NAME

INSTALL — Installation procedure for NetBSD/vax.

CONTENTS

About this Document....2
What is NetBSD?....2
Changes Between The NetBSD 6.0 and 6.1 Releases....2
  Security Advisory Fixes....2
  Security Fixes....3
  General kernel....3
  Networking....3
  File systems....3
  Drivers....4
  Platforms....4
  Userland fixes....5
The NetBSD Foundation....6
Sources of NetBSD....6
NetBSD 6.1_STABLE Release Contents....6
  NetBSD/vax subdirectory structure....7
  Binary distribution sets....7
NetBSD/vax System Requirements and Supported Devices....8
  Supported hardware....8
Getting the NetBSD System on to Useful Media....9
  Creating boot tapes....11
  Creating boot floppies....11
  Booting from NFS server....12
Preparing your System for NetBSD installation....12
Installing the NetBSD System....12
  Running the sysinst installation program....13
    Introduction....13
    Possible hardware problems....13
    General....13
    Quick install....14
    Booting NetBSD....14
    Network configuration....15
    Installation drive selection and parameters....15
    Selecting which sets to install....15
    Partitioning the disk....15
    Preparing your hard disk....16
    Getting the distribution sets....16
    Installation from CD-ROM....16
    Installation using ftp....16
    Installation using NFS....16
    Installation from an unmounted file system....17
    Installation from a local directory....17
    Extracting the distribution sets....17
    Configure additional items....17
    Finalizing your installation....17
Post installation steps....17
Upgrading a previously-installed NetBSD System....20

Compatibility Issues With Previous NetBSD Releases.....20
Issues affecting an upgrade from NetBSD 5.x releases 20
Issues affecting an upgrade from NetBSD 4.x releases 21
Using online NetBSD documentation.....21
Administrivia.....22
Thanks go to.....22
We are.....23
Legal Mumbo-Jumbo.....31
The End.....34

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 6.1_STABLE on the *vax* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

`.more` The enhanced text format used on UNIX-like systems by the `more`(1) and `less`(1) pager utility programs. This is the format in which the on-line *man* pages are generally presented.

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on 57 different system architectures (ports) across 15 distinct CPU families, and is being ported to more. The NetBSD 6.1_STABLE release contains complete binary releases for many different system architectures. (A few ports are not fully supported at this time and are thus not part of the binary distribution. Please see the NetBSD web site at **http://www.NetBSD.org/** for information on them.)

NetBSD is a completely integrated system. In addition to its highly portable, high performance kernel, NetBSD features a complete set of user utilities, compilers for several languages, the X Window System, firewall software and numerous other tools, all accompanied by full source code.

NetBSD is a creation of the members of the Internet community. Without the unique cooperation and coordination the net makes possible, it's likely that NetBSD wouldn't exist.

Changes Between The NetBSD 6.0 and 6.1 Releases

The NetBSD 6.1_STABLE release provides numerous significant functional enhancements, including support for new devices, integration of hundreds of bug fixes, updated kernel subsystems, and many user-land enhancements. The result of these improvements is a stable operating system fit for production use that rivals most commercially available systems.

The complete list of changes can be found in the CHANGES-6.1:

http://ftp.NetBSD.org/pub/NetBSD/NetBSD-6.1/CHANGES-6.1

file in the top level directory of the NetBSD 6.1 release tree. An abbreviated list is as follows:

Security Advisory Fixes

- NetBSD-SA2013-001: *,:*
  http://ftp.netbsd.org/pub/NetBSD/security/advisories/NetBSD-SA2013-001.txt.asc
  Kernel panic triggered from userland
- NetBSD-SA2013-002: *,:*
  http://ftp.netbsd.org/pub/NetBSD/security/advisories/NetBSD-SA2013-002.txt.asc
  kqueue related kernel panic triggered from userland
- NetBSD-SA2013-003: *,:*
  http://ftp.netbsd.org/pub/NetBSD/security/advisories/NetBSD-SA2013-003.txt.asc
  RNG Bug May Result in Weak Cryptographic Keys
- NetBSD-SA2013-004: *,:*
  http://ftp.netbsd.org/pub/NetBSD/security/advisories/NetBSD-SA2013-004.txt.asc
  Vulnerabilities in grep

Security Fixes

- expat: Fix CVE-2012-1147, CVE-2012-1148 and CVE-2012-0876.
- BIND: Address CVE-2012-5688: Named could die on specific queries with dns64 enabled.
- Fixed a crash which could happen with sysctl security.curtain=1 set. (PR#47598): **http://gnats.NetBSD.org/47598**
- Address CVE-2012-5667: Multiple integer overflows in GNU grep.
- Several fixes to entropy handling in the kernel.
- Prevent ktrace from being able to crash the kernel.

General kernel

- posix_spawn(): Fix processes with attributes.
- Resolve races between vget() and vrele() resulting in vget() returning dead vnodes.
- Prevent crash when unsupported fd's are used with kevent.
- Fix a bug where kmem_alloc() could be called from interrupt context.
- WAPBL: coalesce writes to the journal to speed up wapbl_flush() on raid5 by a factor of 3 to 4.

Networking

- Fix "atomic fragments" for IPv6.
- ipf: Fix alignment issues in ipmon. (PR#47101): **http://gnats.NetBSD.org/47101**
- npf: handle delayed checksums in the network stack. (PR#47235): **http://gnats.NetBSD.org/47235**
- Fixed some locking issues in `ipf`(4)
- `npf`(3): Many fixes and updates. Config syntax has changed somewhat, please check your config files.
- Fixed sendto(2) issue with IPv6 UDP datagrams. (PR#47408): **http://gnats.NetBSD.org/47408**

File systems

- smbfs: Make smbfs actually work on big-endian ports.
- smbfs: various fixes. (PR#25070): **http://gnats.NetBSD.org/25070**
- Allow mounting ext2fs and msdosfs in 32-bit compat mode.
- v7fs: fix off-by-one error.

Drivers

- `ciss`(4): don't try to handle sensors if there aren't any.
- `isp`(4): Fix FC-AL devices on QLogic ISP2100. (PR#47302): **http://gnats.NetBSD.org/47302**
- `mfi`(4): Add support for LSI Thunderbolt (SAS2208) controllers.
- `mfi`(4): Add support for running the MegaCLI Linux binary to manage the controller.
- `puc`(4): Additional device support.
- `bge`(4): Add support for Apple's Thunderbolt to Gigabit Ethernet adapter. (PR#46961): **http://gnats.NetBSD.org/46961**
- `mvgbe`(4): fix a number of issues
- `nfe`(4): Avoid bounce buffering and improve performance.
- `wm`(4): Fix handling of 82578D and 82579V chips. Various other fixes.
- `fss`(4): Don't crash when running multiple dump -X. (PR#47514): **http://gnats.NetBSD.org/47514**
- `fss`(4): Fixed panic. (PR#47020): **http://gnats.NetBSD.org/47020**

Platforms

- alpha:
  - Fixed longjmp/setjmp on alpha for statically linked programs such as those in /rescue.
- amiga:
  - New `ed`(4) device driver for Hydra and ASDG Zorro2 bus network cards.
- arm:
  - Fix gcc bugid 51408 for arm. (PR#46972): **http://gnats.NetBSD.org/46972**
  - Fixed a bit check in the Kirkwood IRQ code.
  - Fixed incorrect counts for 'vmstat -e' on Kirkwood.
  - Make bigendian ARM get the MBR partition and offset correct. (PR#47081): **http://gnats.NetBSD.org/47081**
  - Fixed bug where IRQ masks of GPIO were set incorrectly on Marvell SoCs.
  - Fixed static linking on ARM platforms. (PR#47139): **http://gnats.NetBSD.org/47139**
  - Properly block IRQs >= 32. (PR#45371): **http://gnats.NetBSD.org/45371**
  - Greatly improved Raspberry Pi support - USB and onboard Ethernet now work.
  - Enabled DCache Streaming Switch and Write Allocate for Sheeva CPUs.

  - Added support for the watchdog timer in some Marvell SoCs.
  - Fix for non-MBR disks on ARM. (PR#47463): **http://gnats.NetBSD.org/47463**
- mips:
  - MIPS ports have switched to gdb 7.3.1. GDB6 is removed.
- vax:
  - Reverted MAXPARTITION bump to 16, lowering it to 12 instead, to fix bootblocks and installboot for VAX 780 and other machines booting via VMB.EXE.
- x68k:
  - Update bootloader: cdboot, netboot support and bugfixes.
  - Add floppy format support.
- x86 (i386, amd64):
  - Work around a possible gcc bug generating bad assembler code. (PR#45673): **http://gnats.NetBSD.org/45673**
  - Disable C1E on AMD K8 CPUs, to prevent freeze during boot.
  - Fix running BSDi and NetBSD <= 1.0 binaries. (PR#41341): **http://gnats.NetBSD.org/41341**
  - Add support in ld.elf_so for relocation type R_386_TLS_TPOFF32. (PR#47061): **http://gnats.NetBSD.org/47061**
  - Fix some ACPI panics. (PR#47016): **http://gnats.NetBSD.org/47016**
  - The amd64 port now supports dtrace. (Not compiled in by default)
- xen:
  - Prevent a memory corruption issue that locks up a Xen DomU, and can potentially cause file system corruption. (PR#47056,: **http://gnats.NetBSD.org/47056**
    PR#47057: **http://gnats.NetBSD.org/47057**)
  - Fix: Xen Dom0 NetBSD kernel could crash by adding duplicate xenwatches.

Userland fixes

- Library Updates
  - `pthread`(3): libpthread minor number was bumped for the addition of pthread_cond_setclock(). Threaded binaries built on NetBSD 6.1 will not function on NetBSD 6.0.
  - `pthread`(3): libpthread can be dlopen()ed again.
  - `terminfo`(3): Various fixes to libterminfo.
  - libc: fix memory corruption in rpc. (PR#13082): **http://gnats.NetBSD.org/13082**
  - libutil: Fixed a bug in `parsedate`(3) where it would treat all input as if it were in the local time zone.
- Update to tzdata2013c.
- cdb: don't refuse to open databases without entries or keys.
- Address graphics corruption in recent Cairo, manifested most commonly by certain rendered text sections appearing as solid rectangular blocks of color.

