NAME

INSTALL – Installation procedure for NetBSD/i386

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 1.4.1 on the *i386* 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.

As is usual between releases, the i386 port has had many improvements made to it -- too many to detail all of them here.

Numerous new drivers have been added. See the supported hardware list for details.

Some (but not all!) notable i386-specific improvements include:

- New i386 boot blocks now support INT13 extensions. This means that on modern BIOSes, it is possible to boot a NetBSD partition that is past the old 1024 cylinder boundary. The new boot blocks also support a mechanism to pass BIOS geometry information to the kernel, permitting improved automation during installs.

- The i386 port also now uses libkvm -- libkvm.old has finally been purged.

NetBSD 1.4 on i386 is, as usual, also fully backward compatible with old NetBSD i386 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 i386 will be switching executable formats from a.out to ELF in the next release. The support for this has already been completed, but was judged too new to be included in NetBSD 1.4.

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/i386 Subdirectory Structure

The i386-specific portion of the NetBSD 1.4.1 release is found in the `i386` subdirectory of the distribution:

`.../NetBSD-1.4.1/i386/`
`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/` i386 binary distribution sets; see below.
  `security/` i386 security distribution; see below.
`installation/`
  `floppy/` i386 boot and installation floppies; see below.
  `misc/` Miscellaneous i386 installation utilities; see installation section, below.

Binary Distribution Sets

The NetBSD i386 binary distribution sets contain the binaries which comprise the NetBSD 1.4.1 release for the i386. There are eight binary distribution sets and the *security* distribution set. The binary distribution sets can be found in the `i386/binary/sets` subdirectory of the NetBSD 1.4.1 distribution tree, and are as follows:

base The NetBSD 1.4.1 i386 **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.
11.2M gzipped, 28.2M 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.
8.7M gzipped, 28.2M 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, 340K uncompressed

games This set includes the games and their manual pages.
2.8M gzipped, 6.9M uncompressed

kern This set contains a NetBSD/i386 1.4.1 GENERIC kernel, named `/netbsd`. You *must* install this distribution set.
1.5M gzipped, 3M 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, 16.2M uncompressed

misc This set includes the (rather large) system dictionaries, the typesettable document set, and other files from `/usr/share`.
2.1M gzipped, 8.1M uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
1.3M gzipped, 4.4M uncompressed

The i386 security distribution set is named **secr** and can be found in the
`i386/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.
798K gzipped, 2.4M uncompressed

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.
2.6M gzipped, 7.8M uncompressed

xcomp The extra libraries and include files needed to compile X source code.
1.7M gzipped, 7M uncompressed

xcontrib Programs that were contributed to X.
184k gzipped, 600k uncompressed

xfont Fonts needed by X.
5.9M gzipped, 7.1M uncompressed

xserver All XFree86 X servers. Because all of them are included, this set is large. However, you will only need one of the servers provided in this set. (Typically, XF86_SVGA.)
15.9M gzipped, 37.7M uncompressed

The i386 binary distribution sets are distributed as gzipped tar files named with the extension **.tgz**, e.g. `base.tgz`. They are also available in split form – catted together, the members of a split set form a gzipped tar file.

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 i386 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/i386 System Requirements and Supported Devices

