Exercise 1 – FreeBSD Installation

Announced Date: 2005/9/22 Due Date: 2005/10/6

Outline

> FreeBSD version
> Installing FreeBSD
> Update source and make world
> Rebuild kernel

FreeBSD branches

- > Two parallel development branches:
 - -CURRENT
 - Latest working sources for FreeBSD
 - Latest release version: 5.2.1 in Feb. 2004.
 - Latest Release version: 6.0-BETA4 in Sep. 2005.
 - -STABLE
 - Receive only well-tested bug fixes and other small incremental enhancement
 - Latest release version: 4.10 May. 2004.
 - Latest Release version:
 - > 4.11 Jan, 2005
 - > **5.4 May, 2005**

FreeBSD version

> A.B.C – Type

- A: major version Number
- B: minor version Number
- C: slight patch version number
- Type: version type
 - SNAP
 - ALPHA
 BETA
 GAMMA
 - RELEASE
 - RELENG
 - STABLE
 - CURRENT

Snapshot \rightarrow $\left\{ \begin{array}{c} Alpha \\ Beta \\ Commune \end{array} \right\}$ Release \rightarrow Releng \rightarrow Stable

FreeBSD view of Disk (1)

> What is the meaning of **ad0s1e**

- Disk name
 - IDE: ad • SCSI: da
- Slice is equal to the partition of common use
 - Primary partition: s1 ~ s4
 - Extended partition: s5 ~ s8
- Label in each slice
 - a: root partition
 - b: swap
 - c: entire disk
 - d: entire partition
 - efgh: /usr, /home, ...

ME	3R
Slice 1 (/d	ev/ad0s1)
Slice 2 (/d	ev/ad0s2)
Slice 3 (/d	ev/ad0s3)
Slice 4 (/d	ev/ad0s4)
Slice 5 /dev/ad0s5	Slice 6 /dev/ad0s6

FreeBSD view of Disk (2)

An Example



Installing FreeBSD

> Steps

- 1. Knowing your hardware
- 2. Obtaining installation file
- **3.** Booting from CD
- 4. Kernel Configuration Menu
- 5. sysinstall main menu
- 6. Custom Installation Options
 - 1. Partition
 - 2. Label
 - 3. Distribution
 - 4. Media
 - 5. Commit
- 7. Post Installation

Installing FreeBSD – 1. knowing your hardware

> CPU

- 32bit or 64bit, Xeon, Intel
AMD or other brand

- > RAM
 - Size
- > HD
 - Size, amount, SCSI or IDE
- > VGA
 - Brand, ram size
- > Sound
 - Brand
- > Network Interface Card
 - Brand
 - IP
 Netmask
 default gateway
 Hostname
 DNS
- > Other Special device

Installing FreeBSD – 2. Obtaining installation file

> FreeBSD installation CD

- <u>ftp://freebsd.csie.nctu.edu.tw/pub/ISO-IMAGES-i386/5.4/5.4-</u>
 <u>RELEASE-i386-bootonly.iso</u>
- <u>ftp://freebsd.csie.nctu.edu.tw/pub/ISO-IMAGES-i386/5.4/5.4-</u>
 <u>RELEASE-i386-disc1.iso</u>
- Burn!
- > Boot Floppy Image
 - <u>ftp://freebsd.csie.nctu.edu.tw/pub/releases/i386/5.4-</u>
 <u>RELEASE/floppies/boot.flp</u>
 - <u>ftp://ftp.freebsd.org/pub/FreeBSD/tools/fdimage.exe</u>
 - C:\fdimage.exe boot.flp a:\

Installing FreeBSD – 3. Booting from CD

Uncompressing ... done

BTX loader 1.00 BTX version is .01 Console: internal video/keyboard BIOS drive A: is disk0 BIOS drive B: is disk1 BIOS drive C: is disk2 BIOS 639kB/129984kB available memory

FreeBSD/i386 bootstrap loader, Revision 0.8 (root@freebsd-stable.sentex.ca, Thu Apr 3 08:41:45 GMT 2003) /kernel text=0x280131 data=0x33018+0x3311c ¦

Hit [Enter] to boot immediately, or any other key for command prompt. Booting [kernel] in 4 seconds...