- Added `flock`(1), inspired by the Linux program of the same name.
- Updated Postfix to version 2.8.13.
- `wsconsctl`(8): add support for touchscreen calibration. (PR#45872): **http://gnats.NetBSD.org/45872**
- openssl: Fixed a multiple-free bug.

The NetBSD Foundation

The NetBSD Foundation is a tax exempt, not-for-profit 501(c)(3) corporation that devotes itself to the traditional goals and Spirit of the NetBSD Project and owns the trademark of the word "NetBSD". It supports the design, development, and adoption of NetBSD worldwide. More information on the NetBSD Foundation, its composition, aims, and work can be found at: **http://www.NetBSD.org/foundation/**

Sources of NetBSD

Refer to **http://www.NetBSD.org/mirrors/**

NetBSD 6.1_STABLE Release Contents

The root directory of the NetBSD 6.1_STABLE release is organized as follows:

`.../NetBSD-6.1_STABLE/`

`CHANGES`	Changes between the 5.0 and 6.0 releases.
`CHANGES-6.0`	Changes between the initial 6.0 branch and final release of 6.0.
`CHANGES-6.1`	Changes between the final release of 6.0 and final release of 6.1.
`CHANGES.prev`	Changes in previous NetBSD releases.
`LAST_MINUTE`	Last minute changes and notes about the release.
`README.files`	README describing the distribution's contents.
`source/`	Source distribution sets; see below.

In addition to the files and directories listed above, there is one directory per architecture, for each of the architectures for which NetBSD 6.1_STABLE has a binary distribution.

The source distribution sets can be found in subdirectories of the `source` subdirectory of the distribution tree. They contain the complete sources to the system. The source distribution sets are as follows:

gnusrc	This set contains the "gnu" sources, including the source for the compiler, assembler, groff, and the other GNU utilities in the binary distribution sets.
sharesrc	This set contains the "share" sources, which include the sources for the man pages not associated with any particular program; the sources for the typesettable document set; the dictionaries; and more.
src	This set contains all of the base NetBSD 6.1_STABLE sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
syssrc	This set contains the sources to the NetBSD 6.1_STABLE kernel for all architectures as well as the `config`(1) utility.
xsrc	This set contains the sources to the X Window System.

All the above source sets are located in the `source/sets` subdirectory of the distribution tree.

The source sets are distributed as compressed tar files. Except for the **pkgsrc** set, which is traditionally unpacked into `/usr/pkgsrc`, all sets may be unpacked into `/usr/src` with the command:

```
# cd / ; tar -zxpf set_name.tgz
```

In each of the source distribution set directories, there are files which contain the checksums of the files in the directory:

`MD5` MD5 digests in the format produced by the command:
cksum -a MD5 *file*.

`SHA512` SHA512 digests in the format produced by the command:
cksum -a SHA512 *file*.

The SHA512 digest is safer, but MD5 checksums are provided so that a wider range of operating systems can check the integrity of the release files.

NetBSD/vax subdirectory structure

The vax-specific portion of the NetBSD 6.1_STABLE release is found in the `vax` subdirectory of the distribution: `.../NetBSD-6.1_STABLE/vax/`. It contains the following files and directories:

`INSTALL.html`
`INSTALL.ps`
`INSTALL.txt`
`INSTALL.more` Installation notes in various file formats, including this file. The `.more` file contains underlined text using the `more`(1) conventions for indicating italic and bold display.
`binary/`
`kernel/`
`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.
`netbsd-GENERIC.MP.gz`
A gzipped NetBSD kernel containing code for everything supported in this release. This kernel supports SMP on systems with more than one CPU.
`sets/` vax binary distribution sets; see below.
`installation/`
`misc/` Miscellaneous vax installation utilities; see installation section below.

Binary distribution sets

The NetBSD vax binary distribution sets contain the binaries which comprise the NetBSD 6.1_STABLE release for vax. The binary distribution sets can be found in the `vax/binary/sets` subdirectory of the NetBSD 6.1_STABLE distribution tree, and are as follows:

base The NetBSD 6.1_STABLE vax **base** binary distribution. You *must* install this distribution set. It contains the base NetBSD utilities that are necessary for the system to run and be minimally functional.

comp Things needed for compiling programs. This set includes the system include files (`/usr/include`) and the various system libraries (except the shared libraries, which are included as part of the **base** set). This set also includes the manual pages for all of the utilities it contains, as well as the system call and library manual pages.

etc This distribution set contains the system configuration files that reside in `/etc` and in several other places. This set *must* be installed if you are installing the system from scratch, but should *not* be used if you are upgrading.

games This set includes the games and their manual pages.

kern-GENERIC
This set contains a NetBSD/vax 6.1_STABLE `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.

man This set includes all of the manual pages for the binaries and other software contained in the **base** set. Note that it does not include any of the manual pages that are included in the other sets.

misc This set includes the system dictionaries, the typesettable document set, and other files from `/usr/share`.

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.

NetBSD maintains its own set of sources for the X Window System in order to assure tight integration and compatibility. These sources are based on X.Org. Binary sets for the X Window System are distributed with NetBSD. The sets are:

xbase The basic files needed for a complete X client environment. This does not include the X servers.

xcomp The extra libraries and include files needed to compile X source code.

xfont Fonts needed by the X server and by X clients.

xetc Configuration files for X which could be locally modified.

xserver The X server.

The vax binary distribution sets are distributed as gzipped tar files named with the extension **.tgz**, e.g. `base.tgz`.

The instructions given for extracting the source sets work equally well for the binary sets, but it is worth noting that if you use that method, the filenames stored in the sets are relative and therefore the files are extracted *below the current directory*. Therefore, if you want to extract the binaries into your system, i.e. replace the system binaries with them, you have to run the **`tar -xzpf`** command from the root directory (`/`) of your system.

Note: Each directory in the vax binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/vax System Requirements and Supported Devices

Supported hardware

- CPU types
  - VAX 11/750
  - VAX 11/78{0,5}
  - VAX 4000 model 100(A),105A,106A,108,200,300,400,500(A),505A,600(A),700
  - VAX 8200/8250/8300/8350
  - VAX 8600/8650
  - MicroVAX/VAXstation II
  - MicroVAX III
  - MicroVAX 3100 model 10,10e,20,20e,30,40,80,85,90,95
  - MicroVAX 3300/3400
  - MicroVAX 3500/3600
  - MicroVAX 3800/3900
  - MicroVAX 2000/VAXstation 2000
  - VAXstation 3100 model 30,38,40,48,76

  - VAXserver 3100 KA41-B and KA41-E
  - VAXserver 3600
  - VAXserver 3900
  - VAXstation 3200/3500
  - VAXstation 4000 models 60,90,90A,96 and VLC

- Networking
  - DEUNA/DELUA Unibus ethernet
  - DEQNA/DELQA Q22 bus ethernet
  - LANCE chip (where available)
  - SGEC chip (where available)

- Serial lines
  - DHU11/DHV11/DL11/DLV11/DZ11/DZQ11/DZV11 Unibus/Q22 bus asynchronous lines
  - DZ11-compatible lines on VAXstations.

- Disks
  - UDA50 Unibus MSCP controller
  - KDA50/RQDX1/2/3 Q22 bus
  - MSCP controller
  - KDB50 BI-bus MSCP controller
  - MFM and SCSI controllers on VAXstations
  - RP04/05/06/07 and RM02/03/05/80 Massbus disks
  - Console RL02 on VAX 8600.

  Some third-party controllers are also known to work, others do not.

- Tapes
  - TMSCP on Q22 bus (TK50/70, TU81)
  - TMSCP on BI bus
  - SCSI tapes on VAXstations.

- Floppy
  - RX33/RX50 on RQDX controllers
  - RX50 on VAX 8200

The minimal configuration requires 2 MB of RAM and ˜40 MB of disk space, but the installation really requires 6 MB RAM unless you plan on using Jedi powers.

Here is a table of recommended HD partition sizes for a full install:

Partition	Suggested	Needed
/ (root)	32 MB	16 MB
/usr	110 MB	45 MB
/var	20 MB	5 MB
swap	*2-3 ∗RAM*	

Anything else is up to you!

Getting the NetBSD System on to Useful Media

Installing on a 'bare' machine requires some bootable device; either a tape, CD-ROM or floppy drive or a NFS server together with a machine that can act as a MOP loader, such as another machine running NetBSD. NetBSD/vax can use both BOOTP/DHCP and BOOTPARAMS for netboot installations.

Installation is supported from several media types, including:

- CD-ROM / DVD
- FTP
- Remote NFS partition
- Tape
- Existing NetBSD partitions, if performing an upgrade

The steps necessary to prepare the distribution sets for installation depend upon which installation medium you choose. The steps for the various media are outlined below.

CD-ROM / DVD Find out where the distribution set files are on the CD-ROM or DVD. Likely locations are `binary/sets` and `vax/binary/sets`.

Proceed to the instructions on installation.

FTP The preparations for this installation/upgrade method are easy; all you need to do is make sure that there's an FTP site from which you can retrieve the NetBSD distribution when you're about to install or upgrade. If you don't have DHCP available on your network, you will need to know the numeric IP address of that site, and, if it's not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself.

Once you have this information, you can proceed to the next step in the installation or upgrade process. If you're installing NetBSD from scratch, go to the section on preparing your hard disk, below. If you're upgrading an existing installation, go directly to the section on upgrading.

NFS Place the NetBSD distribution sets you wish to install into a directory on an NFS server, and make that directory mountable by the machine on which you are installing or upgrading NetBSD. This will probably require modifying the `/etc/exports` file on the NFS server and resetting its mount daemon (mountd). (Both of these actions will probably require superuser privileges on the server.)

You need to know the numeric IP address of the NFS server, and, if you don't have DHCP available on your network and the server is not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself.

Once the NFS server is set up properly and you have the information mentioned above, you can proceed to the next step in the installation or upgrade process. If you're installing NetBSD from scratch, go to the section on preparing your hard disk, below. If you're upgrading an existing installation, go directly to the section on upgrading.

Tape To install NetBSD from a tape, you need to make a tape that contains the distribution set files, in 'tar' format.

Note: the tape devices with which NetBSD/vax is believed to work is the DEC TK-50. This is a very slow device. Installation via disk or network is recommended if possible.