NetBSD 1.4.1 runs on ISA (AT-Bus), EISA, PCI, and VL-bus systems with 386-family processors, with or without math coprocessors. It does NOT support MCA systems, such as some IBM PS/2 systems. The minimal configuration is said to require 4M 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. (4M 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:

```
Floppy controllers.
MFM, ESDI, IDE, and RLL hard disk controllers.
        There is complete support (including IDE DMA or Ultra-
        DMA) for the following PCI controllers:
         -  Acer labs M5229 IDE Controller
         -  CMD Tech PCI0643 and PCI0646 IDE Controllers
         -  Contaq Microsystems/Cypress CY82C693 IDE Controller
         -  Intel PIIX, PIIX3 and PIIX4 IDE Controllers
         -  Silicon Integrated System 5597/5598 IDE controller
         -  VIA Technologies VT82C586 and VT82C586A IDE Controllers
         Most of these controllers are only available in
        multifunction PCI chips.
        Other PCI IDE controllers are supported, but
        performances may not be optimal.
        ISA, ISA plug and play and PCMCIA IDE controllers
        are supported as well.
SCSI host adapters
        Adaptec AHA-154xA, -B, -C, and -CF
        Adaptec AHA-174x
        Adaptec AIC-6260 and AIC-6360 based boards, including
                the Adaptec AHA-152x, Adaptec APA-1460 (PCMCIA),
                and the SoundBlaster SCSI host adapter.  (Note
                that you cannot boot from these boards if they
                do not have a boot ROM; only the AHA-152x and
                motherboards using this chip are likely to be
                bootable, consequently.)
        Adaptec AHA-2x4x[U][W] cards and some onboard PCI designs
                using the AIC-7770, AIC-7850, AIC-7860, AIC-7870, or
                AIC-7880 chip.
        Adaptec AHA-3940[U][W] cards [b]
        AdvanSys ABP-9x0[U][A] cards
        AdvanSys ABP-940UW[68], ABP-970UW[68] ASB3940UW-00 cards
        AMD PCscsi-PCI (Am53c974) based SCSI adapters, including
                Tekram DC-390
        BusLogic 54x (Adaptec AHA-154x clones)
        BusLogic 445, 74x, 9xx  (But not the new "FlashPoint" series
                of BusLogic SCSI adapters)
        Qlogic ISP [12]0x0 SCSI/FibreChannel boards
        Seagate/Future Domain ISA SCSI adapter cards, including
                ST01/02
                Future Domain TMC-885
                Future Domain TMC-950
        Symbios Logic (NCR) 53C8xx-based PCI SCSI host adapters:
                Acculogic PCIpport
                ASUS SC-200 (requires NCR BIOS on motherboard to
                              boot from disks)
                ASUS SC-875
                ASUS SP3[G] motherboard onboard SCSI
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                        DEC Celebris XL/590 onboard SCSI
                        Diamond FirePort 40
                        Lomas Data SCSI adapters
                        NCR/SYM 8125 (and its many clones; be careful, some
                                       of these cards have a jumper to set
                                       the PCI interrupt; leave it on INT A!)
                        Promise DC540 (a particularly common OEM model of
                                       the SYM 8125)
                        Tekram DC-390U/F
                        Tyan Yorktown
                Symbios Logic (NCR) 5380/53C400-based ISA SCSI host adapters [*] [+]
                Ultrastor 14f, 34f, and (possibly) 24f
                Western Digital WD7000 SCSI and TMC-7000 host adapters
                        (ISA cards only)
        MDA, CGA, VGA, SVGA, and HGC Display Adapters.  (Note that not
                all of the display adapters NetBSD/i386 can work with
                are supported by X.  See the XFree86 FAQ for more
                information.)
        Serial ports:
                8250/16450-based ports
                16550/16650/16750-based ports
                AST-style 4-port serial cards [*]
                BOCA 8-port serial cards [*]
                IBM PC-RT 4-port serial cards [*]
                Single-port Hayes ESP serial cards [*]
                Cyclades Cyclom-Y serial cards [*] [+]
                PCI universal communication cards
        Parallel ports. [*] [+]
        Ethernet adapters:
                AMD LANCE and PCnet-based ISA Ethernet adapters [*], including:
                        Novell NE1500T
                        Novell NE2100
                        Kingston 21xx
                        Digital EtherWORKS II ISA adapters (DE200/DE201/DE202)
                AMD PCnet-based PCI Ethernet adapters, including:
                        Addtron AE-350
                        BOCALANcard/PCI
                        SVEC FD0455
                        X/Lan Add-On Adapter
                        IBM #13H9237 PCI Ethernet Adapter
                AT&T StarLAN 10, EN100, and StarLAN Fiber
