2006-01-08
sub   2048g/34F631DC 2006-01-08
```

D.3.359 Garrett Wollman <`wollman@FreeBSD.org`>

```
pub  1024D/0B92FAEA 2000-01-20 Garrett Wollman <wollman@FreeBSD.org>
     Key fingerprint = 4627 19AF 4649 31BF DE2E  3C66 3ECF 741B 0B92 FAEA
sub  1024g/90D5EBC2 2000-01-20
```

D.3.360 Jörg Wunsch <`joerg@FreeBSD.org`>

```
pub  1024D/69A85873 2001-12-11 Joerg Wunsch <j@uriah.heep.sax.de>
     Key fingerprint = 5E84 F980 C3CA FD4B B584  1070 F48C A81B 69A8 5873
pub  1024D/69A85873 2001-12-11 Joerg Wunsch <j@uriah.heep.sax.de>
uid                            Joerg Wunsch <joerg_wunsch@interface-systems.de>
uid                            Joerg Wunsch <joerg@FreeBSD.org>
uid                            Joerg Wunsch <j@ida.interface-business.de>
sub  1024g/21DC9924 2001-12-11
```

D.3.361 David Xu <`davidxu@FreeBSD.org`>

```
pub   1024D/48F2BDAB 2006-07-13 [expires: 2009-07-12]
      Key fingerprint = 7182 434F 8809 A4AF 9AE8  F1B5 12F6 3390 48F2 BDAB
uid                  David Xu <davidxu@freebsd.org>
sub   4096g/ED7DB38A 2006-07-13 [expires: 2009-07-12]
```

D.3.362 Maksim Yevmenkin <`emax@FreeBSD.org`>

```
pub  1024D/F050D2DD 2003-10-01 Maksim Yevmenkin <m_evmenkin@yahoo.com>
     Key fingerprint = 8F3F D359 E318 5641 8C81  34AD 791D 53F5 F050 D2DD
```

D.3.363 Bjoern A. Zeeb <`bz@FreeBSD.org`>

```
pub   1024D/3CCF1842 2007-02-20
      Key fingerprint = 1400 3F19 8FEF A3E7 7207  EE8D 2B58 B8F8 3CCF 1842
uid                  Bjoern A. Zeeb <bz@zabbadoz.net>
uid                  Bjoern A. Zeeb <bzeeb@zabbadoz.net>
uid                  Bjoern A. Zeeb <bz@FreeBSD.org>
uid                  Bjoern A. Zeeb <bzeeb-lists@lists.zabbadoz.net>
sub   4096g/F36BDC5D 2007-02-20
```

D.3.364 Alexey Zelkin <`phantom@FreeBSD.org`>

```
pub  1024D/9196B7D9 2002-01-28 Alexey Zelkin <phantom@FreeBSD.org>
     Key fingerprint = 4465 F2A4 28C1 C2E4 BB95  1EA0 C70D 4964 9196 B7D9
sub  1024g/E590ABA4 2002-01-28
```

D.3.365 Sepherosa Ziehau <`sephe@FreeBSD.org`>

```
pub   2048R/3E51FB42 2005-10-21
      Key fingerprint = 5F47 3861 7ABA 8773 9E32  0474 5C33 841C 3E51 FB42
uid                  Sepherosa Ziehau (freebsd) <sephe@freebsd.org>
uid                  Sepherosa Ziehau (sephe) <sepherosa@gmail.com>
sub   2048R/7AA31321 2005-10-21
```

Ëåîéêü ôïõ FreeBSD

Áõôü ôï ëåîéêü ðåñéÝ÷åé üñïõò êáé áêñùíýìéá ðïõ ÷ñçóéìïðïéïýíôáé áðü ôçí êïéíüôçôá êé áðü ôá êåßìåíá ôçò ôåêìçñßùóçò ôïõ FreeBSD.

A

ACL

Äåßôå: Access Control List

ACPI

Äåßôå: Advanced Configuration and Power Interface

AMD

Äåßôå: Automatic Mount Daemon

AML

Äåßôå: ACPI Machine Language

API

Äåßôå: Application Programming Interface

APIC

Äåßôå: Advanced Programmable Interrupt Controller

APM

Äåßôå: Advanced Power Management

APOP

Äåßôå: Authenticated Post Office Protocol

ASL

Äåßôå: ACPI Source Language

ATA

Äåßôå: Advanced Technology Attachment

ATM

Äåßôå: Asynchronous Transfer Mode

ACPI Machine Language

Øåõäïêþäéêáò, ðïõ åêôåëåßôáé áðü Ýíá virtual machine óå êÜèå ëåéôïõñãéêü óýóôçìá óõìâáôü ìå ôï ðñüôõðï ACPI, ðáñÝ÷ïíôáò Ýíá ôñüðï åðéêïéíùíßáò ôïõ õëéêïý ìå ôï ôåêìçñéùìÝíï interface ôï ïðïßï ÷ñçóéìïðïéåß ôï ßäéï ôï ëåéôïõñãéêü óýóôçìá.

ACPI Source Language

Ç ãëþóóá ðñïãñáììáôéóìïý ìå ôçí ïðïßá ãñÜöåôáé ç AML.

Access Control List

Ìéá ëßóôá áðü Üäåéåò êáé äéêáéþìáôá ðñïóðÝëáóçò, ç ïðïßá Ý÷åé óõíäåèåß ìå Ýíá áíôéêåßìåíï, üðùò ð.÷. Ýíá áñ÷åßï Þ ìéá äéêôõáêÞ óõóêåõÞ.

Advanced Configuration and Power Interface

¸íá ðñüôõðï ôï ïðïßï êáèïñßæåé ôïí ôñüðï åðéêïéíùíßáò ôïõ õëéêïý ìå ôï ëåéôïõñãéêü óýóôçìá. Ï óêïðüò ýðáñîçò ôïõ ACPI åßíáé íá ìðïñåß ôï ËÓ íá åðéêïéíùíÞóåé ìå ôï õëéêü åíüò õðïëïãéóôÞ êáé íá åêìåôáëëåõôåß üóï ôï äõíáôüí êáëýôåñá áõôü ôï õëéêü, áêüìç êé áí äåí îÝñåé ôá ðÜíôá ãéá áõôü. Ôï ACPI áðïôåëåß ìåôåîÝëéîç ôùí APM, PNPBIOS êáé áíôßóôïé÷ùí ôå÷íïëïãéþí, ôéò ïðïßåò êáé áíôéêáèéóôÜ. Ôï ACPI ðáñÝ÷åé ôç äõíáôüôçôá íá åëÝã÷ïõìå ôçí êáôáíÜëùóç éó÷ýïò, ôçí áíáóôïëÞ ëåéôïõñãßáò ôïõ óõóôÞìáôïò, ôçí åíåñãïðïßçóç êáé áðåíåñãïðïßçóç óõóêåõþí, êëð.

Application Programming Interface

¸íá óýíïëï áðü äéåñãáóßåò, ðñùôüêïëëá êáé åñãáëåßá ðïõ êáèïñßæïõí ôïí áíáãíùñéóìÝíï ôñüðï åðéêïéíùíßáò ìåôáîý äýï Þ ðåñéóóüôåñùí ôìçìÜôùí ëïãéóìéêïý. Óå áõôÜ ðåñéëáìâÜíïíôáé ðëçñïöïñßåò ãéá ôï ðùò, ðüôå, êáé ãéáôß ôá ôìÞìáôá áõôÜ ëïãéóìéêïý èá óõíåñãÜæïíôáé, êáé ôé åßäïõò äåäïìÝíá ìðïñïýí íá áíôáëëÜîïõí, íá ìïéñáóôïýí Þ íá åðåîåñãáóôïýí.

