FreeBSD

Korea FreeBSD Users Group – http://www.kr.FreeBSD.org/

Chapter 8 : FreeBSD

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: 2004   8   7

: 2005   3   8

: 1.0

FreeBSD Documentation Project   FreeBSD Handbook   2004   8

7   . FreeBSD Handbook   ,
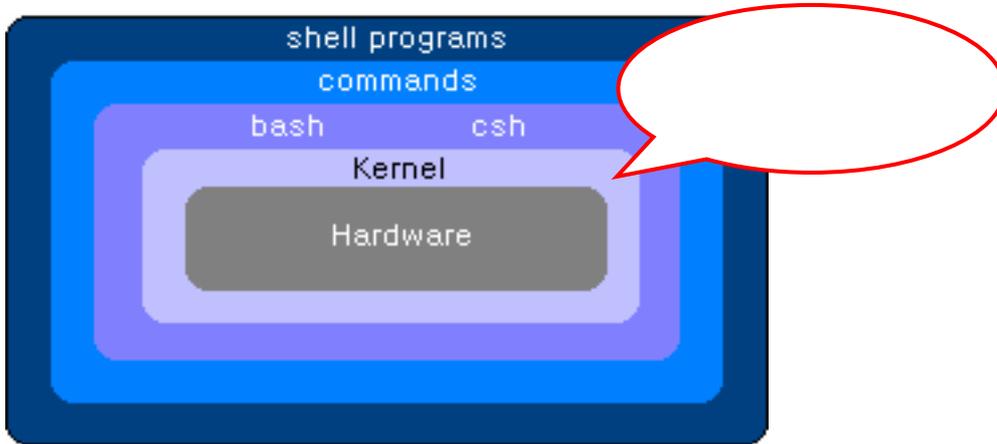
, CVS Repository

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,   .

.   KFUG(Korea FreeBSD Users Group)

,   KFUG

.

"FreeBSD Handbook"   "FreeBSD Documentation Project"   ,   "   FreeBSD

"   "   (Young-oak Lee)"   .

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KFUG   ,   .

.

8   FreeBSD

8.1

FreeBSD   .   ,   ,   ,
. FreeBSD
.

[8-1.bmp]

:

-
-
-
-
- /dev
-

KFUG

8.2 ?

FreeBSD " (monolithic)" .

FreeBSD .

(PCMCIA) (modular)
KLD .

. FreeBSD .
GENERIC PC
. :

- .

- . GENERIC
  . .
  RAM .

- . GENERIC
  .

KFUG .

8.3

/sys

/usr/src/sys

arch/conf 에 *arch* 는 i386 alpha pc98 (

PC) 이다.

FreeBSD

. FreeBSD 5.X sparc64

Note: /usr/src/sys 는

root /stand/sysinstall ➔

Configure ➔ Distributions ➔ src ➔ sys 이다.

```
<<<   X Exit       Exit this menu (returning to previous)
      All          Select all of the below
      Reset        Reset all of the below
[ ]   base         top-level files in /usr/src
[ ]   contrib      /usr/src/contrib (contributed software)
[ ]   gnu          /usr/src/gnu (software from the GNU Project)
[ ]   etc          /usr/src/etc (miscellaneous system files)
[ ]   games        /usr/src/games (the obvious!)
[ ]   include      /usr/src/include (header files)
[ ]   lib          /usr/src/lib (system libraries)
[ ]   libexec      /usr/src/libexec (system programs)
[ ]   release      /usr/src/release (release-generation tools)
[ ]   bin          /usr/src/bin (system binaries)
[ ]   sbin         /usr/src/sbin (system binaries)
[ ]   scrypto      /usr/src/crypto (contrib encryption sources)
[ ]   share        /usr/src/share (documents and shared files)
[ ]   skrb4        /usr/src/kerberosIV (sources for KerberosIV)
[ ]   skrb5        /usr/src/kerberos5 (sources for Kerberos5)
[ ]   ssecure      /usr/src/secure (BSD encryption sources)
[X]   sys          /usr/src/sys (FreeBSD kernel)
[ ]   tools        /usr/src/tools (miscellaneous tools)
[ ]   ubin         /usr/src/usr.bin (user binaries)
[ ]   usbin        /usr/src/usr.sbin (aux system binaries)
```

[8-2.bmp]

sysinstall FreeBSD CDROM

```
# mount /cdrom
# mkdir -p /usr/src/sys
# ln -s /usr/src/sys /sys
```

```
# cat /cdrom/src/ssys.[a-d]* | tar -xzvf -
```

arch/conf   GENERIC   .