                3COM 3c501
                3COM 3c503
                3COM 3c505 [*]
                3COM 3c507
                3COM 3c509, 3c579, 3c589, and 3c59X
                3COM 3c90X (including 3c905B)
                Digital DC21x4x-based PCI Ethernet adapters, including:
                        ASUS PCI-DEC100TX+
                        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)
                        DLINK DFE500-TX
                        JCIS Condor JC1260
                        Linksys PCI Fast Ethernet
                        SMC EtherPower 10, 10/100 (PCI only!)
                        SMC EtherPower^2 [b]
                        SVEC PN0455
                        SVEC FD1000-TP
                        Znyx ZX34X
                Digital EtherWORKS III ISA adapters (DE203/DE204/DE205) [*]
                Digital DEPCM-BA (PCMCIA) and DE305 (ISA) NE2000-compat. cards
                BICC Isolan [* and not recently tested]
                Efficient Networks EN-155 and Adaptec AIC-590x ATM interfaces
                Essential Communications Hippi (800Mbit/s)
                Fujitsu MB86960A/MB86965A based cards:
                        Fujitsu FMV-180 series
                        Allied-Telesis AT1700 series
                        Allied-Telesis RE2000 series
                Intel EtherExpress 16
                Intel EtherExpress PRO/10
                Intel EtherExpress 100 Fast Ethernet adapters
                Novell NE1000, NE2000 (ISA, PCI, PCMCIA, ISA PnP)
                SMC/WD 8003, 8013, and the SMC "Elite16" ISA boards
                SMC/WD 8216 (the SMC "Elite16 Ultra" ISA boards)
                SMC 91C9x-based boards (ISA and PCMCIA)
                SMC EPIC/100 Fast Ethernet boards:
                        SMC Etherpower-II
                Texas Instruments ThunderLAN based ethernet boards:
                        Compaq Netelligent 10/100 TX
                        Compaq ProLiant Integrated Netelligent 10/100 TX
                        Compaq Netelligent 10 T (untested)
                        Compaq Integrated NetFlex 3/P
                        Compaq NetFlex 3/P in baseboard variant (the PCI
                                (variant doesn’t use the same chip !).
                        Compaq Dual Port Netelligent 10/100 TX (untested)
                        Compaq Deskpro 4000 5233MMX (untested)
                        Texas Instruments TravelMate 5000 series laptop
                                docking station Ethernet board
                VIA VT3043(Rhine) and VT86C100A(Rhine-II) based ethernet boards [*] [+
                        D-Link DFE530TX
        FDDI adapters:
                Digital DEFPA PCI FDDI adapters [*] [+]
                Digital DEFEA EISA FDDI adapters [*] [+]
        Token-Ring adapters:
                IBM Token-Ring Network PC Adapter [+]
                IBM Token-Ring Network PC Adapter II [+]
                IBM Token-Ring Network Adapter/A [+]
                IBM Token-Ring Network 16/4 Adapter [+]
                IBM Token-Ring Network 16/4 Adapter/A [+]
```

```
        IBM 16/4 ISA Adapter [+]
        IBM Auto 16/4 Token-Ring ISA Adapter [+]
        3COM 3C619 TokenLink [+]
        3COM 3C319 TokenLink Velocity [+]
High Speed Serial:
        LAN Media Corporation SSI/LMC10000 (up to 10Mbps) [*] [+]
        LAN Media Corporation HSSI/LMC5200 [*] [+]
        LAN Media Corporation DS3/LMC5245 [*] [+]
Tape drives:
        Most SCSI tape drives
        QIC-02 and QIC-36 format (Archive- and Wangtek-
                compatible) tape drives [*] [+]
CD-ROM drives:
        Non-IDE Mitsumi CD-ROM drives [*] [+]
                [Note: The Mitsumi driver device probe is known
                to cause trouble with several devices!]
        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:
        "Logitech"-style bus mice [*] [+]
        "Microsoft"-style bus mice [*] [+]
        "PS/2"-style mice [*] [+]
        Serial mice (no kernel support necessary)
Sound Cards:
        SoundBlaster, SoundBlaster Pro, SoundBlaster 16 [*] [+]
        Gravis Ultrasound and Ultrasound Max [*] [+]
        Windows Sound System [*] [+]
                [The following drivers are not extensively tested]
        Personal Sound System [*] [+]
        ProAudio Spectrum [*] [+]
        Gravis Ultrasound Plug&Play [*] [+]
        Ensoniq AudioPCI [*] [+]
        Yamaha OPL3-SA3 [*] [+]
        Aria based sound cards [*] [+]
        S3 SonicVibes [*] [+]
        ESS Technology ES1777/1868/1869/1887/1888/888 audio [*] [+]
Game Ports (Joysticks). [*] [+]
Miscellaneous:
        Advanced power management (APM) [*]
Universal Serial Bus:
        UHCI host controllers [*] [+]
        OHCI host controllers [*] [+]
        Hubs [*] [+]
        Keyboards using the boot protocol [*] [+]
        Mice [*] [+]
        Printers [*] [+]
        Generic support for HID devices [*] [+]
```