Advanced Power Management

¸íá API ôï ïðïßï ðáñÝ÷åé óôï ëåéôïõñãéêü óýóôçìá ôç äõíáôüôçôá íá óõíåñãáóôåß ìå ôï BIOS åðéôõã÷Üíïíôáò êáëýôåñç äéá÷åßñéóç ôçò éó÷ýïò ôïõ óõóôÞìáôïò. Ôï APM Ý÷åé áíôéêáôáóôáèåß áðü ôï ðñüôõðï ACPI, ôï ïðïßï åßíáé ðéï ïëïêëçñùìÝíï êáé ðéï åõÝëéêôï áðü ôï APM.

Advanced Programmable Interrupt Controller

Advanced Technology Attachment

Asynchronous Transfer Mode

Authenticated Post Office Protocol

Automatic Mount Daemon

Ìéá õðçñåóßá óõóôÞìáôïò ç ïðïßá õëïðïéåß ôçí áõôüìáôç ðñïóÜñôçóç óõóôçìÜôùí áñ÷åßùí üôáí ãßíåôáé ðñïóðÜèåéá ðñïóðÝëáóçò åíüò áñ÷åßïõ Þ êáôáëüãïõ ðïõ ðåñéÝ÷åôáé óå áõôÜ.

B

BAR

Äåßôå: Base Address Register

BIND

Äåßôå: Berkeley Internet Name Domain

BIOS

Äåßôå: Basic Input/Output System

BSD

Äåßôå: Berkeley Software Distribution

Base Address Register

Ïé êáôá÷ùñçôÝò ðïõ êáèïñßæïõí ôçí áñ÷éêÞ äéåýèõíóç ìíÞìçò óôçí ïðïßá áðáíôÜ ìéá óõóêåõÞ PCI.

Basic Input/Output System

Ï áêñéâÞò ïñéóìüò ôïõ BIOS åîáñôÜôáé ëßãï êáé áðü ôá óõìöñáæüìåíá. ÊÜðïéïé áíáöÝñïíôáé óå áõôü ùò ôï ROM chip ðïõ õëïðïéåß âáóéêÝò ëåéôïõñãßåò åðéêïéíùíßáò ìåôáîý õëéêïý êáé ëïãéóìéêïý. ¶ëëïé áíáöÝñïíôáé óå áõôü ùò Ýíá âáóéêü óåô áðü ñïõôßíåò ãéá ôçí åêêßíçóç ôïõ óõóôÞìáôïò. ¶ëëåò öïñÝò ï üñïò BIOS áíáöÝñåôáé óôçí ïèüíç êáé ôï ìåíïý ìå ôï ïðïßï ñõèìßæåôáé ç äéáäéêáóßá åêêßíçóçò ôïõ óõóôÞìáôïò. Ï üñïò BIOS áíáöÝñåôáé óõíÞèùò ãéá óõóôÞìáôá PC, áëëÜ ç ëåéôïõñãéêüôçôá ðïõ õëïðïéåß õðÜñ÷åé ìå ðáñüìïéï ôñüðï êáé óå ó÷åäüí üëá ôá Üëëá óõóôÞìáôá.

Berkeley Internet Name Domain

Ìéá õëïðïßçóç ôïõ ðñùôïêüëëïõ DNS.

Berkeley Software Distribution

Áõôü åßíáé ôï üíïìá ðïõ Ýäùóå ôï Computer Systems Research Group (CSRG) óôï ÐáíåðéóôÞìéï ôçò Êáëéöüñíéá óôï Berkeley (http://www.berkeley.edu) óôéò âåëôéþóåéò êáé ìåôáâïëÝò ðïõ Ýêáíå óôï UNIX 32V ôçò A&T. Ôï FreeBSD åßíáé Ýíáò áðüãïíïò ôçò äïõëåéÜò ôïõ CSRG.

Bikeshed Building

¸íá öáéíüìåíï êáôÜ ôç äéÜñêåéá ôïõ ïðïßïõ ðïëýò êüóìïò ëÝåé ôç ãíþìç ôïõ ãéá Ýíá áðëü èÝìá, åíþ ôçí ßäéá óôéãìÞ Ýíá ðïëýðëïêï (áñ÷éêü) èÝìá ìÝíåé åêôüò åíäéáöÝñïíôïò. Äåßôå êáé ôç ëßóôá FAQ ôïõ FreeBSD (../faq/misc.html#BIKESHED-PAINTING) ãéá ôçí êáôáãùãÞ ôïõ üñïõ.

C

CD

Äåßôå: Carrier Detect

CHAP

Äåßôå: Challenge Handshake Authentication Protocol

CLIP

Äåßôå: Classical IP over ATM

COFF

Äåßôå: Common Object File Format

CPU

Äåßôå: Central Processing Unit

CTS

Äåßôå: Clear To Send

CVS

Äåßôå: Concurrent Versions System

Carrier Detect

¸íá óÞìá RS232C ðïõ õðïäåéêíýåé üôé áíé÷íåýèçêå öÝñïí óÞìá (carrier).

Central Processing Unit

Ç ìïíÜäá ðïõ åßíáé ãíùóôÞ êáé ùò “åðåîåñãáóôÞò”. ÁõôÞ åßíáé ï åãêÝöáëïò åíüò õðïëïãéóôÞ, óôïí ïðïßï ãßíïíôáé üëïé ïé õðïëïãéóìïß. ÕðÜñ÷ïõí ðïëëÝò áñ÷éôåêôïíéêÝò ó÷åäßáóçò åðåîåñãáóôþí, ìå äéÜöïñá óýíïëá åíôïëþí. Ïé ðéï ãíùóôÝò åßíáé ïé áñ÷éôåêôïíéêÝò Intel-x86 êáé ïé ðáñÜãùãÝò ôçò, ç Sun SPARC, ç PowerPC êáé ç Alpha.

Challenge Handshake Authentication Protocol

Ìéá ìÝèïäïò ðéóôïðïßçóçò áõèåíôéêüôçôáò åíüò ÷ñÞóôç, ç ïðïßá âáóßæåôáé óå ìéá ìõóôéêÞ ðëçñïöïñßá ôçí ïðïßá ãíùñßæåé ôüóï ï ðåëÜôçò üóï êáé ï åîõðçñåôçôÞò.

Classical IP over ATM

Clear To Send

¸íá óÞìá RS232C ðïõ äßíåé Üäåéá óôï áðïìáêñõóìÝíï óýóôçìá íá óôåßëåé äåäïìÝíá.

Äåßôå Åðßóçò: Request To Send.

Common Object File Format

Concurrent Versions System

¸íá óýóôçìá äéá÷åßñéóçò åêäüóåùí áñ÷åßùí (version control system). ÐáñÝ÷åé ôç äõíáôüôçôá íá åðåîåñãáóôåßôå êáé íá êñáôÜìå éóôïñéêü áëëáãþí ãéá ðïëëÝò åêäüóåéò åíüò óõíüëïõ áñ÷åßùí. Ôï CVS ðáñÝ÷åé ôç äõíáôüôçôá íá åîÜãïõìå, íá óõã÷ùíåýóïõìå (merge) êáé íá áíáéñÝóïõìå (revert) ïðïéáäÞðïôå áëëáãÞ Þ ïìÜäá áëëáãþí. Åðßóçò ìáò äßíåé ôç äõíáôüôçôá íá êñáôÜìå éóôïñéêü êÜèå áëëáãÞò, ìå ðëçñïöïñßåò üðùò ðïéåò áëëáãÝò Ý÷ïõí ãßíåé, áðü ðïéüí, ðüôå êáé ãéáôß.

