NAME

INSTALL — Installation procedure for NetBSD/amd64.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 5.1 on the *amd64* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

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

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

Quick install notes for the impatient

This section contains some brief notes describing what you need to install NetBSD 5.1 on a machine of the amd64 architecture.

- Fetch files needed to install NetBSD.

  Option 1: bootable CD-ROM images containing the full distribution.

  These can be found on an FTP site near you, usually located in the `/pub/NetBSD/iso/` directory. Check the NetBSD website for details.

  Option 2: bootable CD-ROM images from `amd64/installation/cdrom/`.

  These images are bootable, but do not contain binary sets. They are intended for network installs or system repair. `boot.iso` is for VGA console installation, and `boot-com.iso` is for installation over serial console (com0, 9600 baud).

  Option 3: boot floppy images from `amd64/installation/floppy/`.

  `boot1.fs` and `boot2.fs` are floppy images for VGA console installation. `boot-com1.fs` and `boot-com2.fs` are for installation via serial console (com0, 9600 baud).

- The default kernel on CD-ROMs has ACPI enabled. This is known to cause issues on a few machines which have buggy ACPI implementations.

  To boot with ACPI disabled, choose the "no ACPI" option from the boot menu, or interrupt the menu and enter the NetBSD boot prompt. Type **`boot -2`** to boot with ACPI disabled.

- The actual binary distribution is in the `amd64/binary/sets/` directory. When you boot the install the installation program can fetch these files for you (using e.g. ftp) if you have a network connection. There are several other methods to get the binary sets onto your machine.

  You will at a minimum need one of the kernel sets, typically `kern-GENERIC.tgz`, as well as `base.tgz` and `etc.tgz`. In a typical workstation installation you will probably want all the installation sets.

- Write the CD-ROM images or floppy images out.

  Many commercial and freeware programs are available to burn CD-ROMs.

  If you have problems writing a raw image to a floppy, the **`rawrite.exe`** MS-DOS program or the **`Rawrite32`** Windows32 program (installed by `rawr32.exe`) in the `i386/installation/misc/` directory may be of help.

  The disk(s) you just prepared will be used to boot the installation kernel, which contains all the tools required to install NetBSD.

- For third-party programs which are not part of the base NetBSD distribution, you will want to explore the **`pkgsrc`** system with its many thousands of third party software applications.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on 57 different system architectures (ports) across 15 distinct CPU families, and is being ported to more. The NetBSD 5.1 release contains complete binary releases for many different system architectures. (A few ports are not fully supported at this time and are thus not part of the binary distribution. Please see the NetBSD web site at **http://www.NetBSD.org/** for information on them.)

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

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

Dedication

NetBSD 5.1 is dedicated to the memory of Martti Kuparinen, who was the victim of a traffic accident in June 2010.

Martti's technical contributions are too many to list here in full. He created and maintained numerous packages in pkgsrc, updated two packet filter solutions distributed with NetBSD and improved several hardware drivers. Beyond that he was always helpful and friendly. His example encouraged users to contribute to the project and share their work with the community. Some of these users later became NetBSD developers themselves thanks to Martti's efforts.

Changes Between the NetBSD 5.0 and 5.1 Releases

The NetBSD 5.1 release is the first feature update of the NetBSD 5.0 release branch. It represents a selected subset of fixes deemed critical for security or stability reasons, as well as new features and enhancements.

Please note that all fixes in security/critical updates (i.e., NetBSD 5.0.1, 5.0.2, etc.) are cumulative, so the latest update contains all such fixes since the corresponding minor release. These fixes also appear in minor releases (i.e., NetBSD 5.1, 5.2, etc.).

The complete list of changes can be found in the CHANGES-5.1:

http://ftp.NetBSD.org/pub/NetBSD/NetBSD-5.1/CHANGES-5.1

file in the top level directory of the NetBSD 5.1 release tree. An abbreviated list is as follows:

Security Advisory Fixes

- NetBSD-SA2009-004 (NetBSD OpenPAM `passwd`(1) changing weakness):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-004.txt.asc
- NetBSD-SA2009-005 (Plaintext Recovery Attack Against SSH):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-005.txt.asc
- NetBSD-SA2009-006 (Buffer overflows in ntp):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-006.txt.asc
- NetBSD-SA2009-007 (Buffer overflows in `hack`(6)):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-007.txt.asc
- NetBSD-SA2009-008 (OpenSSL ASN1 parsing denial of service and CMS signature verification weakness):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-008.txt.asc
- NetBSD-SA2009-009 (OpenSSL DTLS Memory Exhaustion and DSA signature verification vulnerabilities):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-009.txt.asc
- NetBSD-SA2009-010 (ISC dhclient subnet-mask flag stack overflow):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-010.txt.asc
- NetBSD-SA2009-011 (ISC DHCP server Denial of Service vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-011.txt.asc
- NetBSD-SA2009-012 (SHA2 implementation potential buffer overflow):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-012.txt.asc
- NetBSD-SA2009-013 (BIND named dynamic update Denial of Service vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2009-013.txt.asc
- NetBSD-SA2010-002 (OpenSSL TLS renegotiation man in the middle vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-002.txt.asc
- NetBSD-SA2010-003 (azalia(4)/hdaudio(4) negative mixer index panic):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-003.txt.asc
- NetBSD-SA2010-004 (amd64 per-page No-execute (NX) bit disabled):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-004.txt.asc
- NetBSD-SA2010-005 (NTP server Denial of Service vulnerability):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-005.txt.asc
- NetBSD-SA2010-006 (Buffer length checking errors in CODA):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-006.txt.asc
- NetBSD-SA2010-007 (Integer overflow in libbz2 decompression code):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-007.txt.asc
- NetBSD-SA2010-008 (sftp(1)/ftp(1)/glob(3) related resource exhaustion):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-008.txt.asc
- NetBSD-SA2010-010 (Buffer Length Handling Errors in netsmb):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-010.txt.asc