Drivers for hardware marked with "[∗]" are NOT present in kernels on the distribution floppies. Except as noted above, all drivers are present on all disks. Also, at the present time, the distributed kernels support only one SCSI host adapter per machine. NetBSD normally allows more, though, so if you have more than one, you can use all of them by compiling a custom kernel once NetBSD is installed.

Support for devices marked with "[+]" IS included in the "generic" kernels, although it is not in the kernels which are on the distribution floppies.

Support for devices marked with "[b]" requires BIOS support for PCI-PCI bridging on your motherboard. Most reasonably modern Pentium motherboards have this support, or can acquire it via a BIOS upgrade.

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

- Multiprocessor systems. (NetBSD will run, but only use one processor.)
- Adaptec AIC-7890 SCSI host adapters.
- PCI WD-7000 SCSI host adapters.
- QIC-40 and QIC-80 tape drives. (Drives that connect to the floppy disk controller.)

We are planning future support for many of these devices.

To be detected by the distributed kernels, the devices must be configured as follows:

```
Device          Name    Port    IRQ     DRQ     Misc
------          ----    ----    ---     ---     ----
Serial ports    com0    0x3f8   4               [8250/16450/16550/clones]
                com1    0x2f8   3               [8250/16450/16550/clones]
                com2    0x3e8   5               [8250/16450/16550/clones]

Parallel ports  lpt0    0x378   7               [interrupt-driven or polling]
                lpt1    0x278                   [polling only]
                lpt2    0x3bc                   [polling only]

Floppy controller
                fdc0    0x3f0   6       2       [supports two disks]

AHA-154x, AHA-174x (in compatibility mode), or BT-54x SCSI host adapters
                aha0    0x330   any     any
                aha1    0x334   any     any

AHA-174x SCSI host adapters (in enhanced mode)
                ahb0    any     any     any

AHA-152x, AIC-6260- or AIC-6360-based SCSI host adapters
                aic0    0x340   11      6

AHA-2X4X or AIC-7XXX-based SCSI host adapters       [precise list: see NetBSD
                ahc0    any     any     any      System Requirements and
                                                 Supported Devices]

AdvanSys ABP-9x0[U][A] SCSI host adapters
                adv0    any     any     any

AdvanSys ABP-940UW[68], ABP-970UW[68], ASB3940UW-00 SCSI host adapters
                adw0    any     any     any
```

```
AMD PCscsi-PCI based SCSI host adapters
               pcscp0  any     any     any

BusLogic BT445, BT74x, or BT9xx SCSI host adapters
               bha0    0x330   any     any
               bha1    0x334   any     any

Symbios Logic/NCR 5380/53C400 based ISA SCSI host adapters
               nca0    0x360   15
               nca1            5               iomem 0xd8000

Symbios Logic/NCR 53C8xx based PCI SCSI host adapters
               ncr0    any     any     any

Ultrastor 14f, 24f (if it works), or 34f SCSI host adapters
               uha0    0x330   any     any
               uha1    0x340   any     any

Western Digital WD7000 based ISA SCSI host adapters
               wds0    0x350   15      6
               wds1    0x358   11      5

PCI IDE hard disk controllers
               pciide0 any     any     any     [supports four devices]
MFM/ESDI/IDE/RLL hard disk controllers
               wdc0    0x1f0   14              [supports two devices]
               wdc1    0x170   15              [supports two devices]

ATA disks      wd0, wd1, ...
