NAME

INSTALL — Installation procedure for NetBSD/vax.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 4.0 on the *vax* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

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

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on fifty four different system architectures (ports), featuring seventeen machine architectures across fifteen distinct CPU families, and is being ported to more. The NetBSD 4.0 release contains complete binary releases for many different system architectures. (A few ports are not fully supported at this time and are thus not part of the binary distribution. Please see the NetBSD web site at **http://www.NetBSD.org/** for information on them.)

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

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

Changes Between The NetBSD 3.0 and 4.0 Releases

The NetBSD 4.0 release provides numerous significant functional enhancements, including support for many new devices, integration of hundreds of bug fixes, new and updated kernel subsystems, and many user-land enhancements. The result of these improvements is a stable operating system fit for production use that rivals most commercially available systems.

It is impossible to completely summarize more than a year of development that went into the NetBSD 4.0 release. The complete list of changes can be found in the CHANGES:

ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-4.0/CHANGES

and CHANGES-4.0:

ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-4.0/CHANGES-4.0

files in the top level directory of the NetBSD 4.0 release tree. Some highlights include:

Networking

- agr(4): new pseudo-device driver for link level aggregation.
- IPv6 support was extended with an RFC 3542-compliant API and added for gre(4) tunnels and the tun(4) device.
- A NDIS-wrapper was added to use Windows binary drivers on the i386 platform, see ndiscvt(8).
- The IPv4 source-address selection policy can be set from a number of algorithms. See "IPSRCSEL" in options(4) and in_getifa(9).
- Imported wpa_supplicant(8) and wpa_cli(8). Utilities to connect and handle aspects of 802.11 WPA networks.
- Imported hostapd(8). An authenticator for IEEE 802.11 networks.
- carp(4): imported Common Address Redundancy Protocol to allow multiple hosts to share a set of IP addresses for high availability / redundancy, from OpenBSD.
- ALTQ support for the PF packet filter.
- etherip(4): new EtherIP tunneling device. It's able to tunnel Ethernet traffic over IPv4 and IPv6 using the EtherIP protocol specified in RFC 3378.
- ftpd(8) can now run in standalone mode, instead of from inetd(8).
- tftp(1) now has support for multicast TFTP operation in open-loop mode, server is in progress.
- tcp(4): added support for RFC 3465 Appropriate Byte Counting (ABC) and Explicit Congestion Notification as defined in RFC 3168.

File systems

- scan_ffs(8), scan_lfs(8): utilities to find FFSv1/v2 and LFS partitions to recover lost disklabels on disks and image files.
- tmpfs: added a new memory-based file system aimed at replacing mfs. Contrary to mfs, it is not based on a disk file system, so it is more efficient both in overall memory consumption and speed. See mount_tmpfs(8).
- Added UDF support for optical media and block devices, see mount_udf(8). Read-only for now.
- NFS export list handling was changed to be filesystem independent.
- LFS: lots of stability improvements and new cleaner daemon. It is now also possible to use LFS as root filesystem.
- vnd(4): the vnode disk driver can be used on filesystems such as smbfs and tmpfs.
- Support for System V Boot File System was added, see newfs_sysvbfs(8) and mount_sysvbfs(8).

Drivers

- Audio:
  - Support for new models on drivers such as Intel ICH8/6300ESB, NVIDIA nForce 3/4, etc.
  - Added support for AC'97 modems.
  - auich(4): added support to handle the AC'97 modem as audio device, enabled with the kernel option "AUICH_ATTACH_MODEM"

  - azalia(4): added support for S/PDIF.

- Hardware Monitors:
  - amdpm(4): added support for the i2c bus on the AMD-8111 used on many Opteron motherboards and for the Analog Devices ADT7464 hardware monitor chip.
  - adt7467c(4): new driver for Analog Devices ADT7467 and ADM1030 hardware monitor chips.
  - ipmi(4): new driver for motherboards implementing the Intelligent Platform Management Interface 1.5 or 2.0, from OpenBSD.
  - it(4): new driver for iTE 8705F/8712F and SiS 950 hardware monitors.
  - The lm(4) driver was rewritten and support for more chips was added, for example for Winbond W83627HF, W83627THF, W83627DHG and Asus AS99127F.
  - owtemp(4): new driver for the 1-Wire temperature sensors.
  - tmp121temp(4): new driver for the Texas Instruments TMP121 temperature sensor.
  - ug(4): new driver for Abit uGuru hardware monitor found on newer Abit motherboards.
- Miscellaneous:
  - geodewdog(4): new AMD Geode SC1100 Watchdog Timer driver.
  - gscpcib(4): new AMD Geode SC1100 PCI-ISA bridge that provides support for the GPIO interface.
- Networking:
  - ath(4): updated HALs with support for WiSOC (AR531x) and 32bit SPARC.
  - bge(4): added support for the following chips: BCM5753, BCM5753M, BCM5715, BCM5754, BCM5755 and BCM5787. Numerous improvements and bugfixes were made too.
  - kse(4): new driver for Micrel KSZ8842/8841 PCI network cards.
  - msk(4): new driver for Marvell Yukon 2 GigE PCI network cards, from OpenBSD.
  - nfe(4): new driver for NVIDIA nForce Ethernet network cards, from OpenBSD.
  - ral(4): new 802.11 driver for PCI/Cardbus Ralink RT2500, RT2501, RT2600, RT2661 and RT2500 USB chipsets, from OpenBSD.
  - rum(4): new 802.11 driver for USB Ralink RT2501 and RT2601 chipsets, from OpenBSD.
  - sip(4): now works on sparc64.
  - tlp(4): added support for ASIX AX88140A and AX88141.
  - vr(4): added support for the VIA Rhine III.
  - wm(4): added support for i8003, ICH8, ICH9 and others. Support for IPv6 Rx TCP/UDP Checksum Offloading and more.
  - wpi(4): new driver for Intel PRO/Wireless 3945ABG PCI 802.11 network cards, from OpenBSD.
- Security:
  - glxsb(4): new driver for the AMD Geode LX AES Security Block that provides random numbers and AES acceleration, from OpenBSD.