D

DAC

Äåßôå: Discretionary Access Control

DDB

Äåßôå: Debugger

DES

Äåßôå: Data Encryption Standard

DHCP

Äåßôå: Dynamic Host Configuration Protocol

DNS

Äåßôå: Domain Name System

DSDT

Äåßôå: Differentiated System Description Table

DSR

Äåßôå: Data Set Ready

DTR

Äåßôå: Data Terminal Ready

DVMRP

Äåßôå: Distance-Vector Multicast Routing Protocol

Discretionary Access Control

Data Encryption Standard

Ìéá ìÝèïäï êñõðôïãñÜöçóçò ðëçñïöïñßáò, ç ïðïßá ðáëéüôåñá áðïôåëïýóå ôç âáóéêÞ ìÝèïäï êñõðôïãñÜöçóçò ôùí êùäéêþí (passwords) óôï UNIX. ×ñçóéìïðïéïýíôáí åðßóçò êáé áðü ôç óõíÜñôçóç crypt(3).

Data Set Ready

¸íá óÞìá RS232C ôï ïðïßï óôÝëíåôáé áðü ôï modem óôïí õðïëïãéóôÞ Þ ôï ôåñìáôéêü, ùò Ýíäåéîç ôçò åôïéìüôçôáò ãéá ëÞøç Þ áðïóôïëÞ äåäïìÝíùí.

Äåßôå Åðßóçò: Data Terminal Ready.

Data Terminal Ready

¸íá óÞìá RS232C ôï ïðïßï óôÝëíåôáé áðü ôïí õðïëïãéóôÞ Þ ôï ôåñìáôéêü óôï modem, ùò Ýíäåéîç ôçò åôïéìüôçôáò ãéá ëÞøç Þ áðïóôïëÞ äåäïìÝíùí.

Debugger

¸íá äéáäñáóôéêü (interactive) õðïóýóôçìá ôïõ ðõñÞíá, ôï ïðïßï ðáñÝ÷åé åñãáëåßá ãéá åîÝôáóç ôçò êáôÜóôáóçò ôïõ óõóôÞìáôïò. Óõ÷íÜ ÷ñçóéìïðïéåßôáé áöïý ôï óýóôçìá Ý÷åé óôáìáôÞóåé íá ëåéôïõñãåß êáíïíéêÜ, ãéá íá êáôáëÜâïõìå üóï ðåñéóóüôåñá ðñÜãìáôá ìðïñïýìå ó÷åôéêÜ ìå ôéò áéôßåò ôïõ ðñïâëÞìáôïò.

Differentiated System Description Table

¸íáò ðßíáêáò ôïõ ACPI ðïõ ðáñÝ÷åé âáóéêÝò ðëçñïöïñßåò ñõèìßóåùí ó÷åôéêÜ ìå ôï âáóéêü óýóôçìá.

Distance-Vector Multicast Routing Protocol

Domain Name System

Ôï óýóôçìá ðïõ ìåôáôñÝðåé ôï åõáíÜãíùóôï, óõìâïëéêü üíïìá êÜèå ìç÷áíÞìáôïò (hostname), üðùò ð.÷. ôï `mail.example.net`, óôçí áñéèìçôéêÞ äéåýèõíóç Internet ðïõ ôïõ áíôéóôïé÷åß êáé ôï áíÜðïäï.

Dynamic Host Configuration Protocol

¸íá óýóôçìá äõíáìéêÞò áíÜèåóçò äéåõèýíóåùí IP. ÊÜèå õðïëïãéóôÞò (host) ìðïñåß íá æçôÞóåé ìéá äéåýèõíóç IP áðü Ýíáí åîõðçñåôçôÞ DHCP. Ç áíÜèåóç ôçò äéåýèõíóçò ëÝãåôáé êáé “lease”.

E

ECOFF

Äåßôå: Extended COFF

ELF

Äåßôå: Executable and Linking Format

ESP

Äåßôå: Encapsulated Security Payload

Encapsulated Security Payload

Executable and Linking Format

Extended COFF

F

FADT

Äåßôå: Fixed ACPI Description Table

FAT

Äåßôå: File Allocation Table

FAT16

Äåßôå: File Allocation Table (16-bit)

FTP

Äåßôå: File Transfer Protocol

File Allocation Table

File Allocation Table (16-bit)

File Transfer Protocol

¸íá ìÝëïò ôçò ïéêïãÝíåéáò ðñùôïêüëëùí õøçëïý åðéðÝäïõ, ôá ïðïßá Ý÷ïõí õëïðïéçèåß ìå âÜóç ôï TCP ãéá ôç ìåôáöïñÜ áñ÷åßùí óå Ýíá äßêôõï TCP/IP.

Fixed ACPI Description Table

G

GUI

Äåßôå: Graphical User Interface

Giant

Ôï üíïìá åíüò ìç÷áíéóìïý áìïéâáßïõ áðïêëåéóìïý (Ýíá `sleep mutex`) ðïõ ðñïóôáôåýåé Ýíá ìåãÜëï ìÝñïò ôùí ðçãþí ôïõ ðõñÞíá. Ðáñüëï ðïõ Ýíáò ôÝôïéïò áðëüò ìç÷áíéóìüò Þôáí áñêåôüò óå ðáëéüôåñåò åêäü÷Ýò (ðïõ Ýíá ìç÷Üíçìá ìðïñåß íá Ýôñå÷å ôï ðïëý ìåñéêÝò äåêÜäåò äéåñãáóßåò, åß÷å ìéá êÜñôá äéêôýïõ êáé öõóéêÜ ìüíï Ýíá åðåîåñãáóôÞ) óÞìåñá ðëÝïí áðïôåëåß ðçãÞ áðáñÜäåêôçò êáèõóôÝñçóçò. Ç ïìÜäá áíÜðôõîçò ôïõ FreeBSD åñãÜæåôáé óêëçñÜ ãéá íá áíôéêáôáóôÞóåé ôï Giant ìå ðéï ìïíôÝñíïõò, ëåðôïýò ìç÷áíéóìïýò áìïéâáßïõ áðïêëåéóìïý, ïé ïðïßïé èá åðéôñÝðïõí ìåãáëýôåñï âáèìü ðáñáëëçëéóìïý ôüóï óå ìç÷áíÞìáôá ìå Ýíá üóï êáé óå óôáèìïýò åñãáóßáò ìå ðïëëïýò åðåîåñãáóôÝò.

Graphical User Interface

¸íá äéáäñáóôéêü óýóôçìá åðéêïéíùíßáò ìåôáîý áíèñþðïõ êáé ìç÷áíÞò, âáóéóìÝíï óå åéêüíåò (graphics).

H

HTML

Äåßôå: HyperText Markup Language

HUP

Äåßôå: HangUp

HangUp

HyperText Markup Language

Ç ãëþóóá ðåñéãñáöÞò êåéìÝíïõ (markup language) ðïõ ÷ñçóéìïðïéåßôáé ãéá ôç äçìéïõñãßá éóôïóåëßäùí (web pages).

