NAME

INSTALL – Installation procedure for NetBSD/mac68k.

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DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 2.0 on the *mac68k* 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 fifty four different system architectures (ports), featuring seventeen machine architectures across fifteen distinct CPU families, and is being ported to more. The NetBSD 2.0 release contains complete binary releases for many different system architectures. (A few ports are not fully supported at this time and are thus not part of the binary distribution. For information on them, please see the NetBSD web site at .: **http://www.NetBSD.org/**)

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

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

Changes Between The NetBSD 1.6 and 2.0 Releases

The NetBSD 2.0 release provides numerous significant functional enhancements, including support for many new devices, integration of hundreds of bug fixes, new and updated kernel subsystems, and many user-land enhancements. The result of these improvements is a stable operating system fit for production use that rivals most commercially available systems.

It is impossible to completely summarize over two years of development that went into the NetBSD 2.0 release. Some highlights include:

Kernel

- Ports to new platforms including: amd64, evbsh5, and xen.
- Native thread support has been added, based on Scheduler Activations. Applications which support native threads can now take full advantage of the high-performance NetBSD POSIX threads implementation.
- Kernel events notification framework - kqueue kqueue provides a stateful and efficient event notification framework. Currently supported events include socket, file, directory, fifo, pipe, tty and device changes, and monitoring of processes and signals. kqueue is supported by all writable filesystems in the NetBSD tree (with the exception of Coda) and all device drivers supporting poll(2).
- Improvements have been made to NetBSD's Linux emulation to support the latest Sun JDK/JRE for Linux. Testing has shown that it now runs as well as it does on Linux natively.
- NetBSD 2.0 enforces non-executable mappings on many platforms. This means that parts of the stack and heap are made non-executable when they are marked writable. This makes exploiting potential buffer overflows harder.
- For the i386 port it now supports SMP and has a new ACPI and power management framework which takes advantage of Intel's ACPI implementation.
- The macppc port also now supports SMP as well as hardware support for newer G4 models has been added.
- SMP support has been added to the sparc port as well.
- New generic i2c framework, supporting bit-bang and "intelligent" controllers.
- `sysctl`(9) was switched from a static binding to a dynamic implementation.
- Add a new driver `satalink`(4) and move SATA support from other controllers into this along with adding support for new controllers.

Networking

- `ipf`(8) has been upgraded to version 4.1.3.
- `tcp`(4) now implements path MTU discovery blackhole detection (i.e. it will turn off path MTU discovery if the connection is losing).
- Socket buffer insertion is now O(C). This can provide a substantial performance boost to some applications which use large socket buffers.
- `wi`(4) has support for Host-AP mode, allowing Intersil Prism2/2.5/3-based boards to be used to make an 802.11 Access Point.
- Support for `ipf`(8) has been added to `bridge`(4) and `brconfig`(8)
- Change port allocation from linked list to a hash table for better performance.

File system

- FreeBSD's UFS2 has been ported to NetBSD. UFS2 is an extension to FFS, adding 64 bit block pointers and support for extended file storage. Among other enhancements, UFS2 allows for file systems larger than 1Terabyte.
- The cryptographic disk driver (cgd) can be used to encrypt disks or partitions, using some strong encryption algorithms, like AES (Rijndael) and Blowfish. cgd can also be configured to encrypt swap.

Security

- The systrace utility has been added to the system. systrace monitors and controls an application access to the system by enforcing access policies for system calls. The systrace utility might be used to trace an untrusted application's access to the system. In addition, it can be used to protect the system from software bugs (such as buffer overflows) by constraining a daemon's access to the system. The privilege elevation feature of systrace can be used to obviate the need to run large, untrusted programs as root when only one or two system calls require the elevated privilege.
- Verified Exec support has been added in this release. Verified Exec verifies a cryptographic hash before allowing execution of binaries and scripts. This can be used to prevent a system from running binaries or scripts which have been illegally modified or installed. In addition, Verified Exec can also be used to limit the use of script interpreters to authorized scripts only and disallow interactive use.

System administration and user tools

- Switched from the GPL version to a non-GPL version of various tools including gzip and awk.

Miscellaneous

- NetBSD 2.0 supports a new toolchain based on gcc 3.3.3 and binutils 2.14. gcc 3.3.1 adds support for a number of CPU targets and greatly improved support for i386 and other targets. The support for new platforms in gcc 3.3.3 has enabled the porting of NetBSD to even more architectures.
- Updates of most third party packages that are shipped in the base system to the following latest stable releases:
  - bind 8.3.7
  - binutils 2.14
  - cvs 1.11.17
  - diffutils 2.8.1
  - file 4.08
  - gcc 3.3.3
  - gdb 5.3
  - grep 2.5.1
  - groff 1.19
  - less 381
  - openssl 0.9.7d
  - postfix 2.0.19
  - sendmail 8.12.11
  - tcpump 3.7.1
  - texinfo 4.6
- Many new packages in the *pkgsrc* system, including the latest open source desktop KDE3, OpenOffice, perl, Apache and many more. A number of new platforms are supported, including Darwin, FreeBSD, IRIX, Linux, OpenBSD and Solaris. Support for various other platforms (among them AIX, BSD/OS and HP-UX) is currently being worked on thanks to our new, portable bootstrap kit which makes it much simpler to port pkgsrc support to new operating systems. At the time of writing, there are over 4500 third party packages available in pkgsrc.

Kernel interfaces have continued to be refined, and more subsystems and device drivers are shared among the different ports. You can look for this trend to continue.

mac68k specific

NetBSD 2.0 is the seventh major release of NetBSD for the m68k-based Macintosh.

For the mac68k port, NetBSD 2.0 offers improved support for a variety of PowerBook models, many of which now support the built-in keyboard and display as a console. Please see the **NetBSD/mac68k System Requirements and Supported Devices** section for details.

There is still a lot of work to be done and help is welcomed. NetBSD 2.0 on the mac68k platform is, as usual, also fully backward compatible with old NetBSD/mac68k binaries, so you don't need to recompile all of your local programs.

Important notes about NetBSD 2.0

- As noted above, the sendmail third-party program has been upgraded since the last release. The new version of sendmail runs without requiring being set-user-ID to ''root''.

  In order to retain the functionality that a newly installed system can send mail ''out of the box'', the default has changed so that sendmail will now start by default, and listen for host-local connections.

  If this behaviour is not desired, you can either
  1. explicitly set the sendmail variable to ''NO'' in `/etc/rc.conf`,
  2. modify `/etc/mail/submit.cf` to point to another host,
  3. modify `/etc/mailer.conf` to point to something else than sendmail, or
  4. make sendmail set-user-ID to ''root'', remove `/etc/mail/submit.cf`, and set the sendmail_suid variable to ''YES'' in `/etc/rc.conf`.