- Power Management:
  - Support for Intel Speedstep SMI on PIIX4 PCI-ISA for i386.
  - Support for AMD PowerNow and Cool'n'Quiet Technology on K7 and K8 CPUs (both in 32 and 64 bit mode), including Athlon Mobile, Athlon64, Opteron or X2. See `options`(4) for more information.
  - Support for more Enhanced Speedstep CPUs, including VIA C7/Eden and Intel Core Solo/Duo/Duo2. See `options`(4) for more information.
  - The Enhanced Speedstep and PowerNow drivers were modified to be able to be scaled in all CPUs available, saving power on SMP systems.
- Storage:
  - `ahcisata`(4): new driver for AHCI 1.0 and 1.1 compliant SATA controllers.
  - `ataraid`(4): added support to handle Adaptec HostRAID and VIA V-Tech software RAID.
  - `ciss`(4): new driver for HP/Compaq 5th+ generation Smart ARRAY controllers, from OpenBSD.
  - `fdc`(4): added support for SBus based sparc64 machines and fixed formatting on sparc.
  - `gcscide`(4): new driver for the AMD Geode CS5535 Companion Device IDE controller.
  - `jmide`(4): new driver for JMicron Technology JMB36x PCIe to SATA II/PATA controllers.
  - `mfi`(4): new driver for LSI Logic and Dell MegaRAID SAS controllers, from OpenBSD.
  - `mpt`(4): added support for newer SAS and similar devices.
  - `njata`(4): new driver for Workbit NinjaATA-32 CardBus IDE controller.
  - `pdcsata`(4): added support for the Promise PDC20775, PDC20771, PDC40518, PDC40718 and some bugfixes.
  - `piixide`(4): added support for some ICH8/ICH8-M/ICH9 IDE and SATA controllers.
  - `svwsata`(4): new driver for Serverworks K2 SATA controllers, from OpenBSD.
  - `viaide`(4) added support for the VIA VT8237A SATA controller and AMD CS5536 Companion Device IDE Controller.
- USB:
  - `ucycom`(4): new driver for Cypress microcontroller based serial devices.
  - `uipaq`(4): new driver for the iPAQ devices.
  - `uslsa`(4): new driver for Silicon Labs CP210x series serial adapters.
  - `utoppy`(4): new driver for the Topfield TF5000PVR range of digital video recorders.

Platforms

- i386:
  - Added support for the for Multiboot specification. This means much improved support for loading the kernel by GRUB, including passing in parameters to the kernel.
  - Added the unichromefb framebuffer driver that supports the VIA Unichrome Graphics adapter.
  - `vesafb`(4): added new framebuffer driver that supports VESA BIOS (VBE) 2.0 extensions and up.

  - Added cd9660 file system support to the BIOS bootloader.

- evbarm: new platform support for Arcom Viper PXA255-based single board, Atmark Techno Armadillo-9 and Armadillo-210, Certance CP-3100, Linksys NSLU2 (a.k.a. "Slug") and I-O DATA HDL-G Giga LANDISK NAS devices.
- evbmips: added support for Alchemy Au1550 processors, DBAu1550 boards, Alchemy Au15XX PCI host, (OMS-AL400/128) and Atheros AR5312 SoC.
- New port ews4800mips: NEC's MIPS based EWS4800 workstations.
- cobalt: added support for booting off raidframe RAID1 mirrors.
- hpcmips: added the `teliosio`(4) driver for the Sharp Telios LCD screen and Battery unit.
- New port landisk: port to the SH4 processor based NAS appliances, supporting models by I-O DATA (USL-5P, HDL-U, HDL-AV, HDL-W and HDLM-U series, SuperTank LAN Tank, UHDL-160U and UHDL-300U) and Plextor PX-EH16L, PX-EH25L and PX-EH40L.
- macppc: this port has gained support to use accelerated wsdisplay drivers by default (if possible), and uses the appropriate driver rather than the Generic Open Firmware Framebuffer.
- prep: this port has been modernized, and support for five additional machines has been added, among them the IBM 7024-E20 and 7025-F30 models and Motorola Powerstack E1. Additionally, sysinst support was added, and the bootloader process was improved, allowing easy installation and upgrade to future releases.
- sparc: added support for booting off raidframe RAID1 mirrors.
- Xen: support for Xen3 domU and dom0 (Unprivileged domain and domain 0), including support for hardware virtualization on CPUs that support it.