- NetBSD-SA2010-011 (OpenSSL Double Free Arbitrary Code Execution):
  http://ftp.NetBSD.org/pub/NetBSD/security/advisories/NetBSD-SA2010-011.txt.asc

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

Other Security Fixes

- openssl: Fix CVE-2009-4355 and CVE-2010-0740.
- Fix crash in openssl: handshake_dgst[] may be used without being allocated, causing NULL pointer dereference.
- Update BIND server and tools to 9.5.2-P2, fixing CVE-2009-0025, CVE-2009-4022, and CVE-2010-0097.
- `ntpd`(8): Fix CVE-2009-3563.
- expat: Fix SA36425 and CVE-2009-3560.
- `fts`(3): Avoid possible integer overflow on really deep dirs, and subsequent collateral damage. Received from OpenBSD via US-CERT as VU #590371.
- Fix a couple issues with POSIX message queues:
  - An invalid signal number passed to mq_notify() could crash the kernel on delivery -- add a boundary check.
  - A user could set mq_maxmsg (the maximal number of messages in a queue) to a huge value on mq_open(O_CREAT) and later use up all kernel memory by mq_send() -- add a sysctl'able limit which defaults to 16*mq_def_maxmsg.
- `arc4random`(3): Keep arc4_i and arc4_j synchronised after a rekeying. This prevents accidentally ending up in a short ARC4 cycle.
- freetype: Fix CVE-2009-0946.
- `ftpd`(8): Fix a remote crash. PR 43023.
- openldap: Fix CVE-2009-3767.
- Fix an NX regression observed on amd64 kernels, where per-page execution right was disabled (therefore leading to the inability of the kernel to detect fraudulent use of memory mappings marked as not being executable).

Kernel

- Fix random "filesystem full" messages on large FFS file systems.
- Fix a regression in the 4.4BSD scheduler, improving interactive performance under load.
- Remove a race where physio_done() may use memory already freed. PR 39536.
- Fix a crash observed when trying to load a corrupted ELF kernel module.
- Fix PR 41566, where writes on the controlling tty were not being awoken from blocks.
- Various fixes for POSIX message queues.
- Fix a couple deadlocks in the VFS subsystem. PR 41374.
- Fix an issue on some architectures where a softint could fire on the wrong CPU.

- Fixes for POSIX advisory locks.
- A number of other stability fixes.
- Fix a case where `setpriority`(2) returned EACCES instead of EPERM. PR 41489.
- `lockf`(3) passes its arguments through to `fcntl`(2) but is supposed to support -ve lengths (lock area before current offset). Nothing in libc or the kernel allowed for this, so some random part of the file would get locked. PR 41620.
- Fix ktrace of data from iovec based system calls. PR 41819.
- Fix stack size enforcement.

File Systems

- `fsck_ext2fs`(8): Ignore the "-P" option as intended, to make this work with, e.g., "fsck_flags=-pP" in `/etc/rc.conf`. PR 41490.
- UFS quotas: Add missing mutex_destroy() before pool_cache_put(). Prevents a "Mutex error: lockdebug_alloc: already initialized" panic.
- `tunefs`(8): Allow tunefs to clear any type of WAPBL log, not only in-filesystem ones.
- `fsck_ffs`(8): Do some basic checks of the WAPBL journal, and fail if the kernel would refuse to mount the filesystem read/write. Add code to clear the bogus journal when not run in preen (-p) mode.
- `wapbl`(4): If the WAPBL journal can't be read (ffs_wapbl_replay_start() fails), mount the filesystem anyway if MNT_FORCE is present. This allows to still boot single-user a system with a corrupted WAPBL on /, and so get a chance to run fsck to fix it.
- smbfs:
  - Fix some panics while trying to umount a smbfs share.
  - Fix detection of SMB capabilities according to the CIFS spec:
    - SMB_CAP_LARGE_FILES advertises support for 64-bit file offsets.
    - SMB_CAP_LARGE_READX and SMB_CAP_LARGE_WRITEX advertise support for large reads and writes (larger than 64KB). PR 42175.
  - Add support for file sizes greater than 4GB.
  - Prevent malicious local program from causing a kernel crash.
- A number of fixes for ext2fs. PR 28712.
- procfs: Fix memory leak. PR 42053.
- Fix `cp`(1) from NTFS. PR 38531.
- cd9660: Change cd9660_mount, in MNT_UPDATE case, to check dev_t's for equality instead of just vnode pointers. Fixes erroneous "Invalid argument" errors from `mount`(8) with -u against cd9660 root in the presence of mfs or tmpfs `/dev` prepared after initial mountroot.
- A number of fixes to ffs snapshots.
- sysctlfs: Fix a crash while trying to read nodes on amd64. PR 41494.
- Various improvements to UDF.
- xattr: Fix system crash which could be triggered by a malicious command.

- coda: Fix incomplete ioctl parameter verification.
- ffs: Fix a race condition which could lead to data corruption.
- wapbl(4): Fix replay problems which could corrupt the fs. PR 43336.

Networking

- ath(4): Remove the binary HAL and update to the open source HAL.
- Add the age(4) driver for Attansic L1.
- Add the ale(4) driver for Atheros AR8121/AR8113/AR8114.
- brgphy(4): Add support for BCM5462, BCM54K2 and BCM5722.
- arp(4): Don't require the gateway address to have room for both an interface name and address. Fixes a regression in 'arp -s ...' on interfaces such as xennet0 with unusually long names. PR 41878.
- Make tcp msl (max segment life) tunable via sysctl net.inet.tcp.msl.
- Fixed a number of bge(4) bugs.
- ifpci(4): Fix endianness issues when accessing the B-channel fifos.
- wm(4):
  - Numerous fixes for various chips.
  - Add SIOCSIFADDR support for setting the AF_LINK address, necessary for agr to be able to set the mac addresses of each port to the agr address (i.e., so it can receive all intended traffic at the hardware level).
  - Enable hardware VLAN support.
- re(4):
  - Detect RTL8169CP, RTL8168D/8111D, and RTL8103E variants.
  - Add hardware checksum support for newer 8168/8111/8102 chips.
  - Fix RX hardware checksum for DESCV2 chips. PR 40605.
- le(4): Don't immediately switch UTP/AUI ports on lost carrier.
- agr(4): Add vlan support and hardware offload capabilities. Add support for disabling the LACP protocol by setting LINK1 on the agr interface.
- bnx(4):
  - Protect against spurious "bnx0: Double mbuf allocation failure!" panics.
  - Add support for BCM5709 and BCM5716.
- Follow exactly the recommendation of draft-ietf-tcpm-tcpsecure-11.txt: Don't check against the last ack received, but the expected sequence number. This makes RST handling independent of delayed ACK.
- vr(4): Add suspend/resume support.
- carp(4): Improve logging. PR 38260.
- Give 100BASE-TX full duplex higher priority than 100BASE-T4.
- Fix wpa with ral(4).