  The latter method is strongly discouraged.

The Future of NetBSD

The NetBSD Foundation has been incorporated as a non-profit organization. Its purpose is to encourage, foster and promote the free exchange of computer software, namely the NetBSD Operating System. The foundation will allow for many things to be handled more smoothly than could be done with our previous informal organization. In particular, it provides the framework to deal with other parties that wish to become involved in the NetBSD Project.

The NetBSD Foundation will help improve the quality of NetBSD by:

- providing better organization to keep track of development efforts, including co-ordination with groups working in related fields.
- providing a framework to receive donations of goods and services and to own the resources necessary to run the NetBSD Project.
- providing a better position from which to undertake promotional activities.
- periodically organizing workshops for developers and other interested people to discuss ongoing work.

We intend to begin narrowing the time delay between releases. Our ambition is to provide a full release every six to eight months.

We hope to support even *more* hardware in the future, and we have a rather large number of other ideas about what can be done to improve NetBSD.

We intend to continue our current practice of making the NetBSD-current development source available on a daily basis.

We intend to integrate free, positive changes from whatever sources submit them, providing that they are well thought-out and increase the usability of the system.

Above all, we hope to create a stable and accessible system, and to be responsive to the needs and desires of NetBSD users, because it is for and because of them that NetBSD exists.

Sources of NetBSD

Refer to .: **http://www.NetBSD.org/Sites/net.html**

NetBSD 2.0 Release Contents

The root directory of the NetBSD 2.0 release is organized as follows:

`.../NetBSD-2.0/`

`CHANGES`	Changes since earlier NetBSD releases.
`LAST_MINUTE`	Last minute changes.
`MIRRORS`	A list of sites that mirror the NetBSD 2.0 distribution.
`README.files`	README describing the distribution's contents.
`TODO`	NetBSD 's todo list (also somewhat incomplete and out of date).
`patches/`	Post-release source code patches.
`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 2.0 has a binary distribution.

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

gnusrc This set contains the "gnu" sources, including the source for the compiler, assembler, groff, and the other GNU utilities in the binary distribution sets.
79 MB gzipped, 367 MB uncompressed

pkgsrc This set contains the "pkgsrc" sources, which contain the infrastructure to build third-party packages.
24 MB gzipped, 200 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.
5 MB gzipped, 20 MB uncompressed

src This set contains all of the base NetBSD 2.0 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.
37 MB gzipped, 176 MB uncompressed

syssrc This set contains the sources to the NetBSD 2.0 kernel for all architectures; `config`(8); and `dbsym`(8).
26 MB gzipped, 140 MB uncompressed

xsrc This set contains the sources to the X Window System.
84 MB gzipped, 450 MB uncompressed

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

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

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

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

`BSDSUM` Historic BSD checksums for the various files in that directory, in the format produced by the command:
cksum -o 1 *file*.

`CKSUM` POSIX checksums for the various files in that directory, in the format produced by the command:
cksum *file*.

`MD5` MD5 digests for the various files in that directory, in the format produced by the command:
cksum -m *file*.

`SYSVSUM` Historic ATT System V UNIX checksums for the various files in that directory, in the format produced by the command:
cksum -o 2 *file*.

The MD5 digest is the safest checksum, followed by the POSIX checksum. The other two checksums are provided only to ensure that the widest possible range of system can check the integrity of the release files.

NetBSD/mac68k subdirectory structure

The mac68k-specific portion of the NetBSD 2.0 release is found in the `mac68k` subdirectory of the distribution: `.../NetBSD-2.0/mac68k/`. 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 kernel containing code for everything supported in this release using the standard SCSI driver.
`netbsd-GENERICSBC.gz`
A kernel containing code for everything supported in this release using the SBC variant of the SCSI driver.
`sets/` mac68k binary distribution sets; see below.

`installation/`
`instkernel/`
mac68k boot and installation kernels; see installation section (Sysinst Method), below.
`misc/`

Binary distribution sets

The NetBSD mac68k binary distribution sets contain the binaries which comprise the NetBSD 2.0 release for the mac68k. The binary distribution sets can be found in the `mac68k/binary/sets` subdirectory of the NetBSD 2.0 distribution tree, and are as follows:

base The NetBSD 2.0 mac68k **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. It includes shared library support, and excludes everything described below.
16 MB gzipped, 46 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.
18 MB gzipped, 69 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.
3 MB gzipped, 7 MB uncompressed

kern-GENERIC
This set contains a NetBSD/mac68k 2.0 `GENERIC` kernel, named `/netbsd`. You *must* install either this distribution set or kern-GENERICSBC.
2 MB gzipped, 3 MB uncompressed

kern-GENERICSBC
This set contains a NetBSD/mac68k 2.0 `GENERICSBC` kernel, named `/netbsd`. You *must* install either this distribution set or kern-GENERIC.
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.
8 MB gzipped, 30 MB uncompressed

misc This set includes the (rather large) system dictionaries, the typesettable document set, and other files from `/usr/share`.
3 MB gzipped, 9 MB uncompressed

text This set includes NetBSD's text processing tools, including `groff`(1), all related programs, and their manual pages.
2 MB gzipped, 7 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, and tightly track XFree86 releases. They are currently equivalent to XFree86 4.4.0. 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, 17 MB uncompressed

xcomp The extra libraries and include files needed to compile X source code.
10 MB gzipped, 37 MB uncompressed

xfont Fonts needed by X.
31 MB gzipped, 39 MB uncompressed

xetc Configuration files for X which could be locally modified.
0.03 MB gzipped, 0.17 MB uncompressed

xserver The X server. This includes the Xmac68k *monochrome* server with man pages.
4 MB gzipped, 10 MB uncompressed

The mac68k 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 -xpf** command from the root directory (/) of your system.

Kernels suitable for booting from an AppleShare server may be found in the `mac68k/binary/kernels` subdirectory of the NetBSD 2.0 distribution tree. These kernels are generally named something like `netbsd-GENERIC.gz` and can be booted as-is by the NetBSD/mac68k Booter utility, if desired. Please note that these kernels are simply gzipped and are not in tar archives.

