NAME

INSTALL – Installation procedure for NetBSD/arm32

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 1.4.2 on the *arm32* 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 UN*X-like operating system derived from the Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on twenty different system architectures featuring eight distinct families of CPUs, and is being ported to more. The NetBSD 1.4.2 release contains complete binary releases for fifteen different machine types. (The remaining ones are not fully supported at this time and are thus not part of the binary distribution. For information on them, please see the NetBSD web site at **http://www.netbsd.org/**)

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, 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.

Upgrade path to NetBSD 1.4.2

If you are not installing your system ''from scratch'' but instead are going to upgrade an existing system already running NetBSD you need to know which versions you can upgrade with NetBSD 1.4.2.

NetBSD 1.4.2 is an upgrade of NetBSD 1.4.1, NetBSD 1.4 and earlier releases of NetBSD such as versions 1.3.3, 1.2 etc.

The intermediate development versions of code available on the main trunk in our CVS repository (also known as ''NetBSD-current'') from *after* the point where the release cycle for 1.4 was started are designated by version identifiers such as 1.4A, 1.4B, 1.4P etc. These identifiers do not designate releases, but indicate major changes in internal kernel APIs. Note that the kernel from NetBSD 1.4.2 can *not* be used to upgrade a system running one of those intermediate development versions. Trying to use the NetBSD 1.4.2 kernel on such a system *will* in all probability result in problems.

Please also note that it is not possible to do a direct ''version'' comparison between any of the intermediate development versions mentioned above and 1.4.2 to determine if a given feature is present or absent in 1.4.2. The development of 1.4, 1.4.1 and 1.4.2 is done on a separate branch in the CVS repository which was created when the release cylcle for 1.4 was started, and during the release cycles for all these versions selective fixes (with minor impact on the stability of the code on the release branch) have been imported from the main development trunk. So, there are features in 1.4.2 which were not in e.g. 1.4H, but the reverse is also true.

Major Changes Between 1.4.1 and 1.4.2

The complete list of changes between NetBSD 1.4.1 and 1.4.2 can be found in the file CHANGES-1.4.2 in the top directory of the source tree. The following are the highlights only.

- A driver for the Alteon Gigabit Ethernet cards has been added, see `ti`(4).
- A driver for the Realtek 8129/8239 Fast Ethernet PCI cards have been added, see `rl`(4).
- A driver for the DPT SmartCache and SmartRAID III or IV SCSI adapters has been added, see `dpt`(4).
- A driver for the BOCA IOAT66 6-port ISA serial adapter has been added, see `ioat`(4).
- Support for the X-surf Amiga board has been added.
- Support has been added for ext2fs revision 1, with read-only support for the ''sparse super'' and the ''file-type'' options.
- BIND has been upgraded to version 8.2.2-P5.
- The IPF packet filtering software has been updated to version 3.3.5.
- Tcpdump now does hex/ascii dumps of packet contents if asked to do so.
- An implementation of the System V user management utilities has been added.
- The name ''errno'' is now always a macro which expands to a function call. This is done to ease the integration of thread libraries with the code in both system and third-party libraries. Please include <errno.h> to access the correct definition of ''errno''.
- A utility for making temporary files for shell scripts has been added, see `mktemp`(1).
- The automounter utility `amd`(8) has been updated to fix a security problem.
- A security problem in procfs has been fixed. Procfs is not used by default in NetBSD.
- The floating point emulation on the ports using the m68k CPU has been reverted to the version in NetBSD 1.4 (the version in 1.4.1 had problems).
- Several subsystems have received substantial work, such as RAIDframe, LFS, and the package tools.

In addition, many, many bugs have been fixed -- more than 100 problems reported through our problem tracking system have been fixed, and many other non-reported problems have also been found and fixed. See the CHANGES-1.4.2 file for the complete list.

Known caveats with 1.4.2

The following are the major known issues with NetBSD 1.4.2.

- The upgrade of `ipf`(8) caused a change of the kernel API. Thus, if you are using `ipf`(8) you need to upgrade both the kernel and the user-land utilities to control that feature in order for it to work.
- As part of fixing a kernel bug, ''struct vfsnode'' needed to change size. This will unfortunately, and contrary to tradition for patch releases, cause incompatibilities for users of file system LKMs compiled for 1.4 and 1.4.1.
- Although LFS has been improved between 1.4.1 and 1.4.2, it can probably still be characterized as being of ''beta test'' quality, e.g. filling the file system still gives ''interesting'' effects. It should probably not be used to store critical data quite yet.
- The version of the IPF packet filtering software in NetBSD 1.4.2 must be enabled with ''ipf -E'' before filtering or NAT rules can be set. Failure to do so may result in a panic.

Major Changes Between 1.4 and 1.4.1

The complete list of changes between NetBSD 1.4 and 1.4.1 can be found in the file CHANGES-1.4.1 in the top directory of the source tree.

- The NetBSD/alpha port's compatibility for Digital UNIX executables has been greatly improved.
- Many bug fixes and improvements of the installation tools and utilities.
- Support for more PCI serial/parallel cards has been added.
- It is now possible to boot NetBSD/i386 on systems with 1GB of RAM.
- The floating point emulation on the ports using the m68k CPU has been upgraded.
- A fatal problem with /dev/random has been found and fixed.
- Support for Alpha 21264 ev6 based systems has been added to NetBSD/alpha.