Kernel subsystems

- Improved Firewire (IEEE1394) support imported from FreeBSD.
- The `midi`(4) framework got a complete overhaul for better support of Active Sensing and improved handling of tempo and timebase changes.
- Added a Bluetooth protocol stack including:
  - hardware drivers: `ubt`(4) for USB controllers, and `bt3c`(4) for the 3Com Bluetooth PC-Card.
  - socket based access to the HCI, L2CAP, RFCOMM and SCO protocols.
  - pseudo drivers for integrating services on remote Bluetooth devices such as Keyboards, Mice and SCO Audio into the NetBSD device framework.

  See `bluetooth`(4), `bthset`(1) and `btpin`(1).
- Imported the `bio`(4) framework from OpenBSD, to query/control block hardware RAID device controllers. Currently supporting the `mfi`(4) driver.
- Kernel uses stateful read-ahead algorithm.
- `dkctl`(8) can be used to switch buffer queuing strategies on the fly on `wd`(4) disks, see also `bufq`(9).
- `fileassoc`(9) is used by Veriexec, it adds in-kernel and file-system independent file meta-data association interface.
- `firmload`(9): an API for loading firmware images used by various hardware devices.

- `gpio`(4): imported General Purpose I/O framework from OpenBSD.
- `onewire`(4): imported Dallas Semiconductor 1-wire bus framework from OpenBSD.
- The `proplib`(3) protocol was added for sending property lists to/from the kernel using ioctls.
- `spi`(4): new SPI (Serial Peripherial Interface) framework.
- `timecounter`(9) adds a new time-keeping infrastructure along with NTP API 4 nanokernel implementation. Almost all platforms were changed to support this API.
- Start of 32bit-Linux-emulation for amd64 (COMPAT_LINUX32).
- `wscons`(4) console driver supports splash screens, scrolling, progress bar for kernel and boot messages.

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.

Security

- The FAST_IPSEC IPsec implementation was extended to use hardware acceleration for IPv6, in addition to the hardware accelerated IPv4 that was available before. See `fast_ipsec`(4) for more information.
- `mprotect`(2) got restrictions to enforce W^X policies, from PaX. See `options`(4), `sysctl`(3), and `paxctl`(1).
- GCC 4's support for stack smashing protection (SSP) was enabled by adding libssp, see `security`(8).
- The kernel authorization framework `kauth`(9) was added, replacing the traditional BSD credential management and privileged operation access control with an abstract layer, allowing the implementation of various security models either as part of the NetBSD distribution or as third-party LKMs.

  NetBSD's kernel authorization is a hybrid clean-room implementation of a similar interface developed by Apple, extending its capabilities and combining concepts of credential inheritance control.

Userland

- 3rd party software updates:
  - BIND 9.4.1-P1
  - OpenSSL 0.9.8e
  - CVS 1.11.22
  - OpenSSH 4.4
  - gettext 0.14.4
  - PF from OpenBSD 3.7
  - (n)awk 20050424
  - Postfix 2.4.5
  - am-utils 6.1.3
  - file 4.21
  - zlib 1.2.3
  - GNU binutils 2.16.1
  - GNU groff 1.19.2

  - IPFilter 4.1.23
  - GNU gcc 4.1.2 prerelease
  - GNU gdb 6.5 (some architectures)
  - NTP 4.2.4p2
  - pppd 2.4.4
- `cdplay`(1): added digital transfer mode support.
- `cksum`(1) can now verify checksums.
- `csplit`(1): new utility that splits a file into pieces. From FreeBSD/OpenBSD.
- `identd`(1): added support for forwarding ident queries and receiving of proxied ident queries.
- `getent`(1): added support for the ethers database.
- `gkermit`(1): new program for transferring files using the Kermit protocol.
- `mail`(1): added support for Mime and multi-character set handling, command line editing and completion.
- `utoppya`(1): new utility to interface to the `utoppy`(4) driver.
- `init`(8): added support for running multi-user in a chroot() environment. Allows / file system on e.g., `cgd`(4), `vnd`(4) or `ccd`(4) volumes.
- `gpt`(8): new GUID partition table maintenance utility, from FreeBSD.
- iSCSI target (server) code added, see `iscsi-target`(8); Initiator (client) code is underway.
- `lockstat`(8): new command to display a summary of kernel locking events recorded over the lifetime of a called program.
- `ofctl`(8): new command to display the OpenPROM or OpenFirmware device tree for the macppc, shark and sparc64.
- Various utilities to support Bluetooth were added:
  - `btconfig`(8) for controller configuration.
  - `btdevctl`(8) to manage pseudo devices relating to remote services.
  - `bthcid`(8) and `btpin`(1) for authenticating radio connections.
  - `sdpd`(8) for providing service discovery to remote devices.
  - `sdpquery`(1) for querying services on remote devices.
  - `rfcomm_sppd`(1) to access remote services over RFCOMM via stdio or pty.
  - `bthset`(1) for making connections to Bluetooth headsets.