I

I/O

Äåßôå: Input/Output

IASL

Äåßôå: Intel's ASL compiler

IMAP

Äåßôå: Internet Message Access Protocol

IP

Äåßôå: Internet Protocol

IPFW

Äåßôå: IP Firewall

IPP

Äåßôå: Internet Printing Protocol

IPv4

Äåßôå: IP Version 4

IPv6

Äåßôå: IP Version 6

ISP

Äåßôå: Internet Service Provider

IP Firewall

IP Version 4

Ç Ýêäïóç 4 ôïõ ðñùôïêüëëïõ IP, ç ïðïßá ÷ñçóéìïðïéåß 32 bits ãéá ôçí äéåõèõíóéïäüôçóç. Ç Ýêäïóç áõôÞ åîáêïëïõèåß íá åßíáé ç ðëÝïí ÷ñçóéìïðïéïýìåíç, áëëÜ áíôéêáèßóôáôáé óôáäéáêÜ ìå ôçí Ýêäïóç IPv6.

Äåßôå Åðßóçò: IP Version 6.

IP Version 6

Ç íÝá Ýêäïóç ôïõ ðñùôïêüëëïõ IP. Ç äçìéïõñãßá ôïõ êñßèçêå áíáãêáßá êáèþò ç ðåñéï÷Þ äéåõèýíóåùí ôïõ IPv4 êïíôåýåé íá åîáíôëçèåß. Ç Ýêäïóç áõôÞ ÷ñçóéìïðïéåß 128 bits ãéá ôç äéåõèõíóéïäüôçóç.

Input/Output

Intel’s ASL compiler

Ï ìåôáãëùôôéóôÞò ôçò Intel ãéá ôç ìåôáôñïðÞ ôïõ ASL óå AML.

Internet Message Access Protocol

¸íá ðñùôüêïëëï ãéá ðñüóâáóç ôùí ìçíõìÜôùí ôá÷õäñïìåßïõ ðïõ âñßóêïíôáé óå Ýíá åîõðçñåôçôÞ ôá÷õäñïìåßïõ. Ôõðéêü, ôá ìçíýìáôá ìÝíïõí áðïèçêåõìÝíá óôïí åîõðçñåôçôÞ áíôß íá ìåôáöïñôþíïíôáé óôïí ðñüãñáììá ëÞøçò email ôïõ ðåëÜôç.

Äåßôå Åðßóçò: Post Office Protocol Version 3.

Internet Printing Protocol

Internet Protocol

Ôï ðñùôüêïëëï ìåôÜäïóçò ðáêÝôùí, ôï ïðïßï áðïôåëåß ôï âáóéêü ðñùôüêïëëï óôï Internet. Áíáðôý÷èçêå áñ÷éêÜ óôï ôìÞìá Áìýíçò ôùí ÇÐÁ êáé áðïôåëåß Ýíá éäéáßôåñá óçìáíôéêü êïìììÜôé ôïõ ðñùôïêüëëïõ TCP/IP. ×ùñßò ôï ðñùôüêïëëï áõôü, ôï Internet äåí èá åß÷å åîåëé÷èåß óå áõôü ðïõ åßíáé óÞìåñá. Ãéá ðåñéóóüôåñåò ðëçñïöïñßåò, äåßôå ôï RFC 791 (ftp://ftp.rfc-editor.org/in-notes/rfc791.txt).

Internet Service Provider

Ìéá åôáéñßá ðïõ ðáñÝ÷åé õðçñåóßåò ðñüóâáóçò óôï Internet.

K

KAME

Ï Éáðùíéêüò üñïò ãéá ôç “÷åëþíá”. Ï üñïò KAME ÷ñçóéìïðïéåßôáé óôïõò êýêëïõò ôçò ðëçñïöïñéêÞò ãéá áíáöïñÜ óôï KAME Project (http://www.kame.net/), ôï ïðïßï åñãÜæåôáé ðñïò ìéá õëïðïßçóç ôïõ IPv6.

KDC

Äåßôå: Key Distribution Center

KLD

Äåßôå: Kernel ld(1)

KSE

Äåßôå: Kernel Scheduler Entities

KVA

Äåßôå: Kernel Virtual Address

Kbps

Äåßôå: Kilo Bits Per Second

Kernel ld(1)

Ìéá ìÝèïäïò äõíáìéêÞò öüñôùóçò ëåéôïõñãéêüôçôáò óôïí ðõñÞíá ôïõ FreeBSD ÷ùñßò íá ÷ñåéÜæåôáé åðáíåêêßíçóç ôïõ óõóôÞìáôïò.

Kernel Scheduler Entities

¸íáò ìç÷áíéóìüò ôïõ ðõñÞíá ãéá õðïóôÞñéîç ðïëõíçìáôéêÞò åðåîåñãáóßáò. Äåßôå ôç óåëßäá ôçò ïìÜäáò åñãáóßáò ôùí KSE (http://www.FreeBSD.org/kse) ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

Kernel Virtual Address

Key Distribution Center

Kilo Bits Per Second

×ñçóéìïðïéåßôáé ãéá ôç ìÝôñçóç ôïõ åýñïõò æþíçò (ôçí ðïóüôçôá ôùí äåäïìÝíùí ðïõ ðåñíÜåé áðü êÜðïéï óõãêåêñéìÝíï óçìåßï óå Ýíá êáèïñéóìÝíï ÷ñïíéêü äéÜóôçìá). ÅíáëëáêôéêÜ ðñïèÝìáôá ãéá ôï Kilo ðåñéëáìâÜíïõí ôá Mega, Giga, Tera, ê.ï.ê.

L

LAN

Äåßôå: Local Area Network

LOR

Äåßôå: Lock Order Reversal

LPD

Äåßôå: Line Printer Daemon

Line Printer Daemon

Local Area Network

Äßêôõï ðïõ ÷ñçóéìïðïéåßôáé óå ìéá ôïðéêÞ ðåñéï÷Þ, ð.÷. ãñáöåßï, óðßôé ê.ï.ê.

Lock Order Reversal

Ï ðõñÞíáò ôïõ FreeBSD ÷ñçóéìïðïéåß Ýíá áñéèìü áðü resource locks ãéá íá äéá÷åéñßæåôáé ôçí ðñüóâáóç óôéò äéÜöïñåò ðçãÝò ôïõ. ¸íáò ìç÷áíéóìüò äéÜãíùóçò ðñïâëçìÜôùí ìå áõôÜ ôá locks, ï ïðïßïò ëÝãåôáé witness(4), ðåñéëáìâÜíåôáé óôïõò ðåéñáìáôéêïýò ðõñÞíåò (áëëÜ áöáéñåßôáé áðü ôïõò ðõñÞíåò ôùí óôáèåñþí åêäüóåùí) êé åëÝã÷åé êáôÜ ôçí þñá ëåéôïõñãßáò ôïõ ðõñÞíá ôçí ðéèáíüôçôá ðñïâëçìÜôùí deadlock. (Ï ìç÷áíéóìüò witness(4) åßíáé âáóéêÜ áñêåôÜ óõíôçñçôéêüò óôïõò åëÝã÷ïõò ðïõ êÜíåé, ïðüôå åßíáé ðéèáíüí êÜðïéá áðü ôá äéáãíùóôéêÜ ìçíýìáôÜ ôïõ íá åßíáé õðåñâïëéêÜ.) ¸íá äéáãíùóôéêü ìÞíõìá áðü ôï ìç÷áíéóìü áõôü óçìáßíåé üôé "áí åßóôå áñêåôÜ Üôõ÷ïé, Ýíá deadlock ìðïñåß íá óõìâåß óôï óçìåßï áõôü".