Major Changes Between 1.3 and 1.4

The NetBSD 1.4 release is a substantial improvement over its predecessors. We have provided numerous significant functional enhancements, including support for many new devices, integration of hundreds of bug fixes, new and updated kernel subsystems, and many userland enhancements. The results of these improvements is a stable operating system fit for production use that rivals most commercially available systems.

It is impossible to completely summarize the nearly two years of development that went into the NetBSD 1.4 release. Some highlights include:

- Substantial improvements in the TCP/IP implementation, including numerous performance enhancements and bug fixes by Jason Thorpe and others.
- A new, high efficiency kernel memory pool allocator by Paul Kranenburg. This has been integrated into most kernel subsystems.
- A new, totally rewritten virtual memory subsystem, UVM, created by Chuck Cranor, which is substantially cleaner and better performing than the old Mach derived VM subsystem.
- Improved POSIX and XPG standards compliance.
- Completion of the integration of all remaining 4.4BSD Lite-2 kernel improvements and bug fixes that had not been previously integrated. (Integration of all userland components was completed before NetBSD 1.3)
- Several new ports, including macppc, bebox, sparc64, next68k, and others, have been integrated into the source tree.
- The system compilers have been upgraded to egcs 1.1.1, and the system compiler toolchain now (mostly) uses the latest versions of GNU binutils instead of the obsolete versions left over from 4.4BSD Lite.
- Everyone's favorite `ftp`(1) client has been improved even further. See the man page for details.
- A new architecture independent console driver, `wscons`(4), has been integrated into many ports.
- Numerous improvements have been made to the audio subsystem support, including support for MIDI device drivers.
- Linux compatibility support has been improved.
- A number of scheduler enhancements have yielded dramatic improvements in interactive performance and better control of background tasks.

- Several network tunneling protocols, including GRE and IP in IP, have been implemented.
- Kernel support for the CODA distributed file system has been added.
- Manuel Bouyer completed major changes to the IDE support. It is now architecture independent. Major changes have been made to the IDE code for better error handling, improved ATAPI support, 32 bit data I/O support and bus-master DMA support on PCI IDE controllers.
- Lennart Augustsson has added full USB support, permitting the use of a wide variety of Universal Serial Bus peripherals. The drivers should easily port to any future platforms that support the PCI bus. See `usb`(4) for an overview.
- RAIDframe, version 1.1, from the Parallel Data Laboratory at Carnegie Mellon University, has been integrated. Supports RAID levels 0, 1, 4, 5, and more.
- Luke Mewburn added `nsswitch.conf`(5) functionality to the system to specify the search order for system databases.
- `syslogd`(8) now supports listening on multiple sockets, to make the chrooting of servers easier.
- Most third party packages have been updated to the latest stable release.

As has been noted, there have also been innumerable bug fixes.

Kernel interfaces have continued to be refined, and more subsystems and device drivers are shared among the different ports. You can look for this trend to continue.

NetBSD/arm32 1.4.2 has a number of improvements over the last release.

Support has been added for the following hardware platforms:

- Digital DNARD (DIGITAL Network Appliance Reference Design) also know as SHARK.
- Intel EBSA285 (SA110/DC21825 evaluation boards)
- Chalice CATS (SA110/DC21825 PC style motherboard)

Additionally there has also been:

- Various code optimizations, in particular improvements in interrupt latencies and improved cache cleaning.
- New drivers.
- Bug fixes.
- full integration of the toolchain.

NetBSD 1.4.2 on arm32 is, as usual, also fully backward compatible with old NetBSD arm32 binaries, so you don't need to recompile all your local programs provided you set the appropriate binary compatibility options in your kernel configuration.

The Future of NetBSD

The NetBSD Foundation has been incorporated as a non-profit organization. Its purpose is to encourage, foster and promote the free exchange of computer software, namely the NetBSD Operating System. The foundation will allow for many things to be handled more smoothly than could be done with our previous informal organization. In particular, it provides the framework to deal with other parties that wish to become involved in the NetBSD Project.

The NetBSD Foundation will help improve the quality of NetBSD by:

- providing better organization to keep track of development efforts, including co-ordination with groups working in related fields.
- providing a framework to receive donations of goods and services and to own the resources necessary to run the NetBSD Project.
- providing a better position from which to undertake promotional activities.
- periodically organizing workshops for developers and other interested people to discuss ongoing work.

We intend to begin narrowing the time delay between releases. Our ambition is to provide a full release every six to eight months.

We hope to support even *more* hardware in the future, and we have a rather large number of other ideas about what can be done to improve NetBSD.

We intend to continue our current practice of making the NetBSD-current development source available on a daily basis. In addition, Anonymous CVS access to the NetBSD source tree has been added since NetBSD 1.4.1; see

http://www.netbsd.org/Changes/#anoncvs-available

We have also added a browsable CVS repository on the web at

http://cvsweb.netbsd.org/cgi-bin/cvsweb.cgi/

We intend to integrate free, positive changes from whatever sources submit them, providing that they are well thought-out and increase the usability of the system.

Above all, we hope to create a stable and accessible system, and to be responsive to the needs and desires of NetBSD users, because it is for and because of them that NetBSD exists.

Sources of NetBSD

Please refer to **http://www.netbsd.org/Sites/net.html**.

