NAME

INSTALL — Installation procedure for NetBSD/mvme68k.

CONTENTS

About this Document....2
What is NetBSD?....2
Dedication....2
Changes Between the NetBSD 5.0 and 5.1 Releases....3
  Security Advisory Fixes....3
  Other Security Fixes....4
  Kernel....5
  File Systems....5
  Networking....6
  Miscellaneous Drivers....7
  Audio....7
  Security....8
  Storage....8
  Platform specific....8
  Miscellaneous....12
  Known Problems....15
Features to be removed in a later release....15
The NetBSD Foundation....15
Sources of NetBSD....15
NetBSD 5.1 Release Contents....16
  NetBSD/mvme68k subdirectory structure....17
  Binary distribution sets....17
NetBSD/mvme68k System Requirements and Supported Devices....20
  Supported VME147 hardware....20
  Supported VME162/VME172 hardware....20
  Supported VME167/VME177 hardware....21
Getting the NetBSD System on to Useful Media....21
  Creating boot/install tapes....21
  Boot/Install from NFS server....22
  Install/Upgrade from CD-ROM....23
  Install/Upgrade via FTP....23
Preparing your System for NetBSD installation....23
Installing the NetBSD System....25
  Installing from tape....25
  Installing from NFS....29
  Booting the miniroot....31
  Miniroot install program:....32
  Running the sysinst installation program....33
    Introduction....33
    General....33
    Quick install....33
    Booting NetBSD....34
    Network configuration....34
    Installation drive selection and parameters....35
    Selecting which sets to install....35
    Partitioning the disk....35

Preparing your hard disk.....35
Getting the distribution sets.....35
Installation from CD-ROM.....36
Installation using ftp.....36
Installation using NFS.....36
Installation from an unmounted file system.....36
Installation from a local directory.....36
Extracting the distribution sets.....37
Finalizing your installation.....37
Post installation steps.....37
Upgrading a previously-installed NetBSD System.....39
Upgrading using the miniroot 39
Manual upgrade 40
Compatibility Issues With Previous NetBSD Releases.....41
Issues when running older binaries on NetBSD 5.1 41
Issues affecting an upgrade from NetBSD 3.x releases 42
Issues affecting an upgrade from NetBSD 4.x releases 43
Using online NetBSD documentation.....43
Administrivia.....44
Thanks go to.....44
We are.....45
Legal Mumbo-Jumbo.....53
The End.....57

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 5.1 on the *mvme68k* platform. It is available in four different formats titled `INSTALL.`*`ext`*, where *`.ext`* is one of `.ps`, `.html`, `.more`, or `.txt`:

`.ps` PostScript.

`.html` Standard Internet HTML.

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

`.txt` Plain old ASCII.

You are reading the *PostScript* version.

What is NetBSD?

The NetBSD Operating System is a fully functional Open Source UNIX-like operating system derived from the University of California, Berkeley Networking Release 2 (Net/2), 4.4BSD-Lite, and 4.4BSD-Lite2 sources. NetBSD runs on 57 different system architectures (ports) across 15 distinct CPU families, and is being ported to more. The NetBSD 5.1 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/mvme68k subdirectory structure

The mvme68k-specific portion of the NetBSD 5.1 release is found in the `mvme68k` subdirectory of the distribution: `.../NetBSD-5.1/mvme68k/`. It contains the following files and directories:

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

`binary/`
`kernel/`
`netbsd-GENERIC.gz`
A gzipped NetBSD kernel containing code for everything supported in this release.
`netbsd-VME147.gz`
A kernel for MVME147 boards.
`netbsd-VME162.gz`
A kernel for MVME162 boards.
`netbsd-VME167.gz`
A kernel for MVME167 boards.
`netbsd-VME172.gz`
A kernel for MVME172 boards.
`netbsd-VME177.gz`
A kernel for MVME177 boards.
`sets/` mvme68k binary distribution sets; see below.

`installation/`
`miniroot/` mvme68k miniroot file system image; see below.
`netboot/` Two programs needed to boot mvme68k kernels over the network; see below.
`tapeimage/`
Tape boot programs, and a RAMDISK kernel; see below.

Binary distribution sets

The NetBSD mvme68k binary distribution sets contain the binaries which comprise the NetBSD 5.1 release for mvme68k. The binary distribution sets can be found in the `mvme68k/binary/sets` subdirectory of the NetBSD 5.1 distribution tree, and are as follows:

base The NetBSD 5.1 mvme68k **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.
26 MB gzipped, 76 MB uncompressed

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

contains, as well as the system call and library manual pages.
36 MB gzipped, 130 MB uncompressed

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

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

kern-GENERIC
This set contains a NetBSD/mvme68k 5.1 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set.
2 MB gzipped, 3 MB uncompressed

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

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

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

NetBSD maintains its own set of sources for the X Window System in order to assure tight integration and compatibility. These sources are based on XFree86 4.5.0. Binary sets for the X Window System are distributed with NetBSD. The sets are:

xbase The basic files needed for a complete X client environment. This does not include the X servers.
6 MB gzipped, 19 MB uncompressed

xcomp The extra libraries and include files needed to compile X source code.
11 MB gzipped, 43 MB uncompressed

xfont Fonts needed by the X server and by X clients.
31 MB gzipped, 39 MB uncompressed

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

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

The mvme68k 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.

