NAME

INSTALL — Installation procedure for NetBSD/pmax.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 6.0 on the *pmax* 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/pmax subdirectory structure

The pmax-specific portion of the NetBSD 6.0 release is found in the `pmax` subdirectory of the distribution: `.../NetBSD-6.0/pmax/`. 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/` pmax binary distribution sets; see below.

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

Binary distribution sets

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

base The NetBSD 6.0 pmax **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/pmax 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 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.

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. This includes the Xpmax server with man page.

The pmax 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 pmax binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/pmax System Requirements and Supported Devices

Supported machines

- DECstation 2100 and 3100, also known as *pmin* and *pmax*
- DECsystem 5100
- Personal DECstations (5000/20, /25 and /33) also known as *MAXINE*
- DECstation 5000/120, /125, and /133, also known as *3MIN*
- DECstation 5000/200, also known as *3MAX*
- DECstation 5000/240 and DECsystem 5900, also known as *3MAXPLUS*
- DECstation 5000/50, 5000/150, 5000/260 (and DECsystem 5900-260) – R4000 and R4400 variants of the *MAXINE, 3MIN* and *3MAXPLUS*

Unsupported machines

- DECsystem 5400 and 5500 (Q-bus based systems, similar to the Vax *Mayfair* or *Mayfair II*, but with an r2000a or r3000 CPU instead of a CVAX CPU.)
- DECsystem 5800 (xbi-based multiprocessor, a Vax 6200 with Vax CPU boards replaced with Mips CPU boards)

The minimal configuration requires 8 MB of RAM and 100 MB of disk space. To install the entire system requires much more disk space, and to run X or compile the system, more RAM is recommended, as NetBSD with 8 MB of RAM feels like Ultrix with 8 MB of RAM - slow. Note that until you have around 16 MB of RAM, getting more RAM is more important than getting a faster CPU.

Supported devices

- DECstation 2100 and 3100 baseboard video
  - one-bit mono or 8-bit pseudocolor frame buffers.
- DECstation 5000 series TurboChannel video
  - PMAG-DV Personal DECstation baseboard 1024x768 frame buffer
  - PMAG-B (CX) 1024x768 8-bit color frame buffer
  - PMAGB-B (HX or SFB) 1280x1024 8-bit color frame buffer
  - PMAG-A (MX) 1280x1024 four-bit greyscale frame buffer
  - PMAG-C (PX) 2D 8-bit accelerated frame buffer.
  - PMAG-D (PXG) 3D 8-bit accelerated frame buffer.
  - PMAG-E (PXG+) 3D 24-bit accelerated frame buffer.
  - PMAG-F (PXG+ Turbo) 3D 24-bit accelerated frame buffer.
- PMAG-JA (TX) 1024x1280 color frame buffer
- PMAG-RO (TX) 1024x1280 color frame buffer

  Note: All supported DECstation video produces sync-on-green. Be sure to use either a DEC-compatible fixed-sync monitor or a multisync monitor that supports sync-on-green.
- Serial ports
  - ttya and ttyb (can be used as console if needed)
- Ethernet
  - on-board AMD Lance ethernet (*le0*),
  - TURBOchannel AMD Lance ethernet cards (the *PMAD*)
- SCSI
  - on-board DEC *sii* SCSI controller (2100 and 3100)
  - on-board *asc* SCSI controller (5000 series machines)
  - TurboChannel *asc* SCSI controller (the *PMAZ*)
- DEC LK-201 (or compatible) keyboard
- DEC *hockey puck* or compatible mouse

Unsupported devices

- Q-bus based DECsystems
- PrestoServe NVRAM on DECsystem 5100 and 5000/2xx machines
- Audio drivers for Personal DECstation machines
- Floppy driver for Personal DECstation machines
- TurboChannel audio hardware (LoFi)

Note: The primary obstacle to supporting the above is non-availability of sample hardware for development.

Getting the NetBSD System on to Useful Media

First-time installation on a bare machine is not supported, because most DECstations do not have any suitable load device. Some versions of the DECstation PROM are buggy and will not boot via TFTP and bootp; other versions are buggy and do not boot via MOP.

The only DECstation with a floppy-disk drive is the Personal DECstation, and that device is not supported as a boot device.

The recommended installation procedure is to boot an install kernel via TFTP, or to use a "helper" system to write a miniroot diskimage onto a disk, move that disk to the target installation system, and then boot the miniroot.