NetBSD 1.4.2 Release Contents

The root directory of the NetBSD 1.4.2 release is organized as follows:

`.../NetBSD-1.4.2/`

`BUGS`	Known bugs list (somewhat incomplete and out of date).
`CHANGES`	Changes since earlier NetBSD releases.
`LAST_MINUTE`	Last minute changes.
`MIRRORS`	A list of sites that mirror the NetBSD 1.4.2 distribution.
`README.files`	README describing the distribution's contents.
`TODO`	NetBSD's todo list (also somewhat incomplete and out of date).
`patches/`	Post-release source code patches.
`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 1.4.2 has a binary distribution. There are also 'README.export-control' files sprinkled liberally throughout the distribution tree, which point out that there are some portions of the distribution (i.e. the 'domestic' portion) that may be subject to export regulations of the United States. It is your responsibility to determine whether or not it is legal for you to export these portions and to act accordingly. The NetBSD project maintains a web page at

http://www.NetBSD.ORG/Misc/crypto-export.html

which should contain up-to-date information on this issue.

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:

secrsrc.tgz: This set contains the "domestic" sources. These sources may be subject to United States export regulations.
421K gzipped, 2M uncompressed

gnusrc.tgz: This set contains the "gnu" sources, including the source for the compiler, assembler, groff, and the other GNU utilities in the binary distribution sets.
19M gzipped, 84.3M uncompressed

syssrc.tgz: This set contains the sources to the NetBSD 1.4.2 kernel, config(8), and dbsym(8).
13.9M gzipped, 68.3M uncompressed

sharesrc.tgz: 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.
3M gzipped, 11.9M uncompressed

src.tgz: This set contains all of the NetBSD 1.4.2 sources which are not mentioned above.
14.4M gzipped, 67.4M uncompressed

Most of the above source sets are located in the `source/sets` subdirectory of the distribution tree. The secrsrc.tgz set is contained in the `source/security` subdirectory. This set, which may only be available to users in the United States and Canada, contains the sources normally found in `/usr/src/domestic` – primarily Kerberos and other cryptographic security related software. (Remember, because of United States law, it may not be legal to distribute this set to locations outside of the United States and Canada. Again, see

http://www.NetBSD.ORG/Misc/crypto-export.html

for updated information on this issue.)

The source sets are distributed as compressed tar files. They may be unpacked into `/usr/src` with the command:

```
cat set_name.tgz | gunzip | (cd /; tar xpf - )
```

The `sets/Split/` and `security/Split/` subdirectories contain split versions of the source sets for those users who need to load the source sets from floppy or otherwise need a split distribution. The split sets are are named "set_name.xx" where "set_name" is the distribution set name, and "xx" is the sequence number of the file, starting with "aa" for the first file in the distribution set, then "ab" for the next, and so on. All of these files except the last one of each set should be exactly 240,640 bytes long. (The last file is just long enough to contain the remainder of the data for that distribution set.)

The split distributions may be reassembled and extracted with **`cat`** as follows:

```
cat set_name.?? | gunzip | (cd /; tar xpf - )
```

In each of the source distribution set directories, there is a file named `CKSUMS` which contains the checksums of the files in that directory, as generated by the `cksum`(1) utility. You can use cksum to check the integrity of the archives, if you suspect that one of the files is corrupt and have access to a cksum binary. Checksums based on other algorithms may also be present – see the `release`(7) man page for details.

NetBSD/arm32 Subdirectory Structure

The arm32-specific portion of the NetBSD 1.4.2 release is found in the `arm32` subdirectory of the distribution: `.../NetBSD-1.4.2/arm32/`

`INSTALL.html`
`INSTALL.ps`
`INSTALL.txt`
`INSTALL.more` Installation notes; this file. The `.more` file contains underlined text using the `more`(1) conventions for indicating italic and bold display.

`binary/`
- `sets/` arm32 binary distribution sets; see below.
- `security/` arm32 security distribution; see below.

`installation/`
- `kernels/` arm32 installation and other kernels; see below.
- *`platform/`* Miscellaneous arm32 installation utilities and supplementary documentation for *`platform`*; see installation section, below.

There are a collection of arm32 kernels in the "arm32/kernels" subdirectory of the NetBSD 1.4.2 distribution. Some of these kernels contain a root file system image and should only be used for the initial installation. Some of the kernels only support a particular subset of the platforms that arm32 supports (See "arm32/kernels/README" for more details.)

Binary Distribution Sets

The NetBSD arm32 binary distribution sets contain the binaries which comprise the NetBSD 1.4.2 release for the arm32. There are eight binary distribution sets and the *security* distribution set. The binary distribution sets can be found in the `arm32/binary/sets` subdirectory of the NetBSD 1.4.2 distribution tree, and are as follows:

base The NetBSD 1.4.2 arm32 **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. It includes shared library support, and excludes everything described below.
13.1M gzipped, 33.5M uncompressed

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.
9.2M gzipped, 30.5M uncompressed

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. (If you are upgrading, it's recommended that you get a copy of this set and *carefully* upgrade your configuration files by hand.)
57K gzipped, 330K uncompressed

games This set includes the games and their manual pages.
2.9M gzipped, 7.1M uncompressed

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.
4M gzipped, 15.9M uncompressed

misc This set includes the (rather large) system dictionaries, the typesettable document set, and other files from `/usr/share`.
2.2M gzipped, 8.4M uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
1.3M gzipped, 4.6M uncompressed

The arm32 security distribution set is named **secr** and can be found in the

`arm32/binary/security`

subdirectory of the NetBSD 1.4.2 distribution tree. It contains security-related binaries which depend on cryptographic source code. You do not need this distribution set to use encrypted passwords in your password file; the **base** distribution includes a crypt library which can perform only the one-way encryption function. The security distribution includes a version of the Kerberos IV network security system, and a Kerberized version of `telnet`(1) program. The **secr** distribution set can be found only on those sites which carry the complete NetBSD distribution and which can legally obtain it. Because of United States law, it may not be legal to distribute this set to locations outside of the United States and Canada. See

http://www.NetBSD.ORG/Misc/crypto-export.html

for updated information on this issue.