Installing FreeBSD – 4. Kernel Configuration Menu

> Install first and configure kernel later

- Choose "Skip kernel configuration and continue with installation"
- Then it will probe the devices in your system

Kernel Configuration Menu

Skip kernel configuration and continue with installation Start kernel configuration in full-screen visual mode Start kernel configuration in CLI mode

Here you have the chance to go into kernel configuration mode, making any changes which may be necessary to properly adjust the kernel to match your hardware configuration.

If you are installing FreeBSD for the first time, select Visual Mode (press Down-Arrow then ENTER).

If you need to do more specialized kernel configuration and are an experienced FreeBSD user, select CLI mode.

If you are certain that you do not need to configure your kernel then simply press ENTER or Q now.

Installing FreeBSD – 5. sysinstall Main Menu

You can press "Scroll Lock" key to see probe results.
 > sysinstall Main Menu

- Choose "Custom"

- 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 Standard Express Custom Configure Doc Keynap Options Fixit Upgrade Load Confi Index

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

[Select] X Exit Install

Installing FreeBSD – 6. Custom Installation Options

>4 major steps

- Partition and label your disk
- Choose what to install and how to install
- Commit

mose Custom Installation Options

This is the custom installation menu. You may use this menu to specify details on the type of distribution you wish to have, where you wish to install it from and how you wish to allocate disk storage to FreeBSD.



Installing FreeBSD – 6. Custom Installation – partition (1)

> Create slice and choose boot manager

- Press "C" to create a new slice or press "A" to use entire disk
- Press "S" to toggle ad0s1 as bootable (we will put / on this slice)
- Press "Q" to next step (Select Boot Manager)

Disk name: DISK Geometr	ad0 ry: 33288	cyls/16 hea	ıds∕63 sec	tors =	FDISK 33554304 se	Partition ectors (163	n Editor 883MB)
Dffset	Size(MB)	End	Name	РТуре	Desc	Subtype	Flags
0	Θ	62		6	unused	0	
63	8191	16777151	ad0s1	3	freebsd	165	CA
16777152	8191	33554303	ad0s2	3	freebsd	165	

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

a = Use Entire Disk	G = set Drive Geometry	C = Create Slice	F = `DD' mode
) = Delete Slice	Z = Toggle Size Units	S = Set Bootable	l = Wizard m.
I = Change Type	U = Undo All Changes	Q = Finish	

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

Installing FreeBSD – 6. Custom Installation – partition (2)

Select "BootMgr" for ad0
After press OK, it will back to Custom Installation Options menu

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"!

BootMgrInstall the FreeBSD Boot ManagerStandardInstall a standard MBR (no boot manager)NoneLeave the Master Boot Record untouched

Cancel

BootMgr • multiple OS Standard • single OS None • Other BM

Installing FreeBSD – 6. Custom Installation – partition (3)

> If you have more than one disk...

- You can choose whether to partition it.
- Install "BootMgr" for first disk and "none" for rest ones

elect 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.



Installing FreeBSD – 6. Custom Installation – Label (1)

> Disklabel Editor

- Move blue bar to select slice
- Press "C" to create disk label
 - / , swap, /home
 - > Specify size
 - > Choose type (either swap or FS)
 - > Specify mount point
- Press "S" to toggle SoftUpdates (async written to disk)
- Press "Q" to next step (back to custom installation options menu)

Installing FreeBSD – 6. Custom Installation – Label (2)