Besides this list, there have also been innumerable bug fixes and other miscellaneous enhancements of course.

Components removed from NetBSD

In this release of NetBSD, some software components known from previous releases were removed from the system. In some cases those were components that are not useful anymore or their utility does not justify maintenance overhead. Other components were not working properly and there was lack of interest in fixing them.

- Sushi was removed from the base system due to lack of interest and maintenance. If you really want it, it is available in the CVS repository at othersrc/usr.sbin/sushi. However, be warned that it is unmaintained and is most likely out of date.
- Vinum was removed due to lack of interest and maintenance. At the time of removal, it had several known serious issues (including not being compilable). RAIDframe provides similar functionality. If you were using Vinum you will need to back up your data, delete the Vinum partitions, create RAIDframe partitions, and restore your data to them. Details about RAIDframe can be found in `raid`(4), `raidctl`(8), and the NetBSD Guide:
  http://www.NetBSD.org/docs/guide/en/chap-rf.html.
- Sendmail was removed. Postfix is the MTA and provides the `sendmail`(1) command line tool. Postfix has been included with NetBSD since NetBSD 1.5 was released in December 2005. Details about Postfix can be found in the NetBSD Guide:
  http://www.NetBSD.org/docs/guide/en/chap-mail.html.
  For those who need Sendmail, it is available from pkgsrc in the `mail/sendmail` and `mail/sendmail813` packages.
- NETCCITT and NETNS were removed due to lack of interest and maintenance. They had known serious issues (including being out of date with respect to other network code) and there were no known users at the time of their removal. Unfortunately, there is no replacement or option for them.
- UUCP was removed. The NetBSD improvements were merged into the pkgsrc version. For those who use UUCP tools, they are available from pkgsrc in the `net/uucp` package. The `cu`(1) command is available as a frontend to `tip`(1).
- The Fortran 77 compiler (g77) has been removed with the transition from GCC 3 to GCC 4, which does not include it. For those who need it, it is available from pkgsrc in the `lang/gcc3-f77` package.
- The evbsh5 port has been removed from NetBSD due to lack of interest, compounded by a lack of available SH5 hardware.

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 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.

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

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

NetBSD 4.0 Release Contents

The root directory of the NetBSD 4.0 release is organized as follows:

`.../NetBSD-4.0/`

`CHANGES`	Changes between NetBSD 3.0 and branching 4.0.
`CHANGES-4.0`	Changes since NetBSD 4.0 was branched.
`CHANGES.prev`	Changes in earlier NetBSD releases.
`LAST_MINUTE`	Last minute changes.
`MIRRORS`	A list of sites that mirror the NetBSD 4.0 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 4.0 has a binary distribution.

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

gnusrc This set contains the "gnu" sources, including the source for the compiler, assembler, groff, and the other GNU utilities in the binary distribution sets.
95 MB gzipped, 484 MB uncompressed

sharesrc This set contains the "share" sources, which include the sources for the man pages not associated with any particular program; the sources for the typesettable document set; the dictionaries; and more.
6 MB gzipped, 25 MB uncompressed

src This set contains all of the base NetBSD 4.0 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
45 MB gzipped, 214 MB uncompressed

syssrc This set contains the sources to the NetBSD 4.0 kernel for all architectures; `config`(1); and `dbsym`(8).
33 MB gzipped, 165 MB uncompressed

xsrc This set contains the sources to the X Window System.
95 MB gzipped, 502 MB uncompressed

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

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

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

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

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

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

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

`SHA512` SHA512 digests for the various files in that directory, in the format produced by the command:
cksum -a SHA512 *file*.

`SYSVSUM` Historic ATT System V UNIX checksums for the various files in that directory, in the format produced by the command:
cksum -o 2 *file*.

The SHA512 digest is the safest checksum, followed by the MD5 digest, and finally the POSIX checksum. The other two checksums are provided only to ensure that the widest possible range of systems can check the integrity of the release files.

NetBSD/vax subdirectory structure

The vax-specific portion of the NetBSD 4.0 release is found in the `vax` subdirectory of the distribution: `.../NetBSD-4.0/vax/`. It contains the following files and directories:

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

`binary/`
`kernel/`
`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.
`sets/` vax binary distribution sets; see below.

`installation/`
`misc/` Miscellaneous vax installation utilities; see installation section, below.