The Mac OS based utilities necessary for installing and running NetBSD can be found in the `mac68k/installation/misc` subdirectory of the NetBSD 2.0 distribution tree. The important files in this directory are as follows:

`Booter.sea.hqx` The NetBSD/mac68k Booter utility. This program is used to boot the NetBSD kernel from within Mac OS.
141 KB archived

`Installer.sea.hqx` The NetBSD/mac68k Installer utility. This program is used to install the distribution sets onto your NetBSD partition(s). This utility is used only in a Traditional method installation; it is not used or required for an installation using the **sysinst** method.
147 KB archived

`Mkfs.sea.hqx` The Mkfs utility. This program is used to format your chosen partitions so that they can be used with NetBSD. This utility is used only in a Traditional method installation; it is not used or required for an installation using the **sysinst** method.
76 KB archived

These files are all BinHexed, self-extracting archives. If you need them, the sources for these utilities are in the `src` subdirectory. This utility is used only in a Traditional method installation.

Note: Each directory in the mac68k binary distribution also has its own checksum files, just as the source distribution does.

NetBSD/mac68k System Requirements and Supported Devices

NetBSD/mac68k 2.0 runs on several of the older Macintosh computers. About 4 MB of RAM is sufficient to boot a stripped-down custom kernel, and a subset of the system can be squeezed onto a 40 MB hard disk with considerable creativity and persistence. However, an 80 MB disk should be considered a practical minimum, and to do anything more interesting than booting at least 8 MB of RAM and more disk space is recommended. About 180 MB will be necessary to install all of the NetBSD/mac68k 2.0 binary system distribution sets (note that this does not count swap space!). You can drop this to 150 MB if you choose not to install the binary X11 distribution sets. Much more disk space is required to install the source and objects as well; a complete source distribution, including X11, consumes nearly 1 GB of storage.

Please note that to install NetBSD/mac68k 2.0 using the **sysinst** method, your system must have a minimum of 6 MB of RAM and 60 MB of available disk space (i.e. not part of an in-use HFS partition).

Supported models

- Mac II, IIx, IIcx, SE/30, IIci, IIsi, IIvx, IIvi
- Performa 400/405/410/430, Performa 450, Performa 460/466/467
- Performa 520, Performa 550/560, Performa 600/600CD
- LC II, LC III, LC III+, LC 520, LC 550
- MacTV
- Classic II, Color Classic
- Centris 650
- Quadra 610, Quadra 630, Quadra 650, Quadra 700, Quadra 800
- Quadra/Centris 660AV, Quadra 840AV
- PowerBook 140, PowerBook 145/145B, PowerBook 170
- PowerBook 160, PowerBook 165, PowerBook 180
- PowerBook 165c, PowerBook 180c, PowerBook 550c

Supported devices

- Onboard SCSI bus and most SCSI tapes, hard drives, and CD-ROMs
- Internal sound — enough to beep on some machines, anyway
- Most basic NuBus video cards (there have been some problems with some 24-bit color cards and with most QuickDraw acclerators)
- Both internal serial ports
- ADB keyboards and mice (both Apple and a number of third party multi-button mice and track-balls are supported)
- Ethernet cards based on the National Semiconductor 8390 and the SONIC (DP83932) chips (Asante, Apple, and a few others — problems still with Ethernet and many NuBus video cards)
- Ethernet cards based on the SMC 91c92 and 91c100 (FEAST) chips. This includes the Asante-FAST 10/100 cards
- Onboard Ethernet based on the SONIC chip for Quadra-series Macs
- Onboard Ethernet based on the MACE (Am79C940) chip for the Quadra AV-series Macs
- Ethernet port on Asante NetDock and Newer Ether MicroDock, for PowerBook Duo series
- Comm-slot Ethernet should be working for most machines/cards

If your 68030 system is not listed above, it may be because of a problem with accessing onboard video, and it may still work with a serial console. Some of the known ones in this category:

- Mac Classic series
- PowerBook Duo series

If your 68LC040 system is not listed above, it is due to a problem with floating point emulation (FPE) for this type of processor. Machines in this category include:

- Newer LC-series machines (47x, 57x)
- Newer Performa-series machines (47x, 57x, 58x, 63x, 640)
- Some PowerBook 500-series Macs

Unsupported models

- Macintosh IIfx

  This machine has unusual custom chips for the ADB and serial interfaces which make support for it difficult. Work is in progress on this, though.

- Quadra 900/950

  These machines have I/O processor chips for their ADB interfaces similar to those used in the IIfx and thus face similar support problems. Note that you can use a serial console on these systems.

- PowerPC-based Macs

  This is a separate effort from the mac68k port. PowerMacs use hardware that is often fairly different from that of the mac68k port. If you are interested in this, you might want to take a look at the new NetBSD/macppc port:
  http://www.NetBSD.org/Ports/macppc/index.html

Known hardware issues with this release

- Real Time Clock

  Due to oddities of the Macintosh hardware interrupt priority scheme, NetBSD/mac68k keeps very poor time. Under a high interrupt load (e.g. SCSI or serial port activity) , a machine can lose several minutes per hour. A consequence of this problem is that attempting to run **ntpd** is generally rather pointless.

- SCSI difficulties

  The NetBSD/mac68k SCSI drivers are not quite as robust as their Mac OS counterparts. Symptoms of these problems are that some SCSI disks will not work under NetBSD that work fine under Mac OS. Other problems include occasional file system corruption with some types of drives and the general unreliability of removable SCSI media. Keep in mind that there are no clear patterns with these problems, and they do not appear to affect the majority of users.

Getting the NetBSD System on to Useful Media

There are currently two installation methods available for initial installation of NetBSD on Apple Macintosh 68000-based systems. Neither supports all installation media types at this time, so the one you select must be compatible with the media you have available on your system.

- The **sysinst** method of installation uses an Installation Kernel which is a minimal NetBSD system with a memory resident set of utilities that are capable of partitioning the disk, initializing the file systems, and loading them from the archive files. Since the installation kernel does not currently support access to Mac OS HFS file systems this method requires that the Binary Distribution Sets be accessible from CD-ROM, remote NFS partition, or via FTP access.
- The Traditional method of installation uses Mac OS hosted utilities to partition your disk, initialize the partitions for use by NetBSD, and load the file systems from archive files stored on the Mac OS HFS file system. This method requires that the Binary Distribution Sets reside on a local Macintosh hard drive, a CD-ROM, or an AppleShare volume.

The Traditional method of installation is currently supported from the local Macintosh hard drive, from a CD-ROM, or from an AppleShare volume (however, you may ugrade a system from within NetBSD; see the **Upgrading a previously-installed NetBSD System** section for more details). If you are installing from a local hard drive, this means that you'll need at least enough room for the largest file that you will have to install. This is the 15.2 MB `base.tgz` file. There has been talk of allowing an install from split files. If you have the time, desire, and knowledge, please feel free to add that functionality.

If the install is being done from an AppleShare-mounted volume, the NetBSD/mac68k Installer must be in the same folder as the binary distribution sets.