- Create label in ad0 and specify size

			FreeBSI	D Disk	label Ed:	itor		
)isk:	ad0	Partition	name:	ad0s1	Free:	33554241	blocks	(16383MB)
lisk:	ad1	Partition	name:	ad1s1	Free:	33554241	blocks	(16383MB)
'art	Mount		Size Ne	ewfs	Part	Mount		Size Newfs
						100		
	Please spec gigabytes, 33554241 bl	cify the p M for meg locks (163	artitic abytes 83MB) a	on siza , or C are fra	e in bloc for cyl: ee.	cks or apj inders.	pend a f	trailing G for
	Please spec gigabytes, 33554241 bl 33554241	ify the p M for meg locks (163	artitid abytes 83MB) d	on siz , or C are fr	e in bloc for cyl: ee.	cks or apj inders.	oend a 1	trailing G for
	Please spec gigabytes, 33554241 bl 33554241	cify the p M for meg locks (163	artitio abytes 83MB) a [on siza , or C are fra	e in bloo for cyl: ee. Ca	cks or apj inders. ancel	oend a t	trailing G for
lhe f	Please spec gigabytes, 33554241 bl 33554241 33554241	rify the p M for meg locks (163	artitid abytes 83MB) d [on siza , or C are fra OK 1 1 here	e in bloc for cyl: ee. Ca	cks or app inders. ancel or lower (case):	trailing G for
	Please spec gigabytes, 33554241 b) 33554241 33554241 ollowing co create	offy the p M for meg locks (163 normands ar D = Del	artitid abytes 83MB) d [c e valid ete]	on siza , or C are fra OK 1 1 here 1 = Mon	e in bloo for cyl: ee. Ca (upper c unt pt <u>.</u>	cks or app inders. ancel or lower (case):	trailing G for
[he f] = C] = N	Please spec gigabytes, 33554241 bl 33554241 33554241 collowing co create ewfs Opts	ommands ar Q = Fin	artitid abytes 83MB) d [[e valid ete] ish S	OK 1 OK 1 DK 1 DK 1 DK 1 DK 1 DK 1	e in bloo for cyl: ee. Ca (upper (unt pt. ggle S <u>of</u>	cks or app inders. ancel or lower of tUpdates	case):	trailing G for
The f C = C I = N T = T	Please spec gigabytes, 33554241 bl 33554241 33554241 ollowing co create lewfs Opts oggle Newfs	offy the p M for meg locks (163 Del D = Del Q = Fin S U = Und	artitid abytes 83MB) a E e valid ete ish S o f	on siza , or C are fra OK 1 A here 1 = Mou 5 = Tou A = Au	e in bloo for cyl: ee. Ca (upper (unt pt. ggle Soft to Defau)	cks or app inders. ancel or lower o tUpdates its R	case): = Deleta	trailing G for

Installing FreeBSD – 6. Custom Installation – Label (3)

Complete disklabel

		Free	BSD Disk	label Edit	or		
Disk: ad0 Disk: ad1		Partition nam Partition nam	ne: ad0s1 ne: ad1s1	Free: 0 Free: 0	blocks blocks	(OMB) (OMB)	
Part	Mount	Size	e Newfs	Part	Mount		Size Newfs
ad0s1b ad0s1a	swap /	512MI 15871MI	SWAP				
ad1s1e	∕home	16383MI	3 UFS+S Y				
The follo C = Creat	wing co e	ommands are va D = Delete	lid here M = Mou	(upper or unt pt.	lower	case):	
N = Newfs T = Togglu	Upts e Newf:	ų = Finish s U = Undo	S = Tog A = Au	ggle SoftU to Default	pdates s R	= Delete	Merge
Use F1 or	? to (get more help,	arrow k	eys to sel	ect.		

Installing FreeBSD – 6. Custom Installation – distri. (1)

> Choose Distributions Menu

Choose "Custom"

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].

