NAME

INSTALL — Installation procedure for NetBSD/next68k.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 5.0.1 on the *next68k* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

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

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on 57 different system architectures (ports) across 15 distinct CPU families, and is being ported to more. The NetBSD 5.0.1 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 5.0 and 5.0.1 Releases

The NetBSD 5.0.1 release is the first security/critical update of the NetBSD 5.0 release branch. This represents a selected subset of fixes deemed critical in nature for stability or security reasons.

Please note that all fixes in security/critical updates (i.e., NetBSD 5.0.1, 5.0.2, etc.) are cumulative, so the latest update contains all such fixes since the corresponding minor release. These fixes will also appear in future minor releases (i.e., NetBSD 5.1, 5.2, etc.), together with other less-critical fixes and feature enhancements.

The complete list of changes can be found in the CHANGES-5.0.1:
http://ftp.NetBSD.org/pub/NetBSD/NetBSD-5.0.1/CHANGES-5.0.1
file in the top level directory of the NetBSD 5.0.1 release tree. An abbreviated list is as follows:

Security Advisory Fixes

- NetBSD-SA2009-004 (NetBSD OpenPAM passwd(1) changing weakness):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-004.txt.asc
- NetBSD-SA2009-005 (Plaintext Recovery Attack Against SSH):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-005.txt.asc
- NetBSD-SA2009-006 (Buffer overflows in ntp):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-006.txt.asc
- NetBSD-SA2009-007 (Buffer overflows in hack(6)):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-007.txt.asc

- NetBSD-SA2009-008 (OpenSSL ASN1 parsing denial of service and CMS signature verification weakness):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-008.txt.asc
- NetBSD-SA2009-009 (OpenSSL DTLS Memory Exhaustion and DSA signature verification vulnerabilities):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-009.txt.asc
- NetBSD-SA2009-010 (ISC dhclient subnet-mask flag stack overflow):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-010.txt.asc
- NetBSD-SA2009-011 (ISC DHCP server Denial of Service vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-011.txt.asc
- NetBSD-SA2009-012 (SHA2 implementation potential buffer overflow):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-012.txt.asc
- NetBSD-SA2009-013 (BIND named dynamic update Denial of Service vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-013.txt.asc

Advisories prior to NetBSD-SA2009-004 do not affect NetBSD 5.0:
http://www.NetBSD.org/support/security/patches-5.0.html

Kernel

- Fix random "filesystem full" messages on large FFS file systems.
- Fix a regression in the 4.4BSD scheduler, improving interactive performance under load.
- Remove a race where physio_done() may use memory already freed. Fixes PR kern/39536.
- Fix a crash observed when trying to load a corrupted ELF kernel module.
- Fix PR kern/41566, where writes on the controlling tty were not being awoken from blocks.
- Various fixes for POSIX message queues.
- Fix a possible deadlock in the VFS subsystem.
- Fixes for POSIX advisory locks.
- A number of other stability fixes.

Networking

- Follow exactly the recommendation of draft-ietf-tcpm-tcpsecure-11.txt: Don't check gainst the last ack received, but the expected sequence number. This makes RST handling independent of delayed ACK.
- Fix a panic when trying to disable IPFilter before enabling it. Fixes PR kern/41364.

Drivers

- `ehci`(4): Add a workaround for ATI SB600 and SB700 revisions A12 and A13 to avoid a USB subsystem hang when the system has multiple USB devices connected to it or one device is re-connected often.
- `wm`(4):
  - On i82563, FreeBSD's em driver says that the ready bit in the MDIC register may be incorrectly set. Insert delay(200) like the em driver. Fixes PR kern/41014.
  - Add workaround for 82543GC. We need to force speed and duplex on the MAC equal to what the PHY speed and duplex configuration is. Fixes PR kern/36430.

- Fix many problems and panic on TBI's cards (PR kern/32009).

Platform specific

- x86 (amd64 and i386): Add a workaround for a bug with some Opteron revisions where locked operations sometimes do not serve as memory barriers, allowing memory references to bleed outside of critical sections.
- amd64: Handle protection faults properly, returning SIGSEGV instead of SIGBUS.
- hp300: Make install.md probe `cd`(4) devices properly.
- pmax: Make ksyms(4) actually work.
- sh3: Fix logic error in copyinstr() when deciding whether to return EFAULT or ENAMETOOLONG.
- sparc64:
  - Fix long double support in 32bit libc. Fixes PR port-sparc64/41406.
  - When preparing the initial trap frame for a new forked lwp, explicitly clear condition code. Otherwise we might catch a signal before we ever return to userland. Fixes PR port-sparc64/41302.
- vax: binutils: Allocate relocation section using bfd_zalloc() to ensure no garbage relocations when not all the entries are used. Fixes PR port-vax/39182.

Userland

- Update pkg_install to 20090724.

  Note: pkg_install now depends on the pkgdb cache for automatic conflict detection. It is recommended to rebuild the cache with

  ```
  # pkg_admin rebuild
  ```

  `audit-packages.conf`(5) has been superseded by `pkg_install.conf`(5). The default configuration is the same.

  Support for `pkg_view`(1) has been retired.

  The functionality of `audit-packages`(1) and `download-vulnerability-list`(1) has moved into `pkg_admin`(1). However, wrapper scripts that handle the common use cases are provided.
- Update libfetch to 2.23.
- `racoonctl`(8): Adjust ADMINPORTDIR to match that of racoon (/var/run). Fixes PR bin/41376.
- `schedctl`(8): Skip LSIDL and LSZOMB threads when retrieving info.
- `postinstall`(8) now knows about /etc/dhcpcd.conf.

Miscellaneous

- The X.Org s3 driver now works.
- Install the Xvidtune app-defaults file.
- Fixes to Linux compat:
  - In sendmsg(2), do copy the msghdr structure before trying to use it.
  - In linux_sys_sched_getaffinity(), do not leak memory on error.

- Various METALOG fixes, including sorting entries. Addresses PR toolchain/24457 and PR bin/41155.

Changes Between The NetBSD 4.0 and 5.0 Releases

The NetBSD 5.0 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 the massive development that went into the NetBSD 5.0 release. The complete list of changes can be found in the CHANGES:

ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-5.0/CHANGES

and CHANGES-5.0:

ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-5.0/CHANGES-5.0

files in the top level directory of the NetBSD 5.0 release tree.