- vlan(4): Inherit the parent's TCP segmentation offload capability.
- dhcpcd:
  - Update to 5.1.3.
  - Add an rc.d script.
  - Only start dhcpcd per interface if not running the full dhcpcd daemon. Only stop dhcpcd per interface if it's running for the interface. PR 40320.
- Fix a panic when trying to disable IPFilter before enabling it. PR 41364.
- ping(8): Deal with source route and record route specially giving a meaningful error message when remote side doesn't support record route. PR 41111.
- ifconfig(8): Don't require a "vlan" argument with "-vlanif". "ifconfig vlan0 -vlanif" now works as one would expect.
- tap(4): Fix a potential leak on device close. bpf(4): Prevent malicious bytecode from crashing the kernel with a divide-by-zero trap.
- UDPv6: Prevent local crash by malicious user program.

Miscellaneous Drivers

- ehci(4): Add a workaround for ATI SB600 and SB700 revisions A12 and A13 to avoid a USB subsystem hang when the system has multiple USB devices connected to it or one device is re-connected often.
- uftdi(4): Add support for multiple channel cards, specifically quad channel FT4232H.
- ums(4): Add quirks to make MS Wireless Laser Mouse 6000 work. PR 41737. Add support for USB HID devices that report absolute coordinates instead of relative movement data, e.g. touchpanels. Add support for the Microsoft Natural Ergonomic Desktop 7000 mouse.
- apm(4): Fix suspend/resume.

Audio

- Add hdaudio(4), a standards-compliant driver for Intel High Definition Audio. It will replace azalia(4) eventually.
- Add gcscaudio(4), an AMD Geode CS5536 audio driver.
- Add support for playback- or capture-only devices. PR 42050.
- pad(4): Catch up to audio(4) device_t/softc split to prevent pad from corrupting its child device's softc.
- audio(4): OSS audio allows mixer operations on the dsp device. NetBSD would previously return EINVAL in these circumstances. This can break audio in apps running under Linux emulation. Select whether to call mixer_ioctl() or audio_ioctl() based on whether the command smells like a mixer ioctl or not.

Security

- pam(3): Restore the good old UNIX behavior of root password changing: only root may change the root password.
- racoon(8): Fix a bug where racoon used a wrong IPsec-SA handle that was for another peer if it received an ISAKMP message for IPsec-SA that has the same message-id as the message-id that was received before.

- ipsec(4): Add a missing splx() call. PR 41701.
- opencrypto(9):
  - Extend the API to allow the destination buffer size to be specified when it is not the same size as the input buffer.
  - Add user-space access to compression features.
  - Add software gzip support (CRYPTO_GZIP_COMP).
  - Add the fast version of crc32 from zlib to libkern.
  - Fix PRs 41069 and 41070.

Storage

- Add support for RAIDframe parity maps. Drastically reduces the amount of time spent checking parity after an unclean shutdown by keeping better track of which regions might have had outstanding writes. Enabled by default; can be disabled on a per-set basis, or tuned, with the new raidctl(8) commands.
- Add sdmmc framework.
- Add sdhc(4), a driver for SD controllers following the SD Host Controller Standard Simplified Specification.
- Add wb(4), a driver for Winbond W83L518D SD/MMC readers.
- siisata(4): Sync with HEAD, fixing a number of bugs. PR 41579.
- mfi(4): Fix command list corruption seen on heavy I/O load. Add support for MFI gen2 devices.
- twa(4): Disable completely bogus DIAGNOSTIC check.
- wdc(4): use 8bits access to legacy IDE registers through the SATA interface (except data registers). Stops errors such as the following when probing SATA drives through controllers that offer the legacy pciide interface: viaide1 channel 0: reset failed for drive 0
- piixide(4): Add Intel 3400 support.

Platform specific

- x86 (amd64 and i386)
  - Add a workaround for a bug with some Opteron revisions where locked operations sometimes do not serve as memory barriers, allowing memory references to bleed outside of critical sections.
  - ichlpcib(4): Fix watchdog code:
    - The timer bound constants are in tick, so convert period to tick before checking it against the bounds.
    - For ICH5 or older, fix code that would have always written a 0 period to the register.
  - Add CPU topology detection support for AMD processors.
  - asus(4):
    - Add experimental cpu fan/voltage switching support (sysctl hw.asus0.*).
    - Add fan sensor.
  - Add hw.wake.* sysctl subtree for toggling which devices are allowed to restore the system from sleep. By default, the following devices are enabled for wake: sleep/power buttons, lid switch, pc kbd controller.