[] 4 Developer	Full sources, binaries and doc but no games
I] 5 X-beveloper	Same as above + X window System
[] 6 Kern-Developer	Full binaries and doc, kernel sources only
[] 7 X-Kern-Developer	Same as above + X Window System
[] 8 User	Average user – binaries and doc only
[] 9 X-User	Same as above + X Window System
[] A Minimal	The smallest configuration possible
> > B Custom	Specify your own distribution set
1	
	[OK] Cancel

nore information on 1

20

Installing FreeBSD – 6. Custom Installation – distri. (2)

- Select

- bin
- compat4x
- crypto
- man
- src (all)
- ports

- : binary
- : 4.x binary compatibility
- : encryption service

UK

			t the	1151	101	ut tons	s you	1 015	1 1 1) install.		
Pleas	se check	off	the	distr	·ibu	tions	you	wish	to	install.	At	the
very	minimum	, thi	is sh	ould	be	"bin"	•					

ALL	All system sources, binaries and X Window System
Reset	Reset all of the below
[X] bin	Binary base distribution (required)
[] compati	🗴 FreeBSD 1.x binary compatibility
[] compat2	FreeBSD 2.0 binary compatibility
[] compat2	FreeBSD 2.1 binary compatibility
[] compat2	FreeBSD 2.2.x and 3.0 a.out binary compatibility
[] compat3	FreeBSD 3.x binary compatibility
[X] compat4	FreeBSD 4.x binary compatibility
[X] crupto	Basic encryption services
[] krb4	KerberosIV authentication services
[] krb5	Kerberos5 authentication services
[] dict	Spelling checker dictionary files

Cancel

Installing FreeBSD – 6. Custom Installation – distri. (3)

- Press "OK" and it will return to "Choose Distributions menu"
- Press "OK" again to back to "Custom Installation Options menu"
- Select "Media"

Installing FreeBSD – 6. Custom Installation – Media (1)

Choose CD/DVD if you have 5.4 Stable CD

- Choose FTP if your NIC is detected

Choose FTP Passive if you in private network

hoose 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 Floppu	Install from a floppy disk set
9 Tape	Install from SCSI or QIC tape
X Options	Go to the Options screen

ess F1 for more information on the various media types

Cancel

Installing FreeBSD – 6. Custom Installation – Media (2)

> Install through FTP

- Specify ftp server and path

P	lease specify the URL of a FreeBSD distribution on a
r	emote ftp site. This site must accept either anonymous
f	tp or you should have set an ftp username and password
i	n the Options screen.
A	URL looks like this: ftp:// <hostname>/<path></path></hostname>
W	here <path> is relative to the anonymous ftp directory or the</path>
h	ome directory of the user being logged in as.
	ftp://freebsd.csie.nctu.edu.tw/pub/releases/i386/
	[OK] Cancel

Installing FreeBSD – 6. Custom Installation – Media (3)

Select NICIPv6 and DHCP

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 a fairly recent (2.0R or later) version of FreeBSD.

de0 DEC DE435 PCI NIC or other DC21040-AA based card Parallel Port IP (PLIP) peer connection SLIP interface on device /dev/cuaa0 (COM1) PPP interface on device /dev/cuaa0 (COM1) SLIP interface on device /dev/cuaa1 (COM2) PPP interface on device /dev/cuaa1 (COM2) PPP interface on device /dev/cuaa1 (COM2)

1

Cance 1

Installing FreeBSD – 6. Custom Installation – Media (4)

Specify your IP informationPress "OK" to next step

Host:		Domain:
		1
IPu4 Gate] ⊿ay:]	Name server:
n	 Configuration Pv4 Address: 1	for Interface de0 Netmask:
 E:	ctra options to	255.255.255.0 if config:
	<u>0</u> K	CANCEL

Installing FreeBSD – 6. Custom Installation – Commit

Start to format disk make file system and install software

> You can press "Alt + F2" to see the install detail



Installing FreeBSD – 7. Post Installation (1)



FreeBSD Configuration Menu

If you've already installed FreeBSD, you may use this menu to customize it somewhat to suit your particular configuration. Most importantly, you can use the Packages utility to load extra "3rd party" software not provided in the base distributions.