If you're making the tape on a UNIX-like system, the easiest way to do so is probably something like:

```
# tar -cf tape_device dist_directories
```

where *tape_device* is the name of the tape device that describes the tape drive you're using; possibly `/dev/rst0`, or something similar, but it will vary from system to sys-

tem. (If you can't figure it out, ask your system administrator.) In the above example, *dist_directories* are the distribution sets' directories, for the distribution sets you wish to place on the tape. For instance, to put the **kern-GENERIC, base,** and **etc** distributions on tape (in order to do the absolute minimum installation to a new disk), you would do the following:

```
# cd .../NetBSD-6.1_STABLE
# cd vax/binary
# tar -cf tape_device kern-GENERIC base etc
```

Note: You still need to fill in *tape_device* in the example.

Once you have the files on the tape, you can proceed to the next step in the installation or upgrade process. If you're installing NetBSD from scratch, go to the section on preparing your hard disk, below. If you're upgrading an existing installation, go directly to the section on upgrading.

Creating boot tapes

Fetch the bootable bootfs image from

```
.../NetBSD-6.1_STABLE/vax/installation/bootfs/boot.fs
```

and write it on the beginning of the tape. Under NetBSD this is done (for MSCP tape, with SCSI tape the name is `nrst0`) via:

```
# mt -f /dev/nrmt0 rewind
# dd if=boot.fs of=/dev/nrmt0 conv=osync
# mt -f /dev/nrmt0 rewoffl
```

Under Ultrix the tape name is different:

```
# mt -f /dev/rmt0h rewind
# dd if=boot.fs of=/dev/rmt0h conv=osync
# mt -f /dev/rmt0h rewoffl
```

Of course, if you have a tape unit other than unit 0 you have to use the corresponding unit number.

If you wish to install the sets from tape then stage you will need to download the *.tgz files from

```
.../NetBSD-6.1_STABLE/vax/binary/sets{50,33}
```

(if your disk is less than 200 MB you will probably want to exclude the X sets) and then before the **mt ... rewoffl** run

```
# tar -cvf /dev/nrmt0 *.tgz
```

When you have booted the bootfs and completed the disk partitioning you will be prompted to **select medium** for install. At this point you will need to press `CONTROL-Z` to suspend the install tool, then

```
# cd /mnt
# mt -f /dev/nrmt0 rewind
# mt -f /dev/nrmt0 fsf
# tar -xvf /dev/nrmt0
# fg
```

then select "install from local dir" and give `/mnt`.

Note: If your disk is small you will need to be careful about filling it up.

If you are using any other OS to create bootable tapes, remember that the blocksize *must* be 512 for the file to be bootable! Otherwise it just won't work.

Creating boot floppies

Fetch the bootable bootfs image from

```
.../NetBSD-6.1_STABLE/vax/installation/bootfs/boot.fs
```

and **gunzip** it. It is a 1.2MB bootable image that will boot from any floppy of size 1.2MB and bigger. Note that you *cannot* install from RX50 floppies due to the small size. This may change in the future.

All floppies except RX50 use a standardized format for storing data so writing the bootfs to the floppy can be done on any PC. From MS-DOS the preferred way to do this is using **rawrite.exe**.

Booting from NFS server

All VAXen that can boot over network uses MOP, a DEC protocol. To be able to use MOP, a MOP daemon must be present on one of the machines on the local network. The boot principle is:

- The VAX broadcast a wish to load an image.
- A mopd answers and send the boot program to the VAX.
- The boot program does rarp/bootp requests, mounts the root file system and loads the kernel.
- The kernel is loaded and starts executing.

If your machine has a disk and network connection, it may be convenient for you to install NetBSD over the network. This involves temporarily booting your machine over NFS, just long enough so you can initialize its disk. This method requires that you have access to an NFS server on your network so you can configure it to support diskless boot for your machine. Configuring the NFS server is normally a task for a system administrator, and is not trivial.

If you are using a NetBSD system as the boot-server, have a look at the diskless(8) manual page for guidelines on how to proceed with this. If the server runs another operating system, consult the documentation that came with it. (I.e. add_client(8) on SunOS.)

There is also very useful documentation at
http://www.NetBSD.org/docs/network/netboot/

You also must install a MOP loader. If you are booting from another NetBSD machine, the MOP daemons are included in the distribution, otherwise you may have to install a MOP loader. A loader can be found at
ftp.stacken.kth.se:/pub/OS/NetBSD/mopd
Fetch the latest and read the installation instructions.

The file that should be loaded is called boot and is located in

```
.../NetBSD-6.1_STABLE/vax/installation/netboot/boot
```

The kernel to load is the same kernel as the bootfs uses and can be found in

```
.../NetBSD-6.1_STABLE/vax/installation/netboot/netbsd.ram.gz
```

From the install program started in the kernel the rest of the system can be installed. There is also a very good (if somewhat out of date) FAQ for netbooting VAXen at
http://world.std.com/~bdc/projects/vaxen/VAX-netboot-HOWTO.html
that describes netbooting of VAXen from many different OS'es.

Preparing your System for NetBSD installation

VAX machines usually need little or no preparation before installing NetBSD, other than the usual well advised precaution of BACKING UP ALL DATA on any attached storage devices.

If you are on a Q-bus or Unibus system the disk controller(s) need be at the standard CSR addresses for DUA (772150) or DUB (760334) to be recognized by the kernel and boot programs.

If you are installing on a VAXstation you *may* require a serial console.

Installing the NetBSD System

Installation of NetBSD/vax is now easier than ever! For the latest news, problem reports, and discussion, join the port-vax maillist by mailing a line saying

```
subscribe port-vax
```

to `majordomo@NetBSD.org`. Also, see **http://www.NetBSD.org/** for more information.

If you encounter any problems, please report them via the mailing list or the `send-pr`(1) program so that they can be fixed for the next release.

To install or upgrade NetBSD, you need to first boot the installation program and then interact with the screen-menu program **`sysinst`**. The installation program actually consists of the NetBSD kernel plus an in-memory file system of utility programs.

The usual procedure is to write the installation system to the install media, as described earlier.

Booting from install media

The built-in console monitor understands a bunch of commands, dependent on which VAX you have. To just boot from a device, type '**`B`**' at the >>> prompt. Device naming in the console monitor differs a lot from the UNIX counterparts. A device looks like `ddcu`, `where` '`dd`' is the device type, '`c`' is the controller number and '`u`' is the device unit. Many console monitors also support the **`SHOW DEV`** command, which shows available units to boot from.

A summary of the most common boot devices and their name:

`B DUA0` first MSCP controller, unit 0.

`B MUA0` first TMSCP tape controller, unit 0.

`B DKB0` second SCSI bus, unit 0.

`B XQA0` first Q22 bus Ethernet controller.

`B ESA0` first LANCE Ethernet controller on VAXstations.

`B EZA0` first SGEC Ethernet controller on VAXstations.
Other devices may be appropriate for your configuration.

Then just proceed with the program **`sysinst`**. The procedure that is described below can be easily adapted to VAX.

Running the sysinst installation program

1. *Introduction*

   Using **`sysinst`**, installing NetBSD is a relatively easy process. Still, you should read this document and have it in hand when doing the installation process. This document tries to be a good guide to the installation, and as such, covers many details for the sake of completeness. Do not let this discourage you; the install program is not hard to use.

2. *Possible hardware problems*

   Should you encounter hardware problems during installation, try rebooting after unplugging removable devices you don't need for installation. Non-removable devices can be disabled with **userconf** (use **boot -c** to enter it).

3. *General*

   The following is a walk-through of the steps you will take while getting NetBSD installed on your hard disk. **sysinst** is a menu driven installation system that allows for some freedom in doing the installation. Sometimes, questions will be asked and in many cases the default answer will be displayed in brackets ("[ ]") after the question. If you wish to stop the installation, you may press CONTROL-C at any time, but if you do, you'll have to begin the installation process again from scratch by running the /sysinst program from the command prompt. It is not necessary to reboot.

4. *Quick install*

   First, let's describe a quick install. The other sections of this document go into the installation procedure in more detail, but you may find that you do not need this. If you want detailed instructions, skip to the next section. This section describes a basic installation, using a CD-ROM install as an example.

   - What you need.
     - The distribution sets (in this example, they are on CD).
     - One 1.44 MB 3.5" floppy.
     - A CD-ROM drive (SCSI), a hard disk and a minimum of of memory installed.
     - The hard disk should have at least + *n* megabytes of space free, where *n* is the number of megabytes of main memory in your system. If you wish to install the X Window System as well, you will need at least 215 MB more.
   - The Quick Installation
     - Insert the first boot floppy you just created and boot the computer. After language selection, the main menu will be displayed.

```
.*********************************************.
* NetBSD-6.1_STABLE Install System             *
*                                              *
*>a: Install NetBSD to hard disk               *
* b: Upgrade NetBSD on a hard disk             *
* c: Re-install sets or install additional sets *
* d: Reboot the computer                       *
* e: Utility menu                              *
* f: Config menu                               *
* x: Exit Install System                       *
.*********************************************.
```

     - If you wish, you can configure some network settings immediately by choosing the **Utility menu** and then **Configure network**. It isn't actually required at this point, but it may be more convenient. Go back to the main menu.
     - Choose **install**.
     - You will be guided through some steps regarding the setup of your disk, and the selection of distributed components to install. When in doubt, refer to the rest of this document for details.

- After your disk has been prepared, choose **CD-ROM** as the medium . The default values for the path and device should be ok.
- After all the files have been unpacked, go back to the main menu and select **reboot**, after you have removed the bootfloppy from the drive.
- NetBSD will now boot. If you haven't already done so in **sysinst**, you should log in as `root` and set a password for that account. You are also advised to edit `/etc/rc.conf` to match your needs.
- Your installation is now complete.

5. *Booting NetBSD*

   Boot your machine. The boot loader will start, and will print a countdown and begin booting.

   If the boot loader messages do not appear in a reasonable amount of time, you either have a bad boot floppy or a hardware problem. Try writing the install floppy image to a different disk, and using that.

   It will take a while to load the kernel from the floppy, probably around a minute or so, then, the kernel boot messages will be displayed. This may take a little while also, as NetBSD will be probing your system to discover which hardware devices are installed. The most important thing to know is that `wd0` is NetBSD's name for your first IDE disk, `wd1` the second, etc. `sd0` is your first SCSI disk, `sd1` the second, etc.

   Note that once the system has finished booting, you need not leave the floppy in the disk drive.

   Once NetBSD has booted and printed all the boot messages, you will be presented with a welcome message and a main menu. It will also include instructions for using the menus.