                    .

```
# cd /usr/src/sys/i386/conf
# cp GENERIC MYKERNEL
```

                                                          FreeBSD

                                    .

MYKERNEL   .

        TIP: /usr/src   .
          /usr/src   . 5

                                        .
                                    GENERIC   .

                        i386   .

                                    .

```
# cd /usr/src/sys/i386/conf
# mkdir /root/kernels
# cp GENERIC /root/kernels/MYKERNEL
# ln -s /root/kernels/MYKERNEL
```

        Note: root

            .

        MYKERNEL   .

                                            vi   .
                            ee   FreeBSD   .
                                            GENERIC   .

SunOS   BSD

.   DOS   GENERIC

.

Note: FreeBSD

/usr/src/UPDATING   .

FreeBSD   .

/usr/src/UPDATING   FreeBSD

.

.

FreeBSD   .

- ●   1   .

- ● FreeBSD 4.0   make world   FreeBSD 4.0
  1   .

- ●   (IPFIREWALL
)   .

- ● make world   2   .

[:   ]

1.

config(8)   .

/usr/sbin/config MYKERNEL

.   .

cd ../compile/MYKERNEL

FreeBSD   5.0   .

```
# cd ../../compile/MYKERNEL




# make depend
# make




# make install




            .

# dmesg | grep MYKERNEL
```

```
Copyright (c) 1992-2004 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 4.10-RELEASE #1: Tue Sep  7 12:14:39 KST 2004
    root@www.trustedbsd.co.kr:/usr/src/sys/compile/MYKERNEL
Timecounter "i8254"  frequency 1193182 Hz
Timecounter "TSC"  frequency 933354324 Hz
CPU: Intel Pentium III (933.35-MHz 686-class CPU)
```

[8-3.bmp]

2.

    /usr/src   .


```
# cd /usr/src




# make buildkernel KERNCONF=MYKERNEL




# make installkernel KERNCONF=MYKERNEL
```

---

1 .

[   ]

Note: FreeBSD 4.2   *KERNCONF =*   *KERNEL=*
. 4.2-STABLE   2   2   *KERNCONF=*
.

buildworld-installwold
(CVSup, CTM   anoncvs   )
config ➔ make ➔ depend ➔ make ➔ make install   .

Note: (   )   FreeBSD 4.X
/dev   .
.
.

root   /kernel   /kernel.old   .
.
.
.

Note: FreeBSD 5.0   /boot/kernel
/boot/kernel.old   .   loader(8)
/boot   .
/boot/modules
.
.

8.4

.
. #

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.

(Networking　)　　　　　　　　GENERIC

GENERIC　　　　　　　.

GENERIC　　　　　　　　　　　LINT

.　　　　　　　　　　　　　　　　LINT　　　　　　.

Note: FreeBSD 5.X　　　　　　LINT　　　.

NOTE　　　　　　.

/usr/src/sys/conf/NOTES　　　　　　　　.

.

GENERIC　　　　　　　　.

/usr/src/sys/i386/conf/GENERIC　　　　　.

/usr/src/sys/i386/conf/LINT　　　.

```
#
# GENERIC -- Generic kernel configuration file for FreeBSD/i386
#
# For more information on this file, please read the handbook section on
# Kernel Configuration Files:
#
#       http://www.FreeBSD.org/doc/en_US.ISO8859-1/books/handbook/kernelconfig-
config.html
#
# The handbook is also available locally in /usr/share/doc/handbook
# if you've installed the doc distribution, otherwise always see the
# FreeBSD World Wide Web server (http://www.FreeBSD.org/) for the
# latest information.
#
# An exhaustive list of options and more detailed explanations of the
# device lines is also present in the ../../conf/NOTES and NOTES files.
# If you are in doubt as to the purpose or necessity of a line, check first
# in NOTES.
#
```

KFUG　　　　　　　　　　　　，　　　　　　　　　　　　　　　　　　　　　　．

```
# $FreeBSD: src/sys/i386/conf/GENERIC,v 1.380 2003/03/29 13:36:41 mdodd Exp $
```

machine   i386

. i386, pc98, sparc64, alpha, ia64, amd64

powerpc   .