X Exit	Exit this menu (returning to previous)
Distributions	Install additional distribution sets
Packages	Install pre-packaged software for FreeBSD
Root Password	Set the sustem manager's password
Fdisk	The disk Slice (PC-stule partition) Editor
Label	The disk Label editor
User Management	Add user and group information
Console	Customize system console behavior
Time Zone	Set which time zone you're in
Media	Change the installation media type
Mouse	Configure your mouse
Networking	Configure additional network services
	[D <mark>K] Cancel</mark>
I Press I	'1 for more information on these options 1

Installing FreeBSD – 7. Post Installation (2)

> Root Password
> Time Zone → Asia → Taiwan
> Mouse → enable
> Networking → sshd

Exercise 1 – FreeBSD build world and kernel

FreeBSD source

- > Maintained in a CVS repository in California
- > We can use CVSup keep our system up-to-date with any FreeBSD mirror sites
 - Install CVSup
 - Edit CVSup supfile
 - Update source using CVSup
 - Make world to build the updated source

CVSup – CVSup Installation

>Install via pkg_add

- Package is pre-compiled application
- % pkg_add ftp://freebsd.csie.nctu.edu.tw/pub/CVSup/cvsup-16.1e.tgz
- pkg_add package-name
- pkg_delete package-name
- pkg_info package-name
- All installed package is stored in /var/db/pkg
- > The cvsup binary is in /usr/local/bin/cvsup
 - You can use "whereis" command to find something

CVSup – CVSup Configuration file (1)

>Example cvsup supfile

- /usr/share/examples/cvsup/stable-supfile
- /usr/share/examples/cvsup/ports-supfile
- > Create your own supfile
 - Edit /usr/local/etc/cvsup-src
 - Edit /usr/local/etc/cvsup-ports



CVSup Configuration file (2)

/usr/local/etc/cvsup-src

- *default host=freebsd.csie.nctu.edu.tw
- *default base=/usr
- *default prefix=/usr
- *default delete use-rel-suffix
- *default release=cvs tag=RELENG_5 src-all

Where to get source Where to put status file Where to put source Allow cvs to delete

CVSup -

CVSup Configuration file (3)

> CVS tags

Branch Tags

- . • RELENG_6
- RELENG 5
- Release Tags

(FreeBSD-CURRENT line) (FreeBSD 6-STABLE line) (FreeBSD 5-STABLE line)

- RELENG_5_4_0_RELEASE
- RELENG_5_3_0_RELEASE
- RELENG_5_2_1_RELEASE
- RELENG_4_11_0_RELEASE
- RELEGN_4_10_0_RELEASE



CVSup Configuration file (4)

/usr/local/etc/cvsup-ports

*default host=freebsd.csie.nctu.edu.tw
*default base=/usr
*default prefix=/usr
*default delete use-rel-suffix
*default release=cvs tag=.
ports-all

CVSup – CVSup Configuration file (5)

Or you can put them all together /usr/local/etc/cvsup-all

*default host=freebsd.csie.nctu.edu.tw

- *default base=/usr
- *default prefix=/usr
- *default delete use-rel-suffix

*default release=cvs tag=RELENG_4

src-all

ports-all tag=.

CVSup -

update source using CVSup

> Update both src and ports

— % /usr/local/bin/cvsup -g -L 1 /usr/local/etc/cvsup-all > /var/log/cvsup.log

The "-g" tells cvsup not to use its GUI The "-L 1" tells cvsup to print out the details of all the file updates it is doing. from 0 (silent) to 2

It will run about 10 minutes P4 1.8G 1GB Ram 100MB NIC

Rebuilding world

>The canonical way to update system

- make buildworld
- make buildkernel
- make installkernel
- reboot and boot in single user mode
- make installworld
- mergemaster
- reboot

Rebuilding world – Prepare make.conf

> Example make.conf

/etc/defaults/make.conf 4.x
 /usr/share/examples/etc/make.conf 5.x
 > Everything add in make.conf is used every time you run make
 - KERNCONF=TYBSD

Rebuilding world – make buildworld

>Build FreeBSD entire system

- % cd /usr/src
- % make –j3 buildworld >& /var/log/world.log &

Spawn multiple (n) processes to do make. The compiling processes of make world is I/O bound.