Each distribution file is in *raw* archive format.

- Distribution files must be downloaded in binary mode. Common web browsers may not be suitable for this task; FTP clients such as Fetch and Anarchie work fine, but be sure to specify a binary file transfer.
- The files should not be unpacked. If you have the Internet Config extension installed, you can disable this in the "Helpers" dialog by removing the entry associated with ".tgz" files. Other FTP clients may require separate changes; consult your package's documentation.

- If you are installing from a CD-ROM, the distribution sets are already in the proper format. No special handling is required.

You will also need to collect the Mac OS installation tools from the `mac68k/installation/misc` subdirectory of the NetBSD 2.0 distribution: Mkfs, NetBSD/mac68k Installer, and NetBSD/mac68k Booter. These three are in BinHexed, self-extracting archives as Mkfs.sea.hqx, Installer.sea.hqx, and Booter.sea.hqx, respectively. Extract them as you would any other Macintosh application.

Note: The Booter is the only Mac OS application needed if the **sysinst** method of installation is used. The Traditional method of installation is deprecated and will be removed in a future release, and the Mkfs and Installer tools will be retired.

Preparing your System for NetBSD installation

No matter which installation method you use, there is some planning and preparation that is required beforehand. First and foremost, before beginning the installation process, make sure you have a reliable backup of any data on your hard disk that you wish to keep. *Mistakes in partitioning your hard disk may lead to data loss.*

NetBSD/mac68k uses the same disk mapping scheme as Mac OS: the Apple Disk Partition Map. This permits both systems to reside on the same disk, but introduces some installation problems unique to the Macintosh. There are very few, if any, reliable ways to reduce the size of an existing Mac OS disk partition, so partitioning a disk that currently contains Mac OS will almost always require a backup and reload step under Mac OS.

If you are using the **sysinst** method of installation you will be able to do most, if not all, of your disk partitioning during the install process. Partitioning the disk with **sysinst** will destroy any partition that is resized, deleted, converted, or designated for use by NetBSD. All space not planned to be used for Mac OS HFS partitions may be used by NetBSD and can be sub-divided by the **sysinst** process. This space may be defined within one or more existing disk partitions of any type, including HFS partitions that are no longer needed for Mac OS. However it is best if this space is physically contiguous on the disk as **sysinst** is not capable of merging non-contiguous disk partitions. If you are using the **sysinst** method and have sufficient disk space in one or more disk partitions you should skip forward to the section labeled **Installing the NetBSD System (Sysinst Method)** in this document.

If you are using the Traditional method of installation you must use a disk partitioning utility to designate the different partitions you will want in your final NetBSD configuration. It is not necessary to create NetBSD (or AU/X) type partitions at this stage; the Mkfs utility can convert a partition of any type to one usable for NetBSD.

If disk partitioning is required because you've selected the Traditional method of installation, or because disk space needs to be freed up for use for the **sysinst** method of installation, follow the directions in the remainder of this section.

Find your favorite disk partitioning utility. Any formatter capable of partitioning a SCSI disk should work. Some of the ones that have been tried and seem to work are:

- Apple HD SC Setup
- Hard Disk ToolKit from FWB
- SCSI Director Lite
- Disk Manager Mac from OnTrack
- Silverlining from LaCie
- APS Disk Tools

Apple's HD SC Setup is probably the easiest to use and the most commonly available. Instructions for patching HD SC Setup so that it will recognize non-Apple drives is available at:

http://www.euronet.nl/users/ernstoud/patch.html

First, you need to choose a drive on which to install NetBSD. Try to pick a drive with a low SCSI target number (or "SCSI ID"), especially if you are likely to add or remove drives to your SCSI chain in the future.

Note: Be certain you have a reliable backup of any data that you may want to keep. Repartitioning your hard drive is an excellent way to destroy important data.

Second, decide how you want to set up your partitions. At minimum, you need a partition to hold the NetBSD installation (the root partition — `/`) and a partition to serve as swap space. You may choose to use more than one partition to hold the installation. This allows you to separate the more vital portions of the file system (such as the kernel and the `/etc` directory) from the more volatile parts of the file system. Typical setups place the `/usr` directory on a separate partition from the root partition (`/`). Generally, `/` can be fairly small while the `/usr` partition should be fairly large. If you plan to use this machine as a server, you may also want a separate `/var` partition.

Once you have decided how to lay out your partitions, you need to calculate how much space to allocate to each partition. A minimal install of NetBSD (i.e. `base.tgz`, `etc.tgz`, and either `kern-GENERIC.tgz` or `kern-GENERICSBC.tgz`) should just fit in a 56 MB partition. For a full installation, you should allocate at least 180 MB (150 MB if you do not wish to install the X sets). A general rule of thumb for sizing the swap partition is to allocate twice as much swap space as you have real memory. Having your swap + real memory total at least 20 MB is also a good idea. Systems that will be heavily used or that are low on real memory should have more swap space allocated. Systems that will be only lightly used or have a very large amount of real memory can get away with less.

Keep in mind that NetBSD currently requires Mac OS in order to boot, so it is likely that you will want to keep at least a minimal install of Mac OS around on an HFS partition for this purpose. The size of this partition may vary depending on the size requirements for the version of Mac OS you are using. Of course, if you have Mac OS on another hard drive or can boot from a floppy, feel free to dedicate the entire drive to NetBSD.

Next, use your favorite partitioning utility to make partitions of the necessary sizes. You can use any type of partition, but partitions of type `Apple_Free` might save you some confusion in the future.

You are now set to install NetBSD on your hard drive.

Installing the NetBSD System (Sysinst Method)

Running the sysinst installation program

1. *Introduction*

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

2. *Possible hardware-specific issues*

   - *SCSI driver problems*

     The SCSI driver used in the kernel on many older Macintosh systems is, by default, the ncrscsi driver. It contains a recognized but as yet unfixed bug that affects some disk drive/controller combinations, usually Quantum disks. Under heavy load these systems may hang or corrupt the file system; or, you may experience frequent *Segmentation fault* and *Illegal instruction* errors that may or may not be consistently repeatable. This latter condition is particularly prevalent on systems with minimal RAM installed.

     If either of these problems occur on your system you are advised to use the SBC variants of the Kernel and Installation Kernel. However, be aware that this issue does not affect e.g. Centris or Quadra

systems.

- *The 68LC040 processor*

  NetBSD has known but unresolved problems running on the 68LC040 processor, the variant of the 68040 that does not contain the floating point unit (FPU). The kernel is thus forced to emulate the missing operations in software. Unfortunately the 68LC040 processor has a design problem that causes the emulation to fail intermittently. We hope to provide a solution for this issue in a future NetBSD release.