Some highlights include:

General kernel

- Introduced new synchronization primitives and made almost all core kernel subsystems use fine-grained locking, resulting in much greater performance on MP systems. See `mutex`(9), `rwlock`(9), and `condvar`(9).
- The threading system was rewritten and is now based on a 1:1 model.
- Made the process scheduler modular, allowing for different scheduling algorithms to be selected.
- The default scheduler implementation was rewritten, giving large performance improvements on SMP systems, and bringing support for real-time and time-sharing classes.
- Added support for SCHED_M2, a second scheduling algorithm, as an alternative to the original SCHED_4BSD algorithm.
- Added support for POSIX real-time scheduling extensions.
- Added support for POSIX asynchronous I/O.
- Added support for POSIX message queues.
- Added support for processor sets, CPU sets, and thread affinity. See `pset`(3), `cpuset`(3), and `affinity`(3).
- Added MI code to support in-kernel preemption and made i386 and amd64 use it. See `kpreempt`(9).
- Added a new implementation of software interrupts in a machine-independent way to provide software interrupts with thread context. All ports were made to use it. See `softint`(9).
- Added support for per-system call statistics.
- Added support for per-CPU work-queues. See `workqueue`(9).
- Added support for kernel core dumps to software RAID 1 sets.
- Added `mremap`(2), to remap virtual memory addresses.
- Added support for dynamic changing of SysV message queues and semaphore limits.
- Improved pagedaemon behavior on memory shortage.
- Added TFTPROOT option for TFTPing root ramdisk at root mount time.

- Added putter(9) (Pass-to-Userspace Transporter), a generic request-response handler for kernel-attached userspace daemons.
- Added a new power management framework, pmf(9).
- By default, the kernel no longer enters ddb(4) if it panics. To get the old behavior, set ddb.onpanic to 1 in /etc/sysctl.conf.
- ddb(4): Added a "whatis" command, inspired by Solaris.
- All ports made to use generic todr(9).
- All ports made to use timecounter(9).
- Added Mersenne Twister PRNG implementation.
- Added posix_madvise(2).
- Numerous improvements to compat_linux(8) and compat_linux32.
- Device attach and detach notifications are now exposed via /dev/drvctl.
- Added sockopt(9), a new kernel API for passing socket options.
- If no usable init(8) program can be found, set the RB_ASKNAME flag and prompt users for the init path.

Networking

- Added ipv6 fast forward support, which increases forwarding speed by hashing/caching flows.
- Added per-socket keepalive timer settings and the ability to change connection timeouts.
- Added support for automatic sizing of TCP socket buffers.
- Added a new socket option SO_NOHEADER to tell the network stack to strip the protocol header from packets received on a raw socket.
- Added accept filters. See accept_filter(9), accf_data(9), and accf_http(9).
- fast_ipsec(4): Added support for IPsec NAT-T.
- pf(4): Made "nat" and "rdr" translation rules obey state policy flags. Extended pf.conf(5) syntax to express the translation-state policies.
- Network statistics were changed to be per-CPU.
- ALTQ: Added support for source address hashing in the WFQ scheduler.
- Pulled in IANA-generated services and protocols files.

File systems

- Added wapbl(4), a preview of metadata journaling for FFS. Contributed by Wasabi Systems.
- Added read-only support for Apple HFS+ file systems. See mount_hfs(8).
- Added read-only support for Silicon Graphics EFS file systems. See mount_efs(8).
- Added write support for UDF file systems. See mount_udf(8).
- Added mount_psshfs(8), to support puffs(3) sshfs.
- Added mount_9p(8), to support 9P file services with puffs(3).

- Added rump_nfs(8), a userspace NFS client.
- Added mount_sysctlfs(8), to support browsing, querying, and modifying the sysctl(3) hierarchy.
- Added refuse(3) for FUSE compatibility functionality, layered on top of puffs(3).
- Added the user kernel file system library, ukfs(3), for standalone file system access.
- Added p2k(3), a puffs(3) to kernel vfs adaption library.
- puffs(4): Added support for NFS exporting puffs file servers.
- Added 32 bit UID/GID support for ext2fs.
- Added a newfs_ext2fs(8) utility to create Ext2 file systems.
- /proc is now mounted by default. Extended the Linux emulation of /proc to include /proc/stat, /proc/loadavg, and /proc/<pid>/statm. Linux compatibility mode is now the default. Use -o nolinux if Linux compatibility is not desired.
- Write speed to FAT file systems was significantly increased and the 255 head limit was removed.
- Imported FreeBSD's unionfs.
- fsck_ext2fs(8), fsck_ffs(8), fsck_lfs(8): Disable userid to username lookups by default and add -U flag to perform them.
- scan_ffs(8): Added -b option to search a partition for valid alternate superblocks.
- fsck_ffs(8): Added -x/-X options, which allow running fsck_ffs -n on a snapshot of a live filesystem.

Security

- Added support for per-user /tmp. See security(8).
- Added support for ASLR (Address Space Layout Randomization) in the kernel and dynamic linker. See security(8).
- Added an opencrypto(9) provider for VIA ACE (AES encryption instructions).
- Added nsp(4), a driver for NetOctave NSP2000, contributed by NBMK Encryption Technologies, ported from vendor FreeBSD SDK and integrated with opencrypto by Coyote Point Systems.
- opencrypto(9): Improved performance by adding asynchronous operation and batched submit/retrieve of requests/results. Contributed by Coyote Point Systems.
- cgd(4): Changed the default IV to encblkno1, which is faster without a real loss of security.
- openssl(1): Enabled support for Camellia.

Drivers

- Audio:
  - Added pad(4), a pseudo-audio device driver for feeding back raw PCM data to userland.
  - Added sgsmix(4), a driver for the SGS 7433 mixer found in some G3 Macs.
  - umidi(4): Added support for Roland UA25, UA4FX, and SonicCell devices.
  - dbri(4): Added support for audio input.
  - auvia(4) now works on big endian machines.

  - azalia(4): AD1984 support was greatly improved. Added support for Realtek ALC662-GR and ALC269 codecs, which are found in EeePCs. Added support for ALC268.
  - auich(4): Fixed a clock accounting problem that prevented detecting sample rates correctly.