Ôá ðñáãìáôéêÜ LOR, óõíÞèùò, äéïñèþíïíôáé ãñÞãïñá, ïðüôå íá åëÝã÷åôå ôç http://lists.FreeBSD.org/mailman/listinfo/freebsd-current êáé ôç óåëßäá ôùí LOR ðïõ åßíáé ãíùóôÜ ìÝ÷ñé óÞìåñá (http://sources.zabbadoz.net/freebsd/lor.html) ðñéí óôåßëåôå ìÞíõìá óå êÜðïéá áðü ôéò ëßóôåò çëåêôñïíéêïý ôá÷õäñïìåßïõ.

M

MAC

Äåßôå: Mandatory Access Control

MADT

Äåßôå: Multiple APIC Description Table

MFC

Äåßôå: Merge From Current

MFP4

Äåßôå: Merge From Perforce

MFS

Äåßôå: Merge From Stable

MIT

Äåßôå: Massachusetts Institute of Technology

MLS

Äåßôå: Multi-Level Security

MOTD

Äåßôå: Message Of The Day

MTA

Äåßôå: Mail Transfer Agent

MUA

Äåßôå: Mail User Agent

Mail Transfer Agent

Ìéá åöáñìïãÞ ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí ìåôáöïñÜ email. ÊáôÜ ðáñÜäïóç, ôï MTA áðïôåëïýóå ôìÞìá ôïõ âáóéêïý óõóôÞìáôïò ôïõ BSD. ÓÞìåñá, ôï sendmail ðåñéëáìâÜíåôáé óôï âáóéêü óýóôçìá áëëÜ õðÜñ÷ïõí êáé ðïëëÜ Üëëá MTAs, üðùò ôá postfix, qmail êáé Exim.

Mail User Agent

Ìéá åöáñìïãÞ ãéá ôç äéá÷åßñéóç, áíÜãíùóç ìçíõìÜôùí çëåêôñïíéêÞò áëëçëïãñáößáò êáé ôçí áðïóôïëÞ áðáíôÞóåùí óå áõôÜ.

Mandatory Access Control

Massachusetts Institute of Technology

Merge From Current

Ç óõã÷þíåõóç Þ ìåôáöïñÜ åíüò ÷áñáêôçñéóôéêïý Þ ìéáò äéüñèùóçò áðü ôïí êëÜäï áíÜðôõîçò -CURRENT óå Ýíá Üëëï êëÜäï (óõíÞèùò Ýíá áðü ôïõò êëÜäïõò -STABLE).

Merge From Perforce

Ç óõã÷þíåõóç Þ ìåôáöïñÜ åíüò ÷áñáêôçñéóôéêïý Þ ìéáò äéüñèùóçò áðü ôï áðïèåôÞñéï Perforce óôïí êëÜäï áíÜðôõîçò -CURRENT.

Äåßôå Åðßóçò: Perforce.

Merge From Stable

Ç öõóéïëïãéêÞ äéáäéêáóßá áíÜðôõîçò ôïõ FreeBSD âáóßæåôáé óôï üôé êÜèå áëëáãÞ ãßíåôáé ðñþôá óôï -CURRENT branch ãéá íá äïêéìáóôåß ðñéí åíóùìáôùèåß óôï -STABLE. Ìüíï óå ðïëý åéäéêÝò ðåñéðôþóåéò ãßíåôáé êÜðïéá áëëáãÞ ðñþôá óôï -STABLE êáé ìåôÜ óôï -CURRENT.

Ï ßäéïò üñïò ÷ñçóéìïðïéåßôáé üôáí ìéá áëëáãÞ ìåôáöÝñåôáé áðü ôï -STABLE branch óå êÜðïéï áðü ôá security branches.

Äåßôå Åðßóçò: Merge From Current.

Message Of The Day

¸íá ìÞíõìá ôï ïðïßï åìöáíßæåôáé óõíÞèùò êáôÜ ôç äéáäéêáóßá åéóüäïõ êáé ÷ñçóéìïðïéåßôáé óõ÷íÜ ãéá ôç äéáíïìÞ ðëçñïöïñéþí óôïõò ÷ñÞóôåò ôïõ óõóôÞìáôïò.

Multi-Level Security

Multiple APIC Description Table

N

NAT

Äåßôå: Network Address Translation

NDISulator

Äåßôå: Project Evil

NFS

Äåßôå: Network File System

NTFS

Äåßôå: New Technology File System

NTP

Äåßôå: Network Time Protocol

Network Address Translation

Ìéá ôå÷íéêÞ êáôÜ ôçí ïðïßá ôá ðáêÝôá IP ìåôáâÜëëïíôáé êáôÜ ôçí Ýîïäï ôïõò áðü ìéá ðýëç äéêôýïõ (gateway), åðéôñÝðïíôáò Ýôóé óå ðïëëÜ ìç÷áíÞìáôá ðïõ âñßóêïíôáé ðßóù áðü ôçí ðýëç íá ìïéñÜæïíôáé ìéá êïéíÞ åîùôåñéêÞ äéåýèõíóç IP.

Network File System

New Technology File System

¸íá óýóôçìá áñ÷åßùí ðïõ áíáðôý÷èçêå áðü ôç Microsoft êáé äéáíÝìåôáé ìå ôá ëåéôïõñãéêÜ ôçò “New Technology”, ð.÷. ôá Windows 2000, Windows NT êáé Windows XP.

Network Time Protocol

¸íáò ôñüðïò óõã÷ñïíéóìïý ôïõ ñïëïãéïý ðñáãìáôéêïý ÷ñüíïõ ìÝóù äéêôýïõ.

O

OBE

Äåßôå: Overtaken By Events

ODMR

Äåßôå: On-Demand Mail Relay

OS

Äåßôå: Operating System

On-Demand Mail Relay

Operating System

¸íá óýíïëï ðñïãñáììÜôùí, âéâëéïèçêþí êáé åñãáëåßùí ôá ïðïßá ðáñÝ÷ïõí ðñüóâáóç óôïõò ðüñïõò õëéêïý ôïõ õðïëïãéóôÞ. Ôá óçìåñéíÜ ëåéôïõñãéêÜ óõóôÞìáôá êõìáßíïíôáé áðü áðëïúêÝò õëïðïéÞóåéò ìå äõíáôüôçôá åêôÝëåóçò åíüò ìüíï ðñïãñÜììáôïò êÜèå öïñÜ êáé ìå äõíáôüôçôá ðñüóâáóçò óå ìéá ìüíï óõóêåõÞ, ùò êáé óõóôÞìáôá ðïõ õðïóôçñßæïõí ðïëëáðëÜ ðñïãñÜììáôá êáé ÷ñÞóôåò ìå äõíáôüôçôá åîõðçñÝôçóçò ÷éëéÜäùí ÷ñçóôþí êÜèå óôéãìÞ. ÊÜèå ÷ñÞóôçò ìðïñåß íá åêôåëåß äåêÜäåò äéáöïñåôéêÝò åöáñìïãÝò.

Overtaken By Events

×ñçóéìïðïéåßôáé ãéá íá ðåñéãñÜøåé ìéá ðñïôåéíüìåíç áëëáãÞ (üðùò ìéá ÁíáöïñÜ ÐñïâëÞìáôïò Þ ìéá áßôçóç ãéá êÜðïéï íÝï ÷áñáêôçñéóôéêü) ðïõ äåí éó÷ýåé ðëÝïí Þ äåí Ý÷åé áîßá ëüãù êÜðïéáò ðñüóöáôçò áëëáãÞò óôï FreeBSD, áëëáãÝò óå êÜðïéï ðñüôõðï, åðåéäÞ ôï ó÷åôéêü õëéêü èåùñåßôáé ðëÝïí îåðåñáóìÝíï, êëð.