6. *Network configuration*

   If you do not intend to use networking during the installation, but you do want your machine to be configured for networking once it is installed, you should first go to the **Utility menu** and select the **Configure network** option. If you only want to temporarily use networking during the installation, you can specify these parameters later. If you are not using the Domain Name System (DNS), you can give an empty response when asked to provide a server.

7. *Installation drive selection and parameters*

   To start the installation, select **Install NetBSD to hard disk** from the main menu.

   The first thing is to identify the disk on which you want to install NetBSD. **sysinst** will report a list of disks it finds and ask you for your selection. You should see disk names like `sd0` or `sd1`.

8. *Selecting which sets to install*

   The next step is to choose which distribution sets you wish to install. Options are provided for full, minimal, and custom installations. If you choose sets on your own, **base**, **etc**, and a kernel must be selected.

9. *Partitioning the disk*

   - Which portion of the disk to use.

     You will be asked if you want to use the entire disk or only part of the disk. If you decide to use the entire disk for NetBSD, **sysinst** will check for the presence of other operating systems and you will be asked to confirm that you want to overwrite these.

10. *Editing the NetBSD disklabel*

The partition table of the NetBSD part of a disk is called a *disklabel*. If your disk already has a disklabel written to it, you can choose **Use existing partition sizes**. Otherwise, select **Set sizes of NetBSD partitions**.

After you have chosen your partitions and their sizes (or if you opted to use the existing partitions), you will be presented with the layout of the NetBSD disklabel and given one more chance to change it. For each partition, you can set the type, offset and size, block and fragment size, and the mount point. The type that NetBSD uses for normal file storage is called **4.2BSD**. A swap partition has a special type called **swap**. Some partitions in the disklabel have a fixed purpose.

`a` Root partition (`/`)

`b` Swap partition.

`c` The NetBSD portion of the disk.

`d`–`h` Available for other use. Traditionally, `d` is the partition mounted on `/usr`, but this is historical practice and not a fixed value.

You will then be asked to name your disk's disklabel. The default response will be ok for most purposes. If you choose to name it something different, make sure the name is a single word and contains no special characters. You don't need to remember this name.

11. *Preparing your hard disk*

    You are now at the point of no return. Nothing has been written to your disk yet, but if you confirm that you want to install NetBSD, your hard drive will be modified. If you are sure you want to proceed, select **yes**.

    The install program will now label your disk and make the file systems you specified. The file systems will be initialized to contain NetBSD bootstrapping binaries and configuration files. You will see messages on your screen from the various NetBSD disk preparation tools that are running. There should be no errors in this section of the installation. If there are, restart from the beginning of the installation process. Otherwise, you can continue the installation program after pressing the return key.

12. *Getting the distribution sets*

    The NetBSD distribution consists of a number of *sets* that come in the form of gzipped tarfiles. At this point, you will be presented with a menu which enables you to choose from one of the following methods of installing the sets. Some of these methods will first load the sets on your hard disk, others will extract the sets directly.

    For all these methods, the first step is making the sets available for extraction, and then do the actual installation. The sets can be made available in a few different ways. The following sections describe each of those methods. After reading the one about the method you will be using, you can continue to the section labeled 'Extracting the distribution sets'.

13. *Installation from CD-ROM*

    When installing from a CD-ROM, you will be asked to specify the device name for your CD-ROM drive (usually `cd0`), and the directory name on the CD-ROM where the distribution files are.

    sysinst will then check if the files are indeed available in the specified location, and proceed to the actual extraction of the sets.

14. *Installation using ftp*

    To be able to install using ftp, you first need to configure your network setup if you haven't already done so. **sysinst** will do this for you, asking you if you want to use DHCP. If you do not use DHCP, you can enter network configuration details yourself. If you do not have DNS set up for the machine that

you are installing on, you can just press RETURN in answer to this question, and DNS will not be used.

You will also be asked to specify the host that you want to transfer the sets from, the directory on that host, the account name and password used to log into that host using ftp, and optionally a proxy server to use. If you did not set up DNS, you will need to specify an IP address instead of a hostname for the ftp server.

sysinst will proceed to transfer all the default set files from the remote site to your hard disk.

15. *Installation using NFS*

    To be able to install using NFS, you first need to configure your network setup if you haven't already done so. **sysinst** will do this for you, asking you if you want to use DHCP. If you do not use DHCP, you can enter network configuration details yourself. If you do not have DNS set up for the machine that you are installing on, you can just press RETURN in answer to this question, and DNS will not be used.

    You will also be asked to specify the host that you want to transfer the sets from and the directory on that host that the files are in. This directory should be mountable by the machine you are installing on, i.e., correctly exported to your machine.

    If you did not set up DNS, you will need to specify an IP address instead of a hostname for the NFS server.

16. *Installation from an unmounted file system*

    In order to install from a local file system, you will need to specify the device that the file system resides on (for example sd1e) the type of the file system, and the directory on the specified file system where the sets are located. **sysinst** will then check if it can indeed access the sets at that location.

17. *Installation from a local directory*

    This option assumes that you have already done some preparation yourself. The sets should be located in a directory on a file system that is already accessible. **sysinst** will ask you for the name of this directory.

18. *Extracting the distribution sets*

    A progress bar will be displayed while the distribution sets are being extracted.

    After all the files have been extracted, the device node files will be created. If you have already configured networking, you will be asked if you want to use this configuration for normal operation. If so, these values will be installed in the network configuration files.

19. *Configure additional items*

    The next menu will allow you to select a number of additional items to configure, including the time zone that you're in, to make sure your clock has the right offset from UTC, the root user's shell, and the initial root password.

    You can also enable installation of binary packages, which installs the pkgin(1) tool for managing binary packages for third-party software. This will feel familiar to users of other package tools, such as **apt-get** or **yum**. Or, you can install the pkgsrc(7) tree for installing third-party software from source.

    Finally, you can enable some daemons such as sshd(8), ntpd(8), or mdnsd(8).

20. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 6.1_STABLE. You can now reboot the machine and boot NetBSD from hard disk.

Post installation steps

Once you've got the operating system running, there are a few things you need to do in order to bring the system into a properly configured state. The most important steps are described below.

1. Configuring `/etc/rc.conf`

   If you or the installation software haven't done any configuration of `/etc/rc.conf` (**sysinst** usually will), the system will drop you into single user mode on first reboot with the message

   ```
   /etc/rc.conf is not configured. Multiuser boot aborted.
   ```

   and with the root file system (`/`) mounted read-only. When the system asks you to choose a shell, simply press `RETURN` to get to a `/bin/sh` prompt. If you are asked for a terminal type, respond with **vt220** (or whatever is appropriate for your terminal type) and press `RETURN`. You may need to type one of the following commands to get your delete key to work properly, depending on your keyboard:

   ```
   # stty erase '^h'
   # stty erase '^?'
   ```

   At this point, you need to configure at least one file in the `/etc` directory. You will need to mount your root file system read/write with:

   ```
   # /sbin/mount -u -w /
   ```

   Change to the `/etc` directory and take a look at the `/etc/rc.conf` file. Modify it to your tastes, making sure that you set `rc_configured=YES` so that your changes will be enabled and a multi-user boot can proceed. Default values for the various programs can be found in `/etc/defaults/rc.conf`, where some in-line documentation may be found. More complete documentation can be found in `rc.conf`(5).

   When you have finished editing `/etc/rc.conf`, type **exit** at the prompt to leave the single-user shell and continue with the multi-user boot.

   Other values that may need to be set in `/etc/rc.conf` for a networked environment are *hostname* and possibly *defaultroute*. You may also need to add an *ifconfig_int* for your ⟨int⟩ network interface, along the lines of

   ```
   ifconfig_le0="inet 192.0.2.123 netmask 255.255.255.0"
   ```

   or, if you have *myname.my.dom* in `/etc/hosts`:

   ```
   ifconfig_le0="inet myname.my.dom netmask 255.255.255.0"
   ```

   To enable proper hostname resolution, you will also want to add an `/etc/resolv.conf` file or (if you are feeling a little more adventurous) run `named`(8). See `resolv.conf`(5) or `named`(8) for more information. Instead of manually configuring network and naming service, DHCP can be used by setting `dhclient=YES` in `/etc/rc.conf`.

   Other files in `/etc` that may require modification or setting up include `/etc/mailer.conf`, `/etc/nsswitch.conf`, and `/etc/wscons.conf`.

2. Logging in

   After reboot, you can log in as `root` at the login prompt. Unless you've set a password in **sysinst**, there is no initial password. You should create an account for yourself (see below) and protect it and the "root" account with good passwords. By default, root login from the network is disabled (even via `ssh`(1)). One way to become root over the network is to log in as a different user that belongs to group "wheel" (see `group`(5)) and use `su`(1) to become root.

3. Adding accounts

   Use the `useradd`(8) command to add accounts to your system. Do not edit `/etc/passwd` directly! See `vipw`(8) and `pwd_mkdb`(8) if you want to edit the password database.

4. The X Window System

   If you installed the X Window System, you may want to read the chapter about X in the NetBSD Guide:
   http://netbsd.org/docs/guide/en/chap-x.html

5. Installing third party packages

   If you wish to install any of the software freely available for UNIX-like systems you are strongly advised to first check the NetBSD package system, pkgsrc. pkgsrc automatically handles any changes necessary to make the software run on NetBSD. This includes the retrieval and installation of any other packages on which the software may depend.

   - More information on the package system is available at
     http://www.NetBSD.org/docs/software/packages.html
   - A list of available packages suitable for browsing is at
     ftp://ftp.NetBSD.org/pub/pkgsrc/current/pkgsrc/README.html
   - Precompiled binaries can be found at
     ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/
     usually in the `vax/6.1_STABLE/All` subdir. If you installed `pkgin`(1) in the **sysinst** post-installation configuration menu, you can use it to automatically install binary packages over the network. Assuming that `/usr/pkg/etc/pkgin/repositories.conf` is correctly configured, you can install them with the following commands:

     ```
     # pkgin install tcsh
     # pkgin install bash
     # pkgin install perl
     # pkgin install apache
     # pkgin install kde
     # pkgin install firefox
     ...
     ```

     Note: Some mirror sites don't mirror the `/pub/pkgsrc` directory.

     The above commands will install the Tenex-csh and Bourne Again shells, the Perl programming language, Apache web server, KDE desktop environment and the Firefox web browser as well as all the packages they depend on.