- Hardware Monitoring:
  - Imported envsys2, which brings, among other things, the ability to send events to powerd(8). See envsys(4) and sysmon_envsys(9).
  - Added support for hardware monitoring on Sun Ultra Enterprise 450.
  - Added aiboost(4), a driver for the ASUS AI Booster ACPI Hardware monitor.
  - Added smsc(4), a driver for the hardware monitoring portion of the SMSC LPC47B397.
  - Added aps(4), a driver for the IBM Thinkpad Active Protection System.
  - Added coretemp(4), a driver for Intel Core (and newer) on-die thermal sensors.
  - Added finsio(4), a driver for various Fintek Super I/O chips.
  - Added amdtemp(4), a driver for AMD CPU on-die thermal sensors.
  - Added dbcool(4), a driver for Analog Devices dbCool chips including ADT7460, ADT7463, ADT7467, and ADM1030.
  - Added alipm(4), a driver for the Acer Labs M7101 Power Management Controller.
  - Added admtemp(4), a driver for the Analog Devices ADM1021 temperature sensor.
  - viaenv(4): Added support for VIA VT8231.
  - nsclpcsio(4): Added support for the VLM logical device.
  - lm(4): Added an i2c attachment for the LM78 family of temp sensor and fan controllers.
- Networking:
  - Added jme(4), a driver for the JMicron Technologies JME250 Gigabit Ethernet and JME260 Fast Ethernet controllers.
  - Added u3g(4), a driver for many multi-port 3G datacards.
  - Added iwn(4), a driver for the Intel Wireless LAN 4965AGN adapter.
  - Added zyd(4), a driver for ZyDAS ZD1211/ZD1211B USB IEEE 802.11b/g wireless network devices.
  - Added uhmodem(4), a driver for 3G wireless modems including Huawei E220 and E620, E-mobile D01HW and D02HW, and NTT DoCoMo a2502.
  - Added lii(4), a driver for the Atheros L2 Fast Ethernet controller.
  - Added btuart(4), a driver for Bluetooth HCI UART (H4).
  - Firmware images are now shipped for ipw(4), iwi(4), wpi(4), and iwn(4). For ipw(4) and iwi(4), the Intel EULA has to be accepted via sysctl(8).
  - fxp(4): Fixed some TX timeout and RX pool corruption problems. Added a workaround for a hardware ip4csum-tx bug.
  - bge(4): Added support for BCM5786 and BCM5906(M). Fixed fiber card support.

  - nfe(4): Added support for NVIDIA MCP67/73 Ethernet controllers. Fixed wakeup issues on some newer chips. Fixed a problem with receiving jumbo frames.
  - btbc(4): Added support for AnyCom BlueCard devices.
  - rum(4): Added support for MELCO WLI-U2-SG54HP, PLANEX GW-US54Mini2, COREGA CG-WLUSB2GL and K.K. CG-WLUSB2GPX, and ABOCOM WUG2700.
  - makphy(4): Added support for Marvell 88E1116 Gigabit PHY.
  - gem(4): Added support for Sun PCI SX fiber cards and Sun SBus SX fiber cards.
  - wm(4): Added support for the Intel PRO/1000 PT Quad Port Server Adapter. Fixed a bug on receiving a jumbo frame which lead to a panic in sbcompress(). Added support for more ICH9 devices. Fixed an EEPROM-trashing bug on ICH8 and ICH9 chipsets.
  - udav(4): Added support for Shantou ADM8515.
  - brgphy(4): Added support for BCM5708C.
  - re(4): Made hardware vlan(4) insertion/extraction work properly. Added support for the Realtek 8102E/8102EL PCIe 10/100 Ethernet adapters, as well as the 8111C chips that are found on many Intel-based motherboards.
  - sk(4), msk(4): Fixed a lock panic on receiving jumbo packets.
  - msk(4): Fixed a Yukon EC Ultra cold power up issue.
  - bnx(4): Added support for SerDes controllers.
  - vge(4): Added ifconfig down and ALTQ support.

- Storage:
  - Added arcmsr(4), a driver for Areca Technology Corporation SATA RAID controllers.
  - Added siisata(4), a driver for Silicon Image SteelVine SATA-II controllers (SiI3124, SiI3132, and SiI3531).
  - isp(4): Major update, including 4Gb (24XX) card support and new firmware sets.
  - piixide(4): Added support for ICH10.
  - ahcisata(4): Added support for ATAPI devices.
  - svwsata(4): Added support for ServerWorks HT-1000 SATA controller.
  - njata(4): Added support for Workbit CF32A CF adapter.
  - viaide(4): Added support for VIA CX700, CX700M2, NVIDIA MCP67, and MCP73/77 controllers.
  - mfi(4): Added support for LSI SAS1078 and Dell PERC 6 controllers.
  - mpt(4): Fixed performance problems for old revisions of the Symbios 53c1030.
  - cac(4): Added initial bio(4) support; only volume status is handled at this time.
  - siop(4): Added support for the non-PCI NCR 53c720/770 in big-endian mode.
  - twa(4): Added support for 3ware 9650 and 9690, based on contributions from Wasabi Systems.
  - ciss(4): Added bio(4) support.

  - ataraid(4): Added NVIDIA MediaShield, JMicron RAID, and Intel MatrixRAID support. Added support for status reports through bio(4).
  - ixpide(4): Added support for ATI SB700/SB800 controllers.
  - aac(4): Added support for raw I/O mode and >2TB.
  - umass(4): Added support for Sony GPS GPS-CS1. Fixed a panic on device removal.
  - aic(4): Worked around an rbus resource allocation problem so that aic PCMCIA cards work again.
  - Implemented DIOCACHESYNC for RAIDframe, vnd(4), and cgd(4).
  - rccide: Added support for the ServerWorks HT-1000 IDE controller.
  - wd33c93: Enabled Fast SCSI transfers for WD33C93B parts with appropriate input clocks.
- USB:
  - Added uvideo(4), a driver for USB Video Class capture devices, from Patrick Mahoney's Google Summer of Code 2008 project.
  - Added uslsa(4), a driver for CP210x USB-RS232 devices.
  - Added uchcom(4), a driver for WinChipHead CH341/340 and HL-340 USB-Serial adapters.
  - Added uberry(4), a driver to allow RIM BlackBerries to charge from the USB port.
  - Added appropriate bus_dmamap_sync(9) calls to uhci(4), ohci(4), and ehci(4) to prevent the CPU from reordering loads and stores against DMA descriptors. This fixes "host controller process error/host controller halted" errors.
  - ehci(4): Added isochronous transfer support, contributed by Jeremy Morse as part of his Google Summer of Code 2008 project.
  - ukbd(4): Added support for function keys F16 through F19.
  - uplcom(4): Added support for Willcom WS002IN PHS and SMART Technologies-badged devices. Recognize Corega CG-USBRS232R as a serial device.
  - ugensa(4): Added support for Novatel Wireless Merlin CMDA and Ovation U727.
  - ubsa(4): Added support for CDMA modems sold by Eurotel/O2.
  - uftdi(4): Added support for Sealevel SeaPORT+4 USB to Serial adapter.
  - slhci(4): Replaced with Matthew Orgass's driver.
- Graphics and Video:
  - Switched to X.Org on amd64, i386, macppc, sgimips, shark, and sparc64.
  - Added video(4), a video4linux2 compatible capture interface, part of Patrick Mahoney's Google Summer of Code 2008 project.
  - Added uvideo(4), a driver for USB Video Class capture devices, from Patrick Mahoney's Google Summer of Code 2008 project.
  - Added pseye(4), a driver for the Sony PLAYSTATION(R) Eye USB webcam.
  - Added genfb(4), a generic framebuffer console driver with PCI and SBus frontends.
  - Added AGPv3 support to VIA AGP driver.