  - agp(4): Add support for Intel G35, G45, and Q45.
  - Cut down on the number of lines used in acpi autoconf messages.
  - Extend CPU probe of Intel processors to handle extended-models: new Intel 45nm processors, Core i7, Atom, and the 45nm Xeon MP. Properly decode several new Intel cache descriptors, as listed in the most recent (March 2009) edition of Intel's Application Note 485. PRs 41289 and 41290.
  - cpuctl(8): Add newer VIA C7 core and VIA Nano. When printing an unknown VIA CPU, default to 'Unknown IDT/VIA' instead of 'C3'.
  - Fix NetBSD under qemu with ACPI enabled. PR 38729.
  - acpi(4): If the firmware describes duplicate keyboard controller nodes, don't panic when the driver fails to map registers. PR 39671.
  - Fix a bug where mapping the very end of iomem accidentally returns an address in the ISA hole. Fixes ohci on VirtualPC 7 for Mac, which places OHCI at base address 0xfffff000 size 0x1000.
  - int 15h/AH=86h (WAIT) doesn't work properly on all hardware and emulators, so for the countdown use the more coarsely grained sleep implementation based on int 1ah/AH=00h (GET SYSTEM TIME).
  - Use the TSC and current multiplier to calculate bus clock on VIA C7 Esther.
  - Add support for VIA C7 temperature sensors (options VIA_C7TEMP) and enable in i386 GENERIC kernel.
  - Fix a regression in the boot loader where pressing a letter not bound to a menu item would select a numeric item.
  - Enable cgd(4) support on all amd64 and i386 XEN kernels.
- amd64
  - Handle protection faults properly, returning SIGSEGV instead of SIGBUS.
  - Ensure FP state is reset, if FP is used in a signal handler. PR 39299.
  - Build kernel modules with -mno-red-zone like the kernel is built.
  - On amd64, add a third free list distinct from the default free list, holding RAM between 16Mb and 4Gb. This helps preventing bus_dma(9) memory allocation failures for 32bit DMA on large-memory machines.
- i386
  -
  - The FPU Tag word is a 16bit register, in FPU (387) mode it defines 2-bit tags for each FPU data register, in MMX mode it defines 1-bit tags for each data register. The single bit tags are stored in the lower 8 bits and thus in the first byte of the save frame.
  - Fix a local user crash.
- ARM: Work-around a possible process exit corner case which can leave stale data in the cache after a context-switch. PR 41058.
- sgimips
  - haltwo(4): Set delta value for the mixer's master channel.

  - Add a driver for the Indy's front panel buttons. Power button presses are reported to sysmon, volume control buttons are reported to PMF.
  - Fixes for newport video.
- alpha
  - A number of multiprocessor fixes. PRs 41106 and 42174.
  - Add support for booting off a couple of common RAID adapters found on several models of alpha systems: mlx [Mylex DAC060] and iop [I2O]. PR 25829.
  - Change the kernel text to 0xfffffc0000430000 (which is where Tru64 has its kernel).
  - The tsc(4) bus initialization was using a single statically allocated extent storage for each tsp(4), which caused a LOCKDEBUG kernel to fail because the extent storage contained a mutex which panics when the second mutex_init() is attempted. Put the extent storage into the tsp_config structure so each tsp(4) gets its own. PR 38358.
- amiga
  - Switch amiga to the common m68k pmap.
  - Fix a problem with the timecounter running backwards everytime the hardware counter wraps and the clock-interrupt is not yet serviced by hardclock().
  - Improve precision of small kernel delays.
  - Fix keyboard handshaking problems on Amiga 1200.
- atari
  - Rewrite the `binpatch`(8) utility to add support for ELF binaries, old src/usr.sbin/mdsetimage sources which support misc executable formats without LGPL'ed libbfd.
  - Add a workaround for annoying "WARNING: negative runtime; monotonic clock has gone backwards" message.
  - `fd`(4): Correctly detect the default density.
- hp300: Make install.md probe `cd`(4) devices properly.
- hpcmips: Fix pcic kthread creation timing. PRs 41791 and 41164.
- m68k: Ensure functions like `mmap`(2), `mremap`(2), `shmat`(2) or `sbrk`(2) return -1 in case of an error. A side benefit of this is to fix a segfault caused by jemalloc when `mmap`(2) failed.
- macppc: pbms(4): Avoid an immediate crash during attach, and fix the aspect ratio of the trackpad on the geyser2 model.
- pmax: Make `ksyms`(4) actually work.
- sh3: Fix logic error in copyinstr() when deciding whether to return EFAULT or ENAMETOOLONG.
- sparc64:
  - Fix long double support in 32bit libc. PR 41406.
  - When preparing the initial trap frame for a new forked lwp, explicitly clear condition code. Otherwise we might catch a signal before we ever return to userland. PR 41302.
  - Fix a disk I/O regression under heavy load.

  - Build the sunleo X driver.
  - Add `lom`(4), a driver for LOMlite lights out management hardware monitor and watchdog timer.
  - sab(4): Allow the RSC to be the console on an E250, by checking for RSC-specific properties, and by not changing the port baud rate.

- vax
  - binutils: Allocate relocation section using bfd_zalloc() to ensure no garbage relocations when not all the entries are used. PR 39182.
  - Keep track of the previous ICR value and hardclock_ticks to ensure the 32 bit counter doesn't go backwards. Also, the ICR runs from -10000 to -1, so adjust the value when reading it. Now mfpr works quite nicely on a 4000/90.

- sparc
  - Enable `ddb`(4) in GENERIC-like kernels.
  - Fix a number of issues with floppies.
  - Add apc(4), a driver for the Aurora Personality Chip (APC) found on SPARCstation-4/5, and emulated by qemu to idle the simulator when the CPU is idle. Only the CPU idle part implemented at this time.

- xen
  - Now a XEN3_DOM0 kernel properly updates the CMOS time.
  - Implement DIOCGDISKINFO for xbd disk driver.
  - xbdback: implement and publish "feature-flush-cache". xbd: if feature-flush-cache is present, use it for DIOCCACHESYNC. Should improve WAPBL reliability of Xen guests on a NetBSD dom0.
  - xennet: Write a "feature-rx-notify" to the xenstore, which is used by recent linux dom0 kernels. This reduces packet loss when using a NetBSD domU on such linux dom0.
  - xennetback: Announce feature-rx-copy and feature-rx-flip. Add support for request-rx-copy. PR 40650.
  - Add i368PAE support to Xen3 dom0.
  - Add Xen3 PCI pass-through support.
  - Fix stalled xbdback detach that would stall the whole xenbus thread, preventing new domUs from being created.
  - Make it possible to use netbsd-5 domUs running on a Xen2 hypervisor.