cpu   I486_CPU
cpu   I586_CPU
cpu   I686_CPU

CPU   . CPU
(:   *I586_CPU*   *I686_CPU*   )
CPU   . CPU
/var/run/dmesg.boot   .

```
        The Regents of the University of California. All rights reserved.
FreeBSD 4.10-RELEASE #1: Tue Sep  7 12:14:39 KST 2004
    root@www.trustedbsd.co.kr:/usr/src/sys/compile/MYKERNEL
Timecounter "i8254"  frequency 1193182 Hz
Timecounter "TSC"  frequency 933354324 Hz
CPU: Intel Pentium III (933.35-MHz 686-class CPU)
  Origin = "GenuineIntel"  Id = 0x68a  Stepping = 10
  Features=0x383f9ff<FPU,VME,DE,PSE,TSC,MSR,PAE,MCE,CX8,SEP,MTRR,PGE,MCA,
real memory  = 335478784 (327616K bytes)
avail memory = 322916352 (315348K bytes)
```

[8-4.bmp]

I386_CPU   FreeBSD   STABLE
CURRENT   .   386   CPU   FreeBSD
                    :

            FreeBSD   8.3
        .

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/usr/obj

386   .

CD-ROM   *I386_CPU*   FreeBSD
.

386
.

ident   GENERIC

.
. : *MYKERNEL. Ident*

.

maxusers   *n*

maxusers   .
.

FreeBSD 4.5   *0*   (maxuser
32   384   .)
.

FreeBSD 5.X   *maxusers*   *0*   . FreeBSD 4.5
maxusers   X
maxusers   4   .
maxusers   *20 + 16 * maxusers*
, *maxuses*   1   18   X
15   36
.   9
. *maxusers*   64
1044   .

KFUG   ,   .
.

(ftp.FreeBSD.org   )

Note: *maxusers*   .

                                                                                    .

                    X   *pseudo-*
device pty 16   . FreeBSD 5.X   pty(4)   "   -   "
                                                            device pty
            .

Floating point support - do not disable.
device   npx0   at nexus? port IO_NPX irq 13

npx0   FreeBSD   -
                    .   .

Pseudo devices - the number indicates how many units to allocate.
device   loop   # Network loopback

        TCP/IP   .   FTP   localhost   (127.0.0.1)
                                    . FreeBSD 4.X   *pseudo-*
device loop   .

                    .   .

To statically compile in device wiring instead of /boot/device.hints
hints   "GENERIC.hints"   # Default places to look for devices.

FreeBSD 5.X   device.hints(5)   .
loader(8)   /boot/device.hints   . *hints*

hints   .   /boot   device.hints
             .

        # makeoptions   DEBUG=-g   # Build kernel with gdb(1) debug
        symbols

FreeBSD
STRIPS   . CURRENT
                              FreeBSD
              .   gcc(1)   –*g*
    .   (config; make depend;   )   config(8) –*g*
                    .

        options   MATH_EMULATE   # Support for x87 emulation

              -                    (386   486SX)   -
          . 486DX, 386, 486SX(387   487   )
(,   2   )   .

        Note: FreeBSD   -
                            .   -
                                                            GNU
              GPL_MATH_EMULATE   .

            CPU
                                              GENERIC
        FreeBSD 5.0   .

        options   INET   # InterNETworking

              .   .
                    (: PC   )

              KFUG   ,   .

.

options   INET6   # IPv6 communications protocols

        IPv6   (IP   )   .

options   FFS   # Berkeley Fast Filesystem
options   FFS_ROOT   # FFS usable as root device [keep this!]

.

.

        Note: FreeBSD 5.0   FFS_ROOT   .

options   UFS_ACL   # Support for access control lists

FreeBSD 5.0   .
            UFS2   14.12   . ACL

.

options   UFS_DIRHASH   # Improve performance on big directories

.

FreeBSD   .

options   SOFTUPDATES   # Enable FFS Soft Updates support

        KFUG   .   .