- Added support for Fujitsu AG-10e graphics cards.
- Added r128fb, an accelerated console driver for ATI Rage 128 graphics controllers.
- Added `isv`(4), a driver for the IDEC Supervision/16 image capture board.
- `wscons`(4): Added scrollback support to vcons.
- `cgfourteen`(4): Added support for wscons.
- `agp`(4): Added support for ALI M1689, MB i965Q, Intel Q33/35/G33, Intel 945GME, and Intel 946GZ.
- `bktr`(4) now works on amd64.

• Miscellaneous:

- Added `pud`(4), a driver that makes it possible to implement block and character devices in userspace.
- Added `spdmem`(4), a Serial Presence Detect driver that decodes technical specs stored in the eeprom on common types of memory modules.
- Added `bcsp`(4) to support the BlueCore Serial Protocol.
- Added `thinkpad`(4), a driver to support IBM/Lenovo Thinkpad hotkeys, brightness controls, and temperature and fan monitoring.
- Added `gcscpcib`(4), a driver for the AMD CS5535 and CS5536 Companion Device with support for the timecounter, watchdog timer, and GPIO.
- Added `ichsmb`(4), a driver for Intel ICH SMBus controllers.
- Added `asus`(4), a driver for ASUS ACPI hotkeys as found in the EeePC.
- Added `acpidalb`(4), a driver for PNP0C32 ACPI hotkeys, aka the Direct Application Launch Buttons.
- Added `hpqlb`(4), a driver for hotkeys on some HP notebooks.
- `adb`(4): New and simplified MI ADB drivers.
- `ichlpcib`(4): Added support for the TCO (watchdog) on ICH6 or newer chipsets. Now runs on EM64T systems as well.
- `itesio`(4): Added support for the watchdog timer.
- `ulpt`(4): Implemented non-blocking read.
- `puc`(4): Added support for the I-O DATA RSA-PCI 2 port serial board, Digi International 4 and 8 port boards, and B&B Electronics MIPort serial boards.
- `piixpm`(4): Added support for ATI SB600, SB700, and SB800 SMBus controllers.
- `wscons`(4): Added support for the Colemak keyboard layout.
- `com`(4): Added support for PCMCIA Sierra Wireless Aircard 850.
- `nfsmb`(4): Added support for numerous NVIDIA chipsets.

Platforms

- x86 (i386, amd64):
  - Removed GENERIC.MP and made MULTIPROCESSOR mandatory.
  - Enabled BUFQ_PRIOCSCAN in GENERIC for better responsiveness under heavy disk I/O.
  - Added fatboot, a sub-512 byte bootloader that can be written into the first sector of a FAT16 file system.
  - Added support for enhanced speedstep on Intel Atom CPUs.
  - Added a High Precision Event Timer driver.
  - Merged amd64 and i386 pmap. Large pages are always used if available.
  - Added support for the Intel 82G965 chipset.
  - Added `boot.cfg`(5) to configure the bootloader.
  - The boot menu now allows disabling ACPI and/or SMP.
  - Added support for ACPI S3 (suspend-to-RAM) on MP systems.
  - Added `mbr`(8) variants that directly access serial ports.
  - It is now possible on some systems to get to a `ddb`(4) session on a VGA console if the system crashed while X11 was running.
  - Added detection of errata for AMD Family 10h steppings A and 2.
  - Added checks for erratum 261 on AMD Family 10h stepping 3 processors.
  - `boot`(8): Added support for the multiboot protocol. This allows booting Xen without GRUB.
  - The kernel now recognizes CD-ROMs as booted devices.
  - Added an Intel On Demand Clock Modulation driver.
- i386:
  - Removed support for 80386 level CPUs.
  - Added support for Microsoft Xbox.
  - Added `cmos`(4), a driver for CMOS RAM.
  - Added support for VIA Esther.
  - i386 bootblocks are now able to boot amd64 kernels and support for a.out kernels has been removed.
  - Removed pccons.
  - Added support for sparse kernel core dumps.
  - Removed the MATH_EMULATE option.
  - Added the i386-specific COMPAT_30_PTHREAD option, which restores binary compatibility with netbsd-3 libpthread.
- amd64:
  - Added support for PCI_BUS_FIXUP and PCI_ADDR_FIXUP kernel options.

- acorn32:
  - Added support for Kinetic cards.
  - Fixed up boot32 to work on A7000+.
- algor:
  - Fixed a `delay`(9) issue and now the P5064 kernel works in gxemul.
- alpha:
  - Make dynamic executables work under `compat_osf1`(8) again.
- amiga:
  - Added a `wdc`(4) frontend for the buddha and catweazle Z2 hardware.
- arc:
  - Added support for booting from UFS2 partitions.
  - Added `sysinst`(8) support.
- arm:
  - Added armv6 kernel support.
  - Added arm32 support for kernel crashdumps.
  - Added VFP support.
  - Added AT91 support.
  - Added FA526 support.
  - Added the missing kernel bits that kept `eeprom`(8) from actually changing firmware settings.
- atari:
  - Fixed the sysinst miniroot image and retired the old miniroot.
  - Fixed a hang on loading md_root from floppy during installation.
  - Many pmap bugs were fixed and it was synced with amiga's pmap.
  - Fixed a lost interrupt problem on Falcon `wdc`(4).
  - Renamed the BOOT kernel to SMALL030 and removed BOOTX.
  - Added support for installation from GEMDOS partitions.
  - Fixed an ncr5380 SCSI freezing problem that occurred during boot.
- bebox:
  - Converted to generic powerpc PCI and ISA frameworks.
  - Added support for `genfb`(4).
- cobalt:
  - Added `sysinst`(8) support.
  - Added support for booting from UFS2 partitions.

  - Added support for booting from Ext2fs partitions.
  - Added netboot support for 21041 on Qube 2700.
  - Startup and shutdown messages, as well as a banner and kernel name are now printed on the LCD panel.
  - Added kernel and bootloader support for optional Z85C30 serial on Qube 2700.
  - Fixed a botched `spl`(9) bug which could cause a network freeze on traffic between two network interfaces.
- evbarm:
  - Added support for the Cortina Systems SL3516 evaluation board.
  - Added support for NPE Ethernet found on IXP425 boards.
  - Added a PXA2x0 RTC driver.
- evbmips:
  - Added support for Infineon ADM5120.
- evbppc:
  - Added support for Xilinx Virtex II-Pro/4-FX.
  - Converted PM/PPC to generic powerpc clock, PCI, and interrupt frameworks.
  - Fixed sysinst to refer to the proper WALNUT and OPENBLOCKS266 kernels.
- hp700:
  - Added support for booting from CD-ROM images.
  - Fixed kernel profiling.
  - Kernels are now compiled with -O2.
  - Added `gdb`(1) support.
  - Added bootinfo support.
  - Added support for NCR 53C720.
- hpcmips:
  - Fixed a silent hangup problem on TX3922 machines.
- ibmnws:
  - Converted to generic powerpc clock, PCI, and interrupt frameworks.
- landisk:
  - Added `sysinst`(8) support.
  - Fixed MD `bus_dmamap_load`(9) so that NFS write works with `re`(4).
- mac68k:
  - Added support for more NuBus video cards, including VillageTronic MacPicasso 340.
  - Added support for Creative Systems Inc Hurdler CPI NuBus parallel printer card.