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 XFree86, and tightly track XFree86 releases. They are currently equivalent to XFree86 3.3.6. 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.
2.9M gzipped 8.6M uncompressed

xcomp The extra libraries and include files needed to compile X source code.
1.9M gzipped, 7.7M uncompressed

xcontrib Programs that were contributed to X.
202k gzipped, 660k uncompressed

xfont Fonts needed by X.
5.7M gzipped, 7.0M uncompressed

The arm32 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 files are /-relative and therefore are extracted *below* the current directory. That is, if you want to extract the binaries into your system, i.e. replace the system binaries with them, you have to run the **`tar xfp`** command from /.

Note Each directory in the arm32 binary distribution also has its own checksum files, just as the source distribution does:

All BSDSUM files are historic BSD checksums for the various files in that directory, in the format produced by the command: **`cksum -o 1`** *`file`*

All CKSUM files are POSIX checksums for the various files in that directory, in the format produced by the command: **`cksum`** *`file`*.

All MD5 files are MD5 digests for the various files in that directory, in the format produced by the command: **`cksum -m`** *`file`*.

All SYSVSUM files are historic AT&T System V UNIX checksums for the various files in that directory, in the format produced by the command: **cksum -o -2** *file*.

The MD5 digest is the safest checksum, followed by the POSIX checksum. The other two checksums are provided only to ensure that the widest possible range of system can check the integrity of the release files.

NetBSD/arm32 System Requirements and Supported Devices

NetBSD/arm32 1.4.2 runs on a number of systems with ARM6 or later processors, with or without FPU coprocessor. The minimal configuration is said to require 8M of RAM and 50M of disk space, though we do not know of anyone running with a system quite this minimal today. To install the entire system requires much more disk space (the unpacked binary distribution, without sources, requires at least 65M without counting space needed for swap space, etc), and to run X or compile the system, more RAM is recommended. (8M of RAM will actually allow you to run X and/or compile, but it won't be speedy. Note that until you have around 16M of RAM, getting more RAM is more important than getting a faster CPU.)

Supported devices include (but is not limited to):

```
RiscPC/A7000(+) floppy controller.
IDE controllers:
        Acorn motherboard IDE.
        Simtec IDE controller.
        RapIDE Issue 2 IDE controller.
        ICS V5 & V6 IDE controller.

SCSI host adapters:
        Cumana SCSI 2.
        PowerTec SCSI 2.
        MCS Connect32 SCSI 2.
        Acorn SCSI.
        Oak SCSI I.
        Morley SCSI I (uncached only).

VIDC20 video.
RiscPC Motherboard serial port.
RiscPC Motherboard parallel port.
Ethernet adapters:
        Acorn Ether1.
        Atomwide Ether3.
        ANT Ether3.
        ANT Ether5.
        Atomwide EtherA.
        ANT EtherB.
        Acorn EtherH.
        I-cubed EtherH.
        ANT EtherM.

Most SCSI disk drives.
Most SCSI tape drives.
CD-ROM drives:
        Most SCSI CD-ROM drives.
```

```
        Most ATAPI CD-ROM drives.
                [ Note: Some low-priced IDE CDROM drives are known
                 for being not or not fully ATAPI compliant, and thus
                 requires some hack (generally an entry to a quirk
                 table) to work with NetBSD.]

Mice:
        RiscPC quadrature mouse.
        A7000 PS/2 mouse.

Processors:
        ARM 610.
        ARM 700.
        ARM 700 + FPA11.
        ARM 710.
        ARM 7500.
        ARM 7500FE.
        ARM 810. [*]
        SA110.

Motherboards:
        Acorn RiscPC.
        Acorn A7000.
        Acorn A7000+.
        VLSI RC7500.
        Digital DNARD.
        Intel EBSA285.
        Chalice CATS.

Other devices:
        RiscPC keyboard.
        A7000 keyboard.
        RiscPC realtime clock.
        VLSI RC7500 motherboard devices.

Digital DNARD devices
        IDE
        keyboard
        mouse
        ethernet
        smartcard
        audio
        joystick

Chalice CATS devices
        ALI M1543 southbridge inc PS/2 keyboard & mouse, ide, serial
        parallel, USB and ISA bus
        RTC

Intel EBSA285 & Chalice CATS PCI devices
        PCI - PCI bridges
                DC21150
```

```
        DC21152
        DC21153
        DC21154
        Hint HB1
Digital DC21x4x-based PCI Ethernet adapters, including:
        Cogent EM1X0, EM960 (a.k.a. Adaptec ANA-69XX)
        Cogent EM964 [b]
        Cogent EM4XX [b]
        Compex Readylink PCI
        DANPEX EN-9400P3
        Digital Celebris GL, GLST on-board ethernet
        Digital (DEC) PCI Ethernet/Fast Ethernet adapters (all)
        JCIS Condor JC1260
        Linksys PCI Fast Ethernet
        SMC EtherPower 10, 10/100 (PCI only!)
        SMC EtherPower
        SVEC PN0455
        SVEC FD1000-TP
        Znyx ZX34X
Qlogic ISP [12]0x0 SCSI/FibreChannel boards
Adaptec AHA-2x4x[U][W] cards using the AIC-7770, AIC-7850,
        AIC-7860, AIC-7870, or AIC-7880 chip.
NE2000 PCI ethernet adapters
Universal Serial Bus:
        UHCI host controllers
        OHCI host controllers
        Hubs
        Keyboards using the boot protocol
        Mice
        Printers
        Generic support for HID devices

Video cards
        Diamond Stealth 3D 2000 Pro
        ATI Charger 4MB
        STB Velocity 128
        Cirrus Logic 5446
        IGS 2010
        IGS 5000
        S3 based interfaces
```

Drivers for hardware marked with "[*]" are NOT present in installation kernels.