4.X

mount(8)

```
/dev/da0s1a on / (ufs, local)
/dev/da0s1f on /tmp (ufs, local, soft-updates)
/dev/da0s1g on /usr (ufs, local, soft-updates)
/dev/da0s1e on /var (ufs, local, soft-updates)
procfs on /proc (procfs, local)
```

[8-5.bmp]

soft-updates   tunefs(8)   newfs(8)

options   MFS   # Memory Filesystem
options   MD_ROOT   # MD is a potential root device

RAM   .
. MFS   /tmp   .
                                        . /tmp   MFS RAM
                     /etc/fstab   :

/dev/ad1s2b   /tmp mfs rw 0 0

                        mount /tmp   .

Note: FreeBSD 5.X   md(4)-backed UFS   MFS
                        . MD-backed
mdconfig(8), mdmfs(8)   16.12   .
     MFS   .

options   NFS   # Network Filesystem
options   NFS_ROOT   # NFS usable as root device, NFS required

. TCP/IP

```
options          MSDOSFS        # MSDOS Filesystem
```

MS-DOS   .   DOS

.   DOS

.   mtools   (   )

    DOS   (*MSDOSFS*   )   .

```
options          CD9660         # ISO 9660 Filesystem
options          CD9660_ROOT   # CD-ROM usable as root, CD9660 required
```

CDROM   ISO 9660   . CDROM

     CD   (CD

)   .   CD   .

```
options          PROCFS         # Process filesystem
```

.   ps(1)

          /proc   .

  PROCFS   FreeBSD 5.X   *PROCFS*

                    . 5.X-CURRENT   *PROCFS*

  PSEUDOFS   .

```
options          PSEUDOFS       # Pseudo-filesystem framework
```

PSEUDOFS   FreeBSD 4.X   . FreeBSD 4.X   FreeBSD 5.X

                                        .

```
options          COMPAT_43      # Compatible with BSD 4.3 [KEEP THIS!]
```

4.3 BSD   .   ;
                                               .

          options   COMPAT_FREEBSD4   # Compatible with FreeBSD4

          FreeBSD 5.X i386   alpha
              FreeBSD   .
                      i386   alpha   ; ia64
Sparc64   5.X   .

          options   SCSI_DELAY=15000   # Delay (in ms) before probing SCSI

                     SCSI   15   . IDE

5   .   FreeBSD   SCSI
                                         .

          options   UCONSOLE   # Allow users to grab the console

X   .
             write(1)   talk(1)
xterm   xterm - c   .

          Note: FreeBSD 5.X   *UCONSOLE*   .

          options   USERCONFIG   # boot - c editor

                                              .

          options   VISUAL_USERCONFIG   # visual boot - c editor

.

Note: FreeBSD　　　5.0　　　　　　　　　*USERCONFIG*
device.hints(5)　　　　　　　　　　　. device.hints(5)
12.5　　　　　　　.

options　　　　　　KTRACE　　　　　　# ktrace(1) support

.

options　　　　　　SYSVSHM　　　　　# SYSV-style shared memory

　　System V　　　　　　　　　　.　　　　　　　　　　X
　　　　　　　　　　　　　　　　　XSHM　　　. X
　　　　　　　　.

options　　　　　　SYSVSEM　　　　　# SYSV-style semaphores

System V　　　　　　.　　　　　　　　　　　　　.

options　　　　　　SYSVMSG　　　　　# SYSV-style message queues

System V　　　　　.　　　　　　　　　　.

Note: ipcs(1)　　　　　System V
　　　　.

options　　P1003_1B　　　# Posix P1003_1B real-time extensions
options　　　_KPOSIX_PRIORITY_SCHEDULING

　　KFUG　　　　　　　　　　　　　,　　　　　　　　　　　　　　.
　　　　　　　　　　.

1993 POSIX   .   (
)   .

> **Note**: FreeBSD 5.X
>   _KPOSIX_PRIORITY_SCHEDULING   P1003_1B
>   .

```
options          ICMP_BANDLIM          # Rate limit bad replies
```

        ICMP   .
                                   .

> **Note**: FreeBSD 5.X
> ICMP_BANDLIM   .

```
# To make an SMP kernel, the next two are needed
# options          SMP                          # Symmetric MultiProcessor Kernel
# options          APIC_IO                      # Symmetric (APIC) I/O
```

        SMP(CPU)   .

```
device          isa
```

FreeBSD   PC   ISA   . IBM PS/2(
)   FreeBSD   . MCA
                    /usr/src/sys/i386/conf/LINT   .

```
device          eisa
```

EISA   .   EISA
                                   .