SCSI and ATAPI disks sd0, sd1, ...
SCSI tapes     st0, st1, ...
SCSI and ATAPI CD-ROMs cd0, cd1, ...
       For each SCSI and IDE controller found, the SCSI or ATA(PI) devices
       present on the bus are probed in increasing id order for SCSI and
       master/slave order for ATA(PI). So the first SCSI drive found will
       be called sd0, the second sd1, and so on ...

3Com 3c501 Ethernet cards
               el0     0x300   9

3Com 3c503 Ethernet cards
               ec0     0x250   9               iomem 0xd8000

3Com 3c505 Ethernet cards
               eg0     0x280   9

3Com 3c507 Ethernet cards
               ef0     0x360   7               iomem 0xd0000

Novell NE1000, or NE2000 Ethernet boards
               ne0     0x280   9
```

```
                ne1     0x300   10

     SMC/WD 8003, 8013, Elite16, and Elite16 Ultra Ethernet boards
                we0     0x280   9              iomem 0xd0000
                we1     0x300   10             iomem 0xcc000

     3COM 3c509 or 3COM 3c579 Ethernet boards
                ep0     any     any

     3COM 3x59X PCI Ethernet boards
                ep0     any     any     [you must assign an interrupt in your
                                         PCI BIOS, or let it do so for you]

     3COM 3x90X PCI Ethernet boards
                ex0     any     any     [you must assign an interrupt in your
                                         PCI BIOS, or let it do so for you]

     AT&T StarLAN 10, EN100, or StarLAN Fiber, 3COM 3c507 or Intel
     EtherExpress 16 Ethernet boards
                ie0     0x360   7              iomem 0xd0000
                ie1     0x300   10             iomem 0xd0000

     Intel EtherExpress PRO 10 ISA
                iy0             0x360   any

     Intel EtherExpress 100 Fast Ethernet adapters
                fxp0    any     any     [you must assign an interrupt in your
                                         PCI BIOS, or let it do so for you]

     SMC91C9x based Ethernet cards
                sm0     0x300   10

     PCnet-PCI based Ethernet boards; see above for partial list
                le0     any     any     [you must assign an interrupt in your
                                         PCI BIOS, or let it do so for you]

     DC21x4x based Ethernet boards; see above for partial list
                de0     any     any     [you must assign an interrupt in your
                                         PCI BIOS, or let it do so for you]

     Digital EtherWORKS III (DE203/DE204/DE205)
                lc0     any     any

     Qlogic ISP [12]0x0 SCSI/FibreChannel boards
                isp0    any     any

     Efficient Networks EN-155 and Adaptec AIC-590x ATM interfaces
                en0     any     any

     SMC EPIC/100 Fast Ethernet boards:
                epic0   any     any
```

```
Texas Instruments ThunderLAN based ethernet boards:
               tl0     any     any

VIA VT3043(Rhine) and VT86C100A(Rhine-II) based ethernet boards
               vr0     any     any
```

Getting the NetBSD System on to Useful Media

Installation is supported from several media types, including:

- FTP
- Remote NFS partition
- DOS floppies

No matter which installation medium you choose, you'll need to have a floppy disk (either 1.2M or 1.44M will work). You'll put the boot floppy image ("boot1.fs" and "boot2.fs" for 1.44M floppies, "boot-tiny.fs" for 1.2M floppies) onto this disk, which contains software to install or upgrade your NetBSD system. Note that the "boot-tiny.fs" image is tailored for "small" machines, this install image does not have drivers for PCI, PCMCIA, EISA or SCSI (i.e. ISA-only), but can be used on machines with only 4MB of RAM.