  - Switched sn(4) to use the MI SONIC driver.

- macppc:
  - Switched to generic powerpc interrupt, clock, PCI, bus_dma(9), bus_space(9), SMP, and IPI frameworks.
  - genfb(4) is now the default framebuffer.
  - Switched to the new ADB subsystem.
  - Added support for bus speed control found in some Intrepid-based laptops like the 800MHz iBook G4.
  - Converted to shared ofw_autoconf.
  - Converted to shared powerpc major numbers.
  - Added an experimental Apple UniNorth AGP driver.
- mvmeppc:
  - Converted to generic powerpc clock/PCI/interrupt frameworks.
- m68k:
  - Fixed a panic in FPE code caused by 040/060 specific FDADD instructions on 020/030 machines.
  - gcc(1): Fix jump table addressing in the M68k codegen.
  - Fixed floating point handling regressions.
- ofppc:
  - Completely rewrote the ofppc port from scratch.
  - Added support for the bplan/Genesi Pegasos II.
  - Added support for the IBM 7044-270.
  - Added support for the IBM 7046-B50.
  - Added install support and booting from RAID.
  - Fixed ofwboot to work on an IBM CHRP-based RS/6000.
  - Added support for SMP.
- pmppc:
  - Removed pmppc as a port and moved it under evbppc.
- powerpc:
  - Added a generic interrupt handler framework.
  - Added generic shared timecounter-based clock routines.
  - Added shared PReP memory maps.
  - Added generic powerpc OpenFirmware code.
  - Added a generic powerpc IPI framework.
  - Added new generic powerpc SMP support framework.

  - Added tuned assembler from IBM for memcpy(3), memmove(3), and memcmp(3).
  - Added booted_kernel and booted_device sysctl.
  - Added the missing kernel bits that kept eeprom(8) from actually changing firmware settings.
- prep:
  - Switched to generic powerpc PCI, ISA, interrupt, clock, IPI, and SMP frameworks.
  - Added support for the MTX604 RAVEN based machine. Other RAVEN based machines are also likely to work now.
  - Added support for floppy controller/drive.
- sandpoint:
  - Switched to generic powerpc interrupt, clock, PCI, and ISA frameworks.
  - Added a DHCP/NFS bootloader.
  - Converted to shared powerpc major numbers.
- sgimips:
  - Added support for the SGI O2 PS/2 controller macekbc(4), onboard display adapter crmfb(4), and audio driver mavb(4).
  - Added support for Set Engineering's GIO Fast Ethernet board: tl(4).
  - Added support for the SGI Light/Entry/Starter LG1/LG2 framebuffers found in Indigo systems: light(4).
  - Added support for the sq(4) interface on the Challenge S's IOPLUS mezzanine.
  - Added support for booting from UFS2 partitions.
  - Many bug fixes and improvements to the MAC-110 Ethernet driver found in the O2.
- sh3:
  - Implemented fast path TLB miss handling.
  - Fixed compilation of native sh3 gcc on 64-bit build machines.
  - Added support for single-stepping in ddb(4).
- shark:
  - Added dhclient(8) to the install disk image.
  - The installation disk now uses wscons.
  - Removed pccons, which has been obsoleted by wscons(4).
  - X works again on revision 4 machines.
- sparc:
  - Added support for booting from UFS2 partitions.
  - Added support for Sun PGX32 / TechSource Raptor GFX 8P to genfb(4).
- sparc64:

  - SMP now works.
  - Fixed boot device matching on U5/U10 machines to properly distinguish cd0 from wd0.
- vax:
  - Turned on generation of PIC code.
  - Added an accelerated driver for SPX graphics cards found in some VAXstations.
  - Fixed Unibus support on VAX11/780 and 8600 models.
- xen:
  - Added support for amd64, both as dom0 and domU.
  - Added support for the i386 PAE extension to Xen3 domU.
  - Fixed PCI_BUS_FIXUP/PCI_ADDR_FIXUP support.
- zaurus:
  - Added the zaurus port, with support for Sharp C3x00 PDAs.
  - Allow Zaurus screen to rotate 90 degrees to a usable state with the keyboard.
  - Added support for detecting the AC adapter and charging the battery.
  - Added `sysinst`(8) support.

Userland

- 3rd party software updates:
  - ACPICA 20080321
  - am-utils 6.2a3
  - BIND 9.5.0-P2
  - file 4.26
  - GNU gcc 4.1.3-20080831
  - GNU gdb 6.5 on all ports
  - IPFilter 4.1.29
  - (n)awk 20070501
  - NTP 4.2.4p6
  - nvi 1.81
  - openpam 20071221
  - OpenSSH 5.0p1
  - OpenSSL SNAP-20080509
  - PF from OpenBSD 4.2
  - Postfix 2.5.4
  - texinfo 4.8

- Libraries:
  - pthread(3):
    - Major overhaul, resulting in many performance and stability improvements.
    - Added POSIX real-time extensions.
    - Diagnostic assertions are now disabled by default. Application errors will be reported only by error return from pthread APIs. The assertions can be re-enabled by setting the PTHREAD_DIAGASSERT environment variable as desired.
    - Added a PTHREAD__COMPAT build flag which creates a libpthread that can be dropped into a NetBSD 2/3/4 chroot and used on a kernel without scheduler activations support.
  - Replaced the default malloc(3) with jemalloc, bringing a significant performance boost for many threaded workloads that make heavy use of malloc.
  - curses(3):
    - Merged wide curses work done by Ruibiao Qui as a Google Summer of Code project.
    - Added termattrs(3) and term_attrs(3).
    - Added getwin(3) and putwin(3).
  - util(3):
    - Added estrndup(3).
    - Added raise_default_signal(3).
  - Added C99 complex support (float/double) to math(3).
  - proplib(3):
    - Implemented prop_dictionary_make_immutable(3).
    - Added prop_array_util(3) functions.
  - libc:
    - Added dehumanize_number(3).
    - Added posix_memalign(3).
    - Replaced O(nm) versions of strspn(3), strcspn(3), and strpbrk(3) with O(n+m) implementations.
    - Added getlogin_r(2).
    - Added the C99 functions imaxabs(3) and imaxdiv(3).
    - Enabled atomic_ops(3) in userspace.
    - queue(3): Added TAILQ_CONCAT() and STAILQ_CONCAT().
  - Added libgcov.
- Imported bozohttpd, a small HTTP server. See httpd(8).
- Imported dhcpcd 4.0.10.
- Imported openldap 2.4.11.