P

p4

Äåßôå: Perforce

PAE

Äåßôå: Physical Address Extensions

PAM

Äåßôå: Pluggable Authentication Modules

PAP

Äåßôå: Password Authentication Protocol

PC

Äåßôå: Personal Computer

PCNSFD

Äåßôå: Personal Computer Network File System Daemon

PDF

Äåßôå: Portable Document Format

PID

Äåßôå: Process ID

POLA

Äåßôå: Principle Of Least Astonishment

POP

Äåßôå: Post Office Protocol

POP3

Äåßôå: Post Office Protocol Version 3

PPD

Äåßôå: PostScript Printer Description

PPP

Äåßôå: Point-to-Point Protocol

PPPoA

Äåßôå: PPP over ATM

PPPoE

Äåßôå: PPP over Ethernet

PPP over ATM

PPP over Ethernet

PR

Äåßôå: Problem Report

PXE

Äåßôå: Preboot eXecution Environment

Password Authentication Protocol

Perforce

¸íá óýóôçìá åëÝã÷ïõ åêäüóåùí ôï ïðïßï ãñÜöåôáé áðü ôçí Perforce Software (http://www.perforce.com/) êáé ôï ïðïßï åßíáé ðéï ðñï÷ùñçìÝíï áðü ôï CVS. Áí êáé äåí åßíáé áíïéêôïý êþäéêá, ç ÷ñÞóç ôïõ åßíáé åëåýèåñç óå Ýñãá áíïéêôïý êþäéêá üðùò ôï FreeBSD.

ÊÜðïéá ìÝëç ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD ÷ñçóéìïðïéïýí Ýíá áðïèåôÞñéï Perforce ùò ðåéñáìáôéêÞ ðåñéï÷Þ ãéá êþäéêá ðïõ èåùñåßôáé éäéáßôåñá ðåéñáìáôéêüò áêüìá êáé ãéá ôïí êëÜäï -CURRENT.

Personal Computer

Personal Computer Network File System Daemon

Physical Address Extensions

Ìéá ìÝèïäïò ãéá åíåñãïðïßçóç ðñüóâáóçò ìÝ÷ñé êáé óå 64 GB RAM óå óõóôÞìáôá ôá ïðïßá äéáèÝôïõí ìüíï 32 bit ðåñéï÷Þ äéåõèýíóåùí (äéáöïñåôéêÜ èá ðåñéïñßæïíôáí óå 4 GB ÷ùñßò PAE).

Pluggable Authentication Modules

Point-to-Point Protocol

Pointy Hat

¸á ìõèéêü ó÷åäüí êáðÝëï, ðïõ ìïéÜæåé ðïëý ìå Ýíá `dunce cap`, ôï ïðïßï ÷áñßæåôáé óôá ìÝëç ôçò ïìÜäáò áíÜðôõîçò ôïõ FreeBSD üôáí äçìéïõñãïýí ðñïâëÞìáôá ìå ôç ìåôáãëþôôéóç ôïõ FreeBSD, üôáí êÜíïõí áëëáãÝò ðïõ äåí ÷ñåéÜæïíôáé, Þ ãåíéêÜ óå ïðïéáäÞðïôå ðåñßðôùóç ðñïêáëïýí ðñïâëÞìáôá óôïí êþäéêá. Ãåíéêü, üëá ôá ìÝëç ôçò ïìÜäáò áíÜðôõîçò ðïõ êÜíïõí ðñáãìáôéêÜ äïõëåéÜ ìáæåýïõí ó÷åôéêÜ óýíôïìá ìéá ìåãÜëç óõëëïãÞ áðü áõôÜ ôá êáðåëÜêéá. Ç ÷ñÞóç ôïõ üñïõ åßíáé (ó÷åäüí ðÜíôïôå) ÷éïõìïñéóôéêÞ.

Portable Document Format

Post Office Protocol

Äåßôå Åðßóçò: Post Office Protocol Version 3.

Post Office Protocol Version 3

¸á ðñùôüêïëëï ãéá ðñüóâáóç ôùí ìçíõìÜôùí óå Ýíá åîõðçñåôçôÞ ôá÷õäñïìåßïõ. Óôï ðñùôüêïëëï áõôü, ôá ìçíýìáôá ìåôáöïñôþíïíôáé áðü ôïí åîõðçñåôçôÞ óôïí ðåëÜôç, áíôß íá ðáñáìÝíïõí óôïí åîõðçñåôçôÞ.

Äåßôå Åðßóçò: Internet Message Access Protocol.

PostScript Printer Description

Preboot eXecution Environment

Principle Of Least Astonishment

Êáèþò áíáðôýóóåôáé ôï FreeBSD ïé áëëáãÝò ðïõ åßíáé ïñáôÝò óôïí ôåëéêü ÷ñÞóôç ðñÝðåé íá ðñïêáëïýí üóï ôï äõíáôüí ìéêñüôåñåò êáé ëéãüôåñåò åêðëÞîåéò. Ãéá ðáñÜäåéãìá, ç Üóêïðç ìåôáêßíçóç ìåôáâëçôþí ðïõ åðçñåÜæïõí ôçí Ýíáñîç ôïõ óõóôÞìáôïò óôï áñ÷åßï `/etc/defaults/rc.conf` èåùñåßôáé ðáñáâßáóç ôïõ POLA. Ôá ìÝëç ôçò ïìÜäáò áíÜðôõîçò Ý÷ïõí êáôÜ íïõ ôïõò ôï POLA üôáí êÜíïõí áëëáãÝò óôï óýóôçìá ïé ïðïßåò åðçñåÜæïõí ôïí ôåëéêü ÷ñÞóôç.

Problem Report

Ìéá ðåñéãñáöÞ êÜðïéïõ åßäïõò ðñïâëÞìáôïò ôï ïðïßï âñÝèçêå óôïí ðçãáßï êþäéêá Þ óôçí ôåêìçñßùóç ôïõ FreeBSD. Äåßôå ôï Üñèñï ÃñÜöïíôáò ÁíáöïñÝò ÐñïâëçìÜôùí ãéá ôï FreeBSD (http://www.FreeBSD.org/doc/el_GR.ISO8859-7/articles/problem-reports/index.html).

Process ID

¸íáò áñéèìüò ðïõ áíáãíùñßæåé ìå ìïíáäéêü ôñüðï ìéá äéåñãáóßá ôïõ óõóôÞìáôïò êáé ìáò åðéôñÝðåé íá äñÜóïõìå óå áõôÞ.

Project Evil

Ï ðñáãìáôéêüò ôßôëïò ôïõ NDISulator ðïõ Ýãñáøå ï Bill Paul, ï ïðïßïò ôï ïíüìáóå Ýôóé ãéá íá äåßîåé ðüóï áðáßóéï åßíáé (áðü öéëïóïöéêÞò Üðïøçò) íá õðÜñ÷åé ç áíÜãêç ãéá êÜôé ôÝôïéï. Ôï NDISulator åßíáé Ýíá åéäéêü Üñèñùìá óõìâáôüôçôáò ôï ïðïßï åðéôñÝðåé óå ïäçãïýò óõóêåõþí äéêôýïõ ôýðïõ Microsoft Windows™ NDIS miniport íá ÷ñçóéìïðïéçèïýí óôï FreeBSD/i386. Áõôüò åßíáé óõíÞèùò ï ìüíïò ôñüðïò íá ÷ñçóéìïðïéçèïýí êÜñôåò äéêôýïõ ôùí ïðïßùí ïé ïäçãïß äåí åßíáé äéáèÝóéìïé óå ìïñöÞ åëåýèåñïõ Þ áíïé÷ôïý ëïãéóìéêïý. Äåßôå êáé ôï áñ÷åßï `src/sys/compat/ndis/subr_ndis.c` ãéá ðåñéóóüôåñåò ëåðôïìÝñåéåò.

