NAME

INSTALL — Installation procedure for NetBSD/sparc.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 4.0.1 on the *sparc* 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.

Quick install notes for the impatient

This section contains some brief notes describing what you need to install NetBSD 4.0.1 on a machine of the sparc architecture.

- Fetch the CD image, `sparccd-4.0.1.iso` or the floppy disk images, `sparc/install/floppy/disk1.gz` and `sparc/install/floppy/disk2`. You need either the pair of floppies or the CD to boot your system. Alternatively, you may netboot the installation kernel. This process is covered below, in detail.
- The actual binary distribution is in the `sparc/binary/sets/` directory. When you boot the install floppies or CD-ROM, the installation program can fetch these files for you (using e.g. ftp), if you have a network connection. There are several other methods to get the binary sets onto your machine.

  You will at a minimum need the following sets: `kern-GENERIC.tgz`, `base.tgz` and `etc.tgz`. In a typical workstation installation you will probably want all the installation sets.
- Make sure your sparc's CD-ROM drive is bootable. Burn the CD. Otherwise, write the floppy images directly to a pair of floppies (after uncompressing disk1.gz).

  The disk(s) you just prepared will be used to boot the installation kernel, which contains all the tools required to install NetBSD.
- You will need to get to the OpenBoot PROM "**`ok`**" prompt. After your system first powers on, and displays some initial information, press the `STOP-A` keys, or send a BREAK if you're on a serial console. At the "**`ok`**" prompt, type the command to boot your system into NetBSD. The command to boot from CD is one of the following commands (depending on your model): "**`b sd(,30,)`**", "**`boot sd(,30,)`**", or "**`boot cdrom`**".

The command to boot from floppy is either "**boot fd(,,1)**" or "**boot floppy**". The installer will prompt you to insert the second floppy when it is ready for it.

- For third-party programs which are not part of the base NetBSD distribution, you will want to explore the **pkgsrc** system with its more than 7200 program packages.

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 4.0.1 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 4.0 release and 4.0.1 update

The NetBSD 4.0.1 update is the first security/critical update of the NetBSD 4.0 release branch. This represents a selected subset of fixes deemed critical in nature for stability or security reasons.

These fixes will also appear in future releases (NetBSD 4.1), together with other less-critical fixes and feature enhancements.

The complete list of changes can be found in the CHANGES-4.0.1:

ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-4.0.1/CHANGES-4.0.1

file in the top level directory of the NetBSD 4.0.1 release tree.

Security Advisories Fixes

- NetBSD-SA2008-004, `bzip2`(1) Multiple issues (CVE-2008-1372 and CVE-2005-0953), has been fixed by upgrading bzip2 to 1.0.5.
- NetBSD-SA2008-005, OpenSSH Multiple issues (CVE-2008-1483 and CVE-2008-1657), has been fixed by applying patches from upstream.
- NetBSD-SA2008-006, Integer overflow in `strfmon`(3) function (CVE-2008-1391), has been fixed.
- NetBSD-SA2008-008, OpenSSL Montgomery multiplication (CVE-2007-3108), has been fixed.
- NetBSD-SA2008-009, BIND cache poisoning (CVE-2008-1447 and CERT VU#800113), has been fixed by updating BIND to 9.4.2-P2. Note there are two related changes to this advisory:
  - The default behavior of ipfilter's Port Address Translation has been changed to using random port allocation rather than sequential mappings, to avoid decreasing the randomness of source ports used for DNS queries which affects the BIND cache poisoning problem.
  - A '`query-source`' statement, which could allow the BIND cache poisoning attack, has been commented out in the default `named.conf`(5) file.
- NetBSD-SA2008-010, Malicious PPPoE discovery packet can overrun a kernel buffer (CVE-2008-3584), has been fixed.

- NetBSD-SA2008-011, ICMPv6 MLD query (CVE-2008-2464), has been fixed.
- NetBSD-SA2008-012, Denial of Service issues in racoon(8) (CVE-2008-3652), has been fixed by upgrading ipsec-tools to release 0.7.1. Note this also fixes CVE-2008-3651.
- upcoming NetBSD-SA2008-013, IPv6 Neighbor Discovery Protocol routing vulnerability (CVE-2008-2476), has been fixed.
- upcoming NetBSD-SA2008-014, Remote cross-site request forgery attack issue in ftpd(8) (CVE-2008-4247), has been fixed.
- upcoming NetBSD-SA2008-015, Remote kernel panics on IPv6 connections (CVE-2008-3530), has been fixed.

Note: NetBSD-SA2008-007 and advisories prior to NetBSD-SA2008-004 don't affect NetBSD 4.0.

Other Security Fixes

- Fix a buffer overrun which could crash a FAST_IPSEC kernel.
- tcpdump(8): Fix CVE-2007-1218, CVE-2007-3798 and CAN-2005-1278 in base-tcpdump.
- Fix a buffer overflow of PCF font parser in X11 libXfont library (CVE-2008-0006).
- Fix a buffer overflow of Tektronix Hex Format support in binutils (CVE-2006-2362).
- machfb(4), voodoofb(4): Introduce two missing KAUTH_GENERIC_ISSUSER check in the mmap(2) code.

Networking

- Update root.cache to 2008020400 version.
- Fix IP packet forwording code to make sure to send a reasonable fragment size when IPSEC is configured.
- Fix a bug in TCP SACK code which causes data corruption.
- Fix an rc.d(8) script for amd(8) not to shutdown gracefully since it seems to cause problems for more people than the old (also broken) behavior.
- ftpd(8): Fix and reorganize PAM support.

Libraries

- Pthread support of BIND has been disabled for future binary compatibility after removal of the scheduler activations.
- Fix coredump of gdtoa (conversion between binary floating-point and ASCII string) functions on out of memory conditions.

Drivers

- fxp(4): Fix random pool corruption and hangup problems.
- wd(4): Handle more LBA48 bug quirks on some Hitachi's SATA/IDE drives.

Miscellaneous

- Disable a NULL pointer check in zlib for standalone programs. This fixes errors on loading a gzipped kernel (including installation kernels) on several ports (news68k etc.) whose kernels are loaded at address zero.

- awk(1): Bring back an accidentally removed fix to allow escape of a newline in string literals.
- gcc(1):
  - Fix compilation of native sh3 gcc on 64-bit build machines.
  - Fix an internal compiler error on compiling m68k softfloat or m68010 targets on 64-bit build machines.
- zgrep(1): Make '**-h**' option (suppress filenames on output when multiple files are searched) actually work.
- Fix parallel build failure on building hpcarm, hpcmips and hpcsh releases.

Platforms specific

- acorn32: Fix a bootloader problem on some RiscPCs.
- cobalt:
  - Add a workaround to avoid panic on probing a multi function PCI device on Qube's PCI slot.
  - Fix a bug in the interrupt handler which causes network freeze if more than one interfaces are used.
- hp700: Fix potential kernel / userland memory corruption in copyinstr(9) and copyoutstr(9).
- sparc64: Fix a bug in locore.s which causes unexpected behavior.
- sun3: Fix a bug which might cause an occasional panic during boot.
- vax: Make syscall handler use proper copyin(9) function on parsing syscall args.

