NAME

INSTALL — Installation procedure for NetBSD/vax.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 6.0 on the *vax* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

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

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on 57 different system architectures (ports) across 15 distinct CPU families, and is being ported to more. The NetBSD 6.0 release contains complete binary releases for many different system architectures. (A few ports are not fully supported at this time and are thus not part of the binary distribution. Please see the NetBSD web site at **http://www.NetBSD.org/** for information on them.)

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

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

Changes Between The NetBSD 5.0 and 6.0 Releases

The NetBSD 6.0 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 6.0 release. The complete list of changes can be found in the CHANGES:

http://ftp.NetBSD.org/pub/NetBSD/NetBSD-6.0/CHANGES

and CHANGES-6.0:

http://ftp.NetBSD.org/pub/NetBSD/NetBSD-6.0/CHANGES-6.0

files in the top level directory of the NetBSD 6.0 release tree.

Some highlights include:

General kernel

- time_t and dev_t are now 64 bits.
- Much-improved compat_linux support for running Linux binaries.
- Added a generic producer/consumer queue.
- Added a new ptree (Patricia / RADIX tree) implementation.
- Removed MALLOC() and FREE() macros.
- Compute kern.ipc.shmmaxpages on startup based on physical memory. Can be overridden via sysctl(8).
- kmem_alloc(9): Add more extensive runtime debugging facilities.
- File descriptor access performance improvements were made.
- cpu_reboot(9): tear down stacks of devices and file systems in an orderly fashion during shutdown.
- Added 'show vmem' and 'show all vmems' commands to ddb(4).
- Added high-priority xcall(9) support.
- Added direct select()/poll() support.
- Add PCU (Per-CPU Unit) interface to unify synchronization of per CPU context, like lazy FPU management.
- Added new system calls pipe2(2), paccept(2), kqueue1(2), flags SOCK_CLOEXEC/SOCK_NONBLOCK to socket(2), socketpair(2), F_DUPFD_CLOEXEC to fcntl(2), and a MSG_CMSG_CLOEXEC to recvfrom(2) to be able to set close-on-exec to all newly created file descriptors.
- Major improvements to uvm_map(9), uvm_km(9), vmem(9), and kmem(9) layers.
- Removed ltsleep(9) and wakeup_one(9).
- Rewrote most of the entropy-gathering and entropy-distributing code, separating the rnd(4) pseudodevice from the bitstream generation code cprng(9) and entropy-pool code rnd(9).
- kmem_alloc(9): add more extensive runtime debugging facilities.
- Kernel support for posix_spawn(3).

Networking

- ip(4): added IP_RECVTTL option to let recvmsg(2) return the TTL of the received datagram.
- ip(4): added IP_MINTTL option to discard packets with a TTL lower than the option value.
- Added SOCK_SEQPACKET for local sockets.
- Added net.inet.icmp.bmcastecho sysctl(7), to disable ICMP replies to the braodcast address.
- Make TCP window size autoscaling the default.
- Derive the mbuf cluster (NMBCLUSTERS) at boot time from the available memory. The default can be raised by changing kern.mbuf.nmbclusters

- Added NPF, the NetBSD Packet Filter.
- udp(4): implement RFC6056 port selection algorithms.

File systems

- Added CHFS, a file system for flash devices.
- The default behavior when mounting empty msdosfs file systems has been changed to assume long filenames. The behavior with populated file systems has not changed.
- UDF: Added support for session opening/closing on sequential media.
- ext2fs: Added support for >128 byte inodes.
- Import OpenSolaris ZFS code. Experimental-only; does not work yet.
- ffs: New quota support. This adds a new on-disk format to store disk quota usage and limits, integrated with ffs metadata. Usage is checked by fsck_ffs(8) (no more quotacheck) and is covered by the WAPBL journal. Enabled with kernel option QUOTA2.

Security

- secmodel_bsd44(9), secmodel_securelevel(9): Add provisions to control access to gpio(4) pins.
- security.conf(5): Add check_pkg_vulnerabilities and check_pkg_signatures to validate the installed packages against the vulnerabilities database and the expected checksums for their files.

Drivers

- Audio:
  - Added gcscaudio(4) driver for AMD Geode CS5536.
  - Added hdaudio(4), a new standards-compliant Intel High Definition Audio driver written to replace azalia(4).
  - audio(9): Audio drivers are now MP-safe.
- Hardware Monitoring:
  - sysmon_envsys(9): Enhancements to allow access to driver-internal limit values.
  - acpicpu(4): Add a driver for ACPI-based processor functionality.
  - acpipmtr(4): Add a driver for ACPI power meters.
  - acpismbus(4): ACPI SMBus Control Method Interface driver.
  - acpiwdrt(4): ACPI Watchdog Resource Tables driver.
  - acpiwmi(4): Windows Management Instrumentation support for ACPI. Also added mappings for wmidell(4), wmieeepc(4), wmihp(4), and wmimsi(4).
  - aibs(4): New driver for ASUSTeK AI Booster (ACPI ASOC ATK0110) hardware monitor with limit support.
  - amdtemp(4): Add support for Family 12h.
  - dbcool(4): Added support for ADM1031 thermal sensor / fan controller.
- Networking:

- Added support for more chip revisions to re(4). Added hardware checksum support for newer PCIe 8168C/8111C/8102E chips.
- Switch ath(4) from the binary HAL to the open-source HAL from Sam Leffler.
- Added bwi(4) driver for Broadcom AirForce / Apple Airport Extreme network cards.
- Added flow control and RTL8211C(L) PHY support to rgephy(4).
- Added age(4) and atphy(4) drivers for Attansic/Atheros L1 Gigabit Ethernet and F1 PHY, respectively.
- Added support for flow control to sk(4).
- Added support for flow control on MCP65 to nfe(4).
- Added TCPv4/UDPv4 RX hardware checksum support for i82559 and later chips to fxp(4).
- wm(4): Added ICH10, PCH, PCH2, 82575, 82576, 82580 and I350 devices support. Added some other improvements and workarounds.
- bge(4): added misc quirk code for chip specific bugs.
- Added ale(4): Attansic/Atheros L1E Gigabit Ethernet.
- agr(4): added support for layering vlans on top, and allow LACP to be disabled.
- alc(4): Add a driver for Atheros AR813x/AR815x Ethernet.
- aue(4): Add support for I-O DATA ETX-US2.
- bnx(4): Added support for Broadcom BCM5709 and BCM5716 chips. Add support for Broadcom BCM5709S (SerDes) chip.
- et(4), etphy(4): Add a driver for Agere/LSI ET1310/ET1301 10/100/Gigabit Ethernet device and the Agere/LSI ET1011 TruePHY Gigabit Ethernet PHY.
- kue(4): fixed unaligned memory accesses so it now works on ARM and MIPS machines.
- ne(4): add proper support for NE2000 8-bit mode.
- nfe(4): Add support for flow control for MCP65.
- otus(4): Atheros AR9100U driver.
- smsh(4): Add a SMSC LAN9118 Family Ethernet driver.
- upgt(4): Add a driver for Conexant/Intersil PrismGT SoftMAC USB IEEE 802.11b/g WLAN.

• Storage:

- Added an experimental in-kernel iSCSI initiator, from Wasabi Systems.
- viaide(4): Added VT8237S Integrated SATA controller support, and VT6410 PATA RAID controller support (without RAID).
- Added LVM functionality with dm(4) driver and lvm2 userland tools.
- Added support for 82965PM to piixide(4).
- vnd(4): implemented DIOCCACHESYNC. Also, allow vnd(4) to be backed by a sparse file.
- Added sdmmc(4) driver for SD/MMC.

  - mvsata(4): support the Marvell Hercules-I/II SATA controllers.
  - flash(9): Add a subsystem to handle flash memory devices, and nand(9), a subsystem to handle NAND controllers.
  - mfi(4): Add support for LSI's newer (GEN2) RAID controller.
  - nside(4): Add a driver for the National Semiconductor PC87415 IDE controller.
  - raid(4):
    - RAIDFrame parity maps, which greatly improve parity rewrite times after unclean shutdown.
    - Added support for non 512-byte sector devices.
    - Added support for >2TB devices.
- USB:
  - uftdi(4): Added support for REX-USB60F.
  - ehci(4): work around USB subsystem freeze for SB600/SB700 chipsets.
  - ums(4): Added touchpanel support.
- Graphics and Video:
  - drm(4): updated to mesa-drm 85b9f737db0d2a845e4d7e2bbf9ad12ff9e2227c.
  - acpivga(4): ACPI Video Extensions driver.
  - agp(4): Added support for Intel G35, Intel G45, and Intel 82855GM.
  - auvitek(4): Add a driver for Auvitek AU0828 family USB video capture controllers.
  - dtv(4): Add new digital TV framework.
  - cxdtv(4): Add driver for Conexant CX23880-based DTV cards.
  - emdtv(4): Add a driver for Empia EM28xx family USB video capture controllers.
  - omapfb(4): a simple driver for OMAP 3xxx on-chip video, especially the Beagleboard.
- Miscellaneous:
  - Added Elantech multi-touch trackpad support to pms(4).
  - Added the altmem(4) "alternative memory"

    disk driver, which allows memory that is normally inaccessible by the machine-dependent pmap(9) to be used (as swap space).
  - ichlpcib(4): support 82801IEM LPC Interface Bridge.
  - Complete rework of gpio(4) to integrate with kauth(9), allow for runtime driver attachment, and naming of individual pins. Add gpiosim(4) driver to simulate a gpio(4) device for testing purposes.
  - Added gpioiic(4) driver to bit-bang an I2C bus using GPIO pins.
  - btmagic(4): Apple Magic Mouse driver.
  - vmt(4): Add a VMware Tools driver, from OpenBSD.