Miscellaneous

- `sh`(1): Make the cd builtin accept and ignore -P. PR 42557.
- `fdisk`(8): Fix issues with large disks.
- `savecore`(8): Instead of exiting with an obscure error message if -N /kernelname isn't specified, blithely assume the kernel will consume around 20 megs.
- `newfs`(8): Issue a better error message if attempting to create a file system on a block device. Inspired by PR 41127.

- `newfs_msdos`(8): Make fs size detection get proper size rather than disk size.
- `termcap`(3): Only add the ZZ capability for termcap entries that are larger than 1023 bytes.
- `dkctl`(8): List the partition types addwedge understands. PR 37252. Make dkctl conform to its man page and print the device name on addwedge when the addition was successful (as well as indicating success).
- If the current locale doesn't define the 'thousands' grouping info then use sane defaults (',' every 3 digits). PR 40714.
- `pthread`(3):
  - Make nanosleep cancelable again.
  - Improve the algorithm used in pthread creation so that it does a better job of reusing dead threads.
  - Make sure thread id is set correctly in case a threaded program forks from a thread other than the main thread. Fixes issues with, e.g., ruby.
- `newsyslog`(8): Reset ziptype on each line. Failure to do this caused any log file to be compressed if it was listed after a line using Z or J flag.
- nvi(1):
  - Fix a problem where the pattern / didn't match a dollar sign. PR 41781.
  - Make :ESC, #+ and #- work again.
  - Rename "expandtabs" to "expandtab" to match documentation.
  - Implement the "et" abbreviation for expandtab.
  - Fix regexp on LP64 systems. PR 41924.
  - Fix format string bug: filenames may contain % characters.
  - Fix ~ on big-endian architecturs.
- `pstat`(8): Distinguish between UFS1 and UFS2 inodes by reading the ufsmount structure, the previous heuristic of comparing the size fields of inode and dinode failed.
- `btpin`(1): Add a -P flag to attempt immediate pairing.
- `ksh`(1): Support 0xnn for hexadecimal constants, as well as 16#nn. PR 40512.
- Add support for fr_*.UTF-8 locale. Setting LANG to fr_*.UTF-8 won't get the message catalog right (they're encoded in iso-8859-1), but other locale functions should work properly.
- Add Solaris-like dlinfo() interface to the ELF dynamic linker. Implement RTLD_DI_LINKMAP which returns a pointer to the linkmap chain at the given object.
- `kill`(1): Make sure that numerical signals and pids are in range for their types. PR 42143.
- `pcap`(3): pcap_lookupnet(): reset ifr before SIOCGIFNETMASK. Without it we get back a bogus netmask. PR 41367.
- `man`(1): Accept a pathname to a man file, e.g., "man ./man.1"
- `setlocale`(3): Handle nonexistent locales properly. PR 42124.
- `amldb`(8): Check validity of parent to avoid a potential segfault.

- `sort`(1): Fix a ton of bugs including but not limited to PR 18614 PR 27257 PR 25551 PR 221 82 PR 31095 PR 30504 PR 36816 PR 37860 PR 39308 PR 42094.
- `user`(8): Fix -p flag: rm_eo is the first character *after* the match, so no need for a +1. Blowfish hashes are only 53 chars long, not 54.
- Update libevent to 1.4.11-stable.
- `hunt`(6): Fix possible remote DoS of a running hunt game, and prevent a possible theoretical attack involving >= 1 billion ammo.
- `systat`(1): Fix problems with SIGWINCH. PR 42161.
- `gzip`(1):
  - Fix support for multi-section bzip2 files, as created by pbzip2.
  - Add "pack" uncompression support.
  - Avoid an overflow in suffix handling.
- audio{ctl,play,record}: Add extended WAVE header support, attempt to play a bunch more WAV files.
- Update Postfix to 2.6.5.
- `df`(1): Block numbers are measured in f_frsize units. Make -P option use this instead of f_bsize. Also account for reserved blocks like normal non-P output. PR 41541.
- Update libfetch to 2.30.
- `window`(1): Fix a SEGV with certain terminal types. PR 41581.
- Update pkg_install to 20100204:
  - audit-packages.conf(5) has been superseded by pkg_install.conf(5). The default configuration is the same.
  - Support for pkg_view(1) has been retired.
  - The functionality of audit-packages(1) and download-vulnerability-list(1) has moved into `pkg_admin`(1). Wrapper scripts that handle the common use cases are provided.
- `racoonctl`(8): Adjust ADMINPORTDIR to match that of racoon (`/var/run`). PR 41376.
- `schedctl`(8): Skip LSIDL and LSZOMB threads when retrieving info.
- `postinstall`(8) now knows about `/etc/dhcpcd.conf`.
- `drvctl`(8): Allow querying for root devices in the tree by specifying an empty device name. Ensure that l_devname is NUL-terminated and fail otherwise. If drvctl -l is used without argument, print the root device nodes.
- `paste`(1): Null-terminate the delimiter list string after processing escapes (which can shorten it) because the code that issues delimiters depends on it being null-terminated. This caused e.g. paste -d ' ' a b to print a '0' at the beginning of each line. PR 41159.
- Don't attempt to read or write ~/.lesshst if it's not a regular file or a symlink to a regular file. Previously, symlinking to `/dev/null` would cause less to trash `/dev/null` if run with sufficient privileges. PR 42237.
- Make rtsold_flags default to -a. PR 39657.