  Software emulation of floating point operations is not a problem on the 68020 and 68030 processors.

3. *General*

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

4. *Quick install*

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

   - What you need.
     - The distribution sets (in this example, they are on CD).
     - The Mac OS Booter application and an Installation Kernel
     - A Macintosh with a 68020 and MMU, 68030 or 68RC040 processor. An FPU is not required but will be used if present (but see the note above regarding the 68LC040).
     - A CD-ROM drive (SCSI), a hard disk and a minimum of 8 MB of memory installed.
     - The hard disk should have at least 120 + *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 120 MB more.
   - The NetBSD Boot Tools folder.
     - Create a Folder on your Mac OS disk for the NetBSD/mac68k components.
     - Copy the Booter application into the newly created Folder. Expand the file if necessary to create the Mac OS executable.
     - Copy the Installation Kernels into the newly created Folder. It is not necessary to **gunzip** compressed kernel files.
     - Single-click on the Booter application icon then select the "Get Info" from the File Menu list. Increase the memory allocation for the Booter to as much as possible for your system. Having a large number of fonts, extensions or sounds installed on your system can cause memory exhaustion problems for the Booter if you don't do this. Also, the extra memory is needed by the Booter to expand compressed kernels while booting.

- The Quick Installation
  - Double-click on the Booter application icon to start executing it. From the **Options** pull-down menu, select **Monitors**, then select **Change Monitor Depth** and make sure BW is highlighted. Close the window using the **Close** button.
  - From the **Options** pull-down menu select **Boot Options**. This will bring up an option panel. Set the **Auto-set GMT Bias** checkbox in the lower left and then select the **Boot from Mac OS** option at the top of the window. The **Set** button on the right will become active. Use it to locate and select the Installation Kernel file appropiate for your hardware. This will be either `netbsd-INSTALL.gz` or `netbsd-INSTALLSBC.gz`. Close the window using the **Close** button.
  - From the **Options** pull-down menu select the **Boot Now**, or use the Apple-B (Command-B) key combination to start the NetBSD boot process. Do not move the mouse while the boot operation is in progress as this may leave the keyboard locked to NetBSD.

    The main menu will be displayed.

```
.*********************************************.
* NetBSD-2.0 Install System                    *
*                                              *
*a: Install NetBSD to hard disk                *
* b: Upgrade NetBSD on a hard disk             *
* c: Re-install sets or install additional sets *
* d: Reboot the computer                       *
* e: Utility menu                              *
* x: Exit Install System                       *
.*********************************************.
```

  - If you wish, you can configure some network settings immediately by choosing the **Utility menu** and then **Configure network**. It isn't actually required at this point, but it may be more convenient. Go back to the main menu.
  - Choose **install**.
  - You will be guided through some steps regarding the setup of your disk, and the selection of distributed components to install. When in doubt, refer to the rest of this document for details.
  - After your disk has been prepared, choose **CD-ROM** as the medium. The default values for the path and device should be ok.
  - After all the files have been unpacked, go back to the main menu and select **reboot.**
  - NetBSD will now boot. If you haven't already done so in **sysinst**, you should log in as `root`, and set a password for that account. You are also advised to edit the file `/etc/rc.conf` to match your system needs.
  - Your installation is now complete.
  - For configuring the X window system, if installed, see the files in `/usr/X11R6/lib/X11/doc`. Further information can be found on **http://www.xfree86.org/**.

5. *Booting NetBSD*

   Prior to attempting to boot NetBSD/mac68k verify that all the following are done:

- Enable 32-bit addressing in the Memory Control Panel [1].
- Disable all forms of virtual memory (the Memory Control Panel, RAM Doubler, or other software-based memory enhancement products).
- Place the system in BW Mode (1-bit color or grayscale) as shown in the Monitors Control Panel or in the Monitors options dialog of the Booter. You may choose to have the Booter do this for you automatically by selecting the appropiate check box and radio button in the **Monitors** dialog on the **Options** menu.

It is probably best to boot your machine with all extensions turned off [1]. You can do this by booting into Mac OS with the SHIFT key held down. You may have to restart your Macintosh for changes to take effect before proceeding.

[1] If your version of the Memory control panel does not have a 32-bit addressing mode radio button, this means that your system is already 32-bit clean and is running in 32-bit addressing mode by default. If the Booter complains that your are not in 32-bit mode, it may be necessary for you to press the "Use Defaults" button in the Memory control panel to restore 32-bit addressing. You should probably reboot after doing so. If you have an older II-class system (including the II, IIx, IIcx, and SE/30), it is necessary to install Connectix's MODE32 to work around ROM issues which prevent you from enabling 32-bit addressing. Please see the NetBSD/mac68k FAQ at
http://www.NetBSD.org/Ports/mac68k/faq/
for more information.

Double-click on the NetBSD/mac68k Booter icon to start the application. Select **Booting** from the **Options** menu. Select the Kernel Location to be from Mac OS with the filename corresponding to the name of the Installation Kernel you are using. Typically this will be netbsd-INSTALL.gz.

If you haven't already put your Macintosh into BW mode, select the **Monitor Options** from the **Options** menu and check the box for BW mode.

Try booting NetBSD by selecting **Boot Now** from the **Options** menu.

If the system does not come up, send mail to port-mac68k@NetBSD.org describing your software, your hardware, and as complete a description of the problem as you can. As an alternative, try using the Traditional method of installation described in the next section.

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

6. *Network configuration*

If you will not use network operation 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 in reply to answers relating to this.

7. *Preparing a disk for* Mac OS *and NetBSD*

sysinst can manipulate the Apple Disk Partition Map allowing you to partition your disk for use with NetBSD. It does not support resizing existing Mac OS HFS disk partitions. If there is insufficient Free space on the disk to support an installation of NetBSD you will need to backup, repartition and restore your existing Mac OS partitions before proceeding. You may choose to use a Traditional method of creating disk partitions for NetBSD if you wish. They can still be used by **sysinst** for a NetBSD installation.

8. *Installation drive selection and parameters*

   To start the installation, select **Install NetBSD to hard disk** from the main menu. To start the installation, select the menu option in install NetBSD 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. Depending on how many disks are found, you may get a different message. You should see disk names like `wd0`, `wd1`, `sd0` or `sd1`.

   sysinst next tries to figure out how the selected volume has been partitioned. It does this by reading the Apple Disk Partition Map from the disk. If the disk does not have a Partition Map, **sysinst** will give you the option of writing one, but doing so will not make the disk a Mac OS bootable volume. You will have the option of creating HFS partitions that may be subsequentially initialized and used under Mac OS though.