   - If you did not install it from the **sysinst** post-installation configuration menu, the `pkgsrc`(7) framework for compiling packages can be obtained by retrieving the file
     ftp://ftp.NetBSD.org/pub/pkgsrc/pkgsrc.tar.gz.
     It is typically extracted into `/usr/pkgsrc` (though other locations work fine) with the commands:

     ```
     # cd /usr
     # tar -zxpf pkgsrc.tar.gz
     ```

     After extracting, see the `doc/pkgsrc.txt` file in the extraction directory (e.g., `/usr/pkgsrc/doc/pkgsrc.txt`) for more information.

6. Misc

   - Edit `/etc/mail/aliases` to forward root mail to the right place. Don't forget to run `newaliases`(1) afterwards.
   - The `/etc/postfix/main.cf` file will almost definitely need to be adjusted. If you prefer a different MTA, then install it using pkgsrc or by hand and adjust `/etc/mailer.conf`.

- Edit `/etc/rc.local` to run any local daemons you use.
- Many of the `/etc` files are documented in section 5 of the manual; so just invoking

  ```
  # man 5 filename
  ```

  is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

The easiest way to upgrade to NetBSD 6.1_STABLE is with binaries, and that is the method documented here.

To do the upgrade, you must have one form of boot media available. You must also have at least the **base** and **kern** binary distribution sets available. Finally, you must have sufficient disk space available to install the new binaries. Since files already installed on the system are overwritten in place, you only need additional free space for files which weren't previously installed or to account for growth of the sets between releases. If you have a few megabytes free on each of your root (`/`) and `/usr` partitions, you should have enough space.

Since upgrading involves replacing the kernel, boot blocks, and most of the system binaries, it has the potential to cause data loss. You are strongly advised to *back up* any important data on the NetBSD partition or on another operating system's partition on your disk before beginning the upgrade process.

The upgrade procedure is similar to an installation, but without the hard disk partitioning. **sysinst** will attempt to merge the settings stored in your `/etc` directory with the new version of NetBSD. Also, file systems are checked before unpacking the sets. Fetching the binary sets is done in the same manner as the installation procedure; refer to the installation part of the document for help.

After a new kernel has been copied to your hard disk, your machine is a complete NetBSD 6.1_STABLE system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in `/dev`. If you've changed the contents of `/dev` by hand, you will need to be careful about this, but if not, you can just cd into `/dev`, and run the command:

```
# sh MAKEDEV all
```

Finally, you will want to delete old binaries that were part of the version of NetBSD that you upgraded from and have since been removed from the NetBSD distribution.

NetBSD/vax has switched its executable format from the old a.out format to ELF, the now more commonly used and supported format. Your old binaries will continue to work just fine. The installation procedure will try to take the necessary steps to accomplish this. The most important step is to move the old a.out shared libraries in `/usr/lib` and `/usr/X11R6/lib` (if X was installed) to `/emul/aout`, where they will be automatically found if an older a.out binary is executed. **sysinst** will use an existing `/emul` and / or `/emul/aout` directory if available, and will create it (as a symbolic link to `/usr/aout`) if necessary.

If you already had a `/emul` directory, or a symbolic link by that name, **sysinst** should rename it and tell you about it.

Compatibility Issues With Previous NetBSD Releases

Users upgrading from previous versions of NetBSD may wish to bear the following problems and compatibility issues in mind when upgrading to NetBSD 6.1_STABLE.

Note that **sysinst** will automatically invoke

```
postinstall fix
```

and thus all issues that are fixed by **postinstall** by default (see below) will be handled.

Issues affecting an upgrade from NetBSD 5.x releases

The pthread libraries from previous versions of NetBSD require that the `sysctl`(3) node `kern.no_sa_support` be set to `0`. This affects the following environments:

- Running a 5.0 kernel with an older userland.
- Running an older userland inside a chroot'ed environment on a 5.0 system.
- Running older statically linked pthread applications.

The 5.0 kernel defaults to `0` for `kern.no_sa_support`, which covers the first case. However, please note that a full installation of 5.0 (either from scratch or through an upgrade) will set `kern.no_sa_support` to 1 during the boot process. This means that for the last two cases, you will have to manually set `kern.no_sa_support` to `0`, using either the `sysctl`(8) command or through `sysctl.conf`(5).

The implementation of SHA2-HMAC in KAME_IPSEC as used in NetBSD-5 and before did not comply to current standards. FAST_IPSEC does, with the result that old and new systems cannot communicate over IPSEC, if one of the affected authentication algorithms (hmac_sha256, hmac_sha384, hmac_sha512) is used.

Issues affecting an upgrade from NetBSD 4.x releases

The following issues can generally be resolved by running *postinstall* with the **etc** set:

```
postinstall -s /path/to/etc.tgz check
postinstall -s /path/to/etc.tgz fix
```

Issues fixed by *postinstall*:

- Various files in `/etc` need upgrading. These include:
  - `/etc/defaults/*`
  - `/etc/mtree/*`
  - `/etc/daily`
  - `/etc/weekly`
  - `/etc/monthly`
  - `/etc/security`
  - `/etc/rc.subr`
  - `/etc/rc`
  - `/etc/rc.shutdown`
  - `/etc/rc.d/*`
  - `/etc/envsys.conf`

The following issues need to be resolved manually:

- The users '_httpd' and '_timedc' and the groups '_httpd' and '_timedc' need to be created.
- Unprivileged use of the `mount`(8) command now requires the *`nosuid`* and *`nodev`* options to be explicitly specified. Previously, these options were automatically enforced even if they were not explicitly specified.
- A number of things have been removed from the NetBSD 6.1_STABLE release. See the "Components removed from NetBSD" section near the beginning of this document for a list.

Using online NetBSD documentation

Documentation is available if you installed the manual distribution set. Traditionally, the "man pages" (documentation) are denoted by '`name(section)`'. Some examples of this are

- intro(1),
- man(1),
- apropos(1),
- passwd(1), and
- passwd(5).

The section numbers group the topics into several categories, but three are of primary interest: user commands are in section 1, file formats are in section 5, and administrative information is in section 8.

The *man* command is used to view the documentation on a topic, and is started by entering **man** [*section*] *topic*. The brackets [] around the section should not be entered, but rather indicate that the section is optional. If you don't ask for a particular section, the topic with the lowest numbered section name will be displayed. For instance, after logging in, enter

```
# man passwd
```

to read the documentation for passwd(1). To view the documentation for passwd(5), enter

```
# man 5 passwd
```

instead.

If you are unsure of what man page you are looking for, enter

```
# apropos subject-word
```

where *subject-word* is your topic of interest; a list of possibly related man pages will be displayed.

Administrivia

If you've got something to say, do so! We'd like your input. There are various mailing lists available via the mailing list server at majordomo@NetBSD.org. To get help on using the mailing list server, send mail to that address with an empty body, and it will reply with instructions. See **http://www.NetBSD.org/mailinglists/** for a web interface.

There are various mailing lists set up to deal with comments and questions about this release. Please send comments to: netbsd-comments@NetBSD.org.

To report bugs, use the send-pr(1) command shipped with NetBSD, and fill in as much information about the problem as you can. Good bug reports include lots of details.

Bugs also can be submitted and queried with the web interface at
http://www.NetBSD.org/support/send-pr.html

There are also port-specific mailing lists, to discuss aspects of each port of NetBSD. Use majordomo to find their addresses, or visit **http://www.NetBSD.org/mailinglists/**

If you're interested in doing a serious amount of work on a specific port, you probably should contact the 'owner' of that port (listed below).

If you'd like to help with this effort, and have an idea as to how you could be useful, send us mail or subscribe to: netbsd-users@NetBSD.org.

As a favor, please avoid mailing huge documents or files to these mailing lists. Instead, put the material you would have sent up for FTP or WWW somewhere, then mail the appropriate list about it, or, if you'd rather not do that, mail the list saying you'll send the data to those who want it.

Thanks go to

- The former members of UCB's Computer Systems Research Group, including (but not limited to):

  Keith Bostic
  Ralph Campbell
  Mike Karels
  Marshall Kirk McKusick

  for their work on BSD systems, support, and encouragement.
- The Internet Systems Consortium, Inc. for hosting the NetBSD FTP, CVS, AnonCVS, mail, mail archive, GNATS, SUP, Rsync and WWW servers.
- The Internet Research Institute in Japan for hosting the server which runs the CVSweb interface to the NetBSD source tree.
- The Luleå Academic Computer Society for providing the backup services server.
- The Columbia University Computer Science Department for hosting the NYC build cluster.
- The Western Washington University Computer Science Department for running the WWU build cluster.
- The many organizations that provide NetBSD mirror sites.
- Without CVS, this project would be impossible to manage, so our hats go off to Brian Berliner, Jeff Polk, and the various other people who've had a hand in making CVS a useful tool.
- We list the individuals and organizations that have made donations or loans of hardware and/or money, to support NetBSD development, and deserve credit for it at **http://www.NetBSD.org/donations/** (If you're not on that list and should be, tell us! We probably were not able to get in touch with you, to verify that you wanted to be listed.)
- Finally, we thank all of the people who've put sweat and tears into developing NetBSD since its inception in January, 1993. (Obviously, there are a lot more people who deserve thanks here. If you're one of them, and would like to be mentioned, tell us!)

We are...