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 4.0.1 Release Contents

The root directory of the NetBSD 4.0.1 release is organized as follows:

`.../NetBSD-4.0.1/`

`CHANGES` Changes between NetBSD 3.0 and branching 4.0.

`CHANGES-4.0` Changes since NetBSD 4.0 was branched.

`CHANGES-4.0.1` Changes between NetBSD 4.0 and 4.0.1.

`CHANGES.prev` Changes in earlier NetBSD releases.

`LAST_MINUTE` Last minute changes.

`MIRRORS` A list of sites that mirror the NetBSD 4.0.1 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 4.0.1 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 4.0.1 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
45 MB gzipped, 214 MB uncompressed

syssrc This set contains the sources to the NetBSD 4.0.1 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/sparc subdirectory structure

The sparc-specific portion of the NetBSD 4.0.1 release is found in the `sparc` subdirectory of the distribution: `.../NetBSD-4.0.1/sparc/`. It contains the following files and directories:

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

`binary/`

`kernel/`

`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.

`netbsd-GENERIC.MP.gz`
A gzipped NetBSD kernel containing code for everything supported in this release. This kernel also supports SMP on systems with more than one CPU.

`netbsd-GENERIC_SCSI3.gz`
A kernel with SCSI ID 3 explicitly mapped to `sd0`.

`netbsd-KRUPS.gz`
A kernel for JavaStation-NC (Krups) machines.

`netbsd-MRCOFFEE.gz`
A kernel for JavaStation-1 (Mr. Coffee) machines using Open Boot Prom firmware.

`netbsd-MRCOFFEE_OFW.gz`
A kernel for JavaStation-1 (Mr. Coffee) machines using OpenFirmware.

`netbsd-GENERIC_SUN4U.gz`
A kernel which supports sparc64 hardware in 32-bit mode only. See the sparc64 INSTALL notes for help installing this kernel on your sparc64 hardware.

`sets/` sparc binary distribution sets; see below.

`installation/`

`bootfs/` Netbootable RAM disk kernel and the file system in the RAM disk; see below.

`floppy/` sparc boot and installation floppies; see below.

`miniroot/`
sparc miniroot file system image; see below.

`netboot/`
Netboot bootloader and root filesystem with install tools; see below.

`tape/` sparc boot and installation tapes; see below.

Binary distribution sets

The NetBSD sparc binary distribution sets contain the binaries which comprise the NetBSD 4.0.1 release for the sparc. The binary distribution sets can be found in the `sparc/binary/sets` subdirectory of the NetBSD 4.0.1 distribution tree, and are as follows:

base The NetBSD 4.0.1 sparc **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.
25 MB gzipped, 73 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, 90 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.
4 MB gzipped, 8 MB uncompressed

kern-GENERIC
This set contains a NetBSD/sparc 4.0.1 `GENERIC` kernel named `/netbsd`. You *must* install this distribution set.
2 MB gzipped, 4 MB uncompressed

kern-GENERIC.MP
This set contains a NetBSD/sparc 4.0.1 `GENERIC.MP` kernel, which will use multiple processors (if present), named `/netbsd`.
2 MB gzipped, 4 MB uncompressed

kern-GENERIC_SCSI3
This set contains a NetBSD/sparc 4.0.1 `GENERIC_SCSI3` kernel, which will set SCSI ID 3 to `sd0`, named `/netbsd`.
2 MB gzipped, 4 MB uncompressed

kern-GENERIC_SUN4U
This set contains a NetBSD/sparc 4.0.1 `GENERIC_SUN4U` kernel, which supports only UltraSPARC systems in 32 bit mode, named `/netbsd`.

4 MB gzipped, 8 MB uncompressed

kern-KRUPS
This set contains a NetBSD/sparc 4.0.1 `GENERIC-KRUPS` kernel, which supports the JavaStation-NC, named `/netbsd`.
2 MB gzipped, 3 MB uncompressed

kern-MRCOFFEE
This set contains a NetBSD/sparc 4.0.1 `MRCOFFE` kernel, which which supports the OpenBOOT PROM 2 JavaStation-1, named `/netbsd`.
1 MB gzipped, 3 MB uncompressed

kern-MRCOFFEE_OFW
This set contains a NetBSD/sparc 4.0.1 `MRCOFFE_OFW` kernel, which which supports the Open-Firmware JavaStation-1, named `/netbsd`.
1 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.
4 MB gzipped, 11 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.
6 MB gzipped, 19 MB uncompressed

xcomp The extra libraries and include files needed to compile X source code.
12 MB gzipped, 44 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. This includes Xsun, Xsun24, XsunMono and Xvfb servers with man pages.
13 MB gzipped, 35 MB uncompressed

The sparc 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: The distribution cannot be extracted using the SunOS **tar** program

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

NetBSD/sparc System Requirements and Supported Devices

The minimum configuration requires 4 MB of RAM and 60 MB of disk space. To install the entire system requires about 260 MB (not including swap). To install the X window system you need at least 295 MB (not including swap) and 8 MB RAM. NetBSD with 4 MB of RAM feels like Solaris with 4 MB of RAM — slow. Note that until you have around 16 MB of RAM, getting more RAM is more important than getting a faster CPU.

Supported machines

- sun4
  - 4/100
  - 4/200
  - 4/300
  - 4/400
- sun4c
  - SPARCstation/server 1
  - SPARCstation/server 1+
  - SPARCstation/server 2
  - IPC
  - ELC
  - IPX
  - SLC
- sun4c clones
  - Aries Parrot II
  - Opus/5000
  - Opus/5250
  - FORCE Sparc CPU1e/4
  - FORCE Sparc CPU2e/4

  (and possibly more)

  Note: NetBSD doesn't support the VME interface on the FORCE models
- sun4m
  - 4/600
  - SPARC Classic
  - SPARC LX
  - SPARCstation 4
  - SPARCstation/server 5
  - SPARCstation/server 10
  - SPARCstation/server 20
  - SPARCstation Voyager
  - JavaStation-1 (Mr. Coffee)
  - JavaStation-NC (Krups)

  Note: All known SuperSPARC, hyperSPARC, microSPARC, and TurboSPARC CPUs are supported

- sun4m clones
  - Axil 245
  - Axil 311
  - Axil 320
  - Cycle C C Cycle 5-IP
  - DTKstation/Classic+
  - RDI PowerLite-85
  - RDI PowerLite-110
  - RDI BriteLite
  - Ross sparc 20
  - Transtec SS5/170
  - Tatung microCOMPstation 5
  - Twinhead TWINstation 5G
  - TWS SuperCOMPstation-20S
  - Tadpole SPARCbook 3 series

  (and possibly more)

Machines not supported by NetBSD/sparc

- sun4d
  - SPARCcenter 1000
  - SPARCcenter 2000
- sun4u and other UltraSPARC based machines in 64-bit mode. They are supported in 32-bit mode with the NetBSD/sparc `GENERIC_SUN4U` kernel.