- libevent: Add -fno-strict-aliasing to work around problems with GCC 4 and strict-aliasing.
- Renamed a number of internal getline() functions to get_line() so as to compile under -current.
- Install the Xvidtune app-defaults file. PR 41577.
- Fixes to Linux compat:
  - In `sendmsg`(2), copy the msghdr structure before trying to use it.
  - In linux_sys_sched_getaffinity(), do not leak memory on error.
- Various METALOG fixes, including sorting entries. PRs 24457 and 41155.
- Update DRM code.
- `cdce`(4): Add support for the Openmoko Freerunner. PR 40049.
- `pms`(4): Add elantech multi-touch support.
- Big X.Org update.
- `ugen`(4): ugen_get_cdesc() can return NULL. When this happens, return EINVAL error instead of crashing.
- Fix a race between nfsd and local rm. PR 41147.
- `puc`(4): Add support for Oxford Semiconductor OXmPCI952 2 port UARTs. Add support for the IBM 481033H SCC.
- `sysinst`(8): Try ATA/SCSI identify commands and when successful, use the model information along with the disk size when creating the 'Available disks' menu. PR 41925.
- Fix PR kern/41659: add missing splx() in FAST_IPSEC code.
- Add hungarian keyboard layout.
- Add Swiss German keyboard layout.
- Introduce MKSUBPIXEL, which allows enabling subpixel rendering code in FreeType.
- Support drives over 1TB in size in sysinst. Error if drive is over 2TB in in size (and thus over the disklabel limit).
- Update and add some TNF ssh keys to `/etc/ssh/ssh_known_hosts`.
- Prevent `makefs`(8) from creating invalid ISO format on rockridge support which causes fatal errors in ARC BIOS firmware on MIPS Magnum R4000. PR 42410.
- `sysinst`(8): When creating /etc/fstab: for the first swap partition use type "sw,dp" instead of "sw", so dump device gets configured correctly if swap is not on the second partition. PR 42148.
- sys/atomic.h: Make atomics usable from C++.
- `wc`(1): Add support for "-L" option (longest line) as present in the GNU and FreeBSD versions of "wc".
- libm: Add f{min,max,dim}{,l,f}.
- jemalloc: Fix race condition on reallocation of huge category. PR 42876.
- sys/null.h: Enclose (void *)0 in an extra set of parenthese to make the result usable in arbitrary expressions. PR 41890.

Known Problems

Using block device nodes (e.g., wd0a) directly for I/O may cause a kernel crash when the file system containing `/dev` is FFS and is mounted with -o log. Workaround: use raw disk devices (e.g., rwd0a), or remount the file system without -o log.

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

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

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

Features to be removed in a later release

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

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

  NetBSD 5.1 includes a preview of WAPBL (Write Ahead Physical Block Logging), which will replace soft dependencies in the next major release. See `wapbl`(4) and
  http://mail-index.netbsd.org/netbsd-announce/2008/12/14/msg000051.html
  for details.

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

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

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

The NetBSD Foundation

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

Sources of NetBSD

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

NetBSD 5.1 Release Contents

The root directory of the NetBSD 5.1 release is organized as follows:

`.../NetBSD-5.1/`

`CHANGES`	Changes between the 4.0 and 5.0 releases.
`CHANGES-5.0`	Changes between the initial 5.0 branch and final release of 5.0.
`CHANGES-5.1`	Changes between the 5.0 and 5.1 releases.
`CHANGES.prev`	Changes in previous NetBSD releases.
`LAST_MINUTE`	Last minute changes and notes about the release.
`README.files`	README describing the distribution's contents.

`source/` Source distribution sets; see below.

In addition to the files and directories listed above, there is one directory per architecture, for each of the architectures for which NetBSD 5.1 has a binary distribution.

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

gnusrc This set contains the "gnu" sources, including the source for the compiler, assembler, groff, and the other GNU utilities in the binary distribution sets.
79 MB gzipped, 450 MB uncompressed

sharesrc This set contains the "share" sources, which include the sources for the man pages not associated with any particular program; the sources for the typesettable document set; the dictionaries; and more.
7 MB gzipped, 32 MB uncompressed

src This set contains all of the base NetBSD 5.1 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
59 MB gzipped, 350 MB uncompressed

syssrc This set contains the sources to the NetBSD 5.1 kernel for all architectures as well as the `config`(1) utility.
34 MB gzipped, 197 MB uncompressed

xsrc This set contains the sources to the X Window System.
127 MB gzipped, 694 MB uncompressed

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

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

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

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

`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/amd64 subdirectory structure