The following are included in the `mvme68k/installation` directory:

`miniroot/`

Note: The **`sysinst`** method of installation is the preferred method for installing NetBSD/mvme68k. *The Traditional method of installation is deprecated and will be removed in a future release.* Some other important differences between the two installation methods are:

- The Installer and Mkfs utilities are not used if the installation is done using the **`sysinst`** method via booting an Installation Kernel.
- Mkfs creates a 4.3BSD "old" format file system. This is the only file system format understood by the Installer. The **`sysinst`** process creates "new" file systems which can't be processed by Mkfs or the Installer.
- The Installer (and probably Mkfs) is known to have problems with BSD file systems that are larger than 1 GB or extend beyond the 1 GB physical limit. Keep this in mind if doing a Traditional method installation with these utilities.
- The Booter is known to have problems booting from a NetBSD file system if the inode of the kernel file is too large. For large disks it is advisable to have a small root partition and one or more usr-type partitions for other files. This ensures the inode of the kernel in the root file system will be small.
- The Booter is designed to work with 4.3BSD "old" file systems, but there are enough similarities between the "old" and "new" file system formats in the first few hundred blocks that the Booter can usually boot a Kernel from a 4.3BSD new file system. If you choose to use "new" file system formats, it is advisable to use a small root partition and one or more usr-type partitions for other files. This is the default layout used by **`sysinst`**.

`miniroot.gz` A copy of the miniroot file system. This file system image is copied into the swap partition of the disk which you intend to boot NetBSD from. Normally, this step will be performed manually from the ramdisk boot environment.

`netboot/`

`sboot` An MVME147 bootstrap program in Motorola S-Record format. This is required when you wish to boot an MVME147 over the network since the ROM has no built-in network support. Instructions for getting this program into memory are discussed later.

`netboot` A standalone 2nd stage bootstrap program loaded over the network via TFTP. This is responsible for fetching and starting the NetBSD mvme68k kernel from an NFS server.

`tapeimage/`

`stboot` This file contains a boot sector for Motorola MVME boards. It must be the first file written to a tape in order to make the tape bootable.

`bootst` This file contains a bootstrap program which knows how to load the NetBSD mvme68k ramdisk image from tape. This must be the second file written to the tape.

`netbsd-RAMDISK.gz` This is the NetBSD mvme68k ramdisk image. It contains a `GENERIC` kernel and a built in RAMDISK with just enough tools to partition a disk, dump the miniroot kernel to it and make the disk bootable. This must be the third file written to the tape.

Note: Each directory in the mvme68k binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/mvme68k System Requirements and Supported Devices

NetBSD/mvme68k 5.1 runs on Motorola MVME147 , MVME162 , MVME167 , MVME172 , and MVME177 Single Board Computers.

The minimal configuration requires 8 MB of RAM and ˜200 MB of disk space. To install the entire system requires much more disk space. To run X (clients only) or compile the system, more RAM is recommended. Good performance requires 16 MB of RAM, or 32 MB when running the X Window System.

Note that you can install NetBSD 5.1 on a system with only 4 MB of onboard RAM, but you will need to use a VMEbus RAM card with at least another 4 MB to augment the onboard memory in order to actually install the system.

A swap partition of 2-3∗RAM is recommended.

Note that the NetBSD/mvme68k installation procedure uses a *miniroot* image which is placed into the swap area of the disk. The swap partition must be large enough to hold this miniroot image (> 7.5 MB).

Supported VME147 hardware

- Serial ports (RS232)
  - built-in console
  - ttyZ1
  - ttyZ2
  - ttyZ3
- Parallel port
  - On-board centronics style printer port
- Network interfaces:
  - On-board Lance Ethernet (le)
- SCSI
  - Most SCSI disks, tapes, CD-ROMs, etc
  - On-board wd33c93 SCSI bus interface chip (async only)
- Miscellaneous:
  - Battery-backed real-time clock
  - VMEbus RAM cards
  - Any VMEbus interface cards with Machine Independent drivers

Supported VME162/VME172 hardware

- Serial ports (RS232)
  - built-in console
  - ttyC1
  - ttyC2
  - ttyC3
- Network interfaces:
  - On-board Intel Ethernet (ie)
- SCSI
  - Most SCSI disks, tapes, CD-ROMs, etc

  - On-board ncr53c710 SCSI I/O processor chip

- Miscellaneous:
  - Battery-backed real-time clock
  - VMEbus RAM cards
  - Any VMEbus interface cards with Machine Independent drivers

Supported VME167/VME177 hardware

- Serial ports (RS232)
  - built-in console
  - ttyZ1
  - ttyZ2
  - ttyZ3
- Parallel port
  - On-board centronics style printer port
- Network interfaces:
  - On-board Intel Ethernet (ie)
- SCSI
  - Most SCSI disks, tapes, CD-ROMs, etc
  - On-board ncr53c710 SCSI I/O Processor chip
- Miscellaneous:
  - Battery-backed real-time clock
  - VMEbus RAM cards
  - Any VMEbus interface cards with Machine Independent drivers

If it's not on the above lists, there is no support for it in this release.

Getting the NetBSD System on to Useful Media

Installation is supported from several media types, including:

- Tape
- NFS
- CD-ROM
- FTP

Note that installing on a 'bare' machine requires either a bootable tape drive or an ethernet to a compatible NFS server. MVME147 may also need to be booted over an RS232 connection.