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 `pmax/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/pmax 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 pmax/binary
# tar -cf tape_device kern-GENERIC base etc
```

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

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

Preparing your System for NetBSD installation

First and foremost, before beginning the installation process, *make sure you have a reliable backup* of any data on your hard disk that you wish to keep. Mistakes in partitioning your hard disk may lead to data loss.

Installing the NetBSD System

Note: There may be updates to this procedure available from the NetBSD/pmax web page at http://www.NetBSD.org/ports/pmax/ .

To install or upgrade NetBSD, you need to first boot an 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.

From most convenient to least convenient, the installation methods are:

1. Installation from an existing NetBSD or Ultrix system by booting the install kernel from an existing root file system (/). See the **Installing from an existing system** section later in these INSTALL notes.
2. Copying a bootable diskimage onto the beginning of a disk and installing onto that disk. See the **Install via diskimage** section later in these INSTALL notes.
3. Booting the install kernel over the network and installing onto a local disk. See the **Install via netboot install kernel** section later in these INSTALL notes.
4. Using a helper machine with a SCSI controller to copy the bootable diskimage onto the beginning of a disk, and moving the disk to the target machine. See the **Install via diskimage** section later in these INSTALL notes.
5. For machines with some PROMs that cannot netboot standard kernels, you will need to set up an NFS server with a diskless root file system for trimmed-down network install kernel and run the installation system from the NFS root file system. See the **Install via diskless boot** section later in these INSTALL notes.

You should familiarize yourself with the console PROM environment and the hardware configuration. The PROMs on the older DECstation 2100 and 3100 use one syntax. The PROMs on the TurboChannel

machines use a completely different syntax. Be sure you know how to print the configuration of your machine, and how to boot from disk or network, as appropriate.

To boot from disk, use:

2100 or 3100: **boot -f rz(0,*X*,0)netbsd**
5000/200: **boot 5/rz*X*/netbsd**
other 5000s: **boot 3/rz*X*/netbsd**

To boot via TFTP, use:

2100 or 3100: **boot -f tftp()**
5000/200: **boot 6/tftp**
other 5000s: **boot 3/tftp**

To boot via MOP, use:

2100 or 3100: **boot -f mop()**
5000/200: **boot 6/mop**
other 5000s: **boot 3/mop**

You will also need to know the total size (in sectors) and the approximate geometry of the disks you are installing onto, so that you can label your disks for the BSD fast file system (FFS). For most SCSI drives (including all SCSI-2 drives), the kernel will correctly detect the disk geometry. The **sysinst** tool will suggest these as the default.

If you're installing NetBSD/pmax for the first time it's a very good idea to pre-plan partition sizes for the disks on which you're installing NetBSD. Changing the size of partitions after you've installed is difficult. If you do not have a spare bootable disk, it may be simpler to re-install NetBSD again from scratch.

Assuming a classic partition scheme with separate / (root) and /usr file systems, a comfortable size for the NetBSD / partition is about 100 MB. A good initial size for the swap partition is twice the amount of physical memory in your machine (though, unlike Ultrix, there are no restrictions on the size of the swap partition that would render part of your memory unusable). The default swap size is 64 MB, which is adequate for doing a full system build.

Install via a NetBSD CD-ROM

You can obtain the disk image or diskless boot tar file from the NetBSD 6.0 CD-ROM.

To mount the CD-ROM from a NetBSD/pmax host, type

```
# mount -r -t cd9660 /dev/cdXc /mnt
```

and from an Ultrix host

```
# mount -r -t cdfs -o nodefperm,noversion /dev/rzXc /mnt
```

where *X* is the SCSI-ID of the CD-ROM.

Note: Ultrix does not have Rock Ridge extensions so leave out everything between the first and last period ('.') in the paths on the CD. For example, the path `NetBSD-1.4.3` would show up as `NetBSD-1.3`.

The diskimage file can be found on the CD-ROM at the following location (relative to the mount point of the CD)

```
pmax/installation/diskimage/diskimage.gz
```

and the diskless boot tar file can be found at

`pmax/installation/netboot/diskimage.tgz`

Once you have located these files, continue on to either **Install via netboot install kernel**, **Install via diskless boot**, **Install via diskimage** or **Installing from an existing system** section later in the INSTALL notes.

Installing from an existing system

With the NetBSD bootblocks or using the Ultrix bootloader, you can boot the kernel located in:

`pmax/binary/kernel/netbsd-INSTALL.gz`

On Ultrix systems you will need to **gunzip** this kernel before booting it.

Then boot using one of:

2100 or 3100: **boot -f rz(0,*X*,0)netbsd-INSTALL**
5000/200: **boot 5/rz*X*/netbsd-INSTALL**
other 5000s: **boot 3/rz*X*/netbsd-INSTALL**

where *X* is your boot disk SCSI-ID, and continue to the **Once you've booted the diskimage** section

Install via diskimage

The diskimage file is in

`pmax/installation/diskimage/diskimage.gz`.

It is shipped compressed and is around 1760 kbytes, uncompressing to exactly 2100 kbytes.

To install the diskimage onto disk `sd`*X* on a NetBSD/pmax system, do:

```
# disklabel -W /dev/rsdXc
# gunzip -c diskimage.gz | dd of=/dev/rsdXc bs=10240
```

When installing on a disk with no NetBSD or Ultrix label, you may get a message like:

```
sdX: WARNING: trying Ultrix label, no disk label
```

or when installing on an old Ultrix disk, you may get a message like:

```
sdX: WARNING: using ULTRIX partition information
```

when issuing the **disklabel -W /dev/rsd*X*c** command. This can safely be ignored.

On NetBSD/i386, the "raw disk partition" is the 'd' partition, so do:

```
# disklabel -W /dev/rsdXd
# gunzip -c diskimage.gz | dd of=/dev/rsdXd bs=10240
```

On NetBSD, be sure to use **disklabel -W** to enable writing to the label area of the disk. If you forget this and/or use the 'block' device, the **dd** command may silently fail.

On Ultrix systems, do:

```
# gunzip -c diskimage.gz | dd of=/dev/rrzXc bs=10240
```

On MS-DOS, use an 'unzip' utility, then use **rawrite**.

Then boot using one of:

2100 or 3100: **boot -f rz(0,*X*,0)netbsd**
5000/200: **boot 5/rz*X*/netbsd**

other 5000s: **boot 3/rz*X*/netbsd**

where *X* is your boot disk SCSI-ID, and continue to the **Once you've booted the diskimage** section.

Install via netboot install kernel

Booting NetBSD/pmax 6.0 install kernel over a network requires a BOOTP or DHCP server and a TFTP server. (These are usually all run on the same machine.) There are two basic stages to the boot:

- The pmax PROM software sends a BOOTP request to get its own address, the address of the TFTP server and the file to download.
- It downloads the file name obtained from BOOTP, which is the install kernel, via TFTP and then executes it.

You will need to set up servers for BOOTP and TFTP.

For the BOOTP server you need to specify the:

- hardware type (Ethernet)
- hardware address (Ethernet MAC address)
- IP address of the client
- subnet mask of the client
- address of the TFTP server
- name of the kernel loaded via TFTP

Here's an example for a UNIX-like system running **bootpd**:

```
myhost.mydom.com:\
         :ht=ethernet:ha=08002b123456:\
         :ip=192.168.1.2:sm=255.255.255.0:\
         :sa=192.168.1.1:bf=install:\
         :rp=/usr/export/pmax:
```

And here's an example for a UNIX-like system running the ISC **dhcpd**:

```
host pmax {
        hardware ethernet 08:0:2b:12:34:56;
        fixed-address 192.168.1.2;
        option host-name "myhost.mydom.com";
        filename "install";
        option domain-name-servers 192.168.1.1;
        option broadcast-address 255.255.255.0;
        option domain-name "my.domain";
        option root-path "/usr/export/pmax";
}
```

For the TFTP server, You will need to copy the **install.ecoff** kernel to the directory used by the TFTP server. This file must be gunzipped.

Then boot using one of:

2100 or 3100: **boot -f tftp()**
5000/200: **boot 6/tftp**
other 5000s: **boot 3/tftp**

and continue to the **Once you've booted the diskimage** section.

Install via diskless boot

The file `pmax/installation/netboot/diskimage.tar.gz` contains a suitable set of files for installing on an NFS server to set up a diskless root filesytem. (It is a tar copy of the contents of an installation ramdisk file system contained in the install kernel.) You will need to find an NFS server, unpack the tarfile, and setup BOOTP/dhcp service for your pmax. Instructions for setting up an NFS server and diskless booting are on the NetBSD/pmax netboot webpage at

http://www.NetBSD.org/ports/pmax/netboot.html

Since the system install utility, **sysinst**, requires a read/write root, installing via diskless boot is only feasible if your NFS server exports the diskless root read-write. If this is not possible, you should install via other of the other installation procedures.

Once you have booted the kernel, continue to the **Once you've booted the diskimage** section.

Once you've booted the diskimage

Once you've booted the installation kernel you will need to select your terminal type. Use **vt100** for a framebuffer console or a serial console with a vt100-compatible terminal, or **xterm** or **xterms** for a `tip`(1) or `cu`(1) connection running in an `xterm`(1).

The system will then start the **sysinst** program.

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. *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.

3. *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).
     - A CD-ROM drive (SCSI), a hard disk and a minimum of 8 MB of memory installed.
     - The hard disk should have at least 200 + *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

- Boot the system as described above. You should be at the **sysinst** main menu.

```
.*******************************************.
* 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.**
- 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.

4. *Booting NetBSD*

   You may want to read the boot messages, to notice your disk's name and capacity. Its name will be something like `sd0` and the geometry will be printed on a line that begins with its name. As mentioned above, you may need your disk's geometry when creating NetBSD's partitions. You will also need to know the name, to tell **sysinst** which disk to use. The most important thing to know is that `sd0` is your first SCSI disk, `sd1` the second, etc.

   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.

5. *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.

6. *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 `rz0` or `rz1`

7. *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.

8. *Partitioning the disk*

   - Which portion of the disk to use.

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

9. *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.

10. *Preparing your hard disk*

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

11. *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'.

12. *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.

13. *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.

14. *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.

15. *Installation from an unmounted file system*

    In order to install from a local file system, you will need to specify the device that the file system resides on (for example `rz1e`) the type of the file system, and the directory on the specified file system where the sets are located. **sysinst** will then check if it can indeed access the sets at that location.

16. *Installation from a local directory*

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

17. *Extracting the distribution sets*

    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.

18. *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).

19. *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 the correct terminal type as discussed in the **Once you've booted the diskimage** section. 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 `pmax/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/pmax/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 install new bootblocks and boot off the **install** kernel as described in the **Installing from an existing system** section. 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.

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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