R

RA

Äåßôå: Router Advertisement

RAID

Äåßôå: Redundant Array of Inexpensive Disks

RAM

Äåßôå: Random Access Memory

RD

Äåßôå: Received Data

RFC

Äåßôå: Request For Comments

RISC

Äåßôå: Reduced Instruction Set Computer

RPC

Äåßôå: Remote Procedure Call

RS232C

Äåßôå: Recommended Standard 232C

RTS

Äåßôå: Request To Send

Random Access Memory

Revision Control System

To *Revision Control System* (RCS) åßíáé Ýíá áðü ôá ðáëéüôåñá óõóôÞìáôá ðïõ õëïðïéïýí “Ýëåã÷ï åêäüóåùí” ãéá áðëÜ áñ÷åßá. ÅðéôñÝðåé ôçí áðïèÞêåõóç, áíÜêôçóç, áñ÷åéïèÝôçóç, êáôáãñáöÞ, áíáãíþñéóç êáé óõã÷þíåõóç ðïëëáðëþí åêäüóåùí ãéá êÜèå áñ÷åßï. Ôï RCS áðïôåëåßôáé áðü ðïëëÜ ìéêñÜ åñãáëåßá ðïõ óõíåñãÜæïíôáé ìåôáîý ôïõò. Äåí äéáèÝôåé ïñéóìÝíá áðü ôá ÷áñáêôçñéóôéêÜ ðïõ ðáñÝ÷ïíôáé áðü ðéï ìïíôÝñíá óõóôÞìáôá åëÝã÷ïõ åêäüóåùí, áëëÜ åßíáé ðïëý åýêïëï óôçí åãêáôÜóôáóç êáé ñýèìéóç êáé ðïëý áðëü óôç ÷ñÞóç ãéá ìéêñü áñéèìü åëåã÷üìåíùí áñ÷åßùí. Ôï RCS äéáôßèåôáé ðñáêôéêÜ ãéá êÜèå ëåéôïõñãéêü ðïõ âáóßæåôáé óôéò áñ÷Ýò ëåéôïõñãßáò ôïõ UNIX.

Äåßôå Åðßóçò: Concurrent Versions System, Subversion.

Received Data

¸íá êáëþäéï Þ áêñïäÝêôçò ôïõ RS232C óôï ïðïßï ãßíåôáé ëÞøç äåäïìÝíùí.

Äåßôå Åðßóçò: Transmitted Data.

Recommended Standard 232C

¸íá ðñüôõðï ãéá åðéêïéíùíßá ìåôáîý óåéñéáêþí óõóêåõþí.

Reduced Instruction Set Computer

Ìéá ðñïóÝããéóç óôç ó÷åäßáóç åðåîåñãáóôþí ðïõ áðëïðïéåß ôï åßäïò ôùí ëåéôïõñãéþí ðïõ ìðïñåß íá åêôåëÝóåé ôï õëéêü þóôå íá íá åßíáé êáôÜ ôï äõíáôüí ãåíéêüôåñï óêïðü. Áõôü ïäçãåß óå ÷áìçëüôåñç êáôáíÜëùóç åíÝñãåéáò, ÷ñçóéìïðïéåß ëéãüôåñïõò çìéáãùãïýò êáé óå ïñéóìÝíåò ðåñéðôþóåéò åðéôõã÷Üíåé êáëýôåñç áðüäïóç êáé áõîçìÝíç ðõêíüôçôá êþäéêá. Ðáñáäåßãìáôá åðåîåñãáóôþí RISC ðåñéëáìâÜíïõí ôïõò Alpha, SPARC, ARM êáé PowerPC.

Redundant Array of Inexpensive Disks

Remote Procedure Call

repocopy

Äåßôå: Repository Copy

Repository Copy

Áðåõèåßáò áíôéãñáöÞ áñ÷åßùí ìÝóá óå Ýíá áðïèåôÞñéï CVS.

×ùñßò ôç äéáäéêáóßá ôïõ repocopy, áí Ýíá áñ÷åßï ÷ñåéÜæåôáé íá áíôéãñáöåß Þ íá ìåôáöåñèåß óå Ýíá Üëëï óçìåßï ìÝóá óôï áðïèåôÞñéï, ï committer èá ðñÝðåé íá åêôåëÝóåé ôçí åíôïëÞ `cvs add` ãéá íá ôïðïèåôÞóåé ôï áñ÷åßï óôçí íÝá ôïõ èÝóç êáé Ýðåéôá ôçí åíôïëÞ `cvs rm` óôï ðáëéü áñ÷åßï ãéá íá ôï äéáãñÜøåé.

Ôï ìåéïíÝêôçìá áõôÞò ôçò ìåèüäïõ åßíáé üôé äåí áíôéãñÜöåôáé ôï éóôïñéêü (ïé êáôá÷ùñÞóåéò óôï áñ÷åßï êáôáãñáöÞò ôïõ CVS) óôç íÝá èÝóç. Êáèþò ôï FreeBSD Project èåùñåß ðïëý ÷ñÞóéìåò áõôÝò ôéò ðëçñïöïñßåò, ãßíåôáé óõ÷íÜ ÷ñÞóç ôçò äéáäéêáóßáò repocopy. ÊáôÜ ôç äéáäéêáóßá áõôÞ, ï äéá÷åéñéóôÞò ôïõ áðïèåôçñßïõ áíôéãñÜöåé ôá áñ÷åßá áðåõèåßáò óôç íÝá èÝóç ôïõ áðïèåôçñßïõ, áíôß íá ÷ñçóéìïðïéÞóåé ôï ðñüãñáììá cvs(1).

Request For Comments

¸íá óýíïëï åããñÜöùí ðïõ ðåñéãñÜöïõí ôá ðñüôõðá, ôá ðñùôüêïëëá êáé ôéò ëïéðÝò äéåñãáóßåò ðïõ äéÝðïõí ôç ëåéôïõñãßá ôïõ Internet. Äåßôå ôï www.rfc-editor.org (http://www.rfc-editor.org/).

×ñçóéìïðïéåßôáé åðßóçò ùò ãåíéêüò üñïò üôáí êÜðïéïò ðñïôåßíåé ìéá áëëáãÞ êáé ðåñéìÝíåé ó÷üëéá ó÷åôéêÜ ìå áõôÞ.

Request To Send

¸íá óÞìá óôï RS232C ðïõ æçôÜåé áðü ôï áðïìáêñõóìÝíï óýóôçìá íá óõíå÷ßóåé ôç ìåôÜäïóç ôùí äåäïìÝíùí.

Äåßôå Åðßóçò: Clear To Send.