If you are using a UN*X-like system to write the floppy images to disks, you should use the `dd` command to copy the file system image(s) (.fs file) directly to the raw floppy disk. It is suggested that you read the `dd`(1) manual page or ask your system administrator to determine the correct set of arguments to use; it will be slightly different from system to system, and a comprehensive list of the possibilities is beyond the scope of this document.

If you are using DOS to write the floppy image(s) to floppy disk, you should use the `rawrite` utility, provided in the `i386/utilities` directory of the NetBSD distribution. It will write a file system image (.fs file) to a floppy disk.

Note that, when installing or upgrading, the floppy can be write-protected if you wish. These systems mount ramdisks as their root file systems once booted, and will not need to write to the floppy itself at any time -- indeed, once booted, the floppy may be removed from the disk drive.

Obviously, the steps necessary to prepare 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 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 one fifth that number of 1.2M floppies, or one sixth that number of 1.44M floppies. You should only use one size of floppy for the install or upgrade procedure; you can't use some 1.2M floppies and some 1.44M floppies.

- Format all of the floppies with DOS. *Do not* make any of them bootable DOS floppies, i.e. don't use `format/s` to format them. (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 as many distribution set parts per disk.) 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, five per disk if you're using 1.2M disks, six per disk if you're using 1.44M disks. How you do this is up to you; there are many possibilities. You could, for instance, use a DOS terminal program to download them on to the floppies, or use a UN*X-like system capable of reading and writing DOS file systems (either with "mtools" or a real DOS file system) to place them on the disk.

Once you have the files on DOS disks, you can start the actual installation or upgrade process.

To install or upgrade NetBSD using NFS, you must do the following:

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

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

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

- 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. 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 or upgrade.

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** and **kern** binary distribution, and so must put the **base** and **kern** sets somewhere in your file system. If you wish, you can do the other sets, as well, but you should NOT upgrade the **etc** distribution; it contains systems 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. Mistakes in partitioning your hard disk may lead to data loss.

Before you begin, you should be aware of the geometry issues that may arise in relation to your hard disk. First of all, you should know about sector size. You can count on this to be 512 bytes; other sizes are rare (and currently not supported). Of particular interest are the number of sectors per track, the number of tracks per cylinder (also known as the number of heads), and the number of cylinders. Together they describe the disk geometry.

The BIOS has a limit of 1024 cylinders and 63 sectors per track for doing BIOS I/O. This is because of the old programming interface to the BIOS that restricts these values. Most of the big disks currently being used have more than 1024 real cylinders. Some have more than 63 sectors per track. Therefore, the BIOS can be instructed to use a fake geometry that accesses most of the disk and the fake geometry has less than or equal to 1024 cylinders and less than or equal to 63 sectors. This is possible because the disks can be addressed in a way that is not restricted to these values, and the BIOS can internally perform a translation. This can be activated in most modern BIOSes by using *Large* or *LBA* mode for the disk.

NetBSD does not have the mentioned limitations with regard to the geometry. However, since the BIOS has to be used during startup, it is important to know about the geometry the BIOS uses. The NetBSD kernel should be on a part of the disk where it can be loaded using the BIOS, within the limitations of the BIOS geometry. The install program will check this for you, and will give you a chance to correct this if this is not the case.

If you have not yet installed any other systems on the hard disk that you plan to install NetBSD on, or if you plan to use the disk entirely for NetBSD, you may wish to check your BIOS settings for the 'Large' or 'LBA' modes, and activate them for the hard disk in question. While they are not needed by NetBSD as such, doing so will remove the limitations mentioned above, and will avoid hassle should you wish to share the disk with other systems. Do *not* change these settings if you already have data on the disk that you want to preserve!

In any case, it is wise to check your the BIOS settings for the hard disk geometry before beginning the installation, and write them down. While this should usually not be needed, it enables you to verify that the install program determines these values correctly.

The geometry that the BIOS uses will be referred to as the *BIOS geometry*, the geometry that NetBSD uses is the *real geometry*.

`Sysinst` will try to discover both the real geometry and BIOS geometry.