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<rick@rickinc.com>

```
        device          pci
```

PCI   .   PCI   PCI   ISA
                                                    .

```
        device          agp
```

   AGP   .   AGP
   AGP GART   .

```
    # Floppy drives
    device          fdc0            at isa? port IO_FD1 irq 6 drq 2
    device          fd0             at fdc0 drive 0
    device          fd1             at fdc0 drive 1
```

                                              . *fd0*   A: *fd1*   B:
   .

```
        device          ata
```

                ATA   ATAPI   .   PCI
ATA/ATAPI   *device ata*   .

```
        device          atadisk                 # ATA disk drives
```

      ATA   *device ata*   .

```
        device          atapicd                 # ATAPI CDROM drives
```

      ATAPI CDROM   *device ata*   .

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                                              .

```
        device          atapifd                 # ATAPI floppy drives
```

        ATAPI   device ata   .

```
        device          atapist                 # ATAPI tape drives
```

        ATAPI   device ata   .

```
        options         ATA_STATIC_ID           # Static device numbering
```

                            (   )
    .

```
        # SCSI Controllers
        device          ahb             # EISA AHA1742 family
        device          ahc             # AHA2940 and onboard AIC7xxx devices
        device          amd              # AMD 53C974 (Teckram DC- 390(T))
        device          dpt             # DPT Smartcache - See LINT for options!
        device          isp             # Qlogic family
        device          ncr             # NCR/Symbios Logic
        device          sym              # NCR/Symbios Logic (newer chipsets)

        device          adv0            at isa?
        device          adw
        device          bt0             at isa?
        device          aha0            at isa?
        device          aic0            at isa?
```

SCSI   .   .   IDE
        .

```
# SCSI peripherals
device          scbus        # SCSI bus (required)
device          da           # Direct Access (disks)
device          sa           # Sequential Access (tape etc)
device          cd           # CD
device          pass         # Passthrough device (direct SCSI
access)
```

SCSI   .   IDE   SCSI
          .

```
# RAID controllers
device          ida          # Compaq Smart RAID
device          amr           # AMI MegaRAID
device          mlx          # Mylex DAC960 family
```

    RAID   . RAID   .

```
# atkbdc0 controls both the keyboard and the PS/2 mouse
device          atkbdc0      at isa? port IO_KBD
```

AT   PS/2   I/O   .
                    (*atkbd*)   PS/2   (*psm*)   .

```
device          atkbd0       at atkbdc? irq 1
```

atkbdc   *atkbd*   AT 84   AT
          AT   .

```
device          psm0         at atkbdc? irq 12
```

PS/2   .

device   vga0   at isa?

                         .

splash screen/screen saver
device   splash

                    (
).   . FreeBSD 4.X
pseudo-device splash   .

syscons is the default console driver, resembling an SCO console
device   sc0   at isa?

SCO   *sc0*   .
   termcap
                VT220   *vt0*   .
                                                                      TERM
      scoansi   .

Enable this and PCVT_FREEBSD for pcvt vt220 compatible console driver
#device   vt0   at isa?
#options   XSERVER   # support for X server on a vt console
#options   FAT_CURSOR   # start with block cursor
If you have a ThinkPAD, uncomment this along with the rest of the PCVT lines
#options   PCVT_SCANSET=2   # IBM keyboards are non-std

                VT100/102   VT220   . *sc0*
                                    .   TERM

vt100   *vt220*   .   *sc0*   termcap
terminfo
        .-- *vt100*   .

        # Power management support (see LINT for more options)
        device   apm0   at nexus? disable flags 0x20   # Advanced Power
        Management

                                                        .

        # PCCARD (PCMCIA) support
        device   card
        device   pcic0   at isa? irq 10 port 0x3e0 iomem 0xd0000
        device   pcic1   at isa? irq 11 port 0x3e2 iomem 0xd4000 disable

PCMCIA   .   .

        # Serial (COM) ports
        device   sio0   at isa? port IO_COM1 flags 0x10 irq 4
        device   sio1   at isa? port IO_COM2 irq 3
        device   sio2   at isa? disable port IO_COM3 irq 5
        device   sio3   at isa? disable port IO_COM4 irq 9

        MS-DOS/   COM1   COM4   4   .