(in alphabetical order)

The NetBSD core group:

Alan Barrett	apb@NetBSD.org
Alistair Crooks	agc@NetBSD.org
Matthew Green	mrg@NetBSD.org
Chuck Silvers	chs@NetBSD.org
Matt Thomas	matt@NetBSD.org
YAMAMOTO Takashi	yamt@NetBSD.org
Christos Zoulas	christos@NetBSD.org

The portmasters (and their ports):

Reinoud Zandijk	reinoud	**acorn32**
Matt Thomas	matt	**alpha**
Ignatios Souvatzis	is	**amiga**
Ignatios Souvatzis	is	**amigappc**
Noriyuki Soda	soda	**arc**
Julian Coleman	jdc	**atari**
Matthias Drochner	drochner	**cesfic**
Erik Berls	cyber	**cobalt**
Antti Kantee	pooka	**emips**
Simon Burge	simonb	**evbmips**
Steve Woodford	scw	**evbppc**
Izumi Tsutsui	tsutsui	**ews4800mips**
Izumi Tsutsui	tsutsui	**hp300**
Nick Hudson	skrll	**hp700**
Valeriy E. Ushakov	uwe	**hpcsh**
Matt Thomas	matt	**ibmnws**
Gavan Fantom	gavan	**iyonix**
Valeriy E. Ushakov	uwe	**landisk**
Izumi Tsutsui	tsutsui	**luna68k**
Scott Reynolds	scottr	**mac68k**
Michael Lorenz	macallan	**macppc**
Steve Woodford	scw	**mvme68k**
Steve Woodford	scw	**mvmeppc**
Matt Thomas	matt	**netwinder**
Izumi Tsutsui	tsutsui	**news68k**
Tim Rightnour	garbled	**ofppc**
Simon Burge	simonb	**pmax**
Tim Rightnour	garbled	**prep**
Tim Rightnour	garbled	**rs6000**
Tohru Nishimura	nisimura	**sandpoint**
Simon Burge	simonb	**sbmips**
Søren Jørvang	soren	**sgimips**
SAITOH Masanobu	msaitoh	**sh3**
Martin Husemann	martin	**sparc64**
Anders Magnusson	ragge	**vax**
NISHIMURA Takeshi	nsmrtks	**x68k**
Manuel Bouyer	bouyer	**xen**

The NetBSD 6.1_STABLE Release Engineering team:

Stephen Borrill	sborrill@NetBSD.org
Manuel Bouyer	bouyer@NetBSD.org
David Brownlee	abs@NetBSD.org
James Chacon	jmc@NetBSD.org
Julian Coleman	jdc@NetBSD.org
Alistair G. Crooks	agc@NetBSD.org
Håvard Eidnes	he@NetBSD.org
John Heasley	heas@NetBSD.org

Martin Husemann	martin@NetBSD.org
Soren Jacobsen	snj@NetBSD.org
Phil Nelson	phil@NetBSD.org
Jeremy C. Reed	reed@NetBSD.org
Jeff Rizzo	riz@NetBSD.org
SAITOH Masanobu	msaitoh@NetBSD.org

NetBSD Developers:

Nathan Ahlstrom	nra@NetBSD.org
Steve Allen	wormey@NetBSD.org
Jukka Andberg	jandberg@NetBSD.org
Julian Assange	proff@NetBSD.org
Lennart Augustsson	augustss@NetBSD.org
Zafer Aydogan	zafer@NetBSD.org
Christoph Badura	bad@NetBSD.org
Marc Balmer	mbalmer@NetBSD.org
Bang Jun-Young	junyoung@NetBSD.org
Dieter Baron	dillo@NetBSD.org
Robert V. Baron	rvb@NetBSD.org
Alan Barrett	apb@NetBSD.org
Grant Beattie	grant@NetBSD.org
Erik Berls	cyber@NetBSD.org
Hiroyuki Bessho	bsh@NetBSD.org
John Birrell	jb@NetBSD.org
Rafal Boni	rafal@NetBSD.org
Stephen Borrill	sborrill@NetBSD.org
Sean Boudreau	seanb@NetBSD.org
Manuel Bouyer	bouyer@NetBSD.org
Allen Briggs	briggs@NetBSD.org
Mark Brinicombe	mark@NetBSD.org
Aaron Brown	abrown@NetBSD.org
Andrew Brown	atatat@NetBSD.org
David Brownlee	abs@NetBSD.org
Jon Buller	jonb@NetBSD.org
Simon Burge	simonb@NetBSD.org
Robert Byrnes	byrnes@NetBSD.org
Pavel Cahyna	pavel@NetBSD.org
D'Arcy J.M. Cain	darcy@NetBSD.org
Taylor R. Campbell	riastradh@NetBSD.org
Daniel Carosone	dan@NetBSD.org
Dave Carrel	carrel@NetBSD.org
James Chacon	jmc@NetBSD.org
Mihai Chelaru	kefren@NetBSD.org
Aleksey Cheusov	cheusov@NetBSD.org
Bill Coldwell	billc@NetBSD.org
Julian Coleman	jdc@NetBSD.org
Marcus Comstedt	marcus@NetBSD.org
Jeremy Cooper	jeremy@NetBSD.org

Thomas Cort	tcort@NetBSD.org
Chuck Cranor	chuck@NetBSD.org
Alistair Crooks	agc@NetBSD.org
Johan Danielsson	joda@NetBSD.org
John Darrow	jdarrow@NetBSD.org
Jed Davis	jld@NetBSD.org
Matt DeBergalis	deberg@NetBSD.org
Arnaud Degroote	degroote@NetBSD.org
Rob Deker	deker@NetBSD.org
Chris G. Demetriou	cgd@NetBSD.org
Tracy Di Marco White	gendalia@NetBSD.org
Jaromír Dolecek	jdolecek@NetBSD.org
Andy Doran	ad@NetBSD.org
Roland Dowdeswell	elric@NetBSD.org
Steven Drake	sbd@NetBSD.org
Emmanuel Dreyfus	manu@NetBSD.org
Matthias Drochner	drochner@NetBSD.org
Jun Ebihara	jun@NetBSD.org
Håvard Eidnes	he@NetBSD.org
Jaime A Fournier	ober@NetBSD.org
Stoned Elipot	seb@NetBSD.org
Michael van Elst	mlelstv@NetBSD.org
Enami Tsugutomo	enami@NetBSD.org
Bernd Ernesti	veego@NetBSD.org
Erik Fair	fair@NetBSD.org
Gavan Fantom	gavan@NetBSD.org
Hauke Fath	hauke@NetBSD.org
Hubert Feyrer	hubertf@NetBSD.org
Jason R. Fink	jrf@NetBSD.org
Matt J. Fleming	mjf@NetBSD.org
Marty Fouts	marty@NetBSD.org
Liam J. Foy	liamjfoy@NetBSD.org
Matt Fredette	fredette@NetBSD.org
Thorsten Frueauf	frueauf@NetBSD.org
Castor Fu	castor@NetBSD.org
Makoto Fujiwara	mef@NetBSD.org
Ichiro Fukuhara	ichiro@NetBSD.org
Quentin Garnier	cube@NetBSD.org
Thomas Gerner	thomas@NetBSD.org
Simon J. Gerraty	sjg@NetBSD.org
Justin Gibbs	gibbs@NetBSD.org
Chris Gilbert	chris@NetBSD.org
Eric Gillespie	epg@NetBSD.org
Brian Ginsbach	ginsbach@NetBSD.org
Oliver V. Gould	ver@NetBSD.org
Paul Goyette	pgoyette@NetBSD.org
Michael Graff	explorer@NetBSD.org
Matthew Green	mrg@NetBSD.org
Andreas Gustafsson	gson@NetBSD.org

Ulrich Habel	rhaen@NetBSD.org
Jun-ichiro itojun Hagino	itojun@NetBSD.org
HAMAJIMA Katsuomi	hamajima@NetBSD.org
Adam Hamsik	haad@NetBSD.org
Juergen Hannken-Illjes	hannken@NetBSD.org
Charles M. Hannum	mycroft@NetBSD.org
Yorick Hardy	yhardy@NetBSD.org
Ben Harris	bjh21@NetBSD.org
Eric Haszlakiewicz	erh@NetBSD.org
John Hawkinson	jhawk@NetBSD.org
Emile Heitor	imil@NetBSD.org
John Heasley	heas@NetBSD.org
Lars Heidieker	para@NetBSD.org
Geert Hendrickx	ghen@NetBSD.org
René Hexel	rh@NetBSD.org
Iain Hibbert	plunky@NetBSD.org
Kouichirou Hiratsuka	hira@NetBSD.org
Michael L. Hitch	mhitch@NetBSD.org
Ádám Hóka	ahoka@NetBSD.org
Jachym Holecek	freza@NetBSD.org
David A. Holland	dholland@NetBSD.org
Christian E. Hopps	chopps@NetBSD.org
Daniel Horecki	morr@NetBSD.org
Ken Hornstein	kenh@NetBSD.org
Marc Horowitz	marc@NetBSD.org
Eduardo Horvath	eeh@NetBSD.org
Nick Hudson	skrll@NetBSD.org
Shell Hung	shell@NetBSD.org
Darran Hunt	darran@NetBSD.org
Martin Husemann	martin@NetBSD.org
Dean Huxley	dean@NetBSD.org
Love Hörnquist Åstrand	lha@NetBSD.org
Roland Illig	rillig@NetBSD.org
Bernardo Innocenti	bernie@NetBSD.org
Tetsuya Isaki	isaki@NetBSD.org
ITOH Yasufumi	itohy@NetBSD.org
IWAMOTO Toshihiro	toshii@NetBSD.org
Matthew Jacob	mjacob@NetBSD.org
Soren Jacobsen	snj@NetBSD.org
Lonhyn T. Jasinskyj	lonhyn@NetBSD.org
Darrin Jewell	dbj@NetBSD.org
Nicolas Joly	njoly@NetBSD.org
Søren Jørvang	soren@NetBSD.org
Takahiro Kambe	taca@NetBSD.org
Antti Kantee	pooka@NetBSD.org
Frank Kardel	kardel@NetBSD.org
KAWAMOTO Yosihisa	kawamoto@NetBSD.org
Min Sik Kim	minskim@NetBSD.org
KIYOHARA Takashi	kiyohara@NetBSD.org