Binary distribution sets

The NetBSD vax binary distribution sets contain the binaries which comprise the NetBSD 4.0 release for the vax. The binary distribution sets can be found in the `vax/binary/sets` subdirectory of the NetBSD 4.0 distribution tree, and are as follows:

base The NetBSD 4.0 vax **base** binary distribution. You *must* install this distribution set. It contains the base NetBSD utilities that are necessary for the system to run and be minimally functional. It includes shared library support, and excludes everything described below.
108 MB gzipped, 239 MB 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.
25 MB gzipped, 81 MB 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.
1 MB gzipped, 1 MB uncompressed

games This set includes the games and their manual pages.
8 MB gzipped, 16 MB uncompressed

kern-GENERIC
This set contains a NetBSD/vax 4.0 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.
2 MB gzipped, 3 MB 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.
8 MB gzipped, 33 MB uncompressed

misc This set includes the (rather large) system dictionaries, the typesettable document set, and other files from `/usr/share`.
4 MB gzipped, 12 MB uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
5 MB gzipped, 13 MB 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 4.5.0. 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.
65 MB gzipped, 121 MB uncompressed

xcomp The extra libraries and include files needed to compile X source code.
8 MB gzipped, 30 MB uncompressed

xfont Fonts needed by the X server and by X clients.
31 MB gzipped, 39 MB uncompressed

xetc Configuration files for X which could be locally modified.
0.03 MB gzipped, 0.17 MB uncompressed

xserver The X server.
15 MB gzipped, 29 MB uncompressed

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

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

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

NetBSD/vax System Requirements and Supported Devices
Supported hardware

- CPU types
  - VAX 11/750
  - VAX 11/78{0,5}
  - VAX 4000 model 100(A),105A,106A,108,200,300,400,500(A),505A,600(A),700
  - VAX 8200/8250/8300/8350
  - VAX 8600/8650
  - MicroVAX/VAXstation II
  - MicroVAX III
  - MicroVAX 3100 model 10,10e,20,20e,30,40,80,85,90,95
  - MicroVAX 3300/3400
  - MicroVAX 3500/3600
  - MicroVAX 3800/3900
  - MicroVAX 2000/VAXstation 2000
  - VAXstation 3100 model 30,38,40,48,76
  - VAXserver 3100 KA41-B and KA41-E
  - VAXserver 3600
  - VAXserver 3900
  - VAXstation 3200/3500
  - VAXstation 4000 models 60,90,90A,96 and VLC
- Networking
  - DEUNA/DELUA Unibus ethernet
  - DEQNA/DELQA Q22 bus ethernet
  - LANCE chip (where available)
  - SGEC chip (where available)
- Serial lines
  - DHU11/DHV11/DL11/DLV11/DZ11/DZQ11/DZV11 Unibus/Q22 bus asynchronous lines
  - DZ11-compatible lines on VAXstations.
- Disks
  - UDA50 Unibus MSCP controller
  - KDA50/RQDX1/2/3 Q22 bus
  - MSCP controller
  - KDB50 BI-bus MSCP controller

- MFM and SCSI controllers on VAXstations
- RP04/05/06/07 and RM02/03/05/80 Massbus disks
- Console RL02 on VAX 8600.

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

- Tapes
  - TMSCP on Q22 bus (TK50/70, TU81)
  - TMSCP on BI bus
  - SCSI tapes on VAXstations.
- Floppy
  - RX33/RX50 on RQDX controllers
  - RX50 on VAX 8200

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

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

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

Anything else is up to you!

Getting the NetBSD System on to Useful Media

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

Note that if you are installing or upgrading from a writable media, the media can be write-protected if you wish. These systems mount a root image from inside the kernel, and will not need to write to the media. If you booted from a floppy, the floppy disk may be removed from the drive after the system has booted.

Installation is supported from several media types, including:

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

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

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

Proceed to the instruction on installation.

MS-DOS floppy NetBSD doesn't include split sets to keep the distribution size down. They can be created on a separate machine using the `split`(1) command, running e.g. **`split -b 235k base.tgz base.`** to split the `base.tgz` file from `vax/binary/sets` into files named `base.aa`, `base.ab`, and so on. Repeat this for all `set_name.tgz` files, splitting them into `set_name.`*`xx`* files. Count the number of `set_name.`*`xx`*

files that make up the distribution sets you want to install or upgrade. You will need one sixth that number of 1.44 MB floppies.

Format all of the floppies with MS-DOS. Do *not* make any of them bootable MS-DOS floppies, i.e. don't use `format /s` to format them. (If the floppies are bootable, then the MS-DOS system files that make them bootable will take up some space, and you won't be able to fit the distribution set parts on the disks.) If you're using floppies that are formatted for MS-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 MS-DOS disks.

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

FTP

The preparations for this installation/upgrade method are easy; all you need to do is make sure that there's an FTP site from which you can retrieve the NetBSD distribution when you're about to install or upgrade. If you don't have DHCP available on your network, you will need to know the numeric IP address of that site, and, if it's not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself. If you don't have access to a functioning nameserver during installation, the IPv4 address of **ftp.NetBSD.org** is `204.152.190.13` and the IPv6 address is `2001:4f8:4:7:230:48ff:fe31:43f2` (as of December, 2007).