Other PCI device may be supported by Intel EBSA285 & Chalice CATS but have not been tested.

Support for some devices is limited to particular kernels. eg there is no SA110 support in A7000 kernels.

Hardware the we do NOT currently support, but get many questions about:

- Acorn/Aleph1 PC cards.
- Any SCSI card using a PowerROM.
- Podule based serial ports.

- Castle SCSI/Ethernet cards.

Drivers are planned for some of the above devices.

Getting the NetBSD System on to Useful Media

Installation is supported from several media types, including:

- CDROM
- DOS Floppy
- Tape
- Remote NFS partition
- FTP

No matter which installation medium you choose, you'll need to have an installation kernel and possibly a boot application, see `arm32/`*`platform`*`/prep` for details.

Note that, if you are installing or upgrading from a writable media, the media can be write-protected if you wish. These systems mount a root image from inside the kernel, and will not need to write to the media.

The distribution sets for installation or upgrade depend on which installation medium you choose. The steps for the various media are outlined below.

- To install or upgrade NetBSD using CDROM, you need to do the following:

  Find out where the distribution set files are on the CDROM.

  Proceed to the instruction on installation.

- To install or upgrade NetBSD using DOS floppies, you need to do the following:

  Count the number of "set_name.xx" files that make up the distribution sets you want to install or upgrade. You will need that number of 1.44M floppies.

  Format all of the floppies with DOS. DO NOT make any of them bootable DOS floppies. (If the floppies are bootable, then the DOS system files that make them bootable will take up some space, and you won't be able to fit the distribution set parts on the disks.) If you're using floppies that are formatted for DOS by their manufacturers, they probably aren't bootable, and you can use them out of the box.

  Place all of the "set_name.xx" files on the DOS disks.

  Once you have the files on DOS disks, 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.

- To install or upgrade NetBSD using a tape, you need to do the following:

  To install NetBSD from a tape, you need to make a tape that contains the distribution set files, in "tar" format. If you're making the tape on a UN∗X-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 system. (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 **misc, 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-1.4.2          # the top of the tree
  cd arm32/binary
  ```

  And then:

  tar cf *`tape_device`* **misc etc kern**

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.

- To install or upgrade NetBSD using a remote partition, mounted via NFS, you must do the following:

  Note This method of installation is recommended only for those already familiar with using BSD network configuration and management commands. If you aren't, this documentation should help, but is not intended to be all-encompassing.

  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 of 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 the numeric IP address of the NFS server, and, if 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.

- To install or upgrade NetBSD by using FTP to get the installation sets, you must do the following:

  Note This method of installation is recommended only for those already familiar with using BSD network configuration and management commands. If you aren't, this documentation should help, but is not intended to be all-encompassing.

  The preparations for this installation/upgrade method are easy; all you make sure that there's some FTP site from which you can retrieve the NetBSD distribution when you're about to install or upgrade. You 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.

- If you are upgrading NetBSD, you also have the option of installing NetBSD by putting the new distribution sets somewhere in your existing file system, and using them from there. To do that, you must do the following:

  Place the distribution sets you wish to upgrade somewhere in your current file system tree. Please note that the /dev on the floppy used for upgrades only knows about wd0, wd1, sd0, sd1 and sd2. If you have more than two IDE drives or more than three SCSI drives, you should take care not to place the sets on the high numbered drives.

  At a bare minimum, you must upgrade the "base" binary distribution, and so must put the "base" set somewhere in your file system. If you wish, you can do the other sets, as well, but you should NOT upgrade the "etc" distribution; the "etc" distribution contains system configuration files that you should review and update by hand.

Once you have done this, you can proceed to the next step in the upgrade process, actually upgrading your system.

Preparing your System for NetBSD Installation

First and foremost, before beginning the installation process, *make sure you have a reliable backup* of any data on your hard disk that you wish to keep. Repartitioning your hard disk is an excellent way to destroy important data.

Second, read and perform the instructions in `arm32/`*`platform`*`/prep` that are specific to your platform for partitioning and booting (even if you're dedicating a device to NetBSD).

Finally, when you are happy with your NetBSD installation, do whatever is necessary to restore order to the partition you took space away from. This will most likely involve restoring files, but might involve some other ''house-work''.

Your hard disk is now prepared to have NetBSD installed on it, and you should proceed with the installation instructions.

Installing the NetBSD System

Installing NetBSD is a relatively complex process, but if you have this document in hand and are careful to read and remember the information which is presented to you by the install program, it shouldn't be too much trouble.

Before you begin, you should know the geometry of your hard disk, i.e. the sector size (note that sector sizes other than 512 bytes are not currently supported), the number of sectors per track, the number of tracks per cylinder (also known as the number of heads), and the number of cylinders on the disk. The NetBSD kernel will try to discover these parameters on its own, and if it can it will print them at boot time. If possible, you should use the parameters it prints. (You might not be able to because you're sharing your disk with another operating system, or because your disk is old enough that the kernel can't figure out its geometry.)

If NetBSD will be sharing the disk with RiscOS or another operating system, you should have already completed the section of these notes that instructed you on how to prepare your hard disk. You should know the size of the NetBSD area of the disk and its offset from the beginning of the disk. You will need this information when setting up your NetBSD partitions.

You should now be ready to install NetBSD. It might be handy for you to have a pencil, some paper, and a calculator handy.

The following is a walk-through of the steps you will take while getting NetBSD installed on your hard disk. If any question has a default answer, it will be displayed in brackets ("[]") after the question. If you wish to stop the installation, you may hit Control-C at any time, but if you do, you'll have to begin the installation process again from scratch.

Boot your machine using the installation kernel for your platform. (Instructions for doing this on your platform can be found in the preparation section of this document.)

If this doesn't work, ensure that you're using the correct kernel for your hardware.

Depending upon your platform and the method of loading the, it may take a while to load the kernel.

You will then be presented with the NetBSD kernel boot messages. You will want to read them, to determine your disk's name and geometry. Its name will be something like "sd0" or "wd0" and the geometry will be printed on a line that begins with its name. As mentioned above, you will need your disk's geometry when

creating NetBSD's partitions. You will also need to know the name, to tell the install tools what disk to install on.

While booting, you will probably see several warnings. You should be warned that no swap space is present, and that init(8) cannot find `/etc/rc`. Do not be alarmed, these are completely normal. When you reach the prompt asking you for a shell name, just hit return.

You will be asked if you wish to install or upgrade your system or go to a shell prompt. Enter **`install`**.

You will be presented with a welcome message and a prompt, asking if you wish to proceed with the installation process. If you wish to proceed, enter **`y`** and hit return.

You will be asked what type of disk driver you have. The valid options are listed by the install program, to make sure you get it right.

The install program will then tell you which disks of that type it can install on, and ask you which it should use. Reply with the name of your disk. (The first disk of the type you selected, either "wd0" for IDE disks, or "sd0" for SCSI disks, is the default.)

You will then be asked to name your disk's disklabel. The default response is "mywd" or "mysd" depending on the type of your disk, and for most purposes it will be OK. 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.

You will be prompted for your disk's geometry information, i.e. the number of bytes per sector, cylinders on the disk, tracks per cylinder (heads), and sectors per track. Enter them when they are requested. If you make a mistake, hit Control-C and when you get to the shell prompt, restart the install process by running the **`install`** command. Once you have entered this data, the install program will tell you the total size of your disk, in both sectors, and cylinders. Remember this number; if you're installing on the whole disk, you'll need it again soon.

When describing your partitions, you will have the option of entering data about them in units of disk sectors or cylinders. If you choose to enter the information in units of sectors, remember that, for optimal performance, partitions should begin and end on cylinder boundaries. You will be asked about which units you wish to use, and you should reply with "c" for cylinders, or "s" for sectors.

You will be asked for the size of the NetBSD portion of the disk. If you're installing on the whole disk, reply with the size of the disk, as printed earlier by the install program. If you're using only part of the disk, reply with the size that you specified in the partition editor. (Don't forget to enter the size in the units you specified in the last step!)

If you are not installing on the whole disk, you will be asked for the offset of the NetBSD partition from the beginning of the disk. Reply with the appropriate offset (again, in whichever units you specified), as determined by how you set up your disk using the partition editor.

You will be asked to enter the size of your NetBSD root partition. It should be at least 13M, but if you are going to be doing development, 14-16M is a more desirable size. This size should be expressed in units of sectors or cylinders, depending on which you said you wanted to use.

Next, you will be asked for the size of your swap partition. You should probably allocate twice as much swap space as you have real memory. Systems that will be heavily used should have more swap space allocated, and systems that will be lightly used can get by with less. If you want the system to be able to save

crash dumps when it panics, you will need at least as much swap space as you have RAM. Again, this number should be expressed in units of sectors or cylinders, as appropriate.

The install program will then ask you for information about the rest of the partitions you want on your disk. For most purposes, you will want only one more partition, `/usr`. (Machines used as servers will probably also want `/var` as a separate partition. That can be done with these installation tools, but is not covered here.) The install program will tell you how much space there is left to be allocated in the NetBSD area of the disk, and, if you only want one more partition (`/usr`), you should enter it at the prompt when the installer asks you how large the next partition should be. It will then ask you for the name of the mount point for that partition. If you're doing a basic installation, that is `/usr`.

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, and its contents may be scrambled at the whim of the install program. This is especially likely if you have given the install program incorrect information. If you are sure you want to proceed, enter **`yes`** at the prompt.

The install program will now label your disk and make the file systems you specified. The filesystems will be initialized to contain NetBSD bootstrapping binaries and configuration files. It will also create an `/etc/fstab` for your system, and mount all of the file systems under `/mnt`. (In other words, your root partition will be mounted on `/mnt`, your `/usr` partition on `/mnt/usr`, and so on.) There should be no errors in this section of the installation. If there are, restart from the beginning of the installation process.

You will be placed at a shell prompt ("#"). The task is to install the distribution sets. The flow of installation differs depending on your hardware resources, and on what media the distribution sets reside.

To install from floppy

The first thing you should do is pick a temporary directory where the distribution files can be stored. To do this, enter the command "Set_tmp_dir", and enter the name of the temporary directory. (Don't forget that if your disk is still mounted under `/mnt`; you should probably pick a directory under `/mnt/usr`.)

After you have picked a temporary directory, enter the "Load_fd" command, to load the distribution sets from your floppies.

You will be asked which floppy drive to use. Enter "0" (zero) if you're using the first floppy drive, or enter "1" if you're using the second.

You will be prompted to insert a floppy into the drive, to have its contents copied to your hard disk. Do so, and hit return to begin copying. When that is done, read the remainder of the floppies that contain the distribution sets that you want to install, one by one. When the last is read, and you are being prompted for another, hit Control-C.

Run the **`Extract`** command once for each distribution set you wish to install. For instance, if you wish to install the "base13" distribution set, followed by the "text13" distribution set, and finally the "etc13" distribution set, use the commands:

```
Extract base13
Extract text13
Extract etc13
```

For each extraction, it will ask you if the extraction should be verbose. If you reply affirmatively, it will print out the name of each file that's being extracted.

Note: If you know that you will be running low on disk space when installing NetBSD, you can load and extract one distribution set at a time. To do this, load only the floppies which contain the files for the first distribution set, extract them, and then change to the temporary directory and remove them with the command **`rm set_name.??`**

Once you are finished extracting all of the sets that you wish to install, you should proceed to the instructions below (after the last install medium type-specific instructions), that explain how you should configure your system.

To install from tape

The first thing you should do is pick a temporary directory where the distribution files can be stored. To do this, enter the command "Set_tmp_dir", and enter the name of the temporary directory. (Don't forget that your disk is mounted under `/mnt`; you should probably pick a directory under `/mnt/usr`.) The default is `/mnt/usr/distrib`.

After you have picked a temporary directory, enter the "Load_tape" command, to load the distribution sets from tape.

You will be asked which tape drive to use. The default is "rst0", which is correct if you're using the SCSI tape drive with the lowest SCSI ID number. (For the SCSI tape drive with the next lowest SCSI ID number, you should use "rst1", and so on.)

You will be prompted to hit return when you have inserted the tape into the tape drive. When you do, the contents of the tape will be extracted into the temporary directory, and the names of the files being extracted will be printed.

After the tape has been extracted, to go the directory containing the first distribution set you wish to install. (Depending on how you made the tape, it's probably a subdirectory of the temporary directory you specified above.) Once there, run the "Set_tmp_dir" command again, and accept its default answer by hitting return at the prompt.

Use the "Extract" command to extract the distribution set. For instance, if you're extracting the "base13" set, use the command:

```
Extract base13
```

You will be asked if you wish the extraction to be verbose. If you reply affirmatively, the name of each file being extracted will be printed.

Repeat the previous two steps for each distribution set you wish to install. Change to the set's directory, run **`Set_tmp_dir`**, and then run **`Extract`** *`set_name`* to extract the set.

Once you are finished extracting all of the sets that you wish to install, you should proceed to the instructions below (after the last install medium type-specific instructions), that explain how you should configure your system.

To install via FTP or NFS

The first thing you should do is pick a temporary directory where the distribution files can be stored. To do this, enter the command "Set_tmp_dir", and enter the name of the temporary directory. (Don't forget that your disk is mounted under `/mnt`; you should probably pick a directory under `/mnt/usr`.) The default is /mnt/usr/distrib.

Configure the appropriate ethernet interface (e.g. ea0, eb0, etc.) up, with a command like:

ifconfig *ifname ipaddr* [**netmask** *netmask*]

where *ifname* is the interface name, like those listed above, and *ipaddr* is the numeric IP address of the interface. If the interface has a special netmask, supply the word **netmask** and that netmask at the end of the command line. (The brackets indicate that those arguments are optional.) For instance, to configure interface ea0 with IP address 129.133.10.10, use the command:

```
ifconfig ea0 129.133.10.10
```

and to configure interface eb0 with IP address 128.32.240.167 and a special netmask, 0xffffff00, use the command:

```
ifconfig eb0 128.32.240.167 netmask 0xffffff00
```

If the NFS server or FTP server is not on a directly- connected network, you need to set up a route to it using a command like:

route add default *gate_ipaddr*

where *gate_ipaddr* is your gateway's numeric IP address.

If you are NFS-mounting the distribution sets, mount them on the temporary directory with a command like:

mount -t nfs *serv_ipaddr:dist_dir tmp_dir*

where *serv_ipaddr* is the server's numeric IP address, *dist_dir* is the path to the distribution files on the server, and *tmp_dir* is the name of the local temporary directory.

Once this is done, proceed as if you had loaded the files from tape, changing to the appropriate directories, running "Set_tmp_dir", and running "Extract" as appropriate.

If you are retrieving the distribution sets using ftp, change into the temporary directory, and execute the command:

ftp *serv_ipaddr*

where *serv_ipaddr* is once again the server's numeric IP address. Get the files with FTP, taking care to use binary mode when transferring the files.

Once you have all of the files for the distribution sets that you wish to install, you can proceed using the instructions above, as if you had installed from a floppy. (Note that as with the floppy install, if you're short on disk space, you can transfer only one set at a time, extract it, then delete it, to save space.)

To install from CDROM:

First create a mount point so that you can mount the CDROM:

```
mkdir /mnt/cdrom
```

If you get an error here of "mkdir: /mnt/cdrom", don't worry it just means that you didn't need to create the directory.

Then all you need to do is mount the CDROM. For the first CDROM drive use:

```
mount -rt cd9660 /dev/cd0a /mnt/cdrom
```

Or, for the second use:

```
mount -rt cd9660 /dev/cd1a /mnt/cdrom
```

Once this is done, extract the required sets as described in the "To install from floppy" section, but ensure that you set the temporary directory to the location of the sets on the CDROM (usually `/cdrom/distrib`, but check the release notes that came with the CD).

Completing your installation

Once you have finished extracting all of the distribution sets that you wish to install, and are back at the "#" prompt, you are ready to configure your system. The configuration utility expects that you have installed the "base13" and "etc13" distribution sets. If you have not, you will not be able to run it successfully (nor will you have a functional system, in any case). To configure your newly-installed NetBSD system, run the command "Configure". It will ask you for the system's host name, domain name, and other network configuration information. It will set up your configuration files and make the device nodes for the newly-installed system.

Congratulations, you have successfully installed NetBSD 1.4.2.

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 propperly configured state, with the most important ones described below.

1. Configuring `/etc/rc.conf`

   If you haven't done any configuration of `/etc/rc.conf`, 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 filesystem mounted read-write. When the system asks you to choose a shell, simply hit return to get to a prompt. If you are asked for a terminal type, respond with **`vt220`** (or whatever is appropriate for your terminal type) and hit return. At this point, you need to configure at least one file in the `/etc` directory. 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. If your `/usr` directory is on a separate partition and you do not know how to use 'ed' or 'ex', you will have to mount your `/usr` partition to gain access to 'vi'. Do the following:

   ```
   mount /usr
   export TERM=vt220
   ```

   If you have `/var` on a seperate partition, you need to repeat that step for it. After that, you can edit `/etc/rc.conf` with `vi`(1). When you have finished, type **`exit`** at the prompt to leave the single-user shell and continue with the multi-user boot.

   Other values that need to be set in `/etc/rc.conf` for a networked environment are *`hostname`* and possibly *`defaultroute`*, furthermore add an *`ifconfig_int`* for your interface <int>, along the lines of

```
ifconfig_de0="inet 123.45.67.89 netmask 255.255.255.0"
```

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

```
ifconfig_de0="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.

Other files in /etc that are new to NetBSD 1.4 and 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. There is no initial password, but if you're using the machine in a networked environment, you should create an account for yourself (see below) and protect it and the "root" account with good passwords.

3. Adding accounts

   Use the vipw(8) command to add accounts to your system, *do not* edit /etc/passwd directly. See adduser(8) for more information on the process of how to add a new user to the system.

4. The X Window System

   If you have installed the X window system, look at the files in /usr/X11R6/lib/X11/doc for information.

   You will need to set up a configuration file, see /usr/X11R6/lib/X11/XF86Config.eg for an example. See **http://www.xfree86.org/** and the XFree86 manual page for more information.

   Don't forget to add /usr/X11R6/bin to your path in your shell's dot file so that you have access to the X binaries.

5. Installing 3rd party packages

   There is a lot of software freely available for Unix-based systems, almost all of which can run on NetBSD. Modifications are usually needed to when transferring programs between different Unix-like systems, so the NetBSD packages collection incorporates any such changes necessary to make that software run on NetBSD, and makes the installation (and deinstallation) of the software packages easy. There's also the option of building a package from source, in case there's no precompiled binary available.

   Precompiled binaries can be found at

   ftp://ftp.netbsd.org/pub/NetBSD/packages/

   Package sources for compiling packages can be obtained by retrieving the file

   ftp://ftp.netbsd.org/pub/NetBSD/NetBSD-current/tar_files/pkgsrc.tar.gz

   and extracting it into /usr/pkgsrc. See /usr/pkgsrc/README then for more information.

6. Misc

   - To adjust the system to your local timezone, point the /etc/localtime symlink to the appropriate file under /usr/share/zoneinfo.
   - Edit /etc/aliases to forward root mail to the right place (run newaliases(1) afterwards.)
   - The /etc/sendmail.cf file will almost definitely need to be adjusted; files aiding in this can be found in /usr/share/sendmail. See the README file there for more information.
   - 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 *filename*
  is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

Upgrading from a previous version of NetBSD isn't currently supported by NetBSD/arm32. If you are currently running NetBSD/arm32 then make a FULL BACKUP of your current installation, and install NetBSD 1.4.2 from scratch. Obviously some of the steps can be skipped (in particular, hard disk partitioning) as they will already be done.

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 1.4.2

Note Only issues effecting an upgrade from NetBSD 1.3 or NetBSD 1.3.x are decribed here.

- "machine" directory/link in "/usr/include"

  Description
  Some architecture may fail to install the **comp** set because the
  `/usr/include/machine`
  directory changed to a symbolic link in NetBSD 1.4.

  Fix If this happens, you can use the command
  # **rm -r /usr/include/machine**
  to remove the old directory and it contents and reinstall the **comp** set.

Using online NetBSD documentation

Documentation is available if you first install 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)m 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.

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. Additionally, bug reports can be sent by mail to: netbsd-bugs@NetBSD.ORG.

Use of send-pr(1) is encouraged, however, because bugs reported with it are entered into the NetBSD bugs database, and thus can't slip through the cracks.

There are also port-specific mailing lists, to discuss aspects of each port of NetBSD. Use majordomo to find their addresses. 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-help@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 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.

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(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 mentioned, tell us!)

We are...

(in alphabetical order)

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