The amd64-specific portion of the NetBSD 5.1 release is found in the `amd64` subdirectory of the distribution: `.../NetBSD-5.1/amd64/`. 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 sup-
                                ported in this release.
                        netbsd-INSTALL.gz
                                The installation kernel.
                        netbsd-INSTALL_XEN3_DOMU.gz
                        netbsd-XEN3_DOM0.gz
                        netbsd-XEN3_DOMU.gz
                sets/   amd64 binary distribution sets; see below.
installation/
                cdrom/      amd64 bootable cdrom images; see below.
                floppy/     amd64 boot and installation floppies; see below.
                misc/       Miscellaneous amd64 installation utilities; see installation section below.
```

Binary distribution sets

The NetBSD amd64 binary distribution sets contain the binaries which comprise the NetBSD 5.1 release for amd64. The binary distribution sets can be found in the `amd64/binary/sets` subdirectory of the NetBSD 5.1 distribution tree, and are as follows:

base The NetBSD 5.1 amd64 **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.
34 MB gzipped, 101 MB uncompressed

comp Things needed for compiling programs. This set includes the system include files (`/usr/include`) and the various system libraries (except the shared libraries, which are included as part of the **base** set). This set also includes the manual pages for all of the utilities it contains, as well as the system call and library manual pages.
59 MB gzipped, 219 MB uncompressed

etc This distribution set contains the system configuration files that reside in `/etc` and in several other places. This set *must* be installed if you are installing the system from scratch, but should *not* be used if you are upgrading.
1 MB gzipped, 1 MB uncompressed

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

kern-GENERIC
This set contains a NetBSD/amd64 5.1 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.
5 MB gzipped, 13 MB uncompressed

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

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

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

NetBSD maintains its own set of sources for the X Window System in order to assure tight integration and compatibility. These sources are based on 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.
8 MB gzipped, 24 MB uncompressed

xcomp The extra libraries and include files needed to compile X source code.
16 MB gzipped, 63 MB uncompressed

xfont Fonts needed by the X server and by X clients.
32 MB gzipped, 74 MB uncompressed

xetc Configuration files for X which could be locally modified.
1 MB gzipped, 1 MB uncompressed

xserver The X server.
9 MB gzipped, 26 MB uncompressed

The amd64 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 amd64 binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/amd64 System Requirements and Supported Devices

NetBSD/amd64 supports CPUs that implement the 64bit AMD64 architecture. These currently include AMD Opteron, AMD Athlon64, and Intel CPUs that implement the EM64T extension.

Getting the NetBSD System on to Useful Media

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

Installation is supported from several media types, including:

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

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

CD-ROM / DVD Find out where the distribution set files are on the CD-ROM or DVD. Likely locations are `binary/sets` and `amd64/binary/sets`.

Proceed to the instructions on installation.

MS-DOS floppy NetBSD does not include split distribution sets for installation by floppy. However, they can be created on a separate machine using the `split`(1) command, running e.g. **`split -b 235k base.tgz base.`** to split the `base.tgz` file from `amd64/binary/sets` into files named `base.aa`, `base.ab`, and so on. Repeat this for all `set_name.tgz` files, splitting them into `set_name.`*`xx`* files. Count the number of `set_name.`*`xx`* files that make up the distribution sets you want to install or upgrade. You will need one sixth that number of 1.44 MB floppies.

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

Place all of the `set_name.`*`xx`* files on the MS-DOS disks.

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

FTP The preparations for this installation/upgrade method are easy; all you need to do is make sure that there's an FTP site from which you can retrieve the NetBSD distribution when you're about to install or upgrade. If you don't have DHCP available on your network, you will need to know the numeric IP address of that site, and, if it's not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself. If you don't have access to a functioning nameserver during installation, the IPv4 address of **ftp.NetBSD.org** is `204.152.190.15` and the IPv6 address is `2001:4f8:3:7:230:48ff:fec6:9aaa:21` (as of May, 2010).

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.

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-5.1
# cd amd64/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

It is strongly recommended that as part of the installation procedure, you upgrade your system's BIOS to the latest version available from your system vendor. Later BIOSes often contain workarounds for CPU and chipset bugs, workarounds that cannot be provided by the operating system.

In the past, bugs fixed this way have been known to cause unpredictable behaviour and frequent system crashes with NetBSD and other UNIX-like operating systems on x86 hardware.

Installing the NetBSD System

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).
     - A CD-ROM drive (SCSI or ATAPI), and a hard disk.
     - 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
     - Insert the CD into the drive and boot the computer.

```
.*********************************************.
* NetBSD-5.1 Install System                    *
*                                              *
*>a: Install NetBSD to hard disk               *
* b: Upgrade NetBSD on a hard disk             *
* c: Re-install sets or install additional sets *
* d: Reboot the computer                       *
* e: Utility menu                              *
* x: Exit Install System                       *
.*********************************************.
```

     - If you wish, you can configure some network settings immediately by choosing the **Utility menu** and then **Configure network**. It isn't actually required at this point, but it may be more convenient. Go back to the main menu.
     - Choose **install**.
     - You will be guided through some steps regarding the setup of your disk, and the selection of distributed components to install. When in doubt, refer to the rest of this document for details.
     - After your disk has been prepared, choose **CD-ROM** as the medium. The default values for the path and device should be ok.
     - After all the files have been unpacked, go back to the main menu and select **reboot.**
     - 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. 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.

   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**. You can also specify a partition as type **MSDOS**. This is useful if you share the disk with MS-DOS or Windows; NetBSD is able to access the files on these partitions. You can use the values from the MBR for the MS-DOS part of the disk to specify the partition of type **MSDOS** (you don't have to do this now, you can always re-edit the disklabel to add this once you have installed NetBSD, or use `mbrlabel`(8) to help you update your disklabel with data from the MBR).

    Some partitions in the disklabel have a fixed purpose.

    `a` Root partition (`/`)

    `b` Swap partition.

    `c` The NetBSD portion of the disk.

    `d` The entire disk.

    `e`–`p` Available for other use. Traditionally, `e` 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*

    Before extraction begins, you can elect to watch the files being extracted; the name of each file that is extracted will be shown. This can slow down the installation process considerably on machines with slow graphics consoles or serial consoles. Alternatively, you can choose to see a progress bar. This is the preferred option as it shows progress without significantly slowing down the installation process.

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

19. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 5.1. 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 doc-

umentation 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_wm0="inet 192.0.2.123 netmask 255.255.255.0"
```

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

```
ifconfig_wm0="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 `amd64/5.1/All` subdir. You can install them with the following commands under `sh`(1):

     ```
     # PKG_PATH=ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/amd64/5.1/All
     # export PKG_PATH
     ```

```
# pkg_add -v tcsh
# pkg_add -v bash
# pkg_add -v perl
# pkg_add -v apache
# pkg_add -v kde
# pkg_add -v firefox
...
```

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

```
# setenv PKG_PATH ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/amd64/5.1/All
```

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/amd64/5.1/All directory, which may have the same contents.

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

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

```
Warning: package 'foo' was built for a different version
of the OS:
NetBSD/i386 M.N (pkg) vs. NetBSD/i386 5.1 (this host),
```

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

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

for more information about NetBSD's release numbering scheme.

- The framework for compiling packages can be obtained by retrieving the file
  ftp://ftp.NetBSD.org/pub/NetBSD/packages/pkgsrc.tar.gz
  It is typically extracted into /usr/pkgsrc (though other locations work fine) with the commands:

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

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

6. Misc

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

```
# man 5 filename
```

is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

The easiest way to upgrade to NetBSD 5.1 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 5.1 system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in `/dev`. If you've changed the contents of `/dev` by hand, you will need to be careful about this, but if not, you can just cd into `/dev`, and run the command:

```
# sh MAKEDEV all
```

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

Compatibility Issues With Previous NetBSD Releases

Users upgrading from previous versions of NetBSD may wish to bear the following problems and compatibility issues in mind when upgrading to NetBSD 5.1.

If your port uses X.Org and you see messages from the X server indicating that no devices were found, you may need to run **`X -configure`** and update your existing xorg.conf to use the BusID line from the newly-generated config file.

Dual-head support for PC systems has become broken for many configurations with the update to xorg-server 1.6.x, which has removed the userland PCI configuration mechanism, and needs to rely upon the OS. We hope to correct this for future releases. Workaround: The only workaround is non-trivial and requires programming several PCI BAR registers as they previously were in NetBSD 5.0.

If you are updating to NetBSD 5.1 without the aid of sysinst or postinstall and your port uses X.Org, be sure to remove `/usr/X11R7/lib/X11/xkb/symbols/pc` before extracting the xbase set. In the version of X.Org shipped with 5.0, this was a directory, but in more recent X.Org versions it is a file.

On ports using X.Org, libpixman and libXfont had their major versions bumped. This can be a source of trouble if using binary packages built on 5.0.x with a clean install of 5.1 (upgrades from 5.0.x will include both old and new versions of libpixman and libXfont). Compatibility packages have been prepared and are available from:

ftp://ftp.NetBSD.org/pub/pkgsrc/packages/NetBSD/amd64/5.0/emulators/compat50-5.1.tgz

(or a convenient mirror). This URL can be passed directly to the `pkg_add`(1) command.

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

```
# pkg_admin rebuild
```

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

Support for pkg_view(1) has been retired.

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

Issues when running older binaries on NetBSD 5.1

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.x kernel with an older userland.
- Running an older userland inside a chroot'ed environment on a 5.x system.
- Running older statically linked pthread applications.

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

Note that **sysinst** will automatically invoke

```
postinstall fix
```

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

Issues affecting an upgrade from NetBSD 3.x releases

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

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

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

Issues fixed by *postinstall*:

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

The following issues need to be resolved manually:

- The users '_proxy', '_rwhod', and '_sdpd' and the groups '_proxy', '_rwhod' and '_sdpd' need to be created and the user 'uucp' needs to be updated.

- A number of things were removed in the NetBSD 4.0 release, including: the evbsh5 port, the Fortran 77 compiler (g77), NETCCITT, NETNS, Sendmail, Sushi, UUCP, and Vinum. If you were using any of these, please see the "Components removed from NetBSD" at
  http://www.NetBSD.org/releases/formal-4/NetBSD-4.0.html#removals

- The replacement of Sendmail by Postfix can be handled automatically by *postinstall* but it is not done by default. If you want to transition to Postfix, the command

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

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

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

  Postfix will be started automatically when the system boots. You may see messages like "$sendmail is not set properly" at boot. You can suppress them by removing `/etc/rc.d/sendmail` and `/etc/rc.d/smmsp`. Those files and other parts of sendmail configuration like files under `/usr/share/sendmail` are not removed by default while upgrading for those who want to continue using sendmail from outside the base system. If you want to delete them, *postinstall* can be used:

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

Issues affecting an upgrade from NetBSD 4.x releases

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

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

Issues fixed by *postinstall*:

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

The following issues need to be resolved manually:

- The users '_httpd' and '_timedc' and the groups '_httpd' and '_timedc' need to be created.

- Unprivileged use of the `mount`(8) command now requires the *`nosuid`* and *`nodev`* options to be explicitly specified. Previously, these options were automatically enforced even if they were not explicitly specified.

- A number of things have been removed from the NetBSD 5.1 release. See the "Components removed from NetBSD" section near the beginning of this document for a list.

Using online NetBSD documentation

Documentation is available if you installed the manual distribution set. Traditionally, the "man pages" (documentation) are denoted by 'name(section)'. Some examples of this are

- intro(1),
- man(1),
- apropos(1),
- passwd(1), and
- passwd(5).

The section numbers group the topics into several categories, but three are of primary interest: user commands are in section 1, file formats are in section 5, and administrative information is in section 8.

The *man* command is used to view the documentation on a topic, and is started by entering **man** [*section*] *topic*. The brackets [] around the section should not be entered, but rather indicate that the section is optional. If you don't ask for a particular section, the topic with the lowest numbered section name will be displayed. For instance, after logging in, enter

```
# man passwd
```

to read the documentation for passwd(1). To view the documentation for passwd(5), enter

```
# man 5 passwd
```

instead.

If you are unsure of what man page you are looking for, enter

```
# apropos subject-word
```

where *subject-word* is your topic of interest; a list of possibly related man pages will be displayed.

Administrivia

If you've got something to say, do so! We'd like your input. There are various mailing lists available via the mailing list server at majordomo@NetBSD.org. To get help on using the mailing list server, send mail to that address with an empty body, and it will reply with instructions. See **http://www.NetBSD.org/mailinglists/** for a web interface.

There are various mailing lists set up to deal with comments and questions about this release. Please send comments to: netbsd-comments@NetBSD.org.

To report bugs, use the send-pr(1) command shipped with NetBSD, and fill in as much information about the problem as you can. Good bug reports include lots of details.

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

There are also port-specific mailing lists, to discuss aspects of each port of NetBSD. Use majordomo to find their addresses, or visit **http://www.NetBSD.org/mailinglists/**

If you're interested in doing a serious amount of work on a specific port, you probably should contact the 'owner' of that port (listed below).

If you'd like to help with this effort, and have an idea as to how you could be useful, send us mail or subscribe to: netbsd-users@NetBSD.org.

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

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- The Luleå Academic Computer Society for providing the backup services server.
- The Columbia University Computer Science Department for hosting the NYC build cluster.
- The Western Washington University Computer Science Department for running the WWU build cluster.
- The many organizations that provide NetBSD mirror sites.
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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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