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

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

NFS

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

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

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

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

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

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

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

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

where *tape_device* is the name of the tape device that describes the tape drive you're using; possibly `/dev/rst0`, or something similar, but it will vary from system to system. (If you can't figure it out, ask your system administrator.) In the above example, *dist_directories* are the distribution sets' directories, for the distribution sets you wish to place on the tape. For instance, to put the **kern-GENERIC, base,** and **etc** distributions on tape (in order to do the absolute minimum installation to a new disk), you would do the following:

```
# cd .../NetBSD-4.0
# cd vax/binary
# tar -cf tape_device kern-GENERIC base etc
```

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

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

Creating boot tapes

Fetch the bootable bootfs image from

```
.../NetBSD-4.0/vax/installation/bootfs/boot.fs
```

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

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

Under Ultrix the tape name is different:

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

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

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

```
.../NetBSD-4.0/vax/binary/sets{50,33}
```

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

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

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

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

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

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

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

Creating boot floppies

Fetch the bootable bootfs image from

```
.../NetBSD-4.0/vax/installation/bootfs/boot.fs
```

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

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

Booting from NFS server

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

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

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

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

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

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

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

```
.../NetBSD-4.0/vax/installation/netboot/boot
```

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

```
.../NetBSD-4.0/vax/installation/netboot/netbsd.ram.gz
```

From the install program started in the kernel the rest of the system can be installed. There is also a very good (if somewhat out of date) FAQ for netbooting VAXen at

http://world.std.com/~bdc/projects/vaxen/VAX-netboot-HOWTO.html

that describes netbooting of VAXen from many different OS'es.

Preparing your System for NetBSD installation

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

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

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

Installing the NetBSD System

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

```
subscribe port-vax
```

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

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

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

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

Booting from install media

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

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

`B DUA0` first MSCP controller, unit 0.

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

`B DKB0` second SCSI bus, unit 0.

`B XQA0` first Q22 bus Ethernet controller.

`B ESA0` first LANCE Ethernet controller on VAXstations.

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

Then just proceed with the program **`sysinst`**. The install descriptions for sysinst that follows can be easily adopted to VAX.

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 for the sake of completeness. Do not let this discourage you; the install program is not hard to use.

2. *Possible hardware problems*

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

3. *General*

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

4. *Quick install*

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

   - What you need.
     - The distribution sets (in this example, they are on CD).
     - One 1.44 MB 3.5" floppy.
     - A CD-ROM drive (SCSI), a hard disk and a minimum of of memory installed.
     - The hard disk should have at least + *n* megabytes of space free, where *n* is the number of megabytes of main memory in your system. If you wish to install the X Window System as well, you will need at least 120 MB more.
   - The Quick Installation
     - Insert the first boot floppy you just created. Boot the computer. After language selection, the main menu will be displayed.

```
.*****************************************.
* NetBSD-4.0 Install System                *
*                                          *
*>a: Install NetBSD to hard disk           *
* b: Upgrade NetBSD on a hard disk         *
* c: Re-install sets or install additional sets *
* d: Reboot the computer                   *
* e: Utility menu                          *
* x: Exit Install System                   *
.*****************************************.
```

- If you wish, you can configure some network settings immediately by choosing the **Utility menu** and then **Configure network**. It isn't actually required at this point, but it may be more convenient. Go back to the main menu.
- Choose **install**.
- You will be guided through some steps regarding the setup of your disk, and the selection of distributed components to install. When in doubt, refer to the rest of this document for details.
- After your disk has been prepared, choose **CD-ROM** as the medium. The default values for the path and device should be ok.
- After all the files have been unpacked, go back to the main menu and select **reboot**, after you have removed the bootfloppy from the drive.
- NetBSD will now boot. If you haven't already done so in **sysinst**, you should log in as `root`, and set a password for that account. You are also advised to edit 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*

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

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

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

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

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

6. *Network configuration*

   If you 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 **Utility menu**, and select the **Configure network** option. If you only want to temporarily use networking during the installation, you can specify these parameters later. If you are not using the Domain Name System (DNS), you can give an empty response in reply to answers relating to this.

7. *Installation drive selection and parameters*

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

   The first thing is to identify the disk on which you want to install NetBSD. **sysinst** will report a list of disks it finds and ask you for your selection. Depending on how many disks are found, you may get a different message. You should see disk names like `sd0` or `sd1`.

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.

9. *Editing the NetBSD disklabel*

   The partition table of the NetBSD part of a disk is called a *disklabel*. There are 4 layouts for the NetBSD part of the disk that you can pick from: **Standard, Standard with X, Custom** and **Use Existing**. The first two use a set of default values (that you can change) suitable for a normal installation, possibly including X. With the **Custom** option you can specify everything yourself. The last option uses the partition info already present on the disk.