9. *Partitioning the disk*

   - Which portion of the disk to use.

     You will be asked if you want to use the entire disk or only part of the disk. If you decide to use the entire disk for NetBSD, it will be checked if there are already other systems present on the disk, and you will be asked to confirm whether you want to overwrite these.

   - Definition of the NetBSD disklabel.

     The Apple Disk Partition Map is used to create an in-core map of the disk called the disklabel. A minimum of two NetBSD partitions will be required, one for root and one for swap. Up to eight partitions may be used by NetBSD. Up to 32 partitions may exist on the disk which can be any combination of Mac OS HFS, Free, Scratch and NetBSD partitions, although only the first eight which meet the needs of NetBSD will be seen and mapped to the NetBSD disklabel.

     Some partitions in the disklabel have a fixed purpose. Partition 'a' is always the root partition, 'b' is the swap partition and 'c' is the entire disk. Partitions 'd' through 'h' are available for other use. Traditionally, 'g' is the partition mounted on the /usr directory, but this is historical practice, not a fixed value.

   - Editing the NetBSD Disklabel (and the underlying Apple Disk Partition Map).

     You will be presented with the current layout of the disk as seen by NetBSD, and given a change to change it. (Even though NetBSD can only use the first eight qualified partitions, all partitions found on the disk will be displayed.) The partitions found on the disk will be shown in the top section of the display. Each will be identified with the name assigned by NetBSD, the current size, offset, type, use and mount point. The partition currently being modified will be highlighted in inverse video. The bottom part of the display will list the operations which may be performed on the selected (highlighted) partition. The options are:

     – Select next partition

       This highlights the next partition in the upper display list and makes it the current one selected for manipulation.

     – Change selected partition

       This changes the type assigned to the partition. A partition may be assigned for use as a NetBSD Root, SWAP, Usr, or Root&Usr; it may be assigned for use as a Mac OS HFS partition; a Scratch (for later reassignment); or a Free partition. Free partitions which are physically adjacent to each other will be collapsed into a single Free partition.

- Set mount point for partition

  This designates the NetBSD file system mount point for the partition, and gets transferred into the /etc/fstab definition so NetBSD knows where to mount the file system on subsequent boots. The option only applies to NetBSD Root, Usr, Root&Usr or Mac OS HFS partitions, although currently HFS access is not supported without optional software components. A common set of predefined mount points (/usr, /home, /var, /tmp or None) will be presented to you to assist you in defining the most commonly used, but you may enter you own names if you choose. Selecting "None" will clear the mount point name and keep the partition from being defined in the resulting `/etc/fstab` file.

- Split selected partition

  This option divides the selected partition into two separate partitions if there is space available in the Disk Partition Map. You will be prompted for the size of the first segment and the remaining portion will be allocated to the second segment. The first segment will be designated as a Scratch type, and the second will be designated as a Free type. To clear a split, or remerge two adjacent partitions into a single one, change both to be Free types. **sysinst** will merge them and update the display.

  This is the primary option used to partition the disk since it allows you to sub-divide the selected partition into two partitions. Changing the types associated with the resulting two parts, or splitting the second part further sub-divides the original partition.

- Page Up, Page Down

  These entries allow you to scroll the upper display if more than eight partitions currently exist on the disk.

- Fix selected partition

  This option reviews the partition's size and starting address and fixes the values if they overlap any adjacent partition. This is primarily a debugging option and shouldn't be necesary during a normal installation. However, some 3rd party disk formatters have been known to create bogus entries in the Apple Disk Partition Map, and this option can aid is repairing these entries.

- Exit

  This option completes the disk partitioning and returns you to the previous installation menu. At that point you will be given one last opportunity to bail out before committing the changes to the Disk Partition Map recorded on the disk.

• Recommended approach to partitioning

  The simplest method of approaching disk partitioning with **sysinst** is to convert everything that can be used for NetBSD into a Free type partition. This will allow **sysinst** to collapse and merge all the available space. Then cycle through the Select, Split, Select, Change, and Set Mount Point options for each of the NetBSD partitions that are desired. Since NetBSD/mac68k has a very specific mount order for partitions during system boot, it is best to create your NetBSD partitions in the following order: Root, SWAP, Usr where the partitions will be mounted in order on 'a', 'b', 'g', 'd', 'e', 'f', and 'h'.

  At least one Root or Root&Usr is required, and a SWAP partition is highly desirable. As a general rule you will need twice as much swap space as you have RAM, more if you plan on running X, Web applications or doing heavy development in a multi-user environment. The Root partition, if it is separate from your Usr, usually requires about 24 MB.

If multiple Root partitions are defined, the second is usually mounted on /altusr by default. NetBSD/mac68k automatically mounts all Root partitions after the first as Usr type partitions. However, it is best to be very specific about mount points and partition type and use.

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, enter `yes` at the prompt.

    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. A few sets must be installed for a working system, others are optional. At this point of the installation, 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 using ftp*

    To be able to install using ftp, you first need to configure your network setup, if you haven't already at the start of the install procedure. **sysinst** will do this for you, asking you if you want to use DHCP, and if not to provide data like IP address, hostname, etc. If you do not have name service set up for the machine that you are installing on, you can just press `RETURN` in answer to these questions, 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 when answering the questions to configure networking, 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.

13. *Installation using NFS*

    To be able to install using NFS, you first need to configure your network setup, if you haven't already at the start of the install procedure. **sysinst** will do this for you, asking you if you want to use DHCP, and if not to provide data like IP address, hostname, etc. If you do not have name service set up for the machine that you are installing on, you can just press `RETURN` in answer to these questions, 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 when answering the questions to configure networking, you will need to specify an IP address instead of a hostname for the NFS server.

14. *Installation from CD-ROM*

    When installing from a CD-ROM, you will be asked to specify the device name for your CD-ROM player (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.

15. *Installation from Mac OS file systems*

    NetBSD/mac68k does not currently have in-kernel support for Mac OS HFS/HFS+ or AppleShare filesystems. **sysinst** therefore can not access the file sets if they are on these filesystems.

16. *Installation from an unmounted file system*

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

17. *Installation from a local directory*

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

18. *Extracting the distribution sets*

    After the install sets containing the NetBSD distribution have been made available, you can either extract all the sets (a full installation), or only extract sets that you have selected. In the latter case, you will be shown the currently selected sets, and given the opportunity to select the sets you want. Some sets always need to be installed (**kern, base**) and **etc** they will not be shown in this selection menu.

    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, especially on machines with slow graphics consoles or serial consoles.

    After all the files have been extracted, all the necessary 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 than set a password for the "root" account, to prevent the machine coming up without access restrictions.

19. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 2.0. You can now reboot the machine, and boot NetBSD from hard disk.

Installing the NetBSD System (Traditional Method)

The Traditional method of installation can be broken down into three basic steps:

- Run Mkfs to build a file system or file systems.
- Run the Installer to load the files onto your file systems.
- Run the Booter to boot the system.

Preparing the file system(s)

Double-click on the Mkfs application icon to start it up. It will ask you for the SCSI-ID (SCSI target number) of the drive that you are installing NetBSD on. Once this is selected, it will present a list of the partitions on that disk. You must first convert the partitions to a type which NetBSD can understand. Select each partition on which you wish to build a file system and click on the **Change** button. If you are placing the entire installation on a single partition, select the **NetBSD RootUsr** radio button. If you are using multiple partitions, select **NetBSD Root** for the root partition (/) and **NetBSD Usr** for all the other partitions. You should select **NetBSD Swap** for the swap partition.

When you have finished converting each partition, select each partition and click on the **Format** button. You will now be asked for a bunch of parameters for the hard drive and the file system. Usually, you can just take the defaults. If you are installing onto removable media (e.g. a Zip, Jaz, or Syquest), please see the FAQ. Note that although this dialog only has the **OK** button, you are not committed, yet. Once you get the values you want, press the **OK** button. A dialog will be presented at this point with two options: **Format** and **Cancel**. If you choose **Cancel**, nothing will be written to your drive. If you choose **Format**, the program will proceed to make a file system.

Mkfs is not a well-behaved Macintosh application. It will not allow any other tasks to run while it does (cooperative multitasking at its best). When it's finished, the program will put up a dialog to ask if you have scanned the output for any error messages. Usually there won't have been any errors, but do scan the output to make sure. Simply click on the **I Read It** button and the program will quit.

Repeat as necessary for any extra partitions that you wish to make file systems on. Note that you do *not* need a file system on your swap partition.

When you are finished, click on the **Done** button and choose **Quit** from the **File** menu to exit Mkfs.

Installing the files

Before using the Installer, it is probably a good idea to increase its memory allocation. Select the Installer icon by clicking on it and choose **Get Info** from the File menu. Increase both the Minimum and Preferred sizes to as much as you can spare.

Double-click on the Installer icon to start it up. The Installer will present the same SCSI-ID menu that Mkfs did. Select the same SCSI-ID (SCSI target number) that you did for Mkfs - i.e., the one you are installing NetBSD on.

If you are installing onto a single root partition (/), proceed to the **Installation of base files** section, below.

If you have not created file systems for / (root), usr, and any other file systems, go back to **Preparing the file system(s)** above.

When you started the Installer, it mounted your root partition (/). Just before it printed

```
Mounting partition 'A' as /
```

it printed lines like:

```
sd1 at scsi ID 5
```

This means that the device for SCSI target 5 ("SCSI ID 5") is sd1. The partitions are signified by a trailing letter. For instance, sd1a would be the root partition (/) of the second SCSI disk in the chain, and sd0g would be the first Usr partition on the first SCSI disk.

You will need to know the proper device to mount the remaining partition(s) by hand:

1. Select **Build Devices** from the **File** menu.

2. Select **Mini Shell** from the **File** menu.
3. You can use the **disklabel** command to get a listing of the available partitions and their types and sizes.
4. Create the directory mount point(s) with the command:

   ```
   # mkdir path
   ```

   E.g. for the `/usr` partition type:

   ```
   # mkdir /usr
   ```

5. Mount the file systems you wish with the command:

   ```
   # mount device path
   ```

   For example, if you wish to mount a `/usr` partition from the first SCSI disk `sd0`, on `/usr`, you would type:

   ```
   # mount /dev/sd0g /usr
   ```

6. Type

   ```
   # fstab force
   ```

   to create a proper `/etc/fstab` file.
7. Type **quit** after you have mounted all the file systems.

Installation of base files

Select the **Install** menu item from the **File** menu and install `base.tgz`, `etc.tgz`, either `kern-GENERIC.tgz` or `kern-GENERICSBC.tgz`, and any other sets you wish to install at this time (see the **NetBSD 2.0 Release Contents** for information about what's in each set). The Installer will print out the filename of each file as it is installed, and will take quite some time to install everything (the base package alone can take over two hours on a slow hard drive).

As is the case with Mkfs, this is not a particularly well-behaved Macintosh application and the machine will be completely tied up while the installation takes place.

At some point after installing the base set, select the **Build Devices** option from the **File** menu if you have not already done so. This will create a bunch of device nodes for you and will create your initial `/etc/fstab`. The Installer program also has an option to give you a mini-shell. Do not use this unless you are sure know what you are doing.

When you are finished installing all of the sets you wish to install, exit the Installer by choosing **Quit** from the **File** menu.

Booting the system

Prior to attempting to boot NetBSD/mac68k, please verify that all of the following are true:

1. 32-bit addressing is enabled [2] in the Memory control panel;
2. All forms of virtual memory are disabled (the Memory control panel, RAM Doubler, or other software-based memory enhancement products); and
3. Your system is in BW mode (1-bit color or grayscale) as shown by the Monitors control panel. You may choose to have the Booter do this for you automatically by selecting the appropriate check box and radio button in the **Monitors** dialog on the **Options** menu.

It is probably best to boot your machine with all extensions turned off [2]. You can do this by booting into Mac OS with the SHIFT key held down. You may have to restart your Macintosh for changes to take effect before proceeding.

[2] If your version of the Memory control panel does not have a 32-bit addressing mode radio button, this means that your system is already 32-bit clean and is running in 32-bit addressing mode by default. If the Booter complains that you are not in 32-bit mode, it may be necessary for you to press the **Use Defaults** button in the Memory control panel to restore 32-bit addressing. You should probably reboot after doing so. If you have an older II-class system (including the II, IIx, IIcx, and SE/30), it is necessary to install Connectix's MODE32 to work around ROM issues which prevent you from enabling 32-bit addressing. Please see the NetBSD/mac68k FAQ at

http://www.NetBSD.org/Ports/mac68k/faq/

for more information.

Double-click on the NetBSD/mac68k Booter icon to start the application. Select **Booting** from the **Options** menu. Check that all of the items in the resulting dialog look sane - especially the SCSI target number. If not, correct them to your preference (the SCSI target number, or "SCSI ID", should be the only thing you need to change). When you are satisfied with your choices, try booting NetBSD by selecting **Boot Now** from the **Options** menu.

If you wish to save your preferences, choose **Save Options** from the **File** menu before Booting (your preferences will not be saved if you forget to do this).