Router Advertisement

S

SCI

Äåßôå: System Control Interrupt

SCSI

Äåßôå: Small Computer System Interface

SG

Äåßôå: Signal Ground

SMB

Äåßôå: Server Message Block

SMP

Äåßôå: Symmetric MultiProcessor

SMTP

Äåßôå: Simple Mail Transfer Protocol

SMTP AUTH

Äåßôå: SMTP Authentication

SSH

Äåßôå: Secure Shell

STR

Äåßôå: Suspend To RAM

SVN

Äåßôå: Subversion

SMTP Authentication

Server Message Block

Signal Ground

¸íáò áêñïäÝêôçò Þ êáëþäéï ôïõ RS232 ðïõ áðïôåëåß ðçãÞ áíáöïñÜò ãéá ôç ãåßùóç ôïõ ìåôáäéäüìåíïõ óÞìáôïò.

Simple Mail Transfer Protocol

Secure Shell

Small Computer System Interface

Subversion

Ôï Subversion åßíáé Ýíá óýóôçìá åëÝã÷ïõ åêäüóåùí, ðáñüìïéï ìå ôï CVS áëëÜ ìå ðéï ðñï÷ùñçìÝíåò äõíáôüôçôåò.

Äåßôå Åðßóçò: Concurrent Versions System.

Suspend To RAM

Symmetric MultiProcessor

System Control Interrupt

T

TCP

Äåßôå: Transmission Control Protocol

TCP/IP

Äåßôå: Transmission Control Protocol/Internet Protocol

TD

Äåßôå: Transmitted Data

TFTP

Äåßôå: Trivial FTP

TGT

Äåßôå: Ticket-Granting Ticket

TSC

Äåßôå: Time Stamp Counter

Ticket-Granting Ticket

Time Stamp Counter

Ðñüêåéôáé ãéá Ýíá åíóùìáôùìÝíï ìåôñçôÞ áðüäïóçò óôïõò ìïíôÝñíïõò åðåîåñãáóôÝò Pentium, ï ïðïßïò áðáñéèìåß ôïõò ðáëìïýò ôïõ âáóéêïý ñïëïãéïý óõóôÞìáôïò.

Transmission Control Protocol

¸íá ðñùôüêïëëï ðïõ âñßóêåôáé ðÜíù áðü ôï (ãéá ðáñÜäåéãìá) IP êáé åîáóöáëßæåé üôé ôá ðáêÝôá èá ìåôáäïèïýí áîéüðéóôá êáé óôç óùóôÞ óåéñÜ.

Transmission Control Protocol/Internet Protocol

Ï üñïò ÷áñáêôçñßæåé ôï óõíäõáóìü ôïõ TCP ðñùôïêüëëïõ, êáèþò åêôåëåßôáé ðÜíù áðü ôï ðñùôüêïëëï IP. Ôï Internet êáôÜ êýñéï ëüãï ÷ñçóéìïðïéåß ôï TCP/IP.

Transmitted Data

¸íáò áêñïäÝêôçò Þ êáëþäéï ôïõ RS232C ìÝóù ôïõ ïðïßïõ ãßíåôáé ìåôÜäïóç äåäïìÝíùí.

Äåßôå Åðßóçò: Received Data.

Trivial FTP

U

UDP

Äåßôå: User Datagram Protocol

UFS1

Äåßôå: Unix File System Version 1

UFS2

Äåßôå: Unix File System Version 2

UID

Äåßôå: User ID

URL

Äåßôå: Uniform Resource Locator

USB

Äåßôå: Universal Serial Bus

Uniform Resource Locator

Ìéá ìÝèïäïò ãéá ôçí åýñåóç åíüò ðüñïõ (üðùò ð.÷. åíüò åããñÜöïõ) óôï Internet, êáèþò êáé Ýíá ìÝóï ãéá ôçí áíáãíþñéóç ôïõ ìå ìïíáäéêü ôñüðï.

Unix File System Version 1

Ôï ðñùôüôõðï óýóôçìá áñ÷åßùí ôïõ UNIX, ãíùóôü åðßóçò êáé ùò Berkeley Fast File System.

Unix File System Version 2

Ìéá åðÝêôáóç ôïõ UFS1, ç ïðïßá ðñùôïåìöáíßóôçêå óôï FreeBSD 5-CURRENT. Ôï UFS2 ðñïóèÝôåé äåßêôåò ìðëïê 64 bit ðåñíþíôáò Ýôóé ôï öñÜãìá ôïõ 1Ô. ÄéáèÝôåé áêüìá õðïóôÞñéîç åêôåôáìÝíùí áñ÷åßùí êáé Üëëá ðñïçãìÝíá ÷áñáêôçñéóôéêÜ.

Universal Serial Bus

¸íá ðñüôõðï õëéêïý ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí äéáóýíäåóç ìåãÜëïõ ðëÞèïõò ðåñéöåñåéáêþí õðïëïãéóôþí, ÷ñçóéìïðïéþíôáò ìéá ôõðïðïéçìÝíç äéåðáöÞ.

User ID

¸íáò ìïíáäéêüò áñéèìüò ðïõ áíáôßèåôáé óå êÜèå ÷ñÞóôç åíüò õðïëïãéóôÞ êáé ÷ñçóéìïðïéåßôáé ãéá ôçí áíáãíþñéóç ôùí ðüñùí êáé ôùí äéêáéùìÜôùí ðïõ Ý÷ïõí åê÷ùñçèåß óå áõôüí.

User Datagram Protocol

¸íá áðëü êáé ìç áîéüðéóôï ðñùôüêïëëï ðïõ ÷ñçóéìïðïéåßôáé ãéá ôçí áíôáëëáãÞ äåäïìÝíùí óå Ýíá äßêôõï TCP/IP. Ôï UDP äåí ðáñÝ÷åé Ýëåã÷ï êáé äéüñèùóç ëáèþí üðùò ôï TCP.

V

VPN

Äåßôå: Virtual Private Network

Virtual Private Network

Ìéá ìÝèïäïò ðïõ ÷ñçóéìïðïéåß Ýíá äçìüóéï äßêôõï åðéêïéíùíßáò (üðùò ôï Internet), ãéá íá ðáñÝ÷åé áðïìáêñõóìÝíç ðñüóâáóç óå Ýíá ôïðéêü äßêôõï, üðùò ôï LAN ìéáò åðé÷åßñçóçò.

Êïñùíßäá

Áõôü ôï âéâëßï åßíáé ôï áðïôÝëåóìá ôçò ïìáäéêÞò åñãáóßáò åêáôïíôÜäùí åèåëïíôþí ôçò “ÏìÜäáò Ôåêìçñßùóçò ôïõ FreeBSD”. Áõôü ôï êåßìåíï ãñÜöôçêå óå ìïñöÞ SGML, óýìöùíá ìå ôï DocBook DTD êáé Ý÷åé ìïñöïðïéçèåß áðü ôçí SGML óå ðïëëÝò äéáöïñåôéêÝò ìïñöÝò ðáñïõóßáóçò ÷ñçóéìïðïéþíôáò ôçí åöáñìïãÞ **Jade**, ìéá ìç÷áíÞ DSSSL áíïé÷ôïý êþäéêá. ×ñçóéìïðïéÞèçêáí ôá DSSSL stylesheets ôïõ Norm Walsh ìå Ýíá åðéðëÝïí åðßðåäï ôñïðïðïßçóçò ãéá íá äþóïõí ôéò ïäçãßåò ðáñïõóßáóçò óôçí **Jade**. Ç Ýíôõðç ìïñöÞ áõôïý ôïõ êåéìÝíïõ äåí èá õðÞñ÷å ÷ùñßò ôçí ãëþóóá óôïé÷åéïèåóßáò TeX ôïõ Donald Knuth, ôï LaTeX ôïõ Leslie Lamport, Þ ôï macro package **JadeTeX** ôïõ Sebastian Rahtz.