Platforms

- x86 (i386, amd64):
  - `pxeboot`(8) now parses `boot.cfg`(5).
  - The bootloader has been enhanced to support framebuffer consoles using VESA BIOS extensions. x86 ports now work with the `genfb`(4) framebuffer, and the i386-only `vesafb`(4) framebuffer has been obsoleted.
  - Added `ucas`(9) support for x86.
  - `sysinst`(8) now defaults to UFS2 for x86 platforms.
  - CPU topology detection suport for AMD processors.
  - Enable Ext2fs support in bootloader.
  - Booting from a disk with a GUID Partition Table (GPT) is now possible.
  - Support `userconf`(4) command in `boot.cfg`(5).
- i386:
  - Use "i486"

    as GNU_ARCH.
  - Added PAE (Physical Address Extension) support.
  - Better support for VIA C7 CPUs.
- amd64:
  - Added direct map support (mapping of all physical memory using large pages).
- alpha:
  - X11: add support for X11FLAVOUR=xorg.
  - Support for Avalon A12 removed.
  - Converted Alpha to use PCU to manage FPU.
- amiga:
  - Added basic PCI support.
  - `efa`(4): ELBOX FastATA 1200 driver.
  - Add a driver for BlizzardPPC 603e+ SCSI.
- amigappc:
  - A CSPPC system with `ahsc`(4) or `cbiiisc`(4) boots into multiuser;
  - Onboard serial now works.
  - `efa`(4): ELBOX FastATA 1200 driver.
- ARM ports(acorn26, acorn32, cats, evbarm, hpcarm, iyonix, netwinder, shark, zaurus):
  - Cortex-A8 CPU support is available.
  - i.MX51 SoC support is available.

- atari:
  - Add support for the SMC Elite Ultra Ethernet with the SMC_TT VME-ISA bridge.
  - Add support for the EtherNEC, ISA NE2000 based Ethernet connected to Atari ROM cartridge slot.
- bebox:
  - Support xserver. Tested on s3(TRIO 64V+).
- cobalt:
  - Add LBA48 support to bootloader so that it can safely load a kernel from NetBSD partition beyond >137GB boundary.
- dreamcast:
  - Fixed a long standing GD-ROM driver bug so that file system on GD-ROM works properly.
  - Build and put a raw binary format kernel into distribution.
  - Switch to using Xorg servers and binaries.
- evbarm:
  -
  - Added support for Gumstix Verdex and Verdex Pro.
  - Support Marvell Sheevaplug and some Marvell SoC NAS boxes.
  - Add initial support for Sharp NetWalker MID.
  - Add driver for OMAP NAND controllers.
  - Add FriendlyARM Mini2440 support.
  - Add initial support for the RaspberryPi. No support yet for the USB controller, the Ethernet interface, or the video chip. Serial console works, and boots multiuser.
- evbmips:
  - Added `voyagerfb`(4) driver, for the Gdium Liberty 1000's video controller.
  - Added support for RMI XLS6ATX_7A board and XL SoC family.
  - Added support for RMI (NetLogic) XLS/XLR models.
- evbppc:
  - Enable builds for OEA, ibm4xx and Book-E modules.
- evbsh3:
  - Add support for Alpha Project MS104-SH4, TAC T-SH7706LAN Rev.3 and TAC T-SH7706LSR Rev.1.
- hp300:
  - Switch NetBSD/hp300 to wscons with rasops.
  - Add support for framebuffers on HP362 and HP382.
  - Add support for Apollo Domain keyboard.

- hp700:
  - Added support for UFS2 boot.
  - pmap update: Support PA 2.0 machines in 32 bit mode. Improve support for machines without the PA7100LC or PA7300LC CPUs.
  - Added `ucas`(9) support for hp700.
  - com at dino now works.
  - `lcd`(4): Driver for hp700 lcds added.
  - Add support for `elroy`(4), `astro`(4), and `ssio`(4) based 64-bit machines running in 32-bit mode.
  - Update `sti`(4) and add `pci`(4) attachment.
  - Add support for HIL devices.
  - Support added for machines with the uturn(4) I/O subsystem.
- hpcarm:
  - Add support for Sharp W-ZERO3 series.
  - Use rtc_offset passed from hpcboot.
  - Bump MAXPARTITIONS from 8 to 16.
  - Switch to using Xorg servers and binaries.
  - Improve console speed on W-ZERO3 machines using write through mapping for framebuffer memory.
  - Improve install on JORNADA720.
- hpcmips:
  - Switch to using Xorg servers and binaries.
- hpcsh:
  - Switch to using Xorg servers and binaries.
  - Add `sysinst`(8) support.
- landisk:
  - Added UFS2 boot support.
  - Enable to build a bootable install disk image.
- luna68k:
  - Enable LUNA to load -current kernels director from firmware.
  - Make SCSI work properly.
  - Use the original OMRON font derived from 4.4BSD-Lite/luna68k rather than gallant19 which is used on Sun workstations.
  - Complete LUNA-II support.
- mac68k:

  - Add timecounter support to the CSI Hurdler Centronics Parallel Interface `cpi`(4) driver.

- macppc:
  - Support new-style `module`(7) kernel modules.
- m68k ports (amiga, atari, cesfic, hp300, luna68k, mac68k, mvme68k, news68k, next68k, sun2, sun3, x68k):
  - Re-enable m68k optimized in_cksum routine.
  - Support `module`(7) loading.
  - Fixed a regression in FPU_EMULATE code that caused weird `awk`(1) behavior.
  - Add hyperbotic and trigonometric functions to m68k FPE.
- mips ports (algor, arc, cobalt, emips, evbmips, ews4800, hpcmips, mipsco, newsmips, pmax, sbmips, sgimips):
  - Added support for 64-bit MIPS processors (O32, N32, N64 ABIs are supported).
  - Added SMP support for MIPS architecture.
  - Rewritten interrupt handling to be much more efficient, added "fast" software interrupts and kernel preemption.
  - Converted MIPS to use PCU to manage FPU.
  - Added MIPS32R2 and MIPS64R2 support.
  - Rework Atheros MIPS-based SoC support. Add initial support for AR71xx (24K) and AR9344 (74K) SoCs
  - Added support for ralink RT3883 SoC from CradlePoint Technologies.
  - Added support for MIPS DSP v2 ASE.
- ofppc:
  - Support Gigabit Ethernet Controller for MV64361 on PegasosII.
  - Support for RDB partitions.
- pmax:
  - Added UFS2 boot support.
- powerpc ports (amigappc, bebox, evbppc, ibmnws, macppc, mvmeppc, ofppc, pmppc, prep, rs6000, sandpoint, walnut):
  - Add support for using secure PLT (thereby allowing data and bss of powerpc programs and shared library to be set non-executable).
  - Added support for Book E Freescale MPC85xx (e500 core) processors. Added "fast" software interrupts support and SOFTFLOAT for PowerPC (Book E only), reworked FPU/VEC support for e500 SPE, other improvements.
  - Converted PowerPC to use PCU to manage FPU/AltiVec/SPE.
  - Initial SMP support for MPC85xx, reworked and unified IPI code, various other improvements.
  - Switch to using direct-mapped uareas (pcb + kernel stacks).

  - The generic PIC code now supports Matt Thomas's fast softintr code.
- prep:
  - Support Xserver. Tested with on-board s3(864).
- sandpoint:
  - Added support for Marvell-SKnet in netboot.
  - D-Link DSM-G600 support.
  - Add support for booting from RAID 1.
  - Iomega Storcenter support.
  - Netronix NH-230/231 and compatible NAS are supported.
- sgimips:
  - Added support for Personal IRIS 4D/20 and 4D/25 (IP6 and IP10).
  - `mec`(4): Added RX hardware checksum support on O2.
  -
- sh3ports (dreamcast, evbsh3, hpcsh, landisk, mmeye):
  - Add some support for SH7706.
- shark:
  - Added support for `module`(7) -style kernel modules.
  - `chipsfb`(4) now works on shark.
- sparc:
  - Switch sparc port to use `wscons`(4)
  - `zx`(4): added `wscons`(4) support.
  - `tcx`(4): support `wsdisplay`(4) and acceleration.
  - `apc`(4): a driver for the Aurora Personality Chip (APC) found on SPARCstation-4/5 and qemu. Allows to idle the CPU when in the idle loop.
  - Re-enable sparc optimized in_cksum routine.
  - Added support for `module`(7) -style kernel modules.
- sparc64:
  - `zx`(4): added `wscons`(4) support.
  - Add a driver for LOMlite lights out management hardware monitor and watchdog timer.
  - Add real UltraSPARC-III∗ CPU support.
  - Add initial support for Fujitsu SPARC64 systems, not yet stable.
  - `ffb`(4): Added EDID (Extended Display Identification Data) reading, and video mode setting support.
  - Added fast `softint`(9) support.

  - Add support for Enterprise systems (Ex[45]00) systems.
- x68k:
  - Switched `pow`(4) to use `powerd`(8).
  - Fix bootloader failure on X68030+060turbo.
  - Removed pow(4) and rtcalarm(8).
  - `powsw`(4): a revised power switch driver.
- xen:
  - Add PCI pass-through support for Xen3. Dom0 kernel gets a `pciback`(4) driver, to which the device specified in the pciback.hide boot parameter will attach. DomU kernels get a `xpci`(4) driver, to which PCI busses will attach.
  - Added XEN3PAE_DOM0, an i386 dom0 kernel with PAE support. Requires an i386PAE or x86_64 hypervisor.
  - `balloon`(4): Balloon driver now enabled for all Xen kernels.
  - Dropped Xen 2 support. Xen 3.1 or later is now required.
  - Added support for request-rx-copy in the virtual network device backend.
  - Provide experimental support for suspend/resume in NetBSD domUs.
  - Enable no-execute bit feature for i386pae and amd64 kernels.
  - Added support for feature-flush-cache in block device backend, used in block device frontend for DIOCCACHESYNC.
- zaurus:
  - Added zboot.
  - Added playback and recording support to `zaudio`(4).
  - Add Xorg support.
  - Add ioexp driver for SL-C1000.
  - Add PXA25x based Zaurus SL-C700/750/760/860 support.

Userland

- 3rd party software updates:
  - `acpi`(4): ACPICA updated to 20110623.
  - `atf`(7) is version 0.15.
  - ISC `cron`(8) 4.1.
  - OpenSSH version 1.0.1c
  - lvm2tools 2.02.44 and libdevmapper 1.02.30
  - dhcpcd-5.5.4
  - am-utils updated from head; adds UDF support and `-uu`
  - CVS 1.12.13

- BIND 9.9.1-P4.
- libbind 6.0-rc1.
- FSF binutils 2.21.1a.
- `httpd`(8): bozohttpd-20111118
- `file`(1) 5.09
- ntp 4.2.6p5
- `flex`(1) version 2.5.35.
- `gcc`(1) version 4.5.3.
- `gdb`(1) version 7.3.1.
- GNU MP 5.0.2.
- `less`(1) version 444.
- libfetch 2.23
- Lua 5.1.4
- OpenLDAP 2.4.23
- SQLite 3.6.9
- `tmux`(1) 1.5
- trousers-0.3.8; tmp-tools 1.3.7.1
- `xz`(1) 5.0.0
- byacc-20110908
- tzdata2011n
- `dns-sd`(1): Import mDNSResponder 212.1.

- Libraries:
  - libc:
    - Add new ptree (Patricia / RADIX tree) implementation.
    - Added `fopendir`(3).
    - Added RFC 2045 MIME Quoted-Printable support.
    - Added `glob_pattern_p`(3).
    - Added `memrchr`(3).
    - Added `stpcpy`(3), `stpncpy`(3), and `strnlen`(3).
    - Added %s (seconds since the Epoch) to `strptime`(3), for symmetry with `strftime`(3).
    - Added the getdate(3) and getdate_err value, conforming to IEEE Std 1003.1 ("POSIX.1") and the Open Group Base Specifications X/Open System Interfaces extension ("XSI").

    - Added `getdelim`(3) and `getline`(3).
    - Added `posix_spawn`(3).
    - Added a space-efficient write-once database (`cdbr`(3), `cdbw`(3)).
    - Provide a re-entrant and thread-safe set of timezone APIs that don't require locking and can operate on user-specified timezones.
  - libm: Add f{dim,max,min}{,f,l} from FreeBSD.
  - Replaced termcap with `terminfo`(3).
  - perfuse: Add the PUFFS RElay to FUSE library, which bridges the kernel level API for FUSE filesystems with native PUFFS.
  - `rump`(3)
    - Moved VFS functionality from librump to a new library, librumpvfs.
    - Added support for remote system calls.
    - Add IPv6 support to rumpnet.
    - Support kernel config framework and devices in rumpdev.
    - rumpfs: support registering exernal files which are accessed from the host OS file system namespace instead of from within the rump virtual kernel.
    - rumpvfs: Use the unmodified kernel vnode pager.
  - `bluetooth`(3): updated the Bluetooth service discovery API and merged it into libbluetooth, retiring the separate libsdp.
- Installer (sysinst):
  - Default to `wapbl`(4) logging for UFS partitions.
  - Make sure the installer rejects UFS2 for root partitions on ports whose bootloaders don't support booting from UFS2.
- Changes to the way `make`(1) processes `.for` loops.
- `makefs`(8): Added support for encoding RISC OS metadata into ISO9660 file systems.
- `mount`(8): Added `-o rump` , which mounts the file system as a userspace server via `puffs`(4) and `rump`(3) instead of using a kernel drver.
- `dkctl`(8): Display cache, strategy and list of wedges if no command is specified on the command line.
- `ar`(1): Added support for "deterministic mode"

- Added `crash`(8), a new utility to debug kernel images, based on the in-kernel debugger, `ddb`(4).
- `eject`(1) now has `amd`(8) support.
- `mtree`(8): add -S option to sort entries.
- Imported `netpgp`(1), a BSD-licensed PGP implementation.
- `install`(1): Added support for writing sha256, sha384, or sha512 hashes to a METALOG.
- `rpcgen`(1): Added support for `hyper` and `quad` keywords.

- New `wakeonlan`(8) command to send Wake-on-LAN packets to machines on the local Ethernet.
- Added `nbperf`(1), a minimal perfect hash function generator.
- `unzip`(1): a libarchive-based unzip frontend.
- `apropos`(1): new implementation using SQLite Full Text Index.
- `audiocfg`(1): new tool to control audio defaults.
- `devpubd`(8): Add a device publishing daemon for automatic device node creation.
- `disklabel`(8): Disable COMPAT_386BSD_MBRPART.
- `dkctl`(8): Display cache, strategy, and list of wedges if no command is specified in the command line.
- `fincore`(1): Add a utility to query file cache.
- `ifconfig`(8): Add the `linkstr` command which can be used to communicate an arbitrary string with the interface driver.
- `man`(1): display a manpage when specified with a path.
- `mkubootimage`(1): Added a tool to generate u-boot kernel images.

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

Components removed from NetBSD

In this release of NetBSD, the following software components have been 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.

- Support for Xen 2 has been dropped. Xen 3.1 or later is now required to run NetBSD.
- Support for LKMs (Loadable Kernel Modules) was dropped; use the new `module`(7) framework.
- "softdep"

  support is no longer available in FFS; use `wapbl`(4) logging instead.
- The

  playstation2:
  http://www.NetBSD.org/ports/playstation2/

  port.
- tn3270 was removed from base; it is available in pkgsrc.
- Support for Darwin, Mach, IRIX and PECOFF emulation was retired.

Features to be removed in a later release

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

- `dhclient`(8) and `rtsol`(8) in favor of `dhcpcd`(8).
- `groff`(1) is being phased out. Man pages are handled with `mandoc`(1), and `groff`(1) can still be found in pkgsrc as `textproc/groff`.
- `kame_ipsec`(4) has been replaced by `fast_ipsec`(4). The option to use the old implementation (see `options`(4)) will be removed in the next NetBSD release.

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 6.0 Release Contents

The root directory of the NetBSD 6.0 release is organized as follows:

`.../NetBSD-6.0/`

`CHANGES` Changes between the 5.0 and 6.0 releases.

`CHANGES-6.0` Changes between the initial 6.0 branch and final release of 6.0.

`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 6.0 has a binary distribution.

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

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

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.

src This set contains all of the base NetBSD 6.0 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.

syssrc This set contains the sources to the NetBSD 6.0 kernel for all architectures as well as the `config`(1) utility.

xsrc This set contains the sources to the X Window System.

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:

`MD5` MD5 digests in the format produced by the command:
cksum -a MD5 *file*.

`SHA512` SHA512 digests in the format produced by the command:
`cksum -a SHA512` *`file`*.

The SHA512 digest is safer, but MD5 checksums are provided so that a wider range of operating systems can check the integrity of the release files.

NetBSD/vax subdirectory structure

The vax-specific portion of the NetBSD 6.0 release is found in the `vax` subdirectory of the distribution: `.../NetBSD-6.0/vax/`. It contains the following files and directories:

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

`binary/`
`kernel/`
`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.
`netbsd-GENERIC.MP.gz`
A gzipped NetBSD kernel containing code for everything supported in this release. This kernel supports SMP on systems with more than one CPU.
`sets/` vax binary distribution sets; see below.

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

Binary distribution sets

The NetBSD vax binary distribution sets contain the binaries which comprise the NetBSD 6.0 release for vax. The binary distribution sets can be found in the `vax/binary/sets` subdirectory of the NetBSD 6.0 distribution tree, and are as follows:

base The NetBSD 6.0 vax **base** binary distribution. You *must* install this distribution set. It contains the base NetBSD utilities that are necessary for the system to run and be minimally functional.

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.

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.

games This set includes the games and their manual pages.

kern-GENERIC
This set contains a NetBSD/vax 6.0 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.

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.

misc This set includes the system dictionaries, the typesettable document set, and other files from `/usr/share`.

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

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 X.Org. 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.

xcomp The extra libraries and include files needed to compile X source code.

xfont Fonts needed by the X server and by X clients.

xetc Configuration files for X which could be locally modified.

xserver The X server.

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

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

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

NetBSD/vax System Requirements and Supported Devices

Supported hardware

- CPU types
  - VAX 11/750
  - VAX 11/78{0,5}
  - VAX 4000 model 100(A),105A,106A,108,200,300,400,500(A),505A,600(A),700
  - VAX 8200/8250/8300/8350
  - VAX 8600/8650
  - MicroVAX/VAXstation II
  - MicroVAX III
  - MicroVAX 3100 model 10,10e,20,20e,30,40,80,85,90,95
  - MicroVAX 3300/3400
  - MicroVAX 3500/3600
  - MicroVAX 3800/3900
  - MicroVAX 2000/VAXstation 2000
  - VAXstation 3100 model 30,38,40,48,76
  - VAXserver 3100 KA41-B and KA41-E
  - VAXserver 3600
  - VAXserver 3900
  - VAXstation 3200/3500
  - VAXstation 4000 models 60,90,90A,96 and VLC
- Networking

  - DEUNA/DELUA Unibus ethernet
  - DEQNA/DELQA Q22 bus ethernet
  - LANCE chip (where available)
  - SGEC chip (where available)

- Serial lines
  - DHU11/DHV11/DL11/DLV11/DZ11/DZQ11/DZV11 Unibus/Q22 bus asynchronous lines
  - DZ11-compatible lines on VAXstations.

- Disks
  - UDA50 Unibus MSCP controller
  - KDA50/RQDX1/2/3 Q22 bus
  - MSCP controller
  - KDB50 BI-bus MSCP controller
  - MFM and SCSI controllers on VAXstations
  - RP04/05/06/07 and RM02/03/05/80 Massbus disks
  - Console RL02 on VAX 8600.

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

- Tapes
  - TMSCP on Q22 bus (TK50/70, TU81)
  - TMSCP on BI bus
  - SCSI tapes on VAXstations.

- Floppy
  - RX33/RX50 on RQDX controllers
  - RX50 on VAX 8200

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

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

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

Anything else is up to you!

Getting the NetBSD System on to Useful Media

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

Installation is supported from several media types, including:

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

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

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

Proceed to the instructions on installation.

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.

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.

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.

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

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

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

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

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

```
# cd .../NetBSD-6.0
# cd vax/binary
# tar -cf tape_device kern-GENERIC base etc
```

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

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

Creating boot tapes

Fetch the bootable bootfs image from

```
.../NetBSD-6.0/vax/installation/bootfs/boot.fs
```

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

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

Under Ultrix the tape name is different:

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

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

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

```
.../NetBSD-6.0/vax/binary/sets{50,33}
```

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

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

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

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

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

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

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

Creating boot floppies

Fetch the bootable bootfs image from

```
.../NetBSD-6.0/vax/installation/bootfs/boot.fs
```

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

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

Booting from NFS server

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

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

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

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

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

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

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

```
.../NetBSD-6.0/vax/installation/netboot/boot
```

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

```
.../NetBSD-6.0/vax/installation/netboot/netbsd.ram.gz
```

From the install program started in the kernel the rest of the system can be installed. There is also a very good (if somewhat out of date) FAQ for netbooting VAXen at
http://world.std.com/~bdc/projects/vaxen/VAX-netboot-HOWTO.html
that describes netbooting of VAXen from many different OS'es.

Preparing your System for NetBSD installation

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

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

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

Installing the NetBSD System

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

```
subscribe port-vax
```

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

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

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

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

Booting from install media

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

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

B DUA0 first MSCP controller, unit 0.

B MUA0 first TMSCP tape controller, unit 0.

B DKB0 second SCSI bus, unit 0.

B XQA0 first Q22 bus Ethernet controller.

B ESA0 first LANCE Ethernet controller on VAXstations.

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

Then just proceed with the program **sysinst**. The procedure that is described below can be easily adapted to VAX.

Running the sysinst installation program

1. *Introduction*

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

2. *Possible hardware problems*

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

3. *General*

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

4. *Quick install*

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

   - What you need.
     - The distribution sets (in this example, they are on CD).
     - One 1.44 MB 3.5" floppy.
     - A CD-ROM drive (SCSI), a hard disk and a minimum of of memory installed.
     - The hard disk should have at least + *n* megabytes of space free, where *n* is the number of megabytes of main memory in your system. If you wish to install the X Window System as well, you will need at least 215 MB more.
   - The Quick Installation
     - Insert the first boot floppy you just created and boot the computer. After language selection, the main menu will be displayed.

```
.*********************************************.
* NetBSD-6.0 Install System                    *
*                                              *
*>a: Install NetBSD to hard disk               *
* b: Upgrade NetBSD on a hard disk             *
* c: Re-install sets or install additional sets *
* d: Reboot the computer                       *
* e: Utility menu                              *
* f: Config menu                               *
* x: Exit Install System                       *
.*********************************************.
```

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

5. *Booting NetBSD*

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

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

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

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

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

6. *Network configuration*

   If you do not intend to use networking during the installation, but you do want your machine to be configured for networking once it is installed, you should first go to the **Utility menu** and select the **Configure network** option. If you only want to temporarily use networking during the installation, you can specify these parameters later. If you are not using the Domain Name System (DNS), you can give an empty response when asked to provide a server.

7. *Installation drive selection and parameters*

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

   The first thing is to identify the disk on which you want to install NetBSD. **`sysinst`** will report a list of disks it finds and ask you for your selection. You should see disk names like `sd0` or `sd1`.

8. *Selecting which sets to install*

   The next step is to choose which distribution sets you wish to install. Options are provided for full, minimal, and custom installations. If you choose sets on your own, **base**, **etc**, and a kernel must be selected.

9. *Partitioning the disk*

   - Which portion of the disk to use.

     You will be asked if you want to use the entire disk or only part of the disk. If you decide to use the entire disk for NetBSD, **`sysinst`** will check for the presence of other operating systems and you will be asked to confirm that you want to overwrite these.

10. *Editing the NetBSD disklabel*

    The partition table of the NetBSD part of a disk is called a *disklabel*. If your disk already has a disklabel written to it, you can choose **`Use existing partition sizes`**. Otherwise, select **`Set sizes of NetBSD partitions`**.

    After you have chosen your partitions and their sizes (or if you opted to use the existing partitions), you will be presented with the layout of the NetBSD disklabel and given one more chance to change it. For each partition, you can set the type, offset and size, block and fragment size, and the mount point. The type that NetBSD uses for normal file storage is called **4.2BSD**. A swap partition has a special type called **swap**. Some partitions in the disklabel have a fixed purpose.

    `a` Root partition (`/`)

    `b` Swap partition.

`c` The NetBSD portion of the disk.

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

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

11. *Preparing your hard disk*

    You are now at the point of no return. Nothing has been written to your disk yet, but if you confirm that you want to install NetBSD, your hard drive will be modified. If you are sure you want to proceed, select **yes**.

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

12. *Getting the distribution sets*

    The NetBSD distribution consists of a number of *sets* that come in the form of gzipped tarfiles. At this point, you will be presented with a menu which enables you to choose from one of the following methods of installing the sets. Some of these methods will first load the sets on your hard disk, others will extract the sets directly.

    For all these methods, the first step is making the sets available for extraction, and then do the actual installation. The sets can be made available in a few different ways. The following sections describe each of those methods. After reading the one about the method you will be using, you can continue to the section labeled 'Extracting the distribution sets'.

13. *Installation from CD-ROM*

    When installing from a CD-ROM, you will be asked to specify the device name for your CD-ROM drive (usually `cd0`), and the directory name on the CD-ROM where the distribution files are.

    `sysinst` will then check if the files are indeed available in the specified location, and proceed to the actual extraction of the sets.

14. *Installation using ftp*

    To be able to install using ftp, you first need to configure your network setup if you haven't already done so. **`sysinst`** will do this for you, asking you if you want to use DHCP. If you do not use DHCP, you can enter network configuration details yourself. If you do not have DNS set up for the machine that you are installing on, you can just press `RETURN` in answer to this question, and DNS will not be used.

    You will also be asked to specify the host that you want to transfer the sets from, the directory on that host, the account name and password used to log into that host using ftp, and optionally a proxy server to use. If you did not set up DNS, you will need to specify an IP address instead of a hostname for the ftp server.

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

15. *Installation using NFS*

    To be able to install using NFS, you first need to configure your network setup if you haven't already done so. **`sysinst`** will do this for you, asking you if you want to use DHCP. If you do not use DHCP, you can enter network configuration details yourself. If you do not have DNS set up for the machine

that you are installing on, you can just press RETURN in answer to this question, and DNS will not be used.

You will also be asked to specify the host that you want to transfer the sets from and the directory on that host that the files are in. This directory should be mountable by the machine you are installing on, i.e., correctly exported to your machine.

If you did not set up DNS, you will need to specify an IP address instead of a hostname for the NFS server.

16. *Installation from an unmounted file system*

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

17. *Installation from a local directory*

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

18. *Extracting the distribution sets*

    A progress bar will be displayed while the distribution sets are being extracted.

    After all the files have been extracted, the device node files will be created. If you have already configured networking, you will be asked if you want to use this configuration for normal operation. If so, these values will be installed in the network configuration files.

19. *Configure additional items*

    The next menu will allow you to select a number of additional items to configure, including the time zone that you're in, to make sure your clock has the right offset from UTC, the root user's shell, and the initial root password.

    You can also enable installation of binary packages, which installs the pkgin(1) tool for managing binary packages for third-party software. This will feel familiar to users of other package tools, such as **apt-get** or **yum**. Or, you can install the pkgsrc(7) tree for installing third-party software from source.

    Finally, you can enable some daemons such as sshd(8), ntpd(8), or mdnsd(8).

20. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 6.0. You can now reboot the machine and boot NetBSD from hard disk.

Post installation steps

Once you've got the operating system running, there are a few things you need to do in order to bring the system into a properly configured state. 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_le0="inet 192.0.2.123 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. 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 `vax/6.0/All` subdir. If you installed `pkgin`(1) in the **sysinst** post-installation configuration menu, you can use it to automatically install binary packages over the network. Assuming that `/usr/pkg/etc/pkgin/repositories.conf` is correctly configured, you can install them with the following commands:

  ```
  # pkgin install tcsh
  # pkgin install bash
  # pkgin install perl
  # pkgin install apache
  # pkgin install kde
  # pkgin install firefox
  ...
  ```

  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/vax/6.0/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.
- If you did not install it from the **sysinst** post-installation configuration menu, the `pkgsrc`(7) 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

The easiest way to upgrade to NetBSD 6.0 is with binaries, and that is the method documented here.

To do the upgrade, you must have one form of boot media available. You must also have at least the **base** and **kern** binary distribution sets available. 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, boot blocks, 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 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. Also, file systems are checked before unpacking the sets. Fetching the binary sets is done in the same manner as the installation procedure; refer to the installation part of the document for help.

After a new kernel has been copied to your hard disk, your machine is a complete NetBSD 6.0 system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in `/dev`. If you've changed the contents of `/dev` by hand, you will need to be careful about this, but if not, you can just cd into `/dev`, and run the command:

```
# sh MAKEDEV all
```

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

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

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

Compatibility Issues With Previous NetBSD Releases

Users upgrading from previous versions of NetBSD may wish to bear the following problems and compatibility issues in mind when upgrading to NetBSD 6.0.

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 5.x releases

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).

The implementation of SHA2-HMAC in KAME_IPSEC as used in NetBSD-5 and before did not comply to current standards. FAST_IPSEC does, with the result that old and new systems cannot communicate over IPSEC, if one of the affected authentication algorithms (hmac_sha256, hmac_sha384, hmac_sha512) is used.

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 6.0 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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- 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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