The procedure for transferring the distribution sets onto installation media depends on the type of media. Instructions for each type of media are given below.

In order to create installation media, you will need all the files and subdirectories in these two directories:

```
.../NetBSD-5.1/mvme68k/installation
.../NetBSD-5.1/mvme68k/binary
```

Creating boot/install tapes

Installing from tape is the simplest method of all. This method uses two tapes, one containing a bootable ramdisk and miniroot, the other containing the installation sets.

The boot tape is created as follows:

```
# cd .../NetBSD-5.1/mvme68k/installation
# set T = /dev/nrst0
# mt -f $T rewind
# dd if=tapeimage/stboot of=$T obs=8k conv=osync
# dd if=tapeimage/bootst of=$T obs=8k conv=osync
# gzip -dc tapeimage/netbsd-RAMDISK.gz | dd of=$T obs=8k conv=osync
# gzip -dc miniroot/miniroot.fs.gz  | dd of=$T obs=8k conv=osync
# mt -f $T rewind
```

The installation set tape is created as follows:

```
# cd .../NetBSD-5.1/mvme68k/binary/sets
# set T = /dev/nrst0
# mt -f $T rewind
# for f in base etc comp games man misc text; do
    gzip -d < $f.tgz | dd of=$T bs=8k conv=osync
# done
# mt -f $T rewind
```

If the tape does not work as expected, you may need to explicitly set the EOF mark at the end of each tape segment. Consult the tape-related manual pages on the system where the tapes are created for more details.

Boot/Install from NFS server

If your machine has a disk and network connection, but no tape drive, it may be convenient for you to install NetBSD over the network. This involves temporarily booting your machine over NFS, just long enough so you can initialize its disk. This method requires that you have access to an NFS server on your network so you can configure it to support diskless boot for your machine. Configuring the NFS server is normally a task for a system administrator, and is not trivial.

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

Booting an MVME147 from ethernet is not possible without first downloading a small bootstrap program (sboot) via RS232. See the section entitled **Installing from NFS** for details on how to accomplish this.

sboot expects to be able to download a second stage bootstrap program via TFTP after having acquired its IP address through RARP It will look for a filename derived from the machine's IP address expressed in hexadecimal, with an extension of '`.147`'. For example, an MVME147 with IP address 130.115.144.11 will make an TFTP request for `8273900B.147`. Normally, this file is just a symbolic link to the NetBSD/mvme68k `netboot` program, which should be located in a place where the TFTP daemon can find it (remember, many TFTP daemons run in a chroot'ed environment). The netboot program may be found in the install directory of this distribution.

The MVME162 , MVME167 , MVME172 , and MVME177 boot ROMs have code builtin to boot over ethernet from a TFTP server. You should configure it to download the same `netboot` program as is used for MVME147.

The netboot program will query a bootparamd server to find the NFS server address and path name for its root, and then load a kernel from that location. The server should have a copy of the netbsd-RAMDISK ker-

nel in the root area for your client (no other files are needed in the client root, although it might be a convenient place to put the uncompressed miniroot image) and `/etc/bootparams` on the server should have an entry for your client and its root directory. Note that you should rename the `netbsd-RAMDISK` kernel to just `netbsd` in the client's root directory before trying to netboot the client.

The client will need access to the miniroot image, which can be provided using NFS or remote shell. If using NFS, miniroot.fs.gz should be expanded on the server, because doing so from the RAMDISK shell is not so easy. The unzipped miniroot takes about 7.5 MB of space.

If you will be installing NetBSD on several clients, it may be useful to know that you can use a single NFS root for all the clients as long as they only use the netbsd-RAMDISK kernel. There will be no conflict between clients because the RAM-disk kernel will not use the NFS root. No swap file is needed; the RAM-disk kernel does not use that either.

Install/Upgrade from CD-ROM

This method requires that you boot from another device (i.e. tape or network, as described above). You may need to make a boot tape on another machine using the files provided on the CD-ROM. Once you have booted netbsd-RAMDISK (the RAMDISK kernel) and loaded the miniroot, you can load any of the distribution sets directly from the CD-ROM. The **`install`** program in the miniroot automates the work required to mount the CD-ROM and extract the files.

Install/Upgrade via FTP

This method requires that you boot from another device (i.e. tape or network, as described above). You may need to make a boot tape on another machine using the files in .../install (which you get via FTP). Once you have booted netbsd-RAMDISK (the RAM-disk kernel) and loaded the miniroot, you can load any of the distribution sets over the net using FTP. The **`install`** program in the miniroot automates the work required to configure the network interface and transfer the files.

This method, of course, requires network access to an FTP server. This might be a local system, or it might even be ftp.NetBSD.org itself. If you wish to use ftp.NetBSD.org as your FTP file server, you may want to keep the following information handy:

```
No IP Address: ftp.NetBSD.org
Login: anonymous
Password: <your e-mail address>
Server path: /pub/NetBSD/NetBSD-5.1/mvme68k/binary
```

Note: If you're not using a nameserver during installation, you might find 204.152.184.75 handy; it's the IP address of ftp.NetBSD.org as of October, 2000.

Preparing your System for NetBSD installation

mvme68k machines usually need little or no preparation before installing NetBSD, other than the usual, well advised precaution of *backing up all data* on any attached storage devices.