  UltraSPARC based machines in 32-bit or 64-bit mode are supported by the NetBSD/sparc64 port. Refer to

  http://www.NetBSD.org/ports/sparc64/index.html
- Solbourne machines

Supported devices

- sun4m mbus CPU modules; Sun 4/600, SPARCstation/server 10, SPARCstation/server 20, and clones
  - *cpu0*; All single-CPU systems are supported
  - *cpuN*; All hardware compatible dual-, tri- and quad-CPU SuperSPARC-I, SuperSPARC-II, and hyperSPARC systems are supported with the SMP kernel (`GENERIC.MP`)

    http://www.NetBSD.org/ports/sparc/faq.html#smp-cpus
- sun4c and sun4m video; Sbus card, on-board, or optional
  - *bwtwo*; 1 bpp framebuffer.
    On-board and Sbus card (MG1 and MG2)
  - *cgthree*; 8 bpp framebuffer.
    On-board and Sbus card
  - *cgsix*; 8 bpp accelerated framebuffer.
    On-board and Sbus card (GX, GX+, TGX, and TGX+)
  - *cgfourteen*; SX 24 bpp accelerated framebuffer.
    On-board SPARCstation 10SX and SPARCstation 20, requires optional 4 or 8 MB VSIMM,
    limited to *cgthree* emulation

  - *tcx*; S24 accelerated color framebuffer.
    On-board SPARCstation 4 (8 bpp), JavaStation-1 (24 bpp), and optional on SPARCstation 5 (24 bpp),
    limited to *cgthree* emulation
  - *pnozz*; Weitek p9100 24 bpp accelerated framebuffer.
    On-board Tadpole SPARCbook 3GS and 3GX,
    limited to *cgthree* emulation
  - *zx*; ZX and TZX 24 bpp accelerated framebuffer.
    Sbus card (leo)
    limited to text console (no X)
  - *igsfb*; 24 bpp IGS C1682 accelerated framebuffer.
    On-board JavaStation-NC
    limited to text console (no X)

- sun4 video; VME card, on-board, or P4 (supported only on 4/100 and 4/300 series machines)
  - *bwtwo*; 1 bpp framebuffer.
    On-board and P4
  - *cgtwo*; 8 bpp framebuffer.
    VME card
  - *cgfour*; 8 bpp framebuffer with overlay.
    P4
  - *cgsix*; LEGO 8 bpp accelerated framebuffer.
    P4
  - *cgeight*; TC 24 bpp framebuffer with overlay.
    P4 (not well tested)

- Network interfaces
  - *be*; 100 Mbps half-duplex "Big Mac" ethernet.
    Sbus card
  - *en*; Efficient Networks, Inc. ATM interface.
    Sbus card
  - *hme*; 100 Mbps full-duplex "Happy Meal" ethernet.
    On-board (JavaStation-NC) and Sbus card
    This hardware is not supported on the sun4c platform
  - *ie*; 10 Mbps Intel 82586 ethernet.
    On-board (4/100 and 4/200, may not be working properly on 4/400) and VME card
  - *le*; 10 Mbps AMD 9790 Lance ethernet.
    On-board (4/300, sun4c, and sun4m) and Sbus card
  - *qec*; One 100 Mbps be interface and four 10 Mbps Mace ethernet interfaces.
    Sbus card
  - *qfe*; four 100 Mbps full-duplex "Happy Meal" ethernet interfaces.
    Sbus card
  - misc: various ethernet interfaces are found on multi-function Sbus cards (e.g. along with SCSI), the ethernet interfaces work even if the other functions do not

- SCSI interfaces
  - *esp*; 5 MB/s and 10 MB/s (Fast) NCR 53C9x SCSI controller, and 20 MB/s (Fast+Wide) FAS336 controller (known as 'fas' on Solaris).
    On-board (sun4c, sun4m, 4/300, Ultra 1e, and Ultra 2) and Sbus cards
  - *isp*; 10 MB/s (Fast) and 20 MB/s (Fast+Wide) Qlogic ISP 10x0 family.
    Sbus card
  - *si*; 5 MB/s NCR 5380 SCSI controller.
    VME card (Interrupt driven and polled DMA)
  - *sw*; 5 MB/s NCR 5380 "SCSI Weird" controller.
    Onboard 4/110 (polled DMA only)
  - misc: SCSI functionality is sometimes found on multi-function Sbus cards (e.g. along with ethernet), the SCSI *esp* and *isp* portions of those cards should work, even if the other functions do not.

    Note: Non-Sun SCSI CD-ROMs may have trouble booting any OS, NetBSD or otherwise. Your CD-ROM must support 512 byte blocks for the OpenBoot PROM to load a file. Most newer CD-ROM drives support this automatically, and many older drives allow you to set it using a jumper. See
    http://www.ebsinc.com/solaris/suncdrom.html
    for information on bootable CD-ROMs
- VME disk interfaces
  - *xd*; Xylogics 7053 VME/SMD disk controller
  - *xy*; Xylogics 450/451 VME disk controller

  Note: VME/IPI disks are not supported
- Floppy drives
  - *fd*; floppy disk drive.
    On-board sun4c and sun4m
  - *sd*; SCSI floppy drive, acts as a SCSI drive to kernel.
    found with some SPARCbook 3 machines
- PCMCIA/Cardbus devices
  - *nell*; PCMCIA interface
    On-board (SPARCstation Voyager) and Sbus card.
    All devices listed in the Machine-independent PCMCIA drivers page should work, but very few have been tested with NetBSD/sparc.
    http://www.NetBSD.org/support/hardware/pcmcia.html

  Note: See the FAQ for more information.
  http://www.NetBSD.org/ports/sparc/faq.html#nell
- Serial interfaces
  - *zs*; Zilog 8530 serial ports, which can be used as the system console
    On-board sun4, sun4c, and sun4m
  - *com*; Zilog 85C30 serial ports (ns16550a)
    On-board Tadpole SPARCbook 3GS and 3GX (internal 14.4 kbps modem, use `/dev/ttyC0`) JavaStation-1, and JavaStation-NC

- Input devices
  - Sun keyboard and mouse
  - SPARCbook 3 keyboard and joystick
  - Third-party keyboards, mice, and trackballs
  - PS/2 keyboards and mice on JavaStation models
- Audio interfaces
  - *audioamd*; AMD 7930-based 8000 Hz, 8 bit, mono, mu-law.
    On-board sun4c and SPARC Classic
  - *audiocs*; CS4231-based 44 KHz, 16 bit, stereo, PCM.
    On-board SPARCStation 5, JavaStation-1, JavaStation-NC, and optional on SPARCStation 4.
- Misc cards
  - *mtty / mbpp*; Magma Serial/Parallel ports.
    Sbus card
  - *xbox*;
    Sun Sbus expander device
- Parallel ports
  - *bpp*; Bi-directional parallel port.
    On-board and Sbus card

Unsupported devices

- DBRIe-based audio and ISDN.
  On-board some sun4m machines (such as SPARCstation 10, SPARCstation 20, SPARC LX, SPARCstation Voyager, and Tadpole SPARCbook 3)
- *sc*; Sun SCSI.
  VME card
- *cgtwelve*; I.e. GS, 24 bpp framebuffer.
  Sbus card
- PCMCIA interface
  On-board Tadpole SPARCbook 3GS and 3GX

Getting the NetBSD System on to Useful Media

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 `sparc/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 `sparc/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.

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-4.0.1
# cd sparc/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.

Preparing your System for NetBSD installation

Configuring your PROM

Before you start, you should configure your PROM. There are three categories of PROM: "sunmon" (sometimes called Restricted Prompt, sun monitor, or old command mode), OpenBoot PROM 1, and OpenBoot PROM 2. The sun4 machines only have sunmon. Some of the early sun4c models default to sunmon but have OpenBoot PROM 1. The later sun4c models and all sun4m models have OpenBoot PROM 2.

First, you need to stop your system from automatically booting when powered on. Pressing the `STOP` key (sometimes called the `L1` key, found on the left side of your keyboard) and the `a` key will halt your system and give you a PROM prompt. If you are using a Tadpole SPARCbook, you press the `Pause` and `a` keys. If you are using a serial console, send a "BREAK" signal from your terminal (the method of sending "BREAK" varies from terminal to terminal).

If the ethernet address of your sparc system is `ff:ff:ff:ff:ff:ff`, then your NVRAM battery is dead and you will have trouble using ethernet (among other problems). Read the Sun NVRAM/Hostid FAQ.

http://www.squirrel.com/squirrel/sun-nvram-hostid.faq.html

If you have a valid ethernet address and you plan to netboot, write down your system's ethernet address.

Next, you should set your system to always use the OpenBoot PROM (sometimes called "new command mode") if it defaults to sunmon. The NetBSD kernel relies on some of the functionality provided by the OpenBoot PROM. If your machine gives you a '>' prompt instead of an 'ok' prompt, type:

```
> n
ok setenv sunmon-compat? false
ok
```

Next, if you are using any security features of OpenBoot PROM, you should turn them off — NetBSD can't deal well with this.

```
ok setenv security-mode none
```

If you are using a serial console, the NetBSD/sparc installer defaults to using 9600 bps, 8N1 settings. You may want to configure your system and serial terminal like this prior to booting the installer. Additionally, a new installation of NetBSD/sparc will default to these settings as well.

The OpenBoot PROM 1 machines (SPARCstation/server 1, SPARCstation/server 1+, IPC, and SLC) have an odd SCSI quirk you should be aware of. There are three SCSI addressing schemes used by your system: SCSI target ID (set by physical jumpers on the device), PROM 'unit' number (set by OpenBoot PROM 1, based on its SCSI target ID), and the name you reference within an operating system (set by the kernel, based on the PROM 'unit' number).

Sun shipped these systems with the internal drives set to SCSI target IDs 3 and 1. The default value of the OpenBoot PROM variable '`sd-targets`' is '`31204567.`' This variable maps how the OpenBoot PROM 1 assigns 'unit' numbers based on the SCSI target ID. Thus the device at SCSI target ID 3 is considered 'unit' 0, and the SCSI device at target ID 0 is 'unit' 3. When you type "**`boot scsi(0,0,0)`**", the OpenBoot PROM will boot from 'unit' 0 (which is SCSI target ID 3, the internal hard drive). The SunOS kernel is hard-wired to map `sd0` to SCSI target 3, and `sd3` to SCSI target 0.

PROM Unit#	*SCSI Target*	*SunOS name*
0	3	sd0
1	1	sd1
2	2	sd2
3	0	sd3
4	4	st0
5	5	st1
6	6	cdrom

The NetBSD/sparc `GENERIC` kernel does not wire things down as does SunOS. It names the disks in the order that the SCSI targets are probed (01234567). If you only have one disk, it is always `sd0` regardless of its SCSI target ID or its PROM 'unit' number, and there are no problems. If you have two disks, one at SCSI ID 2 ('unit' 2) and SCSI ID 3 ('unit' 0), then they are recognized as `sd0` and `sd1` respectively. This can be a problem if you are not aware of it, particularly when creating an fstab.

There are two approaches to fixing this problem: changing the mapping that OpenBoot PROM 1 does, and changing the NetBSD kernel configuration. To get OpenBoot PROM 1 to number the SCSI 'unit' numbers the same as the SCSI target IDs, you need to run this command:

```
ok setenv sd-targets 01234567
```

This may, however, cause problems if you were to later attempt to use SunOS on this machine or if you reset the OpenBoot PROM variables.

The other approach is to use a NetBSD kernel that matches the PROM's odd target mapping by treating 'unit' 0 (i.e. SCSI target ID 3) as `sd0` and 'unit' 3 (i.e. SCSI target ID 0) as `sd3`. The `GENERIC_SCSI3` kernel performs this target mapping, but the `GENERIC` and `INSTALL` kernels do not.

Note: This is also a concern when you start building your own customised kernels.

The machines with OpenBoot PROM 2 (SPARCstation/server 2, ELC, IPX, and all sun4m models) have a similar SCSI target mapping in the form of a **devalias** entry. That is, the device alias **disk** is shorthand for the disk at SCSI ID 3 on the internal SCSI controller. Normally, the **disk** device alias is what the PROM uses as the default boot device, i.e. in the absence of a *device* argument to the **boot** command. Note that there are also pre-configured device alias entries for **disk0, disk1, disk2** and **disk3**, which are in fact a one-to-one mapping to the SCSI targets **0** to **3** (all on the internal SCSI controller) .

Again, it may be advantageous to use a fixed "SCSI target" to "NetBSD disk unit" mapping in your kernel configuration file (such as is done in the GENERIC_SCSI3 kernel) to ensure that your disks remain showing up at the same NetBSD device unit numbers even if you add disks to your system at a later time.

Determining how to access your SCSI disk from the PROM

sunmon and OpenBoot PROM 1 use an archaic sd(*c*,*u*,*p*) syntax to address SCSI devices. OpenBoot PROM 2 uses a more intuitive syntax using device aliases.

To calculate the parameters for sunmon and OpenBoot PROM 1:

c specifies the SCSI controller number (first is 0, second is 1, ...)

u the hexadecimal number obtained from evaluating the expression *(8 * TARGET) + LUN*

p the partition number from which to boot ('0' = 'a', '1' = 'b', etc.)

Therefore, to boot from the swap partition on the internal hard drive (first SCSI bus, target 0, lun 0, partition 1), one would use:

ok **boot sd(0,0,1)**

To boot from a CD-ROM (first SCSI bus, target 6, lun 0, partition dynamically determined), one would use:

ok **boot sd(0,30,)**

And, to boot from a kernel named netbsd-GENERIC on the fourth partition ('d', often the /usr partition) on an external hard drive (first SCSI bus, target 2, lun 0, partition 3), one would use:

ok **boot sd(0,10,3)netbsd-GENERIC**

Now, for OpenBoot PROM 2, SCSI devices are specified by an OpenBOOT **devalias** which provides simple mnemonics for the full path to the device. Type **devalias** in OpenBoot PROM 2 to get a list of all of the available aliases. Just the alias and partition are necessary when booting.

Therefore, to boot from the swap partition on the internal hard drive (OpenBoot PROM 2 assumes the internal hard drive is at target 3), one would use:

ok **boot disk:b**

To boot from a CD-ROM (OpenBoot PROM 2 assumes the CD-ROM is at target 6), one would use:

ok **boot cdrom**

And, to boot from a kernel named netbsd-GENERIC on the fourth partition ('d', often the /usr partition) on an external hard drive (target 2, partition 3), one would use:

ok **boot disk2:d netbsd-GENERIC**

The full device path specifier for OpenBoot PROM 2 depends on how OpenBoot PROM 2 recognizes your SCSI controller. Typically, one would use something like: /sbus/esp/sd@*t*,*p* where t is the SCSI target and p is the partition number.

Determining how to boot from an SBUS card

Some SBUS cards have firmware that lets you use them as a boot device. These cards do not automatically create a **devalias** entry, so you must traverse the device tree to figure out what the OpenBoot PROM calls your card. You will be using OpenBoot PROM commands at the 'ok' prompt. First 'cd' to the top of the device tree and list the nodes there. The following is the procedure to boot from an HME card in a SPARC Classic.

```
ok cd /
ok ls
ffd3b790 TI,TMS390S10@0,f8fffffc
ffd2d254 virtual-memory@0,0
ffd2d198 memory@0,0
ffd2b65c obio
ffd2b310 iommu@0,10000000
ffd2b2a0 openprom
ffd24af0 aliases
ffd24abc options
ffd24a88 packages
```

Usually, you can simply type in the name before the at (@) sign and the OpenBoot PROM will fill in the rest.

```
ok cd iommu
ok ls
ffd2b454 sbus@0,10001000
ok cd sbus
ok ls
ffd467e8 cgthree@3,0
ffd42a1c SUNW,hme@1,8c00000
ffd4297c le@0,c00000
ffd40d28 ledma@4,8400010
ffd40c9c SUNW,bpp@4,c800000
ffd40c00 audio@4,1300000
ffd3dc68 espdma@4,8400000
ok cd SUNW,hme
ok ls
ok pwd
/iommu@0,10000000/sbus@0,10001000/SUNW,hme@1,8c00000
```

OK, now we know the path to the HME device in this example. Now, we need to determine if it's capable of booting. If it is, it will have the **word** 'open'.

```
ok words
reset          seek           load           open           close
watch-net      selftest       obp-selftest   write          read
preamble-32    enable-link-pulse             disable-link-pulse
force-speeds   reset-transceiver             use-bit-bang-mode
use-frame-mode                dump-phys      transfer-speed=10
transfer-speed=100            mii-write      mii-read
create-rev-id
```

Great! Also, in case you're interested in further details about your hardware, you can use the '.attributes' command.

```
ok .attributes
hm-rev                    00000022
version                   1.18
```

```
model                   SUNW,501-2919
device_type             network
intr                    00000037  00000000
interrupts              00000004
address-bits            00000030
max-frame-size          00004000
reg                     00000001  08c00000  00000108
                        00000001  08c02000  00002000
                        00000001  08c04000  00002000
                        00000001  08c06000  00002000
                        00000001  08c07000  00000020
name                    SUNW,hme
ok
```

So, when it's time to type in a boot command, use the shortened version of the **pwd** command. In this example, you'd type:

ok **boot /iommu/sbus/SUNW,hme**

And when the kernel is done booting, it may not automatically use your card as the root device -- you may need to type in the NetBSD/sparc name for that device:

```
root on sd0a dumps on sd0b
no file system for sd0 (dev 0x700)
cannot mount root, error = 79
root device (default sd0a): ?
use one of: fd0[a-h] le0 le1 hme0 sd0[a-h] halt
root device (default sd0a): hme0
dump device: hme0
file system (default generic): nfs
root on hme0
```

Deciding on partition sizes

If you're installing NetBSD/sparc for the first time it's a good idea to look at the partition sizes of disk you intend installing NetBSD/sparc on.

Assuming a classic partition scheme with / (root) and /usr file systems, a comfortable size for the NetBSD root file system partition is about 20 MB; a good initial size for the swap partition is twice the amount of physical memory in your machine (though, unlike SunOS 4.x, there are no restrictions on the size of the swap partition that would render part of your memory unusable). A full binary installation takes about 275 MB in /usr.

Most sparc systems have trouble booting if the root partition extends beyond the first 2 GB of your disk.

Configuration of network interfaces

Some network devices (i.e. the built-in *le* interface on sun4m machines) allow a choice between operating on a UTP or a AUI port once the NetBSD kernel is running. The *le* driver supports automatic detection of the port which is actually connected to the wire. Additionally, some of the Fast ethernet devices (such as *be*, *hme*, *qec*, and *qfe*) support selection of various speeds and options. The default is to attempt to automatically detect the speed.

If automatic detection is not available or not working properly in your environment, you may have to specify the type connection using the **media** parameter of ifconfig(8). During installation, you'll get the opportunity to specify the appropriate medium. Use 10base5 or AUI to select the AUI connector, or 10baseT or UTP to select the UTP connector. Fast ethernet interfaces default to auto, which usually does not detect properly and runs at '10BaseT' speed. The options are 10baseT, 10baseTX, and auto. The *hme* and *qfe*

interfaces also allow `10baseT-FDX` and `100baseT-FDX`.

Installing the NetBSD System

Installing NetBSD is a relatively complex process, but if you have this document in hand it shouldn't be too much trouble.

There are several ways to install NetBSD onto your system. The easiest way is to use the `miniroot.fs` image copied to your local disk's swap partition or a scratch drive. If your Sparc is hooked up in a network, you may configure another UNIX-like machine as a netboot server for your Sparc. Alternatively, there is a pair of floppy images that will boot your system and run the installer.

For more information on the commands and variables available in the OpenBoot PROM (present in all sun4c and sun4m machines), go to **http://docs.sun.com** and search for "openboot reference" (without quotes).

Installing NetBSD by placing a bootable file system on a partitioned hard drive

`installation/miniroot/miniroot.fs.gz` is a compressed, self-contained NetBSD file system holding all utilities necessary to install NetBSD onto a disk attached to your system. It is distributed as a compressed plain file you will transfer to a raw disk partition. You will then boot this installer using the appropriate PROM command. The simplest case is where you place the `miniroot.fs` file system on the swap partition of your disk. Alternatively, you can place it on any other unused partition on any disk (such as a Zip disk). Be forewarned that you will not be able to install NetBSD onto the partition that contains the `miniroot.fs` as this partition is needed during the install process.

Loading the file system onto a raw partition is straightforward. First, download `miniroot.fs` to your system. Next, reboot in single-user mode (i.e. **`boot -s`**) to ensure that your system will not be swapping. Finally, place the `miniroot.fs` on your partition of choice. On NetBSD or SunOS the commands are:

```
# gunzip miniroot.fs.gz
# dd if=miniroot.fs of=/dev/rsd0b bs=4k
```

Here, `/dev/rsd0b` is assumed to be your swap partition. If you decide to place `miniroot.fs` on a non-swap partition, it will overwrite all of the contents of that partition, but you will not need to reboot into single-user mode to write it.

After transferring the file system to disk, bring the system down by:

```
# halt
```

Then boot the installer by typing the appropriate command at the PROM prompt (this example is for the swap partition):

sunmon

```
> b sd(,,1)netbsd -s
```

OpenBoot PROM 1

```
ok boot sd(,,1)netbsd -s
```

OpenBoot PROM 2

```
ok boot disk:b netbsd -s
```

The monitor boot command will load the NetBSD kernel contained in the file system image. After the initial probe messages you'll be asked to start the install or upgrade procedure. Proceed to the section **Running the installation scripts.** below.

Installing NetBSD by using a bootable CD-ROM

If you wish to burn a CD-R containing a bootable NetBSD installation, then you can either burn the prepared disk image in `installation/cdrom/sparccd-4.0.1.iso` or create your own. If you wish to create your own, you should follow the directions on the NetBSD Bootable CD-ROM HOW-TO at:

http://www.NetBSD.org/docs/bootcd.html#sparcimage

Once you have downloaded `sparccd-4.0.1.iso` or created your own disk image, then you need to burn it to a CD-R.

The CD-ROM attached to your Sparc must support 512 byte sectors to be bootable. All Sun brand CD-ROMs will work, as well as many other manufacturers. See the Sun CD-ROM FAQ: **http://saturn.tlug.org/suncdfaq/**

Sun sets their CD-ROM drives to SCSI ID 6. We recommend you do the same.

Boot the installer by typing the appropriate command at the PROM prompt:

sunmon

> **b sd(,30,)**

OpenBoot PROM 1

ok **boot sd(,30,)**

OpenBoot PROM 2

ok **boot cdrom**

After the initial probe messages you'll be asked to start the install or upgrade procedure. Proceed to the section **Running the installation scripts.** below.

Installing NetBSD by using the bootable floppies

The NetBSD install floppies only work on the sun4c and sun4m machines. Making the install floppies is fairly straightforward.

NetBSD and SunOS use the same commands. First, get two 1.44 MB floppy disks and format them either using the `fdformat`(8) command or a PC.

fdformat

Be sure that the 'fdformat' command completes successfully before proceeding; on NetBSD success is a string of all '`V ' s`', and on SunOS success is a string of '`. ' s`'.

Next, transfer the two floppy images (`installation/floppy/disk1.gz` and `installation/floppy/disk2`) to the disks you just formatted. You can do this step from NetBSD, SunOS, or a Windows machine using **rawrite.exe** (available in the NetBSD/i386 distribution). Insert the first floppy and run the following commands:

```
# gunzip disk1.gz
# dd if=disk1 of=/dev/rfd0a bs=36k
# eject floppy
```

Insert the second floppy and run the following commands:

```
# dd if=disk2 of=/dev/rfd0a bs=36k
# eject floppy
```

Note that disk2 may be a symlink to .tgz file; do not uncompress it, just follow the instructions above, verbatim. After writing the two floppies, be sure to label them so you can later identify them.

Insert the floppy made from `disk1` into your Sparc. From the OpenBoot prompt, boot the floppy with the following command:

OpenBoot PROM 1

ok **`boot fd(,,1)`**

OpenBoot PROM 1 (alternate)

ok **`boot /fd`**

OpenBoot PROM 2

ok **`boot floppy`**

After the initial probe messages you'll be asked to insert the floppy labeled "NetBSD disk2". If the floppy is not automatically ejected, you can either use a straightened paperclip to eject the disk or do the following:

Press the `STOP` key (sometimes called the `L1` key, found on the left side of your keyboard) and the `a` key, which will halt your system and give you a PROM prompt.

ok **`eject`**
ok **`go`**

Now, insert the floppy labeled `disk2`. After the installation tools have been loaded, you'll be asked to start the install or upgrade procedure. Proceed to the section **Running the installation scripts.** below.

Installing NetBSD by using a netboot setup

1. Introduction

   To netboot a sparc, you must configure one or more servers to provide information and files to your sparc (the 'client'). If you are using NetBSD (any architecture) on your netboot server(s), the information provided here should be sufficient to configure everything. Additionally, you may wish to look at the `diskless`(8) manual page and the manual pages for each daemon you'll be configuring. If the server(s) are another operating system, you should consult the NetBSD Diskless HOW-TO, which will walk you through the steps necessary to configure the netboot services on a variety of platforms.

   http://www.NetBSD.org/docs/network/netboot/

   You may either netboot the installer so you can install onto a locally attached disk, or you may run your system entirely over the network.

   Briefly, the netboot process involves discovery, bootstrap, kernel and file system stages. In the first stage, the client discovers information about where to find the bootstrap program. Next, it downloads and executes the bootstrap program. The bootstrap program goes through another discovery phase to determine where the kernel is located. The bootstrap program tries to mount the NFS share containing the kernel. Once the kernel is loaded, it starts executing. For RAM disk kernels, it mounts the RAM disk file system and begins executing the installer from the RAM disk. For normal (non-RAM disk) kernels, the kernel tries to mount the NFS share that had the kernel and starts executing the installation tools or `init`(8). All sparc systems except JavaStations with OpenFirmware PROM use a combination of RARP and BOOTP for the discovery stage. In the past, these systems used RARP and BOOTPARAMS. JavaStations booting from OpenFirmware use DHCP. TFTP is used in the bootstrap phase to download the bootstrap program, `boot.net`, which has been linked to a file name appropriate to the client's architecture and IP address as described in the TFTP section below. JavaStations with OpenFirmware need a special bootstrap program, `bootjs.net`, which is a version of boot.net in ELF format. It is not linked to the IP address. NFS is used in both the kernel and file system stages to download the kernel, and to access files on the file server.

   We will use '`CC:CC:CC:CC:CC:CC`' as the MAC address (ethernet hardware address) of your netboot client machine. You should have determined this address in an earlier stage. In this example, we will use '`192.168.1.10`' as the IP address of your client and '`client.test.net`' as its name.

We will assume you're providing all of your netboot services on one machine called 'server.test.net' with the client's files exported from the directory /export/client/root. You should, of course, replace all of these with the names, addresses, and paths appropriate to your environment.

You should set up each netboot stage in order (i.e. discovery, bootstrap, kernel, and then file system) so that you can test them as you proceed.

2. dhcpd(8) in bootpd(8) compatible mode

   Put the following lines in your /etc/dhcpd.conf (see dhcpd.conf(5) and dhcp-options(5) for more information):

```
ddns-update-style none;
                # Do not use any dynamic DNS features
                #
allow bootp;    # Allow bootp requests, thus the dhcp server
                # will act as a bootp server.
                #
authoritative;  # master DHCP server for this subnet
                #
subnet 192.168.1.0 netmask 255.255.255.0 {
                # Which network interface to listen on.
                # The zeros indicate the range of addresses
                # that are allowed to connect.
}
group {
                # Set of parameters common to all clients
                # in this "group".
                #
        option broadcast-address        192.168.1.255;
        option domain-name              "test.net";
        option domain-name-servers      dns.test.net;
        option routers                  router.test.net;
        option subnet-mask              255.255.255.0;
                #
                # An individual client.
                #
        host client.test.net {
                hardware ethernet       CC:CC:CC:CC:CC:CC;
                fixed-address           192.168.1.10;
                #
                # Name of the host (if the fixed address
                # doesn't resolve to a simple name).
                #
                option host-name        "client";
                #
                # Name of the bootloader or kernel
                # to download via tftp.

                #
                # Only needed for JavaStations with OpenFirmware!
                #
                filename                "bootjs.net";
```

```
                        #
                        # The path on the NFS server.
                        #
                        option root-path "/export/client/root";

                        #
                        # If your DHCP server is not your NFS server, supply the
                        # address of the NFS server. Since we assume you run everythi
                        # on one server, this is not needed.
                        #
                        # next-server server.test.net;
                }
         #you may paste another "host" entry here for additional
         #clients on this network
        }
```

Note that for JavaStations booting from OpenFirmware you do not need the

```
allow bootp;
```

statement, since this machines use real DHCP.

You will need to make sure that the `dhcpd.leases` file exists.

```
# touch /var/db/dhcpd.leases
```

You will need to start the **dhcpd**. If it's already running, you will need to restart it to force it to re-read its configuration file. If the server is running NetBSD, you can achieve this with:

```
# /etc/rc.d/dhcpd restart
```

3. `rarpd`(8)

   Note: no **rarpd** is needed to boot OpenFirmware based JavaStations.

   Create an `/etc/ethers` file with the following line:

   ```
   CC:CC:CC:CC:CC:CC     client
   ```

   Add your client to the server's `/etc/hosts` file:

   ```
   192.168.1.10 client
   ```

   You will need to start the **rarpd**. If it's already running, you will need to restart it to force it to re-read its configuration file. If the server is running NetBSD, you can achieve this with:

   ```
   # /etc/rc.d/rarpd restart
   ```

4. `tftpd`(8)

   The default configuration of the TFTP server is to run in a `chroot`(8) environment in the `/tftpboot` directory. Thus, the first order of business is to create this directory:

   ```
   # mkdir -p /tftpboot
   ```

   Next, edit `/etc/inetd.conf` and uncomment the line with the TFTP daemon:

   ```
   tftp  dgram  udp  wait  root  /usr/libexec/tftpd tftpd -l -s /tftpboot
   ```

   Now, restart `inetd`(8). If the server is running NetBSD, you can achieve this with:

   ```
   # /etc/rc.d/inetd restart
   ```

Now, you need to copy the bootloader for your sparc machine to `/tftpboot`. Get `boot.net` from the `installation/netboot` directory of the distribution.

```
# cp boot.net /tftpboot
```

Now, you need to link `boot.net` to the filename that your sparc will look for. It will look for a filename composed of the machine's IP address (in hexadecimal) followed by the machine's architecture, separated by a period. For example, a sun4c machine which has been assigned IP address 192.168.1.10, will make a TFTP request for `C0A8010A.SUN4C`.

You can use `bc`(1) to help calculate the filename:

```
# bc
obase=16
192
C0
168
A8
1
1
10
A
quit
# cd /tftpboot
# ln -s boot.net C0A8010A.SUN4C
```

For OpenFirmware based JavaStations you use the file `bootjs.net` and do not create a symlink for the IP address. This machines do full DHCP autoconfiguration, so the bootstrap filename is provided by the DHCP server.

Just to be sure, let's make everything readable.

```
# chmod -R a+rX /tftpboot
```

Sometimes, the `arp`(8) table gets messed up, and the TFTP server can't communicate with the client. In this case, it will write a log message (via `syslogd`(8)) to `/var/log/messages` saying: '`tftpd: write: Host is down`'. If this is the case, you may need to force the server to map your client's ethernet address to its IP address:

```
# arp -s client CC:CC:CC:CC:CC:CC
```

5. `nfsd`(8), `mountd`(8), and `rpcbind`(8)

   Now your system should be able to load the bootstrap program and start looking for the kernel. Let's set up the NFS server. Create the directory you are exporting for the netboot client:

   ```
   # mkdir -p /export/client/root
   ```

   Put the following line in `/etc/exports` to enable NFS sharing:

   ```
   /export/client/root -maproot=root client.test.net
   ```

   If your server is currently running an NFS server, you only need to restart `mountd`(8). Otherwise, you need to start `rpcbind`(8) and `nfsd`(8). If the server is running NetBSD, you can achieve this with:

   ```
   # /etc/rc.d/rpcbind start
   # /etc/rc.d/nfsd start
   # /etc/rc.d/mountd restart
   ```

6. NetBSD kernel and installation tools

   Now, if you place a kernel named `netbsd` in `/export/client/root` your client should boot the kernel. Use `binary/kernel/netbsd-GENERIC.gz`).

   ```
   # gunzip netbsd-GENERIC.gz
   # mv netbsd-GENERIC /export/client/root/netbsd
   ```

   If you are netbooting the installer, copy the distribution files to the client's root directory and extract the tools from `installation/netboot/rootfs.tgz`.

   ```
   # cp *tgz /export/client/root
   # cd /export/client/root
   # tar -xpzf rootfs.tgz
   ```

7. Client file system

   You can skip this step if you do not plan to run your client diskless after installation. Otherwise, you need to extract and set up the client's installation of NetBSD. The Diskless HOW-TO describes how to provide better security and save space on the NFS server over the procedure listed here.

   http://www.NetBSD.org/docs/network/netboot/nfs.html

   - Extracting distribution sets

     ```
     # cd /export/client/root
     # tar -xpzf /path/to/files/base.tgz
     # tar -xpzf /path/to/files/etc.tgz
     ```

     Continue with the other non-essential distribution sets if desired.

   - Set up swap

     ```
     # mkdir /export/client/root/swap
     # dd if=/dev/zero of=/export/client/swap bs=4k count=4k
     # echo '/export/client/swap -maproot=root:wheel client.test.net' | cat >> /
     # /etc/rc.d/mountd restart
     ```

     This creates a 16 MB swap file and exports it to the client.

   - Create device nodes

     ```
     # cd /export/client/root/dev
     # ./MAKEDEV all
     ```

     This procedure only works on NetBSD hosts.

   - Set up the client's `fstab`(5)

     Create a file in `/export/client/root/etc/fstab` with the following lines:

     ```
     server:/export/client/swap   none  swap  sw,nfsmntpt=/swap
     server:/export/client/root   /     nfs   rw 0 0
     ```

   - Set up the client's `rc.conf`(5)

     Edit `/export/client/root/etc/rc.conf`

     ```
     rc_configured=YES
     hostname="client"
     defaultroute="192.168.1.1"
     nfs_client=YES
     auto_ifconfig=NO
     net_interfaces=""
     ```

Make sure rc does not reconfigure the network device since it will lose its connection to the NFS server with your root file system.

- Set up the client's `hosts`(5) file.

  Edit `/export/client/root/etc/hosts`

```
::1                     localhost
127.0.0.1               localhost
192.168.1.10 client.test.net client
192.168.1.5  server.test.net server
```

8. Setting up the server daemons

   If you want these services to start up every time you boot your server, make sure the following lines are present in your `/etc/rc.conf`:

```
dhcpd=YES         dhcpd_flags="-q"
rarpd=YES         rarpd_flags="-a"
nfs_server=YES          # enable server daemons
mountd=YES
rpcbind=YES       rpcbind_flags="-l"   # -l logs libwrap
```

   Also, you'll need to make sure the `tftpd` line in `/etc/inetd.conf` remains uncommented.

Now, netboot your Sparc from the server by entering the appropriate **`boot`** command at the monitor prompt. Depending on the PROM version in your machine, this command takes one of the following forms:

sunmon

> **`b le()netbsd`**

OpenBoot PROM 1

ok **`b le()netbsd`**

OpenBoot PROM 2

ok **`boot net netbsd`**

After the initial probe messages you'll be asked to start the install or upgrade procedure. Proceed to the section **Running the installation scripts.** below.

Installing NetBSD by using a bootable tape

Sun sets their tape drives to SCSI ID 4. We recommend you do the same.

Get the tape images (`installation/tape/tapefile1.gz` and `installation/tape/tapefile2`) and transfer them to a tape. Make sure you use the 'no rewind scsi tape' device. Run the following commands:

```
# gunzip tapefile1.gz
# mt -f /dev/nrst0 rew
# dd if=tapefile1 of=/dev/nrst0 bs=4k conv=osync
# dd if=tapefile2 of=/dev/nrst0 bs=4k conv=osync
```

Now you can transfer the NetBSD 4.0.1. distribution sets from (`binary/sets`) to the tape by using a series of additional

```
# dd if=<aset>.tgz of=/dev/nrst0 bs=4k conv=osync
```

commands. See also the section **Getting the NetBSD System on to Useful Media.** Be sure to mark the location of these files on the tape; you'll need them during the installation procedure.

Insert the tape into your Sparc's tapestation. Boot the installer by typing the appropriate command at the PROM prompt:

sunmon

> **b st()**

OpenBoot PROM 1

ok **boot st()**

OpenBoot PROM 2

ok **boot tape**

After the initial probe messages you'll be asked to confirm the tape device and tape file number containing the installation tools. Then, proceed to the section **Running the installation scripts.** below.

Running the installation scripts

The first thing that the installation scripts will inquire about is the type of console you're using on your machine. If you're using a Sun frame buffer display, choose the terminal type **sun** (this is presented as the default) .

Note: if your frame buffer device is a cgsix Sbus board, you should change the terminal type to **sun-cgsix** to avoid triggering a bug in the board's firmware code that can garble your screen.

If you're using a terminal device connected to a serial port, choose a terminal type appropriate for that device, e.g. **vt100** or **vt200**.

Next, you will be presented with a choice of two installation methods: a new full-screen **sysinst** program, or the traditional script-based **miniroot** program. The **sysinst** program is easier to use, but the **miniroot** program is more flexible. Both of these installation methods will follow the same set of procedures and will fully install NetBSD on your Sparc.

You will frequently be asked for confirmation before the system proceeds with each phase of the installation process.

Occasionally, you will have to provide a piece of information such as the name of the disk you want to install on, partitioning information, or IP addresses and domain names you want to assign. If your system has more than one disk, you may want to look at the output of the `dmesg`(8) command to see how your disks have been identified by the kernel.

Note: If you repartition a hard drive, be certain that every partition starts on a cylinder boundary for compatibility with the Sparc ROM.

The installation script goes through the following phases:
- determination of the disk on which to install NetBSD
- checking/creation of the partition information on the disk
- creating and mounting the NetBSD file systems
- setup of network configuration
- extraction of the distribution tar files
- installation of bootstrap programs

Now try a reboot. Initially we'd suggest you **boot sd()netbsd -bs**, then try multiuser after that. If you boot single-user the NetBSD incantation to make the root file system writable is

mount -u /dev/sd0a /

Your PROM might have been setup to instruct the boot program to load a file called `vmunix`. On OpenBoot PROM systems you can change it to load `netbsd` instead using the following commands:

OpenBoot PROM 1

ok **setenv boot-from sd(0,0,0)netbsd**

OpenBoot PROM 2

ok **setenv boot-file netbsd**
ok **setenv boot-device disk:a**

Congratulations, you have successfully installed NetBSD 4.0.1.

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 **sun** for a local console, or whatever is appropriate for your serial console (some systems display garbage with a **sun** terminal type, you may need to use **sun-ss5**) 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=sun
   ```

   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_le0="inet 123.45.67.89 netmask 255.255.255.0"
   ```

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

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

To enable proper hostname resolution, you will also want to add an `/etc/resolv.conf` file or (if you are feeling a little more adventurous) run `named`(8). See `resolv.conf`(5) or `named`(8) for more information. 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. Select the proper terminal devices

   If you are using a serial console, you will have to edit the `/etc/ttys` file and change sun to the appropriate terminal type, such as vt220.

3. 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? [...]`.

4. 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.

5. 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.

6. 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/pkgsrc/packages/NetBSD/
     usually in the `sparc/4.0/All` subdir. You can install them with the following commands under `sh`(1):

     ```
     # PKG_PATH=ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/sparc/4.0/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/pkgsrc/packages/NetBSD/sparc/4.0/All
...
```

Note: Some mirror sites don't mirror `/pub/pkgsrc` directory. If you would like to use such mirrors, you could also try the `/pub/NetBSD/packages/current-packages/NetBSD/sparc/4.0/All` directory which may have the same contents.

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.

Note: In some case the `pkg_add`(1) command will complain about a version mismatch of packages with a message like the following:

```
Warning: package 'foo' was built for a different version
of the OS:
NetBSD/i386 4.0 (pkg) vs. NetBSD/i386 4.0.1 (this host),
```

This warning would be harmless if the formal major release numbers are same between the pkg and your host. Please refer "the NetBSD release glossary and graphs":

http://www.NetBSD.org/releases/release-map.html

for details of the release numbering scheme of NetBSD.

- 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.

7. 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 4.0.1 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 boot from the installer kernel using one of the methods described above. 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 4.0.1 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
```

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/sparc 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.

The network bootstrap `/usr/mdec/boot.net` and GENERIC and INSTALL kernels now try DHCP/BOOTP before falling back to bootparams.

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 4.0.1.

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-users@NetBSD.org.

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

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- The Luleå Academic Computer Society for providing the backup services server.
- The Columbia University Computer Science Department for hosting the NYC build cluster.
- The Western Washington University Computer Science Department for running the WWU build cluster that produces daily snapshots.

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

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