It is *important* that `sysinst` know the proper BIOS geometry to be able to get NetBSD to boot, regardless of where on your disk you put it. It is less of a concern if the disk is going to be used entirely for NetBSD. If you intend to have several OSes on your disk, this becomes a much larger issue.

Installing the NetBSD System

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. *Possible* PCMCIA *issues*

   There is a serious bug that may make installation of NetBSD on PCMCIA machines difficult. This bug does not make *use* of PCMCIA difficult once a machine is installed. If you do not have PCMCIA on your machine [PCMCIA] is only really used on laptop machines), you can skip this section, and ignore the "[PCMCIA]" notes.

   This will explains how to work around the installation problem.

   What is the bug: The kernel keeps careful track of what interrupts and i/o ports are in use during autoconfiguration. It then allows the PCMCIA devices to pick unused interrupts and ports. Unfortunately, not all devices are included in the `INSTALL` kernels in order to save space. Let's say your laptop has a soundblaster device built in. The `INSTALL` kernel has no sound support. The PCMCIA code might allocate your soundblaster's IRQ and I/O ports to PCMCIA devices, causing them not to work. This is especially bad if one of the devices in question is your ethernet card.

This problem will impact some, but not all, users of PCMCIA. If this bug is affecting you, watch the [PCMCIA] notes that will appear in this document.

If the kernel by default allocates an interrupt for PCMCIA which is allocated to other (typically undetected) hardware, you may use a workaround by booting the install kernel with "boot -d" to drop into DDB (the in-kernel debugger) and set pcic_isa_intr_alloc_mask to mask out the offending interrupt before continuing. By default the kernel masks out IRQ 10, and the corresponding mask is 0xfbff.

3. *General*

   The following is a walk-through of the steps you will take while getting NetBSD installed on your hard disk. **sysinst** is a menu driven installation system that allows for some freedom in doing the installation. Sometimes, questions will be asked and in many cases the default answer will be displayed in brackets ("[ ]") after the question. If you wish to stop the installation, you may hit Control-C at any time, but if you do, you'll have to begin the installation process again from scratch.

4. *Quick install*

   First, let's describe a quick install. The other sections of this document go into the installation procedure in more detail, but you may find that you do not need this. If you want detailed instructions, skip to 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).
     - Two 1.44M 3.5" floppy disks.
     - A PC with a 386 or newer processor. A CD-ROM drive (SCSI or ATAPI), a harddisk and a minimum of 4Mb of memory installed.
     - The harddisk should have at least 70 + *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.
   - Creating the boot floppies. You can create the floppies needed for installation under DOS or Windows. Supposing your 1.44M floppy drive is drive A:, and your CD is drive E: do the following from an MS-DOS command prompt:
     ```
     e:
     cd \NetBSD-1.4.1\installation\misc
     rawrite
     ```
     When asked for a source filename, answer
     ```
     ..\floppy\boot1.fs for the first diskette and
     ..\floppy\boot2.fs for the second diskette
     ```
     When asked for a destination drive answer
     ```
     a
     ```
   - To create a bootfloppy under NetBSD or other UNIX-like system, you would type something like:
     ```
     dd if=.../boot1.fs bs=18k of=/dev/rfd0a
     ```
   - The Quick Installation
     - Insert the first boot floppy you just created. Restart the computer. When prompted, insert the second boot floppy. The main menu will be displayed.

- 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/**

5. *Booting* NetBSD

   [PCMCIA] Unplug your PCMCIA devices, so that they won't be found by NetBSD.

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

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

   If that doesn't work, try booting after disabling your CPU's internal and external caches (if any). If it still doesn't work, NetBSD probably can't be run on your hardware. This can probably be considered a bug, so you might want to report it. If you do, please include as many details about your system configuration as you can.

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

   Note that, once the system has finished booting, you need not leave the floppy in the disk drive. Earlier version of the NetBSD install floppies mounted the floppy as the system's root partition, but the new installation floppies use a ramdisk file system and are no longer dependent on the floppy once it has booted.

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

6. *Network configuration*

   [PCMCIA] You can skip this section, as you will only get data from floppy in the first part of the install.

   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.