The exception to the above is that MVME162 , MVME167 , MVME172 and MVME177 boards require a jumper to be removed or DIP switch changed before NetBSD can be installed. On MVME162-LX and MVME172-LX pins 1-2 of jumper J11 *must* be removed. On MVME162-P2/P4 and MVME172-P2/P4 switch S4, position 8 *must* be set to OFF. On MVME167 and MVME177 pins 1-2 of jumper J1 *must* be removed.

Once you've made any necessary jumper changes, the following instructions should make your machine "NetBSD Ready".

Power-up your MVME147 board. You should have the *bug* prompt:

```
COLD Start
```

```
Onboard  RAM start = $00000000,  stop = $007FFFFF

147-Bug>
```

Or, if you have an MVME162/172 or MVME167/177 board (the following boot message is from MVME167; the others are similar):

```
MVME167 Debugger/Diagnostics Release Version 2.3 - 02/25/94
COLD Start

Local Memory Found =02000000 (&33554432)

MPU Clock Speed =33Mhz

167-Bug>
```

Make sure the RAM size looks ok (if you've got an 8 MB MVME147 or a 32 MB MVME167 you should have the same value as we do). Also make sure the clock is ticking:

```
1xx-Bug>time
Sunday 12/21/31 16:25:14
1xx-Bug>time
Sunday 12/21/31 16:25:15
1xx-Bug>
```

Note that NetBSD bases its year at 1968, and adds the year offset in the system's real-time clock to get the current year. So the 31 here equates to 1999. You may have to adjust your clock using the **set** command to comply with NetBSD 's requirements. Don't worry if the 'Day of the week' is not correct, as NetBSD doesn't use it. Motorola has acknowledged a year 2000 bug in some versions of the MVME147 whereby the day of the week doesn't get set correctly by the 147Bug PROM.
NetBSD does not affect

Also make sure that your board's ethernet address is initialised to the correct value. You'll find the address on a label on the inside of the MVME147's front panel, and on the VMEbus P2 connector of the other board types. On the MVME147, enter the last five digits of the address using the **lsad** command. On the MVME162/172 and MVME167/177, you should use the **cnfg** command.

The NetBSD kernel reads the first two long words of the onboard NVRAM to determine the starting and ending address of any VMEbus RAM that should be used by the system. You should verify that this area is set properly for your configuration.

If you have no VMEbus RAM boards, the values should be set to zero (0).

For an MVME162, MVME167, MVME172 or MVME177 board, at the 1xx-Bug> prompt:

```
1xx-Bug>mm fffc0000 ;1
fffc0000: xxxxxxxx?0
fffc0004: xxxxxxxx?0
fffc0008: xxxxxxxx?.
1xx-Bug>
```

For an MVME147 board, at the 147Bug prompt:

```
147Bug>mm fffe0764 ;1
fffe0764: xxxxxxxx?0
fffe0768: xxxxxxxx?0
fffe076c: xxxxxxxx?.
```

If you do have VMEbus RAM available and want NetBSD to use it, the first long word should be set to the starting address of this RAM and the second long word should be set to the ending address.

If you have more than one VMEbus RAM board installed, the starting and ending addresses must be contiguous from one board to the next. Also note that, for various reasons beyond the scope of this document, VMEbus RAM should be configured in A32 address space.

To install successfully to a local SCSI disk, you need to ensure that the system is aware of what targets are connected to the SCSI bus. This can be done by issuing the following command:

```
1xx-Bug> iot;t
```

At this point, Bug will scan for any attached SCSI devices. After a short delay, a list of SCSI devices will be displayed. 147Bug will ask if LUNs should be assigned from SCSI ids, to which you should answer Y. You should also answer Y when asked if the information is to be saved to NVRAM. 16xBug does not prompt for this information.

The following installation instructions will assume that your target SCSI disk drive appears at SCSI-ID 0. If you have a tape drive, the instructions assume is is configured for SCSI-ID 5. When the RAMDISK root boots, NetBSD will refer to these devices as `sd0` and `rst0` respectively. You may wish to note these down; you'll be using them a lot. :-)

Installing the NetBSD System

Installing NetBSD is a relatively complex process, but if you have this document in hand it should not be too difficult.

There are several ways to install NetBSD onto your disk. If your MVME147 machine has a tape drive the easiest way is **Installing from tape** (details below). All other machines can be installed easily over the network from a suitable NFS server. See **Installing from NFS** for details. Otherwise, if you have another mvme68k machine running NetBSD you can initialize the disk on that machine and then move the disk.

Installing from tape

Create the NetBSD/mvme68k 5.1 boot tape as described in the section entitled **Preparing a boot tape**. Then, with the tape in the drive, type the following at the Bug prompt:

```
147-Bug> bo 5
```

```
16x-Bug> bo 0,50
```

As mentioned earlier, this assumes your tape is jumpered for SCSI-ID 5.

As the tape loads (which may take 20 to 30 seconds), you will see a series of status messages. It may be useful if you can capture these messages to a file, or a scrollable xterm window. In particular, you should make a note of the lines which describe the geometry of the SCSI disks detected by NetBSD. They are of the form:

```
sd0 at scsibus0 targ 0 lun 0: <Maker, Disk, Foo> SCSI1 0/direct fixed
sd0: 800 MB, 800 cyl, 16 head, 128 sec, 512 bytes/sect x 1638400 sectors
```

The information of most interest is the number of sectors; for the fictitious disk above, it's 1638400. You will need this number when you come to create a disklabel for that drive.

Here is an example of an MVME147 system booting from tape:

```
RAM address from VMEbus = $00000000

Booting from: VME147, Controller 5, Device 0
Loading: Operating System

Volume: NBSD
```

```
IPL loaded at:  $003F0000
>> BSD MVME147 tapeboot [$Revision: 1.20.2.1 $]
578616+422344+55540+[46032+51284]=0x11a6e4
Start @ 0x8000 ...
Copyright (c) 1996, 1997, 1998, 1999, 2000
    The NetBSD Foundation, Inc.  All rights reserved.
Copyright (c) 1982, 1986, 1989, 1991, 1993
    The Regents of the University of California.  All rights reserved.

NetBSD 1.5 (RAMDISK) #1: Sun Oct 29 16:19:04 GMT 2000
    steve@fatbob:/usr/src/sys/arch/mvme68k/compile/RAMDISK
Motorola MVME-147S: 25MHz MC68030 CPU+MMU, MC68882 FPU
real mem  = 7237632
avail mem = 6381568
using 88 buffers containing 360448 bytes of memory
mainbus0 (root)
pcc0 at mainbus0: Peripheral Channel Controller, rev 0, vecbase 0x40
clock0 at pcc0 offset 0x0 ipl 5: Mostek MK48T02, 2048 bytes of NVRAM
  .
  .
```

Note: The exact text of the messages will vary depending on which mvme68k variant you're using.

Finally, you will see the following "welcome" message:

```
        Welcome to the NetBSD/mvme68k RAMDISK root!

This environment is designed to do only four things:
  1:  Partition your disk (use the command:  edlabel /dev/rsd0c)
  2:  Copy a miniroot image into the swap partition  (/dev/rsd0b)
  3:  Make that partition bootable (using 'installboot')
  4:  Reboot (using the swap partition, i.e. /dev/sd0b).

Copying the miniroot can be done several ways, allowing the source
of the miniroot image to be on any of these:
    boot tape,  NFS server, TFTP server, rsh server

The easiest is loading from tape, which is done as follows:
        mt -f /dev/nrst0 rewind
        mt -f /dev/nrst0 fsf 3
        dd if=/dev/nrst0 of=/dev/rsd0b bs=8k conv=sync
(For help with other methods, please see the install notes.)

To reboot using the swap partition after running installboot, first
use
halt,
then at the Bug monitor prompt use a command like:
               1x7Bug> bo 0,,b:

To view this message again, type:  cat /.welcome
#
```

You must now create a disklabel on the disk you wish to use for the root file system (`/`). This will usually be `sd0`. The disklabel is used by NetBSD to identify the starting block and size of each partition on the disk.

Partitions are named `sd0a`, `sd0b`, `sd0c`, etc, up to `sd0h`. The mvme68k port of NetBSD makes some assumptions about the first three partitions on a boot disk:

`sd0a` The root file system (`/`).
`sd0b` The swap partition.
`sd0c` The whole disk. Also known as the *raw partition*.

The *raw partition* is special; NetBSD is able to use it even if the disk has no label. You should never create a file system on the Raw Partition, even on a non-boot disk.

It is good practice to put `/usr` on a different partition than / (root, AKA `sd0a`). So, the first available partition for `/usr` is `sd0d`. Refer to the section entitled **NetBSD System Requirements and Supported Devices** for information on the recommended sizes of the / (root), `/usr` and swap partitions.

You are not required to define any partitions beyond `sd0d`, but if you have a large disk drive, you might want to create several other partitions for file systems such as `/home` or `/usr/src`. Note that at this time you are only required to partition the root/boot disk; you will get the opportunity to partition any other disks in your system from the main **miniroot** installation program.

To create the disklabel and partitions, use the `edlabel` program, passing it the name of the Raw Partition of your root/boot disk.

```
# edlabel /dev/rsd0c
edlabel menu:
print - display the current disk label
modify - prompt for changes to the label
write - write the new label to disk
quit - terminate program
edlabel>
```

The program shows what commands it recognizes; **print**, **modify**, **write**, and **quit**. It will accept the first letter of a command if you don't feel like typing each one in full.

To start creating the basic partitions, you should enter **m** (modify) at the edlabel prompt, then enter the letter corresponding to the first partition, **a**.

```
edlabel> m

modify subcommands:
@: modify disk parameters
a-h: modify partition
s: standardize geometry
q: quit this subcommand
edlabel/modify> a
a (root) 0 (0/00/00) 0 (0/00/00) unused
start as <blkno> or <cyls/trks/sects>: 0
length as <nblks> or <cyls/trks/sects>: 65536
type: 4.2BSD
edlabel/modify>
```

When you enter the start and length of a partition, you can use either blocks or cylinder/track/sector notation. If this is the first time you've partitioned a disk for NetBSD, it's probably easiest to use block notation. The above example creates partition 'a', starting at block zero and with a size of 65536 blocks. Note that the usual size of a block is 512 bytes, so this creates a 32 MB partition.

The `type` of the partition should be `4.2BSD`, otherwise you won't be able to create a file system on it.

Next, create a swap partition (b). Note that the minimum size of this swap partition should be 8 MB, otherwise you won't be able to use a miniroot to complete the NetBSD installation!

```
edlabel/modify> b
b (swap) 0 (0/00/00) 0 (0/00/00) unused
start as <blkno> or <cyls/trks/sects>: 65536
length as <nblks> or <cyls/trks/sects>: 32768
type: swap
edlabel/modify>
```

Here, we specify a value for `start` such that the swap partition follows immediately after partition '`a`', i.e. 65536. The length of the swap partition should be a multiple of the amount of RAM you have in your system. Here, we've chosen 32768, or 16 MB. The next available block on the drive is thus 65536 + 32768. We will use this to create partition '`d`' for our `/usr` file system. (Note that for a busy system, or a system with more than 8 MB of RAM, you'll be better off with a 32 or 64 MB swap partition.)

```
edlabel/modify> d
d (user) 0 (0/00/00) 0 (0/00/00) unused
start as <blkno> or <cyls/trks/sects>: 98304
length as <nblks> or <cyls/trks/sects>: 1540096
type: 4.2BSD
edlabel/modify> q
edlabel>
```

As you can see, we've chosen to assign the remainder of the disk to `/usr`. Since there are 1638400 sectors on the example disk (did you remember to note down the number of sectors on your disk during boot?), and partition **d** starts at sector 98304, a simple bit of arithmetic (1638400 - 98304) gives **d** a size of 1540096.

Note that the above partition sizes are just guidelines. If your disk is large enough, you should resize the partitions appropriately and perhaps also create a /var partition as well.

You now need to write this new disklabel, together with the partition details you've just entered, to disk. You might also try the '**p**' command to view the partitions. Once written, you can quit back to the shell using '**q**'.

```
edlabel> p

        type_num: 4
        sub_type: 0
       type_name: SCSI disk
       pack_name: fictitious
    bytes/sector: 512
   sectors/track: 128
 tracks/cylinder: 16
       cylinders: 800
sectors/cylinder: 2048
partition      start         (c/t/s)      nblks         (c/t/s)  type

 a (root)          0       (0/00/00)      65536      (32/00/00)  4.2BSD
 b (swap)      65536      (32/00/00)      32768      (48/00/00)  swap
 c (disk)          0       (0/00/00)    1638400     (800/00/00)  unused
 d (user)      98304      (48/00/00)    1540096     (752/00/00)  4.2BSD

edlabel> w
edlabel> q
#
```

Now that your disk's partitioned, you need to get the proper installation miniroot image onto it. The miniroot image is designed to be copied into the swap partition of your disk. This is a safe place which won't be overwritten by the installation procedure. From the shell prompt, use the following commands to copy the miniroot image from tape to swap (b).

```
# mt -f /dev/nrst0 rewind
# mt -f /dev/nrst0 fsf 3
# dd if=/dev/nrst0 of=/dev/rsd0b bs=8k conv=osync
```

The disk and the miniroot must now be made bootable using the `installboot`(8) command. To do this, issue the following commands:

```
# mount /dev/sd0b /mnt
# installboot /mnt/usr/mdec/bootsd /bootxx /dev/rsd0b
# umount /dev/sd0b
```

You can now shutdown the system.

```
# halt
signal 15
syncing disks... done
unmounting / (root_device)...
halted

147-Bug> reset
Reset Local SCSI Bus [Y,N] N? y
Automatic reset of known SCSI Buses on RESET [Y,N] Y?
Cold/Warm Reset flag [C,W] = C?
Execute Soft Reset [Y,N] N? y
```

Resetting the other types of MVME boards are very similar. You should now reboot from that just installed miniroot. See the section entitled **Booting the miniroot** for details.

Installing from NFS

Before you can install from NFS, you must have already configured your NFS server to support your machine as a bootable client. Instructions for configuring the server are found in the section entitled **Getting the NetBSD System onto Useful Media** above.

To get started on the MVME147, you need to download `sboot` into RAM (you will find **`sboot`** in the `install` directory of the mvme68k distribution). You can either do that through the console line or through a 2nd serial connection. For example, an MVME147 connected to a sun4/110 and accessed via `tip`(1) can be loaded as follows:

```
lo 0
~Ccat sboot
go 4000
```

Which will look like this:

```
147-Bug> lo 0
~CLocal command? cat sboot
```

away for 11 seconds

```
!

147-Bug> g 4000
Effective address: 00004000
```

```
sboot: serial line bootstrap program (end = 6018)

>>>
```

Now, if you want to do it through serial line 1, then connect serial line one to a machine. At the 147-Bug> prompt type **tm 1** You should then login to the machine it is connected to. Then press CONTROL-A to escape to Bug. Do **lo 1;x=cat sboot** ... then when that is done you can reconnect **tm 1** and logout. Then do **go 4000** and you've got the >>> prompt of **sboot**.

Once you've got the >prompt, you can boot the RAMDISK kernel from the server:

```
>>> b

le0: ethernet address: 8:0:3e:20:cb:87
My ip address is: 192.168.1.4
Server ip address is: 192.168.1.1
4800
Download was a success!
```

See below for the next step in booting MVME147.

The MVME162, MVME167, MVME172 and MVME177 boards are able to download netboot directly using TFTP. To enable this, you must first configure the networking parameters on the board as described in the section entitled "Preparing your System for NetBSD Installation. On a properly configured MVME162/172 or MVME167/177, all you need to type is:

```
1xx-Bug> nbo
```

For all board types, the boot messages are very similar:

```
Start @ 0x8000 ...
>> BSD MVME147 netboot (via sboot) [$Revision: 1.20.2.1 $]
device: le0 attached to 08:00:3e:20:cb:87
boot: client IP address: 192.168.1.4
boot: client name: soapy
root addr=192.168.1.1 path=/export/soapy
578616+422344+55540+[46032+51284]=0x11a6e4
Start @ 0x8000 ...
Copyright (c) 1996, 1997, 1998, 1999, 2000
    The NetBSD Foundation, Inc.  All rights reserved.
Copyright (c) 1982, 1986, 1989, 1991, 1993
    The Regents of the University of California.  All rights reserved.

NetBSD 1.5 (RAMDISK) #1: Sun Oct 29 16:19:04 GMT 2000
    steve@fatbob:/usr/src/sys/arch/mvme68k/compile/RAMDISK
Motorola MVME-147S: 25MHz MC68030 CPU+MMU, MC68882 FPU
real mem  = 7237632
avail mem = 6381568
using 88 buffers containing 360448 bytes of memory
mainbus0 (root)
pcc0 at mainbus0: Peripheral Channel Controller, rev 0, vecbase 0x40
clock0 at pcc0 offset 0x0 ipl 5: Mostek MK48T02, 2048 bytes of NVRAM
  .
  .
```

After the boot program loads the RAMDISK kernel, you should see the welcome screen as shown in the "tape boot" section above.

You now need to create a disklabel with partition information on the SCSI disk on which you intend to create your root file system (/). Follow the instructions in the previous section entitled **Installing from tape** to do this. (But stop short of the part which describes how to copy the miniroot from tape.)

You must now configure the network interface before you can access the NFS server containing the miniroot image. For example the command:

```
# ifconfig le0 inet 192.168.1.4 up
```

will bring up the MVME147 network interface le0 with that address. The command:

```
# ifconfig ie0 inet 192.168.1.4 up
```

will bring up the MVME162/172 or MVME167/177 network interface ie0 with that address. The next step is to copy the miniroot from your server. This can be done using either NFS or remote shell. (In the examples that follow, the server has IP address 192.168.1.1) You may then need to add a default route if the server is on a different subnet:

```
# route add default 192.168.1.2 1
```

You can look at the route table using:

```
# route show
```

Now mount the NFS file system containing the miniroot image:

```
# mount -r 192.168.1.1:/export/soapy /mnt
```

The procedure is simpler if you have space for an expanded (not compressed) copy of the miniroot image. In that case:

```
# dd if=/mnt/miniroot of=/dev/rsd0b bs=8k
```

Otherwise, you will need to use **gzcat** to expand the miniroot image while copying.

```
# gzcat miniroot.fs.gz | dd of=/dev/rsd0b obs=8k conv=osync
```

You must now make the disk bootable. Refer to the previous section on installing from tape, where it describes how to run **installboot**. This is immediately following the part which explains how to copy the miniroot from tape.

Booting the miniroot

Assuming the miniroot is installed on partition 'b' of the disk with SCSI-ID 0, then the boot command is:

```
1xx-Bug> bo 0,,b:
```

The command line parameters above are:

0 controller (usually zero)

,, bug argument separators

b: tell the bootstrap code to boot from partition b

You should see a bunch of boot messages, followed by messages from the miniroot kernel just as you did when the RAMDISK kernel booted.

You will then be prompted to enter the root device. Since the miniroot was booted from the swap partition, you should enter sd0b. You will then be asked for the swap device and file system type. Just press RETURN twice to accept the defaults. When asked to enter a terminal type, either accept the default, or use whatever the TERM environment variable is set to in the shell of your host system:

```
boot device: sd0
root device (default sd0a): sd0b
dump device (default sd0b): (return)
file system (default generic): (return)
root on sd0b dumps on sd0b
mountroot: trying ffs...
root file system type: ffs
init: copying out path '/sbin/init' 11
erase ^H, werase ^W, kill ^U, intr ^C
Terminal type? [vt100] return
```

Congratulations! The system should now be running the miniroot installation program.

Miniroot install program:

The miniroot's install program is very simple to use. It will guide you through the entire process, and is well automated.

All recent releases of NetBSD provide the option of using **sysinst** instead of the old installation and upgrade shell scripts. At this time, **sysinst** is not capable of installing distribution sets from tape. In such a case, you should fallback to the shell script installation or upgrade procedure. In all other cases, **sysinst** should be used. Note that as soon as **sysinst** can deal with tapes, the shell script tools will be removed.

The miniroot's install program (both **sysinst** and the shell script version) will:

- Allow you to place disklabels on additional disks. The disk we are installing on should already have been partitioned using the `RAMDISK` kernel.

  Note that partition sizes and offsets are expressed in sectors. When you fill out the disklabel, you will need to specify partition types and file system parameters. If you're unsure what these values should be, use the following defaults:

  ```
  fstype: 4.2BSD
  fsize: 1024
  bsize: 4096
  cpg: 16
  ```

  If the partition will be a swap partition, use the following:

  ```
  fstype: swap
  fsize: 0 (or blank)
  bsize: 0 (or blank)
  cpg: 0 (or blank)
  ```

  Note that partition '`c`' is special; it covers then entire disk and should not be assigned to a file system.

  The number of partitions is currently fixed at 8.

- Create file systems on target partitions.
- Allow you to set up your system's network configuration. Remember to specify host names without the domain name appended to the end. For example use `foo` instead of `foo.bar.org`. If, during the process of configuring the network interfaces, you make a mistake, you will be able to re-configure that interface by simply selecting it for configuration again.
- Mount target file systems. You will be given the opportunity to manually edit the resulting `/etc/fstab`.

- Extract binary sets from the media of your choice.
- Copy configuration information gathered during the installation process to your root file system (`/`).
- Make device nodes in your root file system under `/dev`.
- Copy a new kernel onto your root partition (`/`).
- Install a new boot block.
- Check your file systems for integrity.

First-time installation on a system through a method other than the installation program is possible, but strongly discouraged.

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).
     - One 1.44 MB 3.5" floppy.
     - A CD-ROM drive (SCSI), a hard disk and a minimum of 4 MB of memory installed.
     - The hard disk should have at least 100 + *n* megabytes of space free, where *n* is the number of megabytes of main memory in your system. If you wish to install the X Window System as well, you will need at least 215 MB more.
   - The Quick Installation
     - Insert the first boot floppy you just created and boot the computer. After language selection, the main menu will be displayed.

```
.*********************************************.
* NetBSD-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**, after you have removed the bootfloppy from the drive.
- NetBSD will now boot. If you haven't already done so in **`sysinst`**, you should log in as `root` and set a password for that account. You are also advised to edit `/etc/rc.conf` to match your needs.
- Your installation is now complete.

4. *Booting NetBSD*

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

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

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

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

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

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 `sd0` or `sd1`.

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 `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.

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*

    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.

18. *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 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 `mvme68k/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/mvme68k/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/mvme68k/5.1/A
     ```

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/mvme68k/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

It is possible to easily upgrade your existing NetBSD/mvme68k system using the upgrade program in the miniroot or by manually performing the same steps as the miniroot upgrade program.

Upgrading using the miniroot

If you wish to upgrade your system by this method, simply select the **upgrade** option once the miniroot has booted. The upgrade program with then guide you through the procedure. The upgrade program will:

1. Enable the network based on your system's current network configuration.
2. Mount your existing file systems.

3. Extract binary sets from the media of your choice.
4. Fixup your system's existing `/etc/fstab`, changing the occurrences of **ufs** to **ffs** and let you edit the resulting file.
5. Make new device nodes in your root file system under `/dev`.
6. Don't forget to extract the **kern** set from the distribution.

   Note: The existing kernel *will not* be backed up; doing so would be pointless, since older kernels may not be capable of running NetBSD 5.1 executables.
7. Install a new boot block.
8. Check your file systems for integrity.
9. You'll have to reboot your system manually

Manual upgrade

While using the miniroot's upgrade program is the preferred method of upgrading your system, it is possible to upgrade your system manually. To do this, follow the following procedure:

1. Place *at least* the **base** binary set in a file system accessible to the target machine. A local file system is preferred, since the NFS subsystem in the NetBSD 5.1 kernel may be incompatible with your old binaries.
2. Back up your pre-existing kernel and copy the 5.1 kernel into your root partition (`/`).
3. Reboot with the 5.1 kernel into single-user mode.
4. Check all file systems:

   ```
   # /sbin/fsck -pf
   ```
5. Mount all local file systems:

   ```
   # /sbin/mount -a -t nonfs
   ```
6. If you keep `/usr` or `/usr/share` on an NFS server, you will want to mount those file systems as well. To do this, you will need to enable the network:

   ```
   # sh /etc/rc.d/network start
   ```
7. Make sure you are in the root file system (`/`) and extract the **base** binary set:

   ```
   # cd /
   # pax -zrvpe -f /path/to/base.tgz
   ```
8. Install a new boot block:

   ```
   # cd /usr/mdec
   # cp bootsd /.bootsd
   # ./installboot /.bootsd bootxx  root-disk
   ```

   E.g.: *root-disk* could be `/dev/rsd0a`.
9. Sync the file systems:

   ```
   # sync
   ```
10. At this point you may extract any other binary sets you may have placed on local file systems, or you may wish to extract additional sets at a later time. To extract these sets, use the following commands:

```
# cd /
# pax -zrvpe -f path_to_set
```

Note: You *should not* extract the **etc** set if upgrading. Instead, you should extract that set into another area and carefully merge the changes by hand.

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.

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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  Ralph Campbell
  Mike Karels
  Marshall Kirk McKusick

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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.
- Without CVS, this project would be impossible to manage, so our hats go off to Brian Berliner, Jeff Polk, and the various other people who've had a hand in making CVS a useful tool.

- We list the individuals and organizations that have made donations or loans of hardware and/or money, to support NetBSD development, and deserve credit for it at **http://www.NetBSD.org/donations/** (If you're not on that list and should be, tell us! We probably were not able to get in touch with you, to verify that you wanted to be listed.)
- Finally, we thank all of the people who've put sweat and tears into developing NetBSD since its inception in January, 1993. (Obviously, there are a lot more people who deserve thanks here. If you're one of them, and would like to be mentioned, tell us!)

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