Thomas Klausner	wiz@NetBSD.org
Klaus Klein	kleink@NetBSD.org
John Klos	jklos@NetBSD.org
Wayne Knowles	wdk@NetBSD.org
Takayoshi Kochi	kochi@NetBSD.org
Jonathan A. Kollasch	jakllsch@NetBSD.org
Radoslaw Kujawa	rkujawa@NetBSD.org
Jochen Kunz	jkunz@NetBSD.org
Martti Kuparinen	martti@NetBSD.org
Arnaud Lacombe	alc@NetBSD.org
Kevin Lahey	kml@NetBSD.org
David Laight	dsl@NetBSD.org
Johnny C. Lam	jlam@NetBSD.org
Guillaume Lasmayous	gls@NetBSD.org
Martin J. Laubach	mjl@NetBSD.org
Greg Lehey	grog@NetBSD.org
Ted Lemon	mellon@NetBSD.org
Christian Limpach	cl@NetBSD.org
Frank van der Linden	fvdl@NetBSD.org
Joel Lindholm	joel@NetBSD.org
Tonnerre Lombard	tonnerre@NetBSD.org
Mike Long	mikel@NetBSD.org
Michael Lorenz	macallan@NetBSD.org
Warner Losh	imp@NetBSD.org
Tomasz Luchowski	zuntum@NetBSD.org
Federico Lupi	federico@NetBSD.org
Brett Lymn	blymn@NetBSD.org
MAEKAWA Masahide	gehenna@NetBSD.org
Anders Magnusson	ragge@NetBSD.org
John Marino	marino@NetBSD.org
Roy Marples	roy@NetBSD.org
Cherry G. Mathew	cherry@NetBSD.org
David Maxwell	david@NetBSD.org
Gregory McGarry	gmcgarry@NetBSD.org
Dan McMahill	dmcmahill@NetBSD.org
Jared D. McNeill	jmcneill@NetBSD.org
Neil J. McRae	neil@NetBSD.org
Julio M. Merino Vidal	jmmv@NetBSD.org
Perry Metzger	perry@NetBSD.org
Luke Mewburn	lukem@NetBSD.org
Jean-Yves Migeon	jym@NetBSD.org
Brook Milligan	brook@NetBSD.org
Minoura Makoto	minoura@NetBSD.org
Simas Mockevicius	symka@NetBSD.org
der Mouse	mouse@NetBSD.org
Constantine A. Murenin	cnst@NetBSD.org
Joseph Myers	jsm@NetBSD.org
Tuomo Mäkinen	tjam@NetBSD.org
Zoltán Arnold NAGY	zoltan@NetBSD.org

Ken Nakata	kenn@NetBSD.org
Takeshi Nakayama	nakayama@NetBSD.org
Alexander Nasonov	alnsn@NetBSD.org
Phil Nelson	phil@NetBSD.org
John Nemeth	jnemeth@NetBSD.org
NISHIMURA Takeshi	nsmrtks@NetBSD.org
Tohru Nishimura	nisimura@NetBSD.org
NONAKA Kimihiro	nonaka@NetBSD.org
Takehiko NOZAKI	tnozaki@NetBSD.org
Tobias Nygren	tnn@NetBSD.org
OBATA Akio	obache@NetBSD.org
Jesse Off	joff@NetBSD.org
Tatoku Ogaito	tacha@NetBSD.org
OKANO Takayoshi	kano@NetBSD.org
Masaru Oki	oki@NetBSD.org
Ryo ONODERA	ryoon@NetBSD.org
Atsushi Onoe	onoe@NetBSD.org
Greg Oster	oster@NetBSD.org
Jonathan Perkin	sketch@NetBSD.org
Fredrik Pettai	pettai@NetBSD.org
Herb Peyerl	hpeyerl@NetBSD.org
Matthias Pfaller	matthias@NetBSD.org
Chris Pinnock	cjep@NetBSD.org
Adrian Portelli	adrianp@NetBSD.org
Chris Provenzano	proven@NetBSD.org
Mindaugas Rasiukevicius	rmind@NetBSD.org
Michael Rauch	mrauch@NetBSD.org
Marc Recht	recht@NetBSD.org
Darren Reed	darrenr@NetBSD.org
Jeremy C. Reed	reed@NetBSD.org
Jens Rehsack	sno@NetBSD.org
Antoine Reilles	tonio@NetBSD.org
Tyler R. Retzlaff	rtr@NetBSD.org
Scott Reynolds	scottr@NetBSD.org
Tim Rightnour	garbled@NetBSD.org
Jeff Rizzo	riz@NetBSD.org
Hans Rosenfeld	hans@NetBSD.org
Steve Rumble	rumble@NetBSD.org
Rumko	rumko@NetBSD.org
Jukka Ruohonen	jruoho@NetBSD.org
Blair J. Sadewitz	bjs@NetBSD.org
David Sainty	dsainty@NetBSD.org
SAITOH Masanobu	msaitoh@NetBSD.org
Kazuki Sakamoto	sakamoto@NetBSD.org
Curt Sampson	cjs@NetBSD.org
Wilfredo Sanchez	wsanchez@NetBSD.org
Ty Sarna	tsarna@NetBSD.org
SATO Kazumi	sato@NetBSD.org
Jan Schaumann	jschauma@NetBSD.org

Matthias Scheler	tron@NetBSD.org
Silke Scheler	silke@NetBSD.org
Karl Schilke (rAT)	rat@NetBSD.org
Amitai Schlair	schmonz@NetBSD.org
Konrad Schroder	perseant@NetBSD.org
Georg Schwarz	schwarz@NetBSD.org
Lubomir Sedlacik	salo@NetBSD.org
Christopher SEKIYA	sekiya@NetBSD.org
Reed Shadgett	dent@NetBSD.org
John Shannon	shannonjr@NetBSD.org
Tim Shepard	shep@NetBSD.org
Naoto Shimazaki	igy@NetBSD.org
Ryo Shimizu	ryo@NetBSD.org
Takao Shinohara	shin@NetBSD.org
Takuya SHIOZAKI	tshiozak@NetBSD.org
Daniel Sieger	dsieger@NetBSD.org
Chuck Silvers	chs@NetBSD.org
Thor Lancelot Simon	tls@NetBSD.org
Jeff Smith	jeffs@NetBSD.org
Noriyuki Soda	soda@NetBSD.org
Wolfgang Solfrank	ws@NetBSD.org
Jörg Sonnenberger	joerg@NetBSD.org
Ignatios Souvatzis	is@NetBSD.org
T K Spindler	dogcow@NetBSD.org
Matthew Sporleder	mspo@NetBSD.org
Bill Squier	groo@NetBSD.org
Adrian Steinmann	ast@NetBSD.org
Bill Studenmund	wrstuden@NetBSD.org
Kevin Sullivan	sullivan@NetBSD.org
Kimmo Suominen	kim@NetBSD.org
Grégoire Sutre	gsutre@NetBSD.org
Sergey Svishchev	shattered@NetBSD.org
Robert Swindells	rjs@NetBSD.org
Shin Takemura	takemura@NetBSD.org
TAMURA Kent	kent@NetBSD.org
Shin'ichiro TAYA	taya@NetBSD.org
Hasso Tepper	hasso@NetBSD.org
Matt Thomas	matt@NetBSD.org
Jason Thorpe	thorpej@NetBSD.org
Christoph Toshok	toshok@NetBSD.org
Greg Troxel	gdt@NetBSD.org
Tsubai Masanari	tsubai@NetBSD.org
Izumi Tsutsui	tsutsui@NetBSD.org
UCHIYAMA Yasushi	uch@NetBSD.org
Masao Uebayashi	uebayasi@NetBSD.org
Shuichiro URATA	ur@NetBSD.org
Valeriy E. Ushakov	uwe@NetBSD.org
Todd Vierling	tv@NetBSD.org
Aymeric Vincent	aymeric@NetBSD.org

Paul Vixie	vixie@NetBSD.org
Mike M. Volokhov	mishka@NetBSD.org
Krister Walfridsson	kristerw@NetBSD.org
Mark Weinem	weinem@NetBSD.org
Lex Wennmacher	wennmach@NetBSD.org
Leo Weppelman	leo@NetBSD.org
Assar Westerlund	assar@NetBSD.org
Frank Wille	phx@NetBSD.org
Nathan Williams	nathanw@NetBSD.org
Rob Windsor	windsor@NetBSD.org
Jim Wise	jwise@NetBSD.org
Colin Wood	ender@NetBSD.org
Steve Woodford	scw@NetBSD.org
YAMAMOTO Takashi	yamt@NetBSD.org
Yuji Yamano	yyamano@NetBSD.org
David Young	dyoung@NetBSD.org
Arnaud Ysmal	stacktic@NetBSD.org
Reinoud Zandijk	reinoud@NetBSD.org
S.P.Zeidler	spz@NetBSD.org
Tim Zingelman	tez@NetBSD.org
Christos Zoulas	christos@NetBSD.org

Legal Mumbo-Jumbo

All product names mentioned herein are trademarks or registered trademarks of their respective owners.

The following notices are required to satisfy the license terms of the software that we have mentioned in this document:

NetBSD is a registered trademark of The NetBSD Foundation, Inc.
This product includes software developed by the University of California, Berkeley and its contributors.
This product includes software developed by the NetBSD Foundation.
This product includes software developed by The NetBSD Foundation, Inc. and its contributors.
This product includes software developed for the NetBSD Project. See http://www.netbsd.org/ for information about NetBSD.
This product includes software developed by Intel Corporation and its contributors.
This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)
This product includes cryptographic software written by Eric Young (eay@mincom.oz.au)
This product includes software designed by William Allen Simpson.
This product includes software developed at Ludd, University of Lulea, Sweden and its contributors.
This product includes software developed at Ludd, University of Lulea.
This product includes software developed at the Information Technology Division, US Naval Research Laboratory.
This product includes software developed by David Jones and Gordon Ross
This product includes software developed by Hellmuth Michaelis and Joerg Wunsch
This product includes software developed by Internet Research Institute, Inc.
This product includes software developed by Leo Weppelman and Waldi Ravens.
This product includes software developed by Mika Kortelainen
This product includes software developed by Aaron Brown and Harvard University.
This product includes software developed by Adam Ciarcinski for the NetBSD project.
This product includes software developed by Adam Glass and Charles M. Hannum.
This product includes software developed by Adam Glass.
This product includes software developed by Advanced Risc Machines Ltd.
This product includes software developed by Alex Zepeda, and Colin Wood for the NetBSD Projet.
This product includes software developed by Alex Zepeda.
This product includes software developed by Amancio Hasty and Roger Hardiman
This product includes software developed by Berkeley Software Design, Inc.
This product includes software developed by Bill Paul.
This product includes software developed by Bodo Moeller. (If available, substitute umlauted o for oe)
This product includes software developed by Boris Popov.