If the system does not come up, send mail to `port-mac68k@NetBSD.org` describing your software, your hardware, and as complete a description of the problem as you can.

If the system does come up, congratulations, you have successfully installed NetBSD 2.0.

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, with the most important ones 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).

   If your `/usr` directory is on a separate partition and you do not know how to use **ed**, you will have to mount your `/usr` partition to gain access to **ex** or **vi**. Do the following:

   ```
   # mount /usr
   # export TERM=vt220
   ```

If you have `/var` on a separate partition, you need to repeat that step for it. After that, you can edit `/etc/rc.conf` with `vi`(1). When you have finished, type **`exit`** at the prompt to leave the single-user shell and continue with the multi-user boot.

Other values that need to be set in `/etc/rc.conf` for a networked environment are *`hostname`* and possibly *`defaultroute`*, furthermore add an *`ifconfig_int`* for your ⟨int⟩ network interface, where your on-board, NuBus or PDS interface may be `ae0`, `mc0` or `sn0`. For example:

```
ifconfig_sn0="inet 123.45.67.89 netmask 255.255.255.0"
```

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

```
ifconfig_sn0="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. If you're using the machine in a networked environment, 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.

   Unless you have connected an unusual terminal device as the console you can just press `RETURN` when it prompts for `Terminal type? [...]`.

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 have installed the X Window System, look at the files in `/usr/X11R6/lib/X11/doc` for information.

   Don't forget to add `/usr/X11R6/bin` to your path in your shell's dot file so that you have access to the X binaries.

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. This automatically handles any changes necessary to make the software run on NetBSD, retrieval and installation of any other packages on which the software may depend, and simplifies installation (and deinstallation), both from source and precompiled binaries.

   – More information on the package system is at
     http://www.NetBSD.org/Documentation/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/NetBSD/packages/
  usually in the `2.0/mac68k/All` subdir. You can install them with the following commands under `sh`(1):

  ```
  # PKG_PATH=ftp://ftp.NetBSD.org/pub/NetBSD/packages/2.0/mac68k/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 mozilla
  ...
  ```

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

  ```
  # setenv PKG_PATH ftp://ftp.NetBSD.org/pub/NetBSD/packages/2.0/mac68k/All
  ...
  ```

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

- Package sources for compiling packages on your own can be obtained by retrieving the file
  ftp://ftp.NetBSD.org/pub/NetBSD/NetBSD-current/tar_files/pkgsrc.tar.gz
  They are typically extracted into `/usr/pkgsrc` (though other locations work fine), with the commands:

  ```
  # mkdir /usr/pkgsrc
  # ( cd /usr/pkgsrc ; tar -zxpf - )  pkgsrc.tar.gz
  ```

  After extracting, see the `README` and `Packages.txt` files in the extraction directory (e.g. `/usr/pkgsrc/README`) 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/mail/sendmail.cf` file will almost definitely need to be adjusted; files aiding in this can be found in `/usr/share/sendmail`. See the `README` file there for more information. If you prefer postfix as MTA, adjust `/etc/mailer.conf`.
   - Edit `/etc/rc.local` to run any local daemons you use.
   - Many of the `/etc` files are documented in section 5 of the manual; so just invoking

     ```
     # man 5 filename
     ```

     is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

The upgrade to NetBSD 2.0 is a binary upgrade; it can be quite difficult to update the system from an earlier version by recompiling from source, primarily due to interdependencies in the various components.

To do the upgrade, you must boot from the installer kernel using one of the methods described above. You must also have at least the **base** and **kern** binary distribution sets available, so that you can upgrade with them, using one of the upgrade methods described above. Finally, you must have sufficient disk space avail-

able to install the new binaries. Since files already installed on the system are overwritten in place, you only need additional free space for files which weren't previously installed or to account for growth of the sets between releases. If you have a few megabytes free on each of your root (`/`) and `/usr` partitions, you should have enough space.

Since upgrading involves replacing the kernel, the boot blocks on your NetBSD partition, and most of the system binaries, it has the potential to cause data loss. You are strongly advised to *back up* any important data on the NetBSD partition or on another operating system's partition on your disk before beginning the upgrade process.

The upgrade procedure using the **sysinst** tool is similar to an installation, but without the hard disk partitioning. **sysinst** will attempt to merge the settings stored in your `/etc` directory with the new version of NetBSD. Getting the binary sets is done in the same manner as the installation procedure; refer to the installation part of the document for how to do this. Also, some sanity checks are done, i.e. file systems are checked before unpacking the sets.

After a new kernel has been copied to your hard disk, your machine is a complete NetBSD 2.0 system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in `/dev`. If you've changed the contents of `/dev` by hand, you will need to be careful about this, but if not, you can just cd into `/dev`, and run the command:

```
# sh MAKEDEV all
```

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

NetBSD/mac68k has switched its executable format from the old a.out format to ELF, the now more commonly used and supported format. Your old binaries will continue to work just fine. The installation procedure will try to take the necessary steps to accomplish this. The most important step is to move the old a.out shared libraries in `/usr/lib` and `/usr/X11R6/lib` (if X was installed) to `/emul/aout`, where they will be automatically found if an older a.out binary is executed. Sysinst will use an existing `/emul` and / or `/emul/aout` directory if available, and will create it (as a symbolic link to `/usr/aout`) if necessary.

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

Compatibility Issues With Previous NetBSD Releases

Users upgrading from previous versions of NetBSD may wish to bear the following problems and compatibility issues in mind when upgrading to NetBSD 2.0.

Issues affecting an upgrade from NetBSD 1.6

The following issues can generally be resolved by extracting the **etc** set into a temporary directory and running *postinstall*:

```
mkdir /tmp/upgrade
cd /tmp/upgrade
pax -zrpe -f /path/to/etc.tgz
./etc/postinstall -s `pwd` check
./etc/postinstall -s `pwd` 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/*

– The following files are now obsolete: /etc/rc.d/fsck.sh /etc/rc.d/gated /etc/rc.d/kerberos /etc/rc.d/NETWORK /etc/rc.d/systemfs /etc/rc.d/xntpd and /etc/rc.d/ypset.

– The users and groups 'smmsp', needs to be created, 'news' is no longer part of the system.

The following issues need to be resolved manually:

– postfix(8) configuration files require upgrading.

```
cd /usr/share/examples/postfix
cp post-install postfix-files postfix-script /etc/postfix
postfix check
```

Using online NetBSD documentation

Documentation is available if you first install 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.

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. Additionally, bug reports can be sent by mail to: netbsd-bugs@NetBSD.org.

Use of send-pr(1) is encouraged, however, because bugs reported with it are entered into the NetBