NAME

INSTALL – Installation procedure for NetBSD/pmax

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 1.4.1 on the *pmax* 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 1.4.1 release contains complete binary releases for fourteen different machine types. (The six remaining 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.

Changes Since The Last Release

The NetBSD 1.4.1 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 1.4.1 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.

This is the fourth public major release of NetBSD for the DECstation and DECsystem family of computers. Significantly, this is the first release for the pmax that builds completely from in-tree source code. Some other pmax-specific changes from the 1.3 release include:

- A much easier-to-use ramdisk-based install procedure.
- New two-stage disk bootblocks that can load a.out, ECOFF and ELF kernels.
- a.out kernels are no longer built. ELF is the preferred format for kernels loaded off disk, and ECOFF kernels are still required for netbooting. a.out kernels will still boot.

- Better support for SFB graphics cards running at different resolutions.
- NetBSD/pmax now uses the X11R6 Xserver.
- Mouse problems in X on 5000/xx machines have been significantly reduced.
- Some improvements in the SCSI driver for the 5000/200 (although some problems are still thought to exist).
- scc serial driver will work up to 115.2k bps on some systems.
- Reworked model-dependent code, including support for 5100 (but not recently tested on this machine).
- Crash dumps now work.
- Switched to in-tree ld.elf_so.
- Breakpoints in gdb work more reliably for R3000 systems (although there still may be some problems with R4X00 systems).

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, we intend to provide Anonymous CVS access to the NetBSD source tree in the near future, so that anyone on the internet can examine the full NetBSD source code repository.

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

NetBSD Mirror Site List

The following sites mirror NetBSD as of April 03, 1999.

If you wish to become a distribution site for NetBSD, contact `mirrors@netbsd.org`.

FTP mirrors

Australia

ftp.au.netbsd.org
RMIT University, Melbourne
ftp://ftp.au.netbsd.org/pub/NetBSD/

ftp2.au.netbsd.org
University of Queensland, Brisbane
ftp://ftp2.au.netbsd.org/pub/NetBSD/

Austria

ftp.at.netbsd.org
University of Technology, Vienna
ftp://ftp.at.netbsd.org/pub/NetBSD/

Brazil

ftp.ravel.ufrj.br
Cidade Universitaria
ftp://ftp.ravel.ufrj.br/pub/NetBSD/

Denmark

ftp.dk.netbsd.org
Aalborg University
ftp://ftp.dk.netbsd.org/pub/NetBSD/

Finland

ftp.fi.netbsd.org
The Finnish University and Research Network, Espoo
ftp://ftp.fi.netbsd.org/pub/NetBSD/

France

ftp.fr.netbsd.org
Paris University
ftp://ftp.fr.netbsd.org/pub/NetBSD/

Germany

ftp.de.netbsd.org
University of Trier
ftp://ftp.de.netbsd.org/pub/NetBSD/

ftp2.de.netbsd.org
University of Erlangen-Nuremberg
ftp://ftp2.de.netbsd.org/pub/NetBSD/

ftp.uni-regensburg.de
University of Regensburg
ftp://ftp.uni-regensburg.de/pub/comp/os/NetBSD/

Japan

ftp.jp.netbsd.org
Internet Research Institute Inc., Tokyo
ftp://ftp.jp.netbsd.org/pub/NetBSD/

core.ring.gr.jp
Electrotechnical Laboratory
ftp://core.ring.gr.jp/pub/NetBSD/

ftp.dti.ad.jp
Dream Train Internet Inc., Tokyo
ftp://ftp.dti.ad.jp/pub/NetBSD/

mirror.nucba.ac.jp
Nagoya University of Commerce and Business
ftp://mirror.nucba.ac.jp/mirror/NetBSD/

netbsd.tohoku.ac.jp
Tohoku University, Sendai
ftp://netbsd.tohoku.ac.jp/NetBSD/

ring.asahi-net.or.jp
ASAHI Net
ftp://ring.asahi-net.or.jp/pub/NetBSD/

Netherlands

ftp.nl.netbsd.org
University of Amsterdam
ftp://ftp.nl.netbsd.org/pub/NetBSD/

Norway

ftp.no.netbsd.org
Bergen IT Consult AS
ftp://ftp.no.netbsd.org/pub/NetBSD/

ftp.ntnu.no
Norwegian University of Science and Technology
ftp://ftp.ntnu.no/pub/NetBSD/

Russia

ftp.ru.netbsd.org
Landau Institute for Theoretical Physics, Chernogolovka
ftp://ftp.ru.netbsd.org/pub/NetBSD/

Sweden

ftp.stacken.kth.se
Royal Institute of Technology, Stockholm
ftp://ftp.stacken.kth.se/pub/OS/NetBSD/

ftp.sunet.se
Swedish University NETwork, Uppsala

ftp://ftp.sunet.se/pub/os/NetBSD/

UK

ftp.uk.netbsd.org
Domino, London
ftp://ftp.uk.netbsd.org/pub/NetBSD/

sunsite.org.uk
ftp://sunsite.org.uk/packages/netbsd/

USA

ftp.netbsd.org
Silicon Valley, California
ftp://ftp.netbsd.org/pub/NetBSD/

ftp.cs.umn.edu
University of Minnesota
ftp://ftp.cs.umn.edu/pub/NetBSD

ftp.eecs.umich.edu
University of Michigan, Ann Arbor
ftp://ftp.eecs.umich.edu/pub/NetBSD/

ftp.iastate.edu
Iowa State University
ftp://ftp.iastate.edu/pub/netbsd/

ftp.op.net
ftp://ftp.op.net/pub/NetBSD/

AFS mirrors

Sweden

ftp.stacken.kth.se
Royal Institute of Technology, Stockholm
AFS path: /afs/stacken.kth.se/ftp/pub/OS/NetBSD

USA

ftp.iastate.edu
Iowa State University
AFS path: /afs/iastate.edu/public/ftp/pub/netbsd

NFS mirrors

UK

sunsite.org.uk
Instructions: mount -o ro sunsite.org.uk:/public/packages/netbsd /mnt

SUP mirrors

Australia

sup.au.netbsd.org
RMIT University, Melbourne
Instructions: ftp://sup.au.netbsd.org/pub/NetBSD/sup/README.sup

France

sup.fr.netbsd.org
Paris University
Instructions: Similar to sup.netbsd.org

Germany

sup.de.netbsd.org
University of Trier
Instructions: ftp://sup.de.netbsd.org/pub/NetBSD/sup/supfile.example

Japan

sup.jp.netbsd.org
Internet Research Institute Inc., Tokyo
Instructions: ftp://sup.jp.netbsd.org/pub/NetBSD/sup/README.sup

Norway

sup.no.netbsd.org
Norwegian University of Science and Technology
Instructions: See /usr/src/share/examples/supfiles/sup.no.netbsd.org

UK

sup.uk.netbsd.org
Domino, London
Instructions: See ftp://ftp.netbsd.org/pub/NetBSD/sup/README.sup

USA

sup.netbsd.org
Silicon Valley, California
Instructions: See ftp://ftp.netbsd.org/pub/NetBSD/sup/README.sup

ftp.cs.umn.edu
University of Minnesota
Instructions: hostbase=/ftp/ftp/packages/NetBSD, collections are the same as on sup.NetBSD.ORG

WWW mirrors

Australia

www.au.netbsd.org
RMIT University, Melbourne
http://www.au.netbsd.org/

Austria

www.at.netbsd.org
University of Technology, Vienna
http://www.at.netbsd.org/

Finland

www.fi.netbsd.org
Global Wire Oy, Lappeenranta
http://www.fi.netbsd.org/

France

www.fr.netbsd.org
Paris University
http://www.fr.netbsd.org/

Germany

www.de.netbsd.org
http://www.de.netbsd.org/

Japan

www.jp.netbsd.org
Internet Research Institute Inc., Tokyo
http://www.jp.netbsd.org/

Norway

www.no.netbsd.org
Bergen IT Consult AS
http://www.no.netbsd.org/

USA

www.netbsd.org
Western Washington State University
http://www.netbsd.org/

www2.us.netbsd.org
New York
http://www.us.netbsd.org/

NetBSD 1.4.1 Release Contents

The root directory of the NetBSD 1.4.1 release is organized as follows:

`.../NetBSD-1.4.1/`

`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 1.4.1 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 1.4.1 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 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, 84.2M uncompressed

syssrc.tgz: This set contains the sources to the NetBSD 1.4.1 kernel, config(8), and dbsym(8).
13.5M gzipped, 66.7M 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 1.4.1 sources which are not mentioned above.
16.1M gzipped, 73.6M 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 is available only 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.)

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/pmax Subdirectory Structure

The pmax-specific portion of the NetBSD 1.4.1 release is found in the `pmax` subdirectory of the distribution:

```
.../NetBSD-1.4.1/pmax/
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/` pmax binary distribution sets; see below.
- `kernel/` pmax installation kernels.
- `security/` pmax security distribution; see below.

`installation/`
- `diskimage/` pmax miniroot file system image; see below.
- `misc/` New bootblocks necessary for booting non **`a.out`** kernels.
- `netboot/` Server tar file for diskless machines.

Binary Distribution Sets

The NetBSD pmax binary distribution sets contain the binaries which comprise the NetBSD 1.4.1 release for the pmax. There are eight binary distribution sets and the *security* distribution set. The binary distribution sets can be found in the `pmax/binary/sets` subdirectory of the NetBSD 1.4.1 distribution tree, and are as follows:

base The NetBSD 1.4.1 pmax **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.
12.8M gzipped, 40.6M 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.
11.3M gzipped, 48.7M 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.)
58K gzipped, 340K uncompressed

games This set includes the games and their manual pages.
2.9M gzipped, 7.7M uncompressed

kern This set contains a NetBSD/pmax 1.4.1 GENERIC kernel, named `/netbsd`. You *must* install this distribution set.
792k gzipped, 2.1M 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, 8.5M uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
1.3M gzipped, 5.1M uncompressed

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

`pmax/binary/security`

subdirectory of the NetBSD 1.4.1 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.

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 3.3.3.1. 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.
3.1M gzipped, 11M uncompressed

xcomp The extra libraries and include files needed to compile X source code.
2.1M gzipped, 9.8M uncompressed

xcontrib Programs that were contributed to X.
206k gzipped, 770k uncompressed

xfont Fonts needed by X.
5.5M gzipped, 6.7M uncompressed

xserver The Xpmax server with man page. *1.8M gzipped, 5.6M uncompressed*

The pmax 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 pmax 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/pmax System Requirements and Supported Devices

NetBSD/pmax 1.4.1 runs on the following classes of machines:

- DECstation 2100 and 3100, also known as *pmin* and *pmax*
- Personal DECstations (5000/20, /25 and /33) also known as *MAXINE*
- DECstation 5000/120, /125, and /133, also known as *3MIN*
- DECstation 5000/200, also known as *3MAX*
- DECstation 5000/240 and DECsystem 5900, also known as *3MAXPLUS*
- DECstation 5000/50, 5000/150, 5000/260 (and DECsystem 5900-260) – R4000 and R4400 variants of the the *MAXINE, 3MIN* and *3MAXPLUS*

NetBSD/pmax 1.4.1 does *not* (yet) run on these machines:

- DECsystem 5100 (an r3000-based cousin of the DECstation 3100)
- DECsystem 5400 and 5500 (Qbus-based systems, similar to the Vax *Mayfair* or *Mayfair II*, but with an r2000a or r3000 cpu instead of a CVAX cpu.)
- DECsystem 5800 (xbi-based multiprocessor, a Vax 6200 with Vax CPU boards replaced with Mips cpu boards)

The minimal configuration requires 8M of RAM and ˜60M of disk space. To install the entire system requires much more disk space, and to run X or compile the system, more RAM is recommended. (NetBSD with 8M of RAM feels like Ultrix with 8M of RAM.) Note that until you have around 16M of RAM, getting more RAM is more important than getting a faster CPU.

Supported devices include:

- DECstation 2100 and 3100 baseboard video
  - one-bit mono or 8-bit pseudocolour frame buffers.
- DECstation 5000 series TurboChannel video
  - PMAG-DV Personal DECstation baseboard 1024x768 frame buffer
  - PMAG-BA 1024x768 8-bit colour frame buffer
  - PMAGB-BA 1024x768 8-bit colour frame buffer
  - PMAG-AA 1280x1024 four-bit greyscale frame buffer

  Note All supported DECstation video produces sync-on-green. Be sure to use either a DEC-compatible fixed-sync monitor or a multisync monitor that supports sync-on-green.
- serial ports:
  - ttya and ttyb (can be used as console if needed)
- ethernet:
  - on-board AMD Lance ethernet (*(le0)*),
  - TURBOchannel AMD Lance ethernet cards (the *PMAD*)
- SCSI:
  - on-board DEC *sii* SCSI controller (2100 and 3100)
  - on-board *asc* SCSI controller (5000 series machines)
  - TurboChannel *asc* SCSI controller (the *PMAZ*)
- DEC (LK-201 or compatible) keyboard
- DEC *hockey puck* or compatible mouse

Hardware the we do *not* currently support, but get questions about from time to time:

- Q-bus DECsystem machines
- DECsystem 5100 machines
- PrestoServe NVRAM on DECsystem 5100 and 5000/2xx machines

- audio drivers for Personal DECstation machines
- floppy driver for Personal DECstation machines
- TurboChannel audio hardware (LoFi)
- PMAG-C 2-D (PX) and other accelerated framebuffers (PXG, PXG+ and PXG+ Turbo) with onboard i860 processors

Note the primary obstacle to support of all but the very last item is non-availability of sample hardware for development.

The primary obstacle for the i860-based framebuffers is that there is no documentation on the accelerator board. There is support for the PX and PXG framebuffers in NetBSD-current after NetBSD 1.4.

Getting the NetBSD System on to Useful Media

First-time installation on a bare machine is not supported, because most DECstations do not have any suitable load device. Some versions of DECstation PROM s are buggy and will not boot via TFTP and bootp; still other versions are buggy and do not boot via MOP.

The only DECstation with a floppy-disk drive is the Personal DECstation, and that device is not supported as a boot device.

The recommended installation procedure is to boot an install kernel via TFTP, or to use a ''helper'' system to write a miniroot diskimage onto a disk, move that disk to the target installation system, and then boot the miniroot.

Installation is supported from several media types, including:
- NFS partitions
- FTP
- Tape
- CD-ROM

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

NFS Installation 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 will need to know the IP address of your nameserver or of your 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 IP address of the closest router . Finally, you need to know the IP address of the NetBSD machine itself. The install program will ask you to provide this information to be able to access the sets via NFS.

If you are using a diskless setup to install NetBSD on your machine, you can take advantage of the fact that the above has already been done on your machine's server. So, you can conveniently put the NetBSD file sets in your machine's root filesystem on the server where the install program can find them.

Once the NFS server is set up properly and you have the information mentioned above, you can start the actual installation process.

FTP Installation Determine an FTP site from which you can retrieve the NetBSD distribution when you're about to install. You will need to know the IP address of your nameserver or of your ftp 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 IP address of the closest router. Finally, you need to know the IP address of the NetBSD machine itself. The install program will ask you to provide this information to be able to access the sets via ftp.

Once you have this information, you can proceed to the actual installation.

Tape Installation To install NetBSD from a tape, you need to somehow get the NetBSD filesets you wish to install on your system on to the appropriate kind of tape, in tar format.

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

If you're making the tape on a UN∗X system, the easiest way to do so is:

```
tar cvf tape_device files
```

where *tape_device* is the name of the tape device that describes the tape drive you're using (possibly something like `/dev/nrst0`, but we make no guarantees 8-). Under SunOS 5.x, this would be something like `/dev/rmt/0mbn`. Again, your mileage may vary. If you can't figure it out, ask your system administrator. *files* are the names of the *set_name.nnn* files which you want to be placed on the tape.

Once you have done this, you can proceed to the next step in the installation process, preparing your system for NetBSD installation.

CD-ROM Installation If you are installing from a CD-ROM, the distribution sets are already in the proper format and no special handling is required.

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. Mistakes in partitioning your hard disk may lead to data loss.

Installing the NetBSD System

Note There may be updates to this procedure available from the NetBSD/pmax web page, at **http://www.netbsd.org/Ports/pmax**.

To install or upgrade NetBSD, you need to first boot an 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.

From most convenient to least convenient, the installation methods are:

1. Installation from an existing NetBSD or Ultrix system by booting the install kernel from an existing root filesystem. See the **Installing from an existing system** section later in these INSTALL notes.
2. Copying a bootable diskimage onto the beginning of a disk and installing onto that disk. See the **Install via diskimage** section later in these INSTALL notes.
3. Booting the install kernel over the network and installing onto a local disk. See the **Install via netboot install kernel** section later in these INSTALL notes.

4. Using a helper machine with a SCSI controller to copy the bootable diskimage onto the beginning of a disk, and moving the disk to the target machine. See the **Install via diskimage** section later in these INSTALL notes.

5. For machines with some PROMs that cannot netboot standard kernels, you will need to set up an NFS server with a diskless root filesystem for trimmed-down network install kernel and run the installation system from the NFS root filesystem. See the **Install via diskless boot** section later in these INSTALL notes.

You should familiarize yourself with the console PROM environment and the hardware configuration. The PROMs on the older DECstation 2100 and 3100 use one syntax. The PROMs on the TurboChannel machines use a completely different syntax. Be sure you know how to print the configuration of your machine, and how to boot from disk or network, as appropriate.

On the 2100/3100, that's

```
boot -f rz(0,N,0)netbsd (boot from rzN)
boot -f tftp()          (boot diskless via TFTP)
boot -f mop()           (boot via MOP from an Ultrix server)
```

On the 5000/200, the equivalent is

```
boot 5/rzN/netbsd
boot 6/tftp
boot 6/mop
```

And on other 5000 series machines,

```
boot 3/rzN/netbsd
boot 3/tftp
boot 3/mop
```

You will also need to know the total size (in sectors) and the approximate geometry of the disks you are installing onto, so that you can label your disks for the BSD fast filesystem (FFS). For most SCSI drives (including all SCSI-2 drives), the kernel will correctly detect the disk geometry. The **sysinst** tool will suggest these as the default.

If you're installing NetBSD/pmax for the first time it's a very good idea to pre-plan partition sizes for the disks on which you're installing NetBSD. Changing the size of partitions after you've installed is difficult. If you do not have a spare bootable disk, it may be simpler to re-install NetBSD again from scratch.

Assuming a classic partition scheme with separate root ('/') and /usr filesystems, a comfortable size for the NetBSD root filesystem partition is about 32M. A good initial size for the swap partition is twice the amount of physical memory in your machine (though, unlike Ultrix, there are no restrictions on the size of the swap partition that would render part of your memory unusable). The default swap size is 64Mbytes, which is adequate for doing a full system build. A full binary installation, with X11R6.3, takes about 150MB in '/usr' - a 200MB '/usr' should be ample.

Install via a NetBSD CDROM

You can obtain the disk image or diskless boot tar file from the NetBSD 1.4.1 CDROM.

To mount the CDROM from a NetBSD/pmax host, type

mount -r -t cd9660 /dev/rz*X*c /mnt

and from an Ultrix host

mount -r -t cdfs -o nodefperm,noversion /dev/rz*X*c /mnt

where *X* is the SCSI id of the CDROM.

Note Ultrix does not have Rock Ridge extensions so leave out everything between the first and last period (.) in the paths on the CD. For example, the path `NetBSD-1.3.2` would show up as `NetBSD-1.2`.

The diskimage file can be found on the CDROM at the following location (relative to the mount point of the CD)

`pmax/installation/diskimage/diskimage.gz`

and the diskless boot tar file can be found at

`pmax/installation/netboot/diskimage.tgz`

Once you have located these files, continue on to either **Install via netboot install kernel**, **Install via diskless boot**, **Install via diskimage** or **Installing from an existing system** section later in the INSTALL notes.

Installing from an existing system

Note If you are installing NetBSD using an existing NetBSD system that is older than NetBSD-1.4, you will need to install new bootblocks before installing NetBSD-1.4.1. New bootblocks are in the tar file:

`pmax/installation/misc/bootblocks.tgz`

in the NetBSD-1.4.1 distribution. To install the new bootblocks, use the following commands:

```
# cd /
# tar xvpfz .../pmax/installation/misc/bootblocks.tgz
# disklabel -B rzX
```

where X is your boot disk SCSI ID.

With new NetBSD bootblocks or using the Ultrix bootloader, you can boot the kernel located in:

`pmax/binary/kernel/install.gz`

On Ultrix systems you will need to gunzip this kernel before booting it. A copy of the gunzip binary for Ultrix systems is located in:

`pmax/installation/misc/gunzip.ultrix`

Then boot using:

```
>> boot -f rz(0,X,0)install
>> boot 5/rzX/install
```

or

```
>> boot 3/rzX/install
```

where X is your boot disk SCSI ID, and continue to the **Once you've booted the diskimage** section

Install via diskimage

The diskimage file is in

`pmax/installation/diskimage/diskimage.gz`.

It is shipped compressed and is around 1150 kbytes, uncompressing to exactly 2 Mbytes.

To install the diskimage onto disk rzX on a NetBSD/pmax system, do:

```
disklabel -W /dev/rrzXc
gunzip -c diskimage.gz | dd of=/dev/rrzXc bs=10240
```

When installing on a disk with no NetBSD or Ultrix label, you may get a message like:

```
rzX: WARNING: trying Ultrix label, no disk label
```

or when installing on an old Ultrix disk, you may get a message like:

```
rzX: WARNING: using ULTRIX partition information
```

when issuing the "disklabel -W /dev/rrzXc" command. This can safely be ignored.

Most other NetBSD ports are similar, but use rsdXc instead of rrzXc.

On NetBSD/i386, the 'raw disk partition' is the 'd' parttion, so do:

```
disklabel -W /dev/rsdXd
gunzip -c diskimage.gz | dd of=/dev/rsdXd bs=10240
```

On NetBSD, be sure to use **disklabel -W** to enable writing to the label area of the disk. If you forget this and/or use the 'block' device, the dd command may silently fail.

On Ultrix systems, do:

```
gunzip -c diskimage.gz | dd of=/dev/rrzXc bs=10240
```

A copy of the gunzip program is located in

```
pmax/installation/misc/gunzip.ultrix
```

if you do not already have it.

On MS-DOS, use an unzip utlility, then use rawrite.

Then boot using:

```
>> boot -f rz(0,X,0)netbsd
>> boot 5/rzX/netbsd
```

or

```
>> boot 3/rzX/netbsd
```

where X is your boot disk SCSI ID, and continue to the **Once you've booted the diskimage** section.

Install via netboot install kernel

Booting NetBSD/pmax 1.4.1 install kernel over a network requires a BOOTP or DHCP server and a TFTP server. (These are usually all run on the same machine.) There are two basic stages to the boot:

- The pmax PROM software sends a BOOTP request to get its own address, the address of the TFTP server and the file to download.
- It downloads the file name obtained from BOOTP, which is the install kernel, via TFTP and then executes it.

You will need to set up servers for BOOTP and TFTP.

For the BOOTP server you need to specify the:

- hardware type (Ethernet)
- hardware address (Ethernet MAC address)
- IP address of the client
- subnet mask of the client
- address of the TFTP server
- name of the kernel loaded via TFTP

Here's an example for a Unix system running bootpd:

```
myhost.mydom.com:\
        :ht=ethernet:ha=08002b123456:\
        :ip=192.168.1.2:sm=255.255.255.0:\
        :sa=192.168.1.1:bf=install:\
        :rp=/usr/export/pmax:
```

And here's an example for a Unix system running the ISC dhcpd:

```
host pmax {
        hardware ethernet 08:0:2b:12:34:56;
        fixed-address 192.168.1.2;
        option host-name "myhost.mydom.com";
        filename "install";
        option domain-name-servers 192.168.1.1;
```

```
        option broadcast-address 255.255.255.0;
        option domain-name "my.domain";
        option root-path "/usr/export/pmax";
}
```

For the TFTP server, You will need to copy the **install** kernel to the directory used by the TFTP server. This file must be gunziped.

Then boot using:

```
>> boot -f tftp()
>> boot 6/tftp
```

or

```
>> boot 3/tftp
```

and continue to the **Once you've booted the diskimage** section.

Install via diskless boot

The file

`pmax/installation/netboot/diskimage.tar.gz`

contains a suitable set of files for installing on an NFS server to set up a diskless root filesytem. (It is a tar copy of the contents of an installation ramdisk filesystem contained in the install kernel.) You will need to find an NFS server, unpack the tarfile, and setup BOOTP/dhcp service for your pmax. Instructions for setting up an NFS server and diskless booting are on the NetBSD/pmax netboot webpage at

http://www.netbsd.org/Ports/pmax/netboot.html

Since the system install utility, sysinst, requires a read/write root, installing via diskless boot is only feasible if your NFS server exports the diskless root read-write. If this is not possible, you should install via other of the other installation procedures.

Once you have booted the kernel, continue to the **Once you've booted the diskimage** section.

Once you've booted the diskimage

Once you'e booted the installation kernel you will need to select your terminal type. Use **pmax** for a frame-buffer console, **vt100** for a serial console with a vt100-compatible terminal, or **xterm** or **xterms** for a `tip`(1) or `cu`(1) connection running in an `xterm`(1).

The system will then start the **sysinst** program.

Running the Sysinst Installation Program

1. *Introduction*

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

2. *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 hit Control-C at any time, but if you do, you'll have to begin the installation process again from scratch.

3. *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 section 3. 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).
     - A CD-ROM drive (SCSI or ATAPI), a harddisk and a minimum of 8Mb of memory installed.
     - The harddisk should have at least 200 + *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 60Mb more.
   - The Quick Installation
     - Boot the system as desribed in the previous section. You should be at the **`sysinst`** main menu.
     - If you wish, you can configure some network settings immediately by choosing the **utilities** 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. You should log in as `root`, and set a password for that account. You are also advised to edit the file `/etc/rc.conf` to match your system needs.
     - Your installation is now complete.
     - For configuring the X window system, if installed, see the files in
       `/usr/X11R6/lib/X11/doc`.
       Further information can be found on **http://www.xfree86.org/**

4. *Booting* NetBSD

   Boot the system as desribed in the previous section.

   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.

5. *Network configuration*

   If you will not use network operation during the installation, but you do want your machine to be configured for networking once it is installed, you should first go to the utilities menu, and select **`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 Domain Name Service (DNS), you can give an empty response in reply to answers relating to this.

6. *Installation drive selection and parameters*

   To start the installation, select the menu option to install NetBSD 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. Depending on how many disks are found, you may get a different message. You should see disk names like `rz0` or `rz1`

7. *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, it will be checked if there are already other systems present on the disk, and you will be asked to confirm whether you want to overwrite these.

     If you want to use the entire disk for NetBSD, you can skip the following section and go to *Editing the* NetBSD *disklabel*.

   - *Editing the* NetBSD *disklabel*.

     The partition table of the NetBSD part of a disk is called a *disklabel*. There are 3 layouts for the NetBSD part of the disk that you can pick from: **`Standard, Standard with X`** and **`Custom`**. The first two use a set of default values (that you can change) suitable for a normal installation, possibly including X. The last option lets you specify everything yourself.

     You will be presented with the current layout of the NetBSD disklabel, and given a 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. Partition **a** is always the root partition, **b** is the swap partition, and **c** is the whole disk. Partitions **e-h** are available for other use. Traditionally, **d** is the partition mounted on the `/usr` directory, but this is historical practice, not a fixed value.

     You will then be asked to name your disk's disklabel. The default response is **mydisk**. For most purposes this 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.

8. *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, 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. 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.

9. *Getting the distribution sets.*

   The NetBSD distribution consists of a number of *sets*, that come in the form of gzipped tarfiles. A few sets must be installed for a working system, others are optional. At this point of the installation, 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 section 9

10. *Installation using ftp*

    To be able to install using ftp, you first need to configure your network setup, if you haven't already at the start of the install procedure. **sysinst** will do this for you, asking you to provide some data, like IP number, hostname, etc. If you do not have name service set up for the machine that you are installing on, you can just press return in answer to these questions, 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, and the account name and password used to log into that host using ftp. If you did not set up DNS when answering the questions to configure networking, you will need to specify an IP number 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.

11. *Installation using NFS*

    To be able to install using NFS, you first need to configure your network setup, if you haven't already at the start of the install procedure. **sysinst** will do this for you, asking you to provide some data, like IP number, hostname, etc. If you do not have name service set up for the machine that you are installing on, you can just press return in answer to these questions, 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 when answering the questions to configure networking, you will need to specify an IP number instead of a hostname for the NFS server.

12. *Installation from CD-ROM*

    When installing from a CD-ROM, you will be asked to specify the device name for your CD-ROM player (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.

13. *Installation from an unmounted filesystem*

    In order to install from a local filesystem, you will need to specify the device that the filesystem resides on (for example `rz1e`) the type of the filesystem, and the directory on the specified filesystem where the sets are located. **sysinst** will then check if it can indeed access the sets at that location.

14. *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 filesystem that is already accessible. **sysinst** will ask you for the name of this directory.

15. *Extracting the distribution sets*

    After the install sets containing the NetBSD distribution have been made available, you can either extract all the sets (a full installation), or only extract sets that you have selected. In the latter case you will be shown the currently selected sets, and given the opportunity to select the sets you want. Some sets always need to be installed (**kern, base** and **etc**) they will not be shown in this selection menu.

Before extraction begins, you can elect to watch the files being extracted; the name of each file that is extracted will be shown. This can slow down the installation process considerably, especially on machines with slow graphics consoles or serial consoles.

After all the files have been extracted, all the necessary 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.

16. *Finalizing your installation.*

    Congratulations, you have successfully installed NetBSD 1.4.1. You can now reboot the machine, and boot from harddisk.

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 the correct terminal type as discussed in the **Once you've booted the diskimage** section. 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=termtype
   ```

   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_le0="inet 123.45.67.89 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.

   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.

   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

The upgrade to NetBSD 1.4.1 is a binary upgrade; it can be quite difficult to advance to a later version by recompiling from source due primarily to interdependencies in the various components.

To do the upgrade, you must install new bootblocks and boot off the **`install`** kernel as described in the **Installing from an existing system** section. You must also have at least the **`base`** and **`kern`** binary distribution sets available, so that you can upgrade with them, using one of the upgrade methods described above. Finally, you must have sufficient disk space available to install the new binaries. Since the old binaries are being overwritten in place, you only need space for the new binaries, which weren't previously on the system. 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 boot blocks on your NetBSD partition, the kernel, 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 your disk, whether on the NetBSD partition or on another operating system's partition, before beginning the upgrade process.

The upgrade procedure using the **sysinst** tool is similar to an installation, but without the hard disk partitioning. Another difference is that existing configuration files in `/etc` are backed up and merged with the new files. Getting the binary sets is done in the same manner as the installation procedure; refer to the installation part of the document for how to do this. Also, some sanity checks are done, i.e. filesystems are checked before unpacking the sets.

After a new kernel has been copied to your hard disk, your machine is a complete NetBSD 1.4.1 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
```

You must also deal with certain changes in the formats of some of the configuration files. The most notable change is that the options given to many of the file systems in `/etc/fstab` have changed, and some of the file systems have changed names. To find out what the new options are, it's suggested that you read the manual page for the file systems' mount commands, for example `mount_nfs`(8) for NFS.

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.

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 1.4.1

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.)

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