        Note: COM4   COM2   FreeBSD
                                            IRQ   2   (
        IRQ2=IRQ9)   .
                                                    sio(4)   .
        0x*2e8   IO   (S3   )
                                        16   IO
                                    COM4   .

                KFUG   ,   .

IRQ　　　　　　　　(

)　　　COM3　COM4

　.

```
# Parallel port
device          ppc0    at isa? irq 7
```

ISA　　　　　　　　　　　　.

```
device          ppbus       # Parallel port bus (required)
```

　.

```
device          lpt         # Printer
```

　.

Note:　　　　　　　　　3　　　　　.

```
device          plip        # TCP/IP over parallel
```

　.

```
device          ppi         # Parallel port interface device
```

I/O("geek port")+IEEE1284 I/O.

```
#device         vpo         # Requires scbus and da
```

Iomega ZIP　　　　　　. *scbus　da*　　　. EPP 1.9

KFUG　　　　　　　　,　　　　　　　.

.

```
# PCI Ethernet NICs.
device          de            # DEC/Intel DC21x4x (``Tulip'')
device          fxp           # Intel EtherExpress PRO/100B (82557, 82558)
device          tx            # SMC 9432TX (83c170 ``EPIC'')
device          vx            # 3Com 3c590, 3c595 (``Vortex'')
device          wx            # Intel Gigabit Ethernet Card (``Wiseman'')
```

PCI   .   .


```
# PCI Ethernet NICs that use the common MII bus controller code.
device          miibus        # MII bus support
```

MII   PCI 10/100   .   MII-
                    MII   . *device
miibus   miibus API
          PHY   PHY   .


```
device          dc            # DEC/Intel 21143 and various workalikes
device          rl            # RealTek 8129/8139
device          sf            # Adaptec AIC-6915 (``Starfire'')
device          sis           # Silicon Integrated Systems SiS 900/SiS 7016
device          ste           # Sundance ST201 (D-Link DFE-550TX)
device          tl            # Texas Instruments ThunderLAN
device          vr            # VIA Rhine, Rhine II
device          wb            # Winbond W89C840F
device          xl            # 3Com 3c90x (``Boomerang'', ``Cyclone'')
```

MII   .

                                        dmesg   .
```

```
isab1: <PCI to ISA bridge (vendor=1106 device=3057)> at device
xl0: <3Com 3c905C-TX Fast Etherlink XL> port 0x1400-0x147f mem
xl0: Ethernet address: 00:01:03:39:00:2d
miibus0: <MII bus> on xl0
ukphy0: <Generic IEEE 802.3u media interface> on miibus0
ukphy0:  10baseT, 10baseT-FDX, 100baseTX, 100baseTX-FDX, auto
```

[8-6.bmp]

ISA Ethernet NICs.
device   ed0   at isa? port 0x280 irq 10 iomem 0xd8000
device   ex
device   ep
WaveLAN/IEEE 802.11 wireless NICs. Note: the WaveLAN/IEEE really
exists only as a PCMCIA device, so there is no ISA attachment needed
and resources will always be dynamically assigned by the pccard code.
device   wi
Aironet 4500/4800 802.11 wireless NICs. Note: the declaration below will
work for PCMCIA and PCI cards, as well as ISA cards set to ISA PnP
mode (the factory default). If you set the switches on your ISA
card for a manually chosen I/O address and IRQ, you must specify
those parameters here.
device   an
The probe order of these is presently determined by i386/isa/isa_compat.c.
device   ie0   at isa? port 0x300 irq 10 iomem 0xd0000
device   fe0   at isa? port 0x300
device   le0   at isa? port 0x300 irq 5 iomem 0xd0000
device   lnc0   at isa? port 0x280 irq 10 drq 0
device   cs0   at isa? port 0x300
device   sn0   at isa? port 0x300 irq 10
requires PCCARD (PCMCIA) support to be activated
#device   xe0   at isa?

ISA   .
/usr/src/sys/i386/conf/LINT   .

```
device      ether          # Ethernet support
```

ether .

. FreeBSD 4.X   *pseudo-device ether*


```
device    sl        1       # Kernel SLIP
```

sl   SLIP   .

PPP   . sl   SLIP

. FreeBSD 4.X   *pseudo-device sl*   .


```
device    ppp      1       # Kernel PPP
```

PPP   .   *tun*

PPP   .

ppp   PPP   . FreeBSD
4.X   *pseudo-device ppp*   .