It will run about 30 minutes P4 1.8G 1GB Ram 100MB NIC

Rebuilding world – make buildkernel (1)

> Why rebuild kernel?

- Fast boot time.
 - Probe necessary device
- Lower memory usage
 - Smaller kernel image
- Additional hardware support.

Rebuilding world – make buildkernel (2)

>Edit kernel config file

- cd /usr/src/sys/i386/conf
 - GENERIC may not have all for your system
 - LINT has every options
- cp GENERIC "YOUR-NAME"
 - We often use hostname to be "YOUR-NAME"
- edit config file
 - Depend on your system
 - Be attention to related options
 - Following the explanation of

http://www.freebsd.org/doc/en_US.ISO88 59-1/books/handbook/kernelconfigconfig.html

Rebuilding world – make buildkernel (3)

>Build kernel

- % cd /usr/src
- % make KERNCONF=TYBSD buildkernel

It will run about 5 minutes depend on your configuration P4 1.8G 1GB Ram 100MB NIC

Rebuilding world – make installkernel

> Install kernel

– % cd /usr/src

– % make KERNCONF=TYBSD installkernel

Rebuilding world – reboot in single user mode

>Boot in single user mode

- Hit any key other than "enter" when counting down
- Type "boot –s"
- Or
- -% shutdown now
 - For a running system, this will drop it to single user mode

Rebuilding world – make installworld

> Install the built world - % make installworld

Rebuilding world – mergemaster

> mergemaster

- Synchronize /usr/src/etc with /etc
- Choose "i" for most case, such as
 - /etc/defaults/rc.conf, ...
- Press "enter" for certain file, such as
 - master.passwd, hosts, csh.*



> Reboot and enjoy it - % reboot

If Something Goes Wrong ... (1)

>Possible errors in building new kernel

- Configuration file
 - % cd /usr/src/sys/i386/conf/
 - % config TYBSD
- make fail
- Install fail
- Kernel does not boot
 - Boot with old kernel, recompile kernel
- Kernel works, but ps does not work
 - Build world

If Something Goes Wrong ... (2)

> Boot with old kernel

- In 5.x
 - Press "4"
 - Type "boot / boot / kernel.old / kernel
- In 4.x
 - Hit any key other than "enter" when counting down
 - Type "unload"
 - Type "load /kernel.old"
 - Type "boot"

Uncompressing ... done

BTX loader 1.00 BTX version is 5.01 Console: internal video/keyboard BIOS drive A: is disk0 BIOS drive B: is disk1 BIOS drive C: is disk2 BIOS 639kB/129984kB available memory

FreeBSD/i386 bootstrap loader, Revision 0.8 (root@freebsd-stable.sentex.ca, Thu Apr 3 08:41:45 GMT 2003) /kernel text=0x280131 data=0x33018+0x3311c ¦

Hit [Enter] to boot immediately, or any other key for command prompt. Booting [kernel] in 4 seconds...

If Something Goes Wrong ... (3)

> Move working kernel to /boot/kernel

% mv /boot/kernel.old/kernel /boot/kernel

> For versions of FreeBSD prior to 5.x

Unlock kernel

- % chflags noschg /kernel
- % cp kernel.old kernel
- % sync;sync; reboot

Lock kernel

% chflags schg /kernel

> Use Is –Io to check similar file

schg → set the immutable (永遠不變的) flag ls –o → include file flags in long output

Install software

> Ports

- cd /usr/ports, make search, make install clean

> Package

- Pre-built ports
- pkg_add, pkg_delete, pkg_info
- > Source
 - Tar ball
 - tar xzvf certain-source.tar.gz
 - ./configure
 - make; make install

How to use ports

>Steps of install software using ports

(1) Figure out the path to the software

- % cd /usr/ports
- % make search key=mutt
- % cd /usr/ports/chinese/mutt
- (2) Fetch and compile the source
 - % make install

> Uninstall

• % make deinstall

How to use ports (1)

- > Try to install some software, such as: - vim
 - mutt
 - wget