   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.

   `a` Root partition (`/`)

   `b` Swap partition.

   `c` The NetBSD portion of the disk.

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

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

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

11. *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 the section labeled 'Extracting the distribution sets'.

12. *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 if you want to use DHCP, and if not to provide data like IP address, 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, the account name and password used to log into that host using ftp, and optionally a proxy server to use. If you did not set up DNS when answering the questions to configure networking, you will need to specify an IP address instead of a hostname for the ftp server.

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

13. *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 if you want to use DHCP, and if not to provide data like IP address, 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 address instead of a hostname for the NFS server.

14. *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.

15. *Installation from an unmounted file system*

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

16. *Installation from a local directory*

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

17. *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. Alternatively, you will be asked if you wish to

have a progress bar. This is the preferred option as it shows progress without significantly slowing down the installation process.

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. The next menu will allow you to select the time zone that you're in, to make sure your clock has the right offset from UTC. Finally you will be asked to select a password encryption algorithm and can then set a password for the "root" account, to prevent the machine coming up without access restrictions.

18. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 4.0. You can now reboot the machine, and boot NetBSD from hard disk.

Post installation steps

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

1. Configuring `/etc/rc.conf`

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

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

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

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

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

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

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

   If your `/usr` directory is on a separate partition and you do not know how to use **ed**, you will have to mount your `/usr` partition to gain access to **ex** or **vi**. Do the following:

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

   If you have `/var` on a separate 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 ⟨int⟩ network interface, 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. Instead of manually configuring network and naming service, DHCP can be used by setting dhclient=YES in /etc/rc.conf.

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

2. Logging in

   After reboot, you can log in as root at the login prompt. Unless you've set a password in **sysinst**, there is no initial password. 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. By default, root login from the network is disabled (even via ssh(1)). One way to become root over the network is to log in as a different user that belongs to group "wheel" (see group(5)) and use su(1) to become root.

   Unless you have connected an unusual terminal device as the console you can just press RETURN when it prompts for Terminal type? [...].

3. Adding accounts

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

4. The X Window System

   If you 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 third party packages

   If you wish to install any of the software freely available for UNIX-like systems you are strongly advised to first check the NetBSD package system. This automatically handles any changes necessary to make the software run on NetBSD, retrieval and installation of any other packages on which the software may depend, and simplifies installation (and deinstallation), both from source and precompiled binaries.

   - More information on the package system is at
     http://www.NetBSD.org/docs/software/packages.html
   - A list of available packages suitable for browsing is at
     ftp://ftp.NetBSD.org/pub/NetBSD/packages/pkgsrc/README.html
   - Precompiled binaries can be found at
     ftp://ftp.NetBSD.org/pub/NetBSD/packages/
     usually in the 4.0/vax/All subdir. You can install them with the following commands under sh(1):

     ```
     # PKG_PATH=ftp://ftp.NetBSD.org/pub/NetBSD/packages/4.0/vax/All
     # export PKG_PATH
     # pkg_add -v tcsh
     # pkg_add -v bash
     # pkg_add -v perl
     ```

```
# pkg_add -v apache
# pkg_add -v kde
# pkg_add -v firefox
...
```

If you are using csh(1) then replace the first two lines with the following:

```
# setenv PKG_PATH ftp://ftp.NetBSD.org/pub/NetBSD/packages/4.0/vax/All
...
```

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

- Package sources for compiling packages on your own can be obtained by retrieving the file
  ftp://ftp.NetBSD.org/pub/NetBSD/packages/pkgsrc.tar.gz
  They are typically extracted into /usr/pkgsrc (though other locations work fine), with the commands:

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

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

6. Misc

   - Edit /etc/mail/aliases to forward root mail to the right place. Don't forget to run newaliases(1) afterwards.
   - The /etc/postfix/main.cf file will almost definitely need to be adjusted. If you prefer a different MTA, then install it using the NetBSD package system or by hand and adjust /etc/mailer.conf.
   - Edit /etc/rc.local to run any local daemons you use.
   - Many of the /etc files are documented in section 5 of the manual; so just invoking

     ```
     # man 5 filename
     ```

     is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

The upgrade to NetBSD 4.0 is a binary upgrade; it can be quite difficult to update the system from an earlier version by recompiling from source, primarily due 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 files already installed on the system are overwritten in place, you only need additional free space for files which weren't previously installed or to account for growth of the sets between releases. If you have a few megabytes free on each of your root (/) and /usr partitions, you should have enough space.

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

The upgrade procedure using the **sysinst** tool is similar to an installation, but without the hard disk partitioning. **sysinst** will attempt to merge the settings stored in your /etc directory with the new version of NetBSD. 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. file systems are checked before unpacking the sets.

After a new kernel has been copied to your hard disk, your machine is a complete NetBSD 4.0 system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in /dev. If you've changed the contents of /dev by hand, you will need to be careful about this, but if not, you can just cd into /dev, and run the command:

```
# sh MAKEDEV all
```

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

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

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

Compatibility Issues With Previous NetBSD Releases

Users upgrading from previous versions of NetBSD may wish to bear the following problems and compatibility issues in mind when upgrading to NetBSD 4.0 .