```
device    tun            # Packet tunnel.
```

PPP   . *tun*   PPP

.   PPP   . FreeBSD 4.X

pseudo-device tun   .


```
device    pty            # Pseudo-ttys (telnet etc)
```

"pseudo-terminal"   .   telnet

rlogin   , xterm   Emacs   . *pty*

ptys   . xterm   16

256   .

```
device      md                   # Memory ``disks''
```

pseudo-devices. FreeBSD 4.X   *pseudo-device md*

```
device      gif        # IPv6 and IPv4 tunneling
```

IPv6   IPv4   , IPv4   IPv6   , IPv4   IPv4
IPv6   IPv6   . FreeBSD 4.4   *gif*
pseudo-device gif   .   FreeBSD   *pseudo-device*
gif 4   .

```
device      faith    # IPv6-to-IPv4 relaying (translation)
```

pseudo-device   IPv4/IPv6
. FreeBSD 4.X   *pseudo-device faith 1*   .

```
# The `bpf' pseudo-device enables the Berkeley Packet Filter.
# Be aware of the administrative consequences of enabling this!
device      bpf               # Berkeley packet filter
```

.   pseude-device
(promiscuous)   (:   )
.   tcpdump(1)
. FreeBSD 4.X   *pseudo-device bpf*   .

Note: bpf(4)   IP   dhclient(8)
. DHCP   .

```
# USB support
#device         uhci            # UHCI PCI->USB interface
#device         ohci            # OHCI PCI->USB interface
```

```
#device          usb             # USB Bus (required)
#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
# USB Ethernet, requires mii
#device          aue             # ADMtek USB ethernet
#device          cue             # CATC USB ethernet
#device          kue             # Kawasaki LSI USB ethernet
```

USB   (USB   ,   ,   )   .

FreeBSD   /usr/src/sys/i386/conf/LINT

.

8.4.1   (PAE)

+   4

.   Intel   Pentium Pro   CPU   36-bit

.

Intel Pentium Pro   CPU   (PAE)   64

. FreeBSD   4.X   FreeBSD 4.9-RELEASE   5.X

FreeBSD 5.1-RELEASE   PAE

.   Intel   4   . 4

(pool)   .

PAE   :

options   PAE

Note: FreeBSD   PAE   Intel IA-32   .

PAE   FreeBSD
.

FreeBSD   PAE   :

- 4   VM   .

- KLD   PAE
.

- bus_dma(9)   PAE
.   PAE
PAE
FreeBSD 5.X   .

-
.   PAE
.   vnode
kern.maxvnodes sysctl   .
.

- (KVA)   KVA
. KVA
KVA_PAGES   .

tuning(7)   . pae(4)
FreeBSD PAE   .

8.5

Note: FreeBSD 5.0   .

devfs(5)   .

/dev   "node"   .

.

/dev/MAKEDEV   .

.   .

IDE CD-ROM   .

device acd0

/dev   acd0   *c*   "raw"

r   .

/dev   .

sh MAKEDEV acd0

acd0c   racd0c   /dev

.

:

sh MAKEDEV snd0

Note:

/etc/fbtab

. fbtab(5)   .

GENERIC   .

Note: SCSI   /dev

.   SLIP/PPP pseudo-devices

/dev   .

8.6

5   .   :

config   :

config(8)
.   config(8)

vi   .

config: line 17: syntax error

vi   17G   .
GENERIC
.

make   :

make   config(8)
.

FreeBSD
(http://lists.freebsd.org/mailman/listinfo/freebsd-questions)
.

:

(make install   make installkernel   )
1   (init(8))   .

.   1

0

.

:

FreeBSD   .

FreeBSD   .   10

                              . Enter   unload

boot kernel.old   .

                                                                          .

                                                                  .

                                                      /var/log/messages

. dmesg(8)   .

Note: GENERIC

                                                                                          .

                                    kernel.old

                                          .

        kernel   ps(1)

. make   (   )

                                              .

chflags noschg /kernel

                        securelevel(8)   O   .

/etc/rc.conf   *kern_securelevel*   - 1   .

                        securelevel(8)   .

                                          .

chflags schg /kernel

FreeBSD 5.X

                                  .

ps(1)   :

3.X   4.X
                    ps(1)   vmstat(8)
        .   libkvm   .
                                                                                .

KFUG