This product includes software developed by Brini.
This product includes software developed by Bruce M. Simpson.
This product includes software developed by Causality Limited.
This product includes software developed by Charles Hannum.
This product includes software developed by Charles M. Hannum, by the University of Vermont and State Agricultural College and Garrett A. Wollman, by William F. Jolitz, and by the University of California, Berkeley, Lawrence Berkeley Laboratory, and its contributors.
This product includes software developed by Charles M. Hannum.
This product includes software developed by Christian E. Hopps, Ezra Story, Kari Mettinen, Markus Wild, Lutz Vieweg and Michael Teske.
This product includes software developed by Christian E. Hopps.
This product includes software developed by Christopher G. Demetriou for the NetBSD Project.
This product includes software developed by Christopher G. Demetriou.
This product includes software developed by Christos Zoulas.
This product includes software developed by Chuck Silvers.
This product includes software developed by Colin Wood for the NetBSD Project.
This product includes software developed by Colin Wood.
This product includes software developed by Daan Vreeken.
This product includes software developed by Daishi Kato
This product includes software developed by Daniel Widenfalk and Michael L. Hitch.
This product includes software developed by Daniel Widenfalk for the NetBSD Project.
This product includes software developed by Dean Huxley.
This product includes software developed by Eric S. Hvozda.
This product includes software developed by Eric S. Raymond
This product includes software developed by Eric Young (eay@@mincom.oz.au)
This product includes software developed by Eric Young (eay@cryptsoft.com)
This product includes software developed by Eric Young (eay@mincom.oz.au)
This product includes software developed by K. Kobayashi.
This product includes software developed by K. Kobayashi and H. Shimokawa.
This product includes software developed by Ezra Story and by Kari Mettinen.
This product includes software developed by Ezra Story, by Kari Mettinen and by Bernd Ernesti.
This product includes software developed by Ezra Story, by Kari Mettinen, Michael Teske and by Bernd Ernesti.
This product includes software developed by Ezra Story, by Kari Mettinen, and Michael Teske.
This product includes software developed by Ezra Story.
This product includes software developed by Florian Stoehr.
This product includes software developed by Frank van der Linden for the NetBSD Project.
This product includes software developed by Gardner Buchanan.
This product includes software developed by Garrett D'Amore.
This product includes software developed by Gary Thomas.
This product includes software developed by Gordon Ross
This product includes software developed by Harvard University and its contributors.
This product includes software developed by Harvard University.
This product includes software developed by Henrik Vestergaard Draboel.
This product includes software developed by Herb Peyerl.
This product includes software developed by Hidetoshi Shimokawa.
This product includes software developed by Ian W. Dall.
This product includes software developed by Ignatios Souvatzis for the NetBSD Project.
This product includes software developed by Internet Initiative Japan Inc.
This product includes software developed by James R. Maynard III.
This product includes software developed by Jason L. Wright
This product includes software developed by Jason R. Thorpe for And Communications, http://www.and.com/
This product includes software developed by Joachim Koenig-Baltes.
This product includes software developed by Jochen Pohl for The NetBSD Project.
This product includes software developed by Joerg Wunsch
This product includes software developed by John Birrell.
This product includes software developed by John P. Wittkoski.
This product includes software developed by John Polstra.
This product includes software developed by Jonathan R. Stone for the NetBSD Project.
This product includes software developed by Jonathan Stone and Jason R. Thorpe for the NetBSD Project.
This product includes software developed by Jonathan Stone.
This product includes software developed by Julian Highfield.
This product includes software developed by Kazuhisa Shimizu.
This product includes software developed by Kazuki Sakamoto.
This product includes software developed by Kenneth Stailey.
This product includes software developed by Kiyoshi Ikehara.
This product includes software developed by Klaus Burkert,by Bernd Ernesti, by Michael van Elst, and by the University of California, Berkeley and its contributors.

This product includes software developed by LAN Media Corporation and its contributors.
This product includes software developed by Lloyd Parkes.
This product includes software developed by Lutz Vieweg.
This product includes software developed by MINOURA Makoto, Takuya Harakawa.
This product includes software developed by Marc Horowitz.
This product includes software developed by Marcus Comstedt.
This product includes software developed by Mark Brinicombe for the NetBSD project.
This product includes software developed by Mark Brinicombe.
This product includes software developed by Mark Tinguely and Jim Lowe
This product includes software developed by Markus Wild.
This product includes software developed by Masanobu Saitoh.
This product includes software developed by Masaru Oki.
This product includes software developed by Matthew Fredette.
This product includes software developed by Michael Smith.
This product includes software developed by Mike Pritchard.
This product includes software developed by Mike Pritchard and contributors.
This product includes software developed by Minoura Makoto.
This product includes software developed by Niels Provos.
This product includes software developed by Niklas Hallqvist, Brandon Creighton and Job de Haas.
This product includes software developed by Niklas Hallqvist.
This product includes software developed by Paul Kranenburg.
This product includes software developed by Paul Mackerras.
This product includes software developed by Per Fogelstrom
This product includes software developed by Peter Galbavy.
This product includes software developed by Phase One, Inc.
This product includes software developed by Philip A. Nelson.
This product includes software developed by RiscBSD.
This product includes software developed by Roar Thronæs.
This product includes software developed by Rodney W. Grimes.
This product includes software developed by Roger Hardiman
This product includes software developed by Rolf Grossmann.
This product includes software developed by Ross Harvey for the NetBSD Project.
This product includes software developed by Ross Harvey.
This product includes software developed by Scott Bartram.
This product includes software developed by Scott Stevens.
This product includes software developed by Shingo WATANABE.
This product includes software developed by Softweyr LLC, the University of California, Berkeley, and its contributors.
This product includes software developed by Stephan Thesing.
This product includes software developed by Steven M. Bellovin.
This product includes software developed by Takashi Hamada.
This product includes software developed by Takumi Nakamura.
This product includes software developed by Tatoku Ogaito for the NetBSD Project.
This product includes software developed by Terrence R. Lambert.
This product includes software developed by TooLs GmbH.
This product includes software developed by Trimble Navigation, Ltd.
This product includes software developed by WIDE Project and its contributors.
This product includes software developed by Waldi Ravens.
This product includes software developed by Wasabi Systems for Zembu Labs, Inc. http://www.zembu.com/
This product includes software developed by Winning Strategies, Inc.
This product includes software developed by Wolfgang Solfrank.
This product includes software developed by Yasushi Yamasaki.
This product includes software developed by Yen Yen Lim and North Dakota State University.
This product includes software developed by Zembu Labs, Inc.
This product includes software developed by the Alice Group.
This product includes software developed by the Center for Software Science at the University of Utah.
This product includes software developed by the Charles D. Cranor, Washington University, University of California, Berkeley and its contributors.
This product includes software developed by the Computer Systems Engineering Group at Lawrence Berkeley Laboratory.
This product includes software developed by the David Muir Sharnoff.
This product includes software developed by the Harvard University and its contributors.
This product includes software developed by the Network Research Group at Lawrence Berkeley Laboratory.
This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (http://www.OpenSSL.org/)
This product includes software developed by the PocketBSD project and its contributors.
This product includes software developed by the RiscBSD kernel team
This product includes software developed by the RiscBSD team.
This product includes software developed by the SMCC Technology Development Group at Sun Microsystems, Inc.

This product includes software developed by the University of California, Berkeley and its contributors, as well as the Trustees of Columbia University.
This product includes software developed by the University of California, Lawrence Berkeley Laboratory and its contributors.
This product includes software developed by the University of California, Lawrence Berkeley Laboratory.
This product includes software developed by the University of Illinois at Urbana and their contributors.
This product includes software developed by the Urbana-Champaign Independent Media Center.
This product includes software developed by the University of Vermont and State Agricultural College and Garrett A. Wollman.
This product includes software developed by the University of Vermont and State Agricultural College and Garrett A. Wollman, by William F. Jolitz, and by the University of California, Berkeley, Lawrence Berkeley Laboratory, and its contributors.
This product includes software developed for the FreeBSD project
This product includes software developed for the NetBSD Project by Bernd Ernesti.
This product includes software developed for the NetBSD Project by Christopher G. Demetriou.
This product includes software developed for the NetBSD Project by Emmanuel Dreyfus.
This product includes software developed for the NetBSD Project by Frank van der Linden
This product includes software developed for the NetBSD Project by Ignatios Souvatzis.
This product includes software developed for the NetBSD Project by Jason R. Thorpe.
This product includes software developed for the NetBSD Project by John M. Vinopal.
This product includes software developed by Kyma Systems.
This product includes software developed for the NetBSD Project by Kyma Systems LLC.
This product includes software developed for the NetBSD Project by Matthias Drochner.
This product includes software developed for the NetBSD Project by Perry E. Metzger.
This product includes software developed for the NetBSD Project by Scott Bartram and Frank van der Linden
This product includes software developed for the NetBSD Project by Allegro Networks, Inc., and Wasabi Systems, Inc.
This product includes software developed for the NetBSD Project by Genetec Corporation.
This product includes software developed for the NetBSD Project by Jonathan Stone.
This product includes software developed for the NetBSD Project by Piermont Information Systems Inc.
This product includes software developed for the NetBSD Project by SUNET, Swedish University Computer Network.
This product includes software developed for the NetBSD Project by Shigeyuki Fukushima.
This product includes software developed for the NetBSD Project by Wasabi Systems, Inc.
This product includes software developed under OpenBSD by Per Fogelstrom Opsycon AB for RTMX Inc, North Carolina, USA.
This product includes software developed under OpenBSD by Per Fogelstrom.
This software is a component of "386BSD" developed by William F. Jolitz, TeleMuse.
This software was developed by Holger Veit and Brian Moore for use with "386BSD" and similar operating systems. "Similar operating systems" includes mainly non-profit oriented systems for research and education, including but not restricted to "NetBSD", "FreeBSD", "Mach" (by CMU).
This software includes software developed by the Computer Systems Laboratory at the University of Utah.
This product includes software developed by Computing Services at Carnegie Mellon University (http://www.cmu.edu/computing/).
This product includes software developed by Marshall M. Midden.
This product includes software developed or owned by Caldera International, Inc.
The Institute of Electrical and Electronics Engineers and The Open Group, have given us permission to reprint portions of their documentation.

In the following statement, the phrase ‘‘this text’’ refers to portions of the system documentation.

Portions of this text are reprinted and reproduced in electronic form in NetBSD, from IEEE Std 1003.1, 2004 Edition, Standard for Information Technology -- Portable Operating System Interface (POSIX), The Open Group Base Specifications Issue 6, Copyright (C) 2001-2004 by the Institute of Electrical and Electronics Engineers, Inc and The Open Group. In the event of any discrepancy between these versions and the original IEEE and The Open Group Standard, the original IEEE and The Open Group Standard is the referee document.

The original Standard can be obtained online at http://www.opengroup.org/unix/online.html.

This notice shall appear on any product containing this material

The End