N.B. when using **sysinst** for upgrading, it will automatically invoke

```
postinstall fix
```

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

Issues affecting an upgrade from NetBSD 2.1 and older releases.

See the section below on upgrading from NetBSD 3.x as well.

It is **very important** that you populate the directory /etc/pam.d with appropriate configuration files for Pluggable Authentication Modules (PAM) because you will not be able to login any more otherwise. Using *postinstall* as described below will take care of this. Please refer to

http://www.NetBSD.org/docs/guide/en/chap-pam.html

for documentation about PAM.

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

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

Issues fixed by *postinstall*:

- Various files in /etc need upgrading. These include:
  - /etc/defaults/*
  - /etc/mtree/*
  - /etc/pam.d/*

- /etc/daily
- /etc/weekly
- /etc/monthly
- /etc/security
- /etc/rc.subr
- /etc/rc
- /etc/rc.shutdown
- /etc/rc.d/*

The following issues need to be resolved manually:

- The user '_pflogd' and the groups '_pflogd' and 'authpf' need to be created.

Issues affecting an upgrade from NetBSD 3.x releases.

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

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

Issues fixed by *postinstall*:

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

The following issues need to be resolved manually:

- The users '_proxy', '_rwhod', and '_sdpd' and the groups '_proxy', '_rwhod' and '_sdpd' need to be created and the user 'uucp' needs to be updated.
- A number of things have been removed from the NetBSD 4.0 release including: the evbsh5 port, the Fortran 77 compiler (g77), NETCCITT, NETNS, Sendmail, Sushi, UUCP, and Vinum. If you were using any of these, then please see the "Components removed from NetBSD" section near the beginning of this document.
- The replacement of Sendmail by Postfix can be handled automatically by *postinstall* but it is not done by default. If you want to transition to Postfix, the command

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

  will update your /etc/mailer.conf file to use Postfix as the MTA. When using **sysinst** to upgrade the system, it will ask if you want this to be done.

  Note that if you have a customized Sendmail setup, you need to set up Postfix in an equivalent way; there is no tool for automatic conversion of Sendmail configuration to a Postfix one.

  Postfix will be started up automatically when the system boots. You may see messages like "$sendmail is not set properly" at boot. You can suppress them by removing /etc/rc.d/sendmail and /etc/rc.d/smmsp. Those files and other parts of sendmail configuration like files under /usr/share/sendmail are not removed by default while

upgrading for those who want to continue using sendmail from outside the base system. If you want to delete them, *postinstall* can be used:

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

Issues with GDB 6.5

Some architectures (arm, i386, powerpc and sparc64) have switched to a newer gdb version (6.5) in this release. Unfortunately support for debugging programs using the SA (scheduler activation) based thread library, is incomplete in this gdb version. Furthermore kernel crashdumps can not be debugged due to a missing identification in the kernel binaries.

Both issues have been addressed on the wrstuden-fixsa branch, but did not make it into the NetBSD release. Both will be fixed in the next patch release.

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), 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, or visit **http://www.NetBSD.org/mailinglists/**. If you're interested in doing a serious amount of work on a specific port, you probably should contact the 'owner' of that port (listed below).

If you'd like to help with this effort, and have an idea as to how you could be useful, send us mail or subscribe to: `netbsd-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 or WWW somewhere, then mail the appropriate list about it, or, if you'd rather not do that, mail the list saying you'll send the data to those who want it.

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- The Columbia University Computer Science Department for hosting the NYC build cluster.
- The Western Washington University Computer Science Department for running the WWU build cluster that produces daily snapshots.
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- Without CVS, this project would be impossible to manage, so our hats go off to Brian Berliner, Jeff Polk, and the various other people who've had a hand in making CVS a useful tool.
- We list the individuals and organizations that have made donations or loans of hardware and/or money, to support NetBSD development, and deserve credit for it at **http://www.NetBSD.org/donations/.** (If you're not on that list and should be, tell us! We probably were not able to get in touch with you, to verify that you wanted to be listed.)
- Finally, we thank all of the people who've put sweat and tears into developing NetBSD since its inception in January, 1993. (Obviously, there are a lot more people who deserve thanks here. If you're one of them, and would like to be mentioned, tell us!)

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Dedication

NetBSD 4.0 is dedicated to the memory of Jun-Ichiro "itojun" Hagino, who died in October 2007. Itojun was a member of the KAME project, which provided IPv6 and IPsec support; he was also a member of the NetBSD core team (the technical management for the project), and one of the Security Officers. Due to Itojun's efforts, NetBSD was the first open source operating system with a production ready IPv6 networking stack, which was included in the base system before many people knew what IPv6 was. We are grateful to have known and worked with Itojun, and we know that he will be missed. This release is therefore dedicated, with thanks, to his memory.

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