7. *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 `wd0`, `wd1`, `sd0`, or `sd1`.

   `sysinst` next tries to figure out the real and BIOS geometry of your disk. It will present you with the values it found, if any, and will give you a chance to change them.

   Next, depending on whether you are using a wd*x* or wd*x* disk, you will either be asked for the type of disk (wd*x*) you are using or you will be asked if you want to specify a fake geometry for your SCSI disk (sd*x*). The types of disk are be IDE, ST-506 or ESDI. If you're installing on an ST-506 or ESDI drive, you'll be asked if your disk supports automatic sector forwarding. If you are *sure* that it does, reply affirmatively. Otherwise, the install program will automatically reserve space for bad144 tables.

8. *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 Master Boot Record.

     First, you will be prompted to specify the units of size that you want to express the sizes of the partitions in. You can either pick megabytes, cylinders or sectors.

     After this, you will be presented with the current values stored in the MBR, and will be given the opportunity to change, create or delete partitions. For each partition you can set the type, the start and the size. Setting the type to **`unused`** will delete a partition. You can also mark a partition as active, meaning that this is the one that the BIOS will start from at boot time.

     Be sure to mark the partition you want to boot from as active!

     After you are done editing the MBR, a sanity check will be done, checking for partitions that overlap. Depending on the BIOS capabilities of your machine and the parameters of the NetBSD partition you have specified, you may also be asked if you want to install newer bootcode in your MBR. If you have multiple operating systems on the disk that you are installing on, you will also be given the option to install a bootselector, that will allow you to pick the operating system to start up when your computer is (re-)started.

If everything is ok, you can go on to the next step, 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**. You can also specify a partition as type **msdos**. This is useful if you share the disk with MS-DOS or Windows95; NetBSD is able to access the files on these partitions. You can use the values from the MBR for the MS-DOS part of the disk to specify the partition of type **msdos** (you don't have to do this now, you can always re-edit the disklabel to add this once you have installed NetBSD).

  Some partitions in the disklabel have a fixed purpose. Partition **a** is always the root partition, **b** is the swap partition, **c** is the entire NetBSD part of the disk, and **d** is the whole disk. Partitions **e-h** are available for other use. Traditionally, **e** 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.

9. *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.

   NOTE: In previous versions of NetBSD, the kernel from the install floppy was copied onto the hard drive in a special step. In the new install system, the kernel on the floppy is unsuited to being copied onto the hard drive. Instead, a new set, **kern**, has been added which contains a generic kernel to be unloaded onto the drive. So, you can not boot from your hard drive yet at this point.

10. *Getting the distribution sets.*

    [PCMCIA] Load a kernel tar file (i.e. the kern.tgz set file) on to your hard disk, for example by mounting the hard disk first, copying the kern.tgz file from floppy and unpacking it. Example:

```
mount /dev/wd0a /mnt
cd /mnt
<repeat following 3 steps until all kern.* files are there>
mount -t msdos /dev/fd0a /mnt2
cp /mnt2/kern.* .
umount /mnt2

cat kern.* | tar vxzf -
```

Then halt the machine using the 'halt' command. Power the machine down, and re-insert all the PCMCIA devices. Remove any floppy from the floppy drive. Start the machine up. After booting NetBSD, you will be presented with the main **sysinst** menu. Choose the option to re-install sets. Wait for the filesystem checks that it will do to finish, and then proceed as described below.

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

11. *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.

12. *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.

13. *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.

14. *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 `wd1e`) 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.

15. *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.

16. *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.

17. *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 **`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

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 have the boot floppy available. 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),
- `apropros`(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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In the following statement, "This software" refers to the Mitsumi CD-ROM driver:

This software was developed by Holger Veit and Brian Moore for use with "386BSD" and similar operating systems. "Similar operating systems" includes mainly non-profit oriented systems for research and education, including but not restricted to "NetBSD", "FreeBSD", "Mach" (by CMU).

In the following statement, "This software" refers to the parallel port driver:

This software is a component of "386BSD" developed by William F. Jolitz, TeleMuse.