- Added rump(3), the Runnable Userspace Meta Program framework. Allows running kernel code in userspace applications.
- Added cpuctl(8), a utility that allows placing CPUs online/offline.
- Added schedctl(8), a program to control scheduling of processes and threads.
- Added psrset(8), a utility to control processor sets.
- Added atf(7), the Automated Testing Framework, Julio M. Merino Vidal's 2007 Google Summer of Code project.
- Added newgrp(1), a utility to change effective group ID.
- Added tcpdrop(8), a utility to drop tcp(4) connections.
- Added acpitools from FreeBSD: acpidump(8) and amldb(8).
- Added dkscan_bsdlabel(8) to scan disks for BSD disklabels.
- Added btkey(1), a utility to manage Bluetooth link keys in OS and device storage.
- Added svhlabel(8), a tool to update disklabel(5) from SGI Volume Header, like mbrlabel(8) for MBR labels.
- Added pcc(1) as an alternative compiler.
- Added btpand(8), a Bluetooth Personal Area Networking profile daemon.
- Added c99(1) as a wrapper to run cc(1) in C99 mode.
- Added support for Solaris $ORIGIN etc. expansions in paths.
- Added BUILDSEED support to build.sh to yield reproducible C++ builds.
- Added support for "cc -m32" on amd64 and sparc64 to generate 32 bit binaries. 32bit libraries are now provided on these two ports.
- ld(1) can now link 32bit objects on amd64.
- vi(1) has been updated to nvi 1.81, which supports internationalization. It also grew a new NetBSD-specific expandtab option.
- pkill(1): Added the -l (long format) option.
- find(1): Added the -delete and -E (extended regex) options.
- xargs(1): Replaced with FreeBSD's while keeping our GNU compatible exit values.
- sdiff(1): Replaced by OpenBSD's sdiff(1).
- pax(1): Added a -V flag for verbose summary without listing.
- top(1): Allow a single process to be selected by pid. Added a thread mode that displays LWPs.
- scsictl(8): Added a setspeed command.
- split(1): Added a new option "-n chunk_count" that splits the input into chunk_count smaller files.
- df(1): Fixed the -P option and added the -g (gigabytes) option.
- wtf(6) now searches pkgsrc's help database when called inside a package directory.
- atactl(8): Improved SATA support.

- `wlanctl`(8): Added a -p flag that only prints public nodes.
- `btconfig`(8): Added a new "rssi" option to toggle inquiry results with RSSI.
- `ifconfig`(8): Added "list scan" to ifconfig, which lists access points in the neighborhood.
- `newsyslog.conf`(5) gained a "J" flag to bzip2 logfiles.
- `fdisk`(8) now reports the first active partition.
- `bioctl`(8) was rewritten to handle new features like creating and removing hot-spares, pass-through disks and RAID volumes, start/stop consistency checks in volumes.
- `savecore`(8) now uses the raw device to read crashdumps.
- `make`(1): Implemented "-dl" (aka LOUD) to override "@" at the start of script lines.
- `monop`(6): The save and restore format changed, breaking compatibility with already broken previous save files.
- `iconv`(1) now allows SUSv3 syntax.
- `lint`(1): Added _Complex support.
- `ftp`(1): Added epsv6 and epsv to disable extended passive mode.
- `getent`(1): Added support for "netgroup" databases.
- `ypserv`(8): Disabled libwrap address to hostname lookups to avoid the chance of ypserv blocking for an extended period of time due to a long DNS timeout.
- `postfix`(1): Enabled LDAP support for tables.
- `amd`(8): Enabled LDAP support for maps.
- `newfs`(8): Added support for the "t" (terabytes) suffix.
- `grep`(1): A warning is now printed if "-r" is used without specifying an argument.
- `db`(1): Added support for encoding or decoding VIS_HTTPSTYLE, and for tuning the page size of the database.
- `daily.conf`(5): Added run_fsck_flags to allow passing extra options to the daily fsck -n.
- `sysinst`(8) now supports the Colemak and Dvorak keyboard layouts.
- `od`(1) Added support for the "-A addressformat" flag.
- `etcupdate`(8): Removed the "-b binarydir" and "-s srcdir/etc" options which were deprecated in NetBSD-4.0. Deprecate the "-s tgz1:tgz2" option; please use "-s tgz1 -s tgz2" instead.
- `postinstall`(8): Deprecated the "-s tgz1:tgz2" option; please use "-s tgz1 -s tgz2" instead.
- `sed`(1): Added the -r flag, which is an alias for -E, to be compatible with GNU sed.
- `patch`(1): Merged improved version from DragonFly. patch -b now behaves as specified by POSIX.
- `rc.conf`(5): ifconfig_xxN variables may now have multi-line values, just like /etc/ifconfig.xxN files, and semicolons may be used instead of line breaks.
- `ls`(1): -n now implies -l.
- `ps`(1): Added the -A option, to display information about all processes. Use "O" for LSONPROC like Solaris instead of bundling LSIDL, LSRUN, and LSONPROC to "R".

- ksh(1): Fixed POSIX mode interpretation of backslashes inside backquotes inside double quotes.
- makefs(8): Made the allow-multidot option for cd9660 useful.
- restore(8) now works on Linux dump volumes, by ignoring extended attribute records on these volumes.
- Added an rc.d(8) script for rndctl(8).
- MAKEDEV(8) now creates /dev rather than init(8).
- MAKEDEV(8) now uses mtree(8) in preference to pax(1) and mknod(8), making node creation more efficient, and mount_tmpfs(8) in preference to mount_mfs(8) when creating a memory file system.
- MAKEDEV.local(8) can now use functions defined in MAKEDEV(8).

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

Components removed from NetBSD

In NetBSD 5.0, the following software components were removed from the system. Some were not useful anymore, or their utility did not justify the maintenance overhead. Others were not working properly and there was a lack of interest in fixing them.

- The pc532 port.
- Support for systrace.
- HP-UX binary compatibility.
- The esl driver.
- Support for NQNFS.
- The TPCONS option in netiso.

Known Problems

Using block device nodes directly for I/O may cause a kernel crash when the file system containing /dev is FFS and is mounted with -o log. Workaround: use raw disk devices, or remount the file system without -o log.

Occassionally, gdb may cause a process that is being debugged to hang when "single stepped". Workaround: kill and restart the affected process.

gdb cannot debug running threaded programs correctly. Workaround: generate a core file from the program using gcore(1) and pass the core to gdb, instead of debugging the running program.

Statically linked binaries using pthreads are currently broken.

The sparc port does not have functional SMP support in this release.

Features to be removed in a later release

The following features are to be removed from NetBSD in the future:

- Support for soft dependencies, also knows as soft updates (see "softdep" in mount(8)) will be removed in the next major release.

  NetBSD 5.0.1 includes a preview of WAPBL (Write Ahead Physical Block Logging), which will replace soft dependencies in the next major release. See wapbl(4) and
  http://mail-index.netbsd.org/netbsd-announce/2008/12/14/msg000051.html
  for details.

- Support for Xen 2.0.x. The Xen-3 and hypervisor interface is diverging from Xen-2 as development is ongoing, increasing the maintenance cost for NetBSD.

  It should be considered as deprecated. Users are expected to not rely on it any more beyond this major release.

  Further, at least version 3.1 of Xen will be required to run NetBSD as Dom0 or DomU.

The NetBSD Foundation

The NetBSD Foundation is a tax exempt, not-for-profit 501(c)(3) corporation that devotes itself to the traditional goals and Spirit of the NetBSD Project and owns the trademark of the word "NetBSD". It supports the design, development, and adoption of NetBSD worldwide. More information on the NetBSD Foundation, its composition, aims, and work can be found at: **http://www.NetBSD.org/foundation/**

Sources of NetBSD

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

NetBSD 5.0.1 Release Contents

The root directory of the NetBSD 5.0.1 release is organized as follows:

`.../NetBSD-5.0.1/`

`CHANGES`	Changes between the 4.0 and 5.0 releases.
`CHANGES-5.0`	Changes between the initial 5.0 branch and final release of 5.0.
`CHANGES.prev`	Changes in previous NetBSD releases.
`LAST_MINUTE`	Last minute changes and notes about the release.
`README.files`	README describing the distribution's contents.
`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 5.0.1 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.
82 MB gzipped, 422 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.
7 MB gzipped, 29 MB uncompressed

src This set contains all of the base NetBSD 5.0.1 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
58 MB gzipped, 284 MB uncompressed

syssrc This set contains the sources to the NetBSD 5.0.1 kernel for all architectures as well as the `config`(1) utility.
36 MB gzipped, 180 MB uncompressed

xsrc This set contains the sources to the X Window System.
133 MB gzipped, 699 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 AT&T System V UNIX checksums for the various files in that directory, in the format produced by the command:
cksum -o 2 *file*.

The 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/next68k subdirectory structure

The next68k-specific portion of the NetBSD 5.0.1 release is found in the `next68k` subdirectory of the distribution: `.../NetBSD-5.0.1/next68k/`. It contains the following files and directories:

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

`binary/`
`kernel/`
`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.
`sets/` next68k binary distribution sets; see below.

`installation/`
`misc/` Miscellaneous next68k installation utilities; see installation section below.

Binary distribution sets

The NetBSD next68k binary distribution sets contain the binaries which comprise the NetBSD 5.0.1 release for next68k. The binary distribution sets can be found in the `next68k/binary/sets` subdirectory of the NetBSD 5.0.1 distribution tree, and are as follows:

base The NetBSD 5.0.1 next68k **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.
25 MB gzipped, 75 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.
36 MB gzipped, 130 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/next68k 5.0.1 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.
2 MB gzipped, 3 MB uncompressed

man This set includes all of the manual pages for the binaries and other software contained in the **base** set. Note that it does not include any of the manual pages that are included in the other sets.
12 MB gzipped, 50 MB uncompressed

misc This set includes the system dictionaries, the typesettable document set, and other files from `/usr/share`.
4 MB gzipped, 13 MB uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
3 MB gzipped, 10 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 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.
11 MB gzipped, 43 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.
1 MB gzipped, 1 MB uncompressed

xserver The X server.
4 MB gzipped, 10 MB uncompressed

The next68k 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 -xzpf`** command from the root directory (`/`) of your system.

Note: Each directory in the next68k binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/next68k System Requirements and Supported Devices

NetBSD/next68k 5.0.1 will run on the 25 MHz 68040-based NeXT workstations. The Turbo (33 MHz) models are not supported. The 68030 model is not supported. NetBSD/next68k 5.0.1 does not have any local disk support, so you must netboot and run diskless.

The minimum configuration requires 4 MB of RAM and a network server capable of netbooting NetBSD/next68k. Serial consoles are poorly supported by the hardware, see the FAQ for help. Typically it is just easier to use the NeXT monitor and keyboard.

http://www.NetBSD.org/ports/next68k/faq.html

Supported hardware

- CPUs
  - 68040-25 2-bit grayscale (NeXTcube)
  - 68040-25 2-bit grayscale (NeXTstation)
  - 68040-25 16-bit color (NeXTstation Color)
- RS232 interfaces
  - on-board A and B serial ports (*zsc*).
- Network interfaces:
  - on-board ethernet (*xe*).
- Displays
  - on-board NeXT monochrome display (*nextdisplay*).
  - on-board NeXT 12-bit color display (*nextdisplay*).
- Input devices
  - NeXT non-adb keyboard (*nextkbd*).
- Miscellaneous
  - Battery-backed real-time clock.

Unsupported hardware

- CPUs
  - 68030-25 2-bit grayscale (NeXT Computer)
  - 68040-33 2-bit grayscale (NeXTcube Turbo)
  - 68040-33 2-bit grayscale (NeXTstation Turbo)
  - 68040-33 16-bit color (NeXTstation Color Turbo)
- Disk interfaces

  - on-board SCSI interface and disks
  - Floppy drive
  - Optical disk
  - non-SCSI CD-ROM

- Miscellaneous devices
  - NeXTdimension 32-bit color framebuffer
  - 16-bit digital audio
  - DSP
  - NeXT Printer

Getting the NetBSD System on to Useful Media

Because NetBSD/next68k must run diskless, the distribution must be installed to a remote machine that NFS exports to the NeXT machine. As a result, there is no automated install procedure. Begin by retrieving the NetBSD set files onto the serving machine. These can be found at ftp.NetBSD.org. You may want to keep the following information handy:

```
IP Address: ftp.NetBSD.org
Login: anonymous
Password: <your e-mail address>
Server path: /pub/NetBSD/NetBSD-5.0.1/next68k/binary/sets
```

Preparing your System for NetBSD installation

Get to the ROM Monitor prompt

After the system performs its power-on self test, and while it tries to boot an operating system, press the `COMMAND-`` keys (the backquote is above 7 on the keypad on the right of the keyboard). You should see a prompt like this:

```
                              NeXT ROM Monitor 2.5 (v66)

CPU MC68040 25 MHz, memory 100 nS
Backplane slot #0
Ethernet address:  0:0:f:0:fb:90
Memory size 40 MB
NeXT>
```

Write down the ethernet address. You will need this later to configure the netboot server for your NetBSD/next68k system.

Change the configuration parameters to netboot

Press the `p` key to modify the configuration parameters. You will need to change the `boot command` to `en()netbsd` which is to boot from the `en()` ethernet device the kernel named `netbsd`. You should write down what the original `boot command` was in case you wish to boot NEXTSTEP in the future. It will probably be `sd()`. While modifying the parameters, you may wish to set the system to use `verbose test mode` which will print detailed messages while it is attempting to load the kernel, as opposed to the normal graphic of a network cable. You should not set the `extended diagnostics` as the system will try to boot a diagnostic kernel. Here is an example configuration session:

NeXT> **p**
boot command: sd()? **en()netbsd**
DRAM tests: yes? **yes**
perform power-on system test: yes? **yes**
    sound out tests: yes? **yes**
    SCSI tests: yes? **yes**

loop until keypress: no? **no**
verbose test mode: no? **yes**
boot extended diagnostics: no? **no**
serial port A is alternate console: no? **yes**
allow any ROM command even if password protected: no? **no**
allow boot from any device even if password protected: no? **no**
allow optical drive #0 eject even if password protected: yes? **yes**
enable parity checking if parity memory is present: no? **no**

Now, whenever you reset or power on your system, it will attempt to netboot. From the ROM Monitor prompt, you can simply type `b` to netboot. You can also press the power key (above the arrows) to turn off the system.

Installing the NetBSD System

1. Introduction

   To netboot a next68k, you must configure one or more servers to provide information and files to your next68k (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/

   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. The kernel tries to mount the NFS share that had the kernel and starts executing `init`(8). All next68k systems use BOOTP for the discovery stage. TFTP is used in the bootstrap phase to download the bootstrap program, `boot`. 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.
#
                filename                "boot";

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

                #
                #next68k machines require non-RFC1048 BOOTP
                #
                always-reply-rfc1048 false;

                #
                # 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
}
```

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. `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 next68k machine to `/tftpboot`. Get `boot` from the `installation` directory of the distribution.

   ```
   # cp boot /tftpboot
   ```

   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
   ```

4. `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
   ```

5. NetBSD kernel

   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
   ```

6. Client file system

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

   - 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
     ```

7. Setting up the server daemons

   You need 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"
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.

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. The most important steps are described below.

1. Configuring /etc/rc.conf

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

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

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

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

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

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

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

   When you have finished editing /etc/rc.conf, type **exit** at the prompt to leave the single-user shell and continue with the multi-user boot.

   Other values that may need to be set in /etc/rc.conf for a networked environment are *hostname* and possibly *defaultroute*. You may also need to add an *ifconfig_int* for your ⟨int⟩ network interface, along the lines of

```
ifconfig_xe0="inet 192.0.2.123 netmask 255.255.255.0"
```

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

```
ifconfig_xe0="inet myname.my.dom netmask 255.255.255.0"
```

   To enable proper hostname resolution, you will also want to add an /etc/resolv.conf file or (if you are feeling a little more adventurous) run named(8). See resolv.conf(5) or named(8) for more information. Instead of manually configuring network and naming service, DHCP can be used by setting dhclient=YES in /etc/rc.conf.

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

2. Logging in

   After reboot, you can log in as `root` at the login prompt. Unless you've set a password in **sysinst**, there is no initial password. 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.

3. Adding accounts

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

4. The X Window System

   If you installed the X Window System, you may want to read the chapter about X in the NetBSD Guide:
   http://netbsd.org/docs/guide/en/chap-x.html

5. Installing third party packages

   If you wish to install any of the software freely available for UNIX-like systems you are strongly advised to first check the NetBSD package system, pkgsrc. pkgsrc automatically handles any changes necessary to make the software run on NetBSD. This includes the retrieval and installation of any other packages on which the software may depend.

   - More information on the package system is available 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 `next68k/5.0.1/All` subdir. You can install them with the following commands under `sh`(1):

     ```
     # PKG_PATH=ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/next68k/5.0.1/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/next68k/5.0.1
     ```

     Note: Some mirror sites don't mirror the `/pub/pkgsrc` directory. If you would like to use such mirrors, you could also try the `/pub/NetBSD/packages/current-packages/NetBSD/next68k/5.0.1/All` directory, which may have the same contents.

     The above commands will install the Tenex-csh and Bourne Again shells, 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 cases 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 M.N (pkg) vs. NetBSD/i386 5.0.1 (this host),
```

This warning is harmless if the formal major release numbers are the same between the pkg and your host. Please refer to the NetBSD release glossary and graphs at

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

for more information about NetBSD's release numbering scheme.

- The framework for compiling packages can be obtained by retrieving the file

  ftp://ftp.NetBSD.org/pub/NetBSD/packages/pkgsrc.tar.gz

  It is typically extracted into /usr/pkgsrc (though other locations work fine) with the commands:

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

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

6. Misc

   - Edit /etc/mail/aliases to forward root mail to the right place. Don't forget to run newaliases(1) afterwards.
   - The /etc/postfix/main.cf file will almost definitely need to be adjusted. If you prefer a different MTA, then install it using pkgsrc 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

NetBSD/next68k does not currently support an upgrade procedure.

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 5.0.1.

pkg_install now depends on the pkgdb cache for automatic conflict detection. It is recommended to rebuild the cache with

```
# pkg_admin rebuild
```

audit-packages.conf(5) has been superseded by pkg_install.conf(5). The default configuration is the same.

Support for pkg_view(1) has been retired.

The functionality of audit-packages(1) and download-vulnerability-list(1) has moved into pkg_admin(1). However, wrapper scripts that handle the common use cases are provided.

The pthread libraries from previous versions of NetBSD require that the sysctl(3) node kern.no_sa_support be set to 0. This affects the following environments:

- Running a 5.0 kernel with an older userland.
- Running an older userland inside a chroot'ed environment on a 5.0 system.
- Running older statically linked pthread applications.

The 5.0 kernel defaults to `0` for `kern.no_sa_support`, which covers the first case. However, please note that a full installation of 5.0 (either from scratch or through an upgrade) will set `kern.no_sa_support` to 1 during the boot process. This means that for the last two cases, you will have to manually set `kern.no_sa_support` to `0`, using either the `sysctl`(8) command or through `sysctl.conf`(5).

Note that **`sysinst`** 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 3.x releases

See the section below on upgrading from NetBSD 4.x as well.

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 were removed in 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, please see the "Components removed from NetBSD" at
  http://www.NetBSD.org/releases/formal-4/NetBSD-4.0.html#removals
- 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 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 affecting an upgrade from NetBSD 4.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 '_httpd' and '_timedc' and the groups '_httpd' and '_timedc' need to be created.
- Unprivileged use of the `mount`(8) command now requires the *`nosuid`* and *`nodev`* options to be explicitly specified. Previously, these options were automatically enforced even if they were not explicitly specified.
- A number of things have been removed from the NetBSD 5.0.1 release. See the "Components removed from NetBSD" section near the beginning of this document for a list.

Using online NetBSD documentation

Documentation is available if you installed 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. See **http://www.NetBSD.org/mailinglists/** for a web interface.

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.

Bugs also can be submitted and queried with the web interface at
http://www.NetBSD.org/support/send-pr.html

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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  Ralph Campbell
  Mike Karels
  Marshall Kirk McKusick

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- The Internet Research Institute in Japan for hosting the server which runs the CVSweb interface to the NetBSD source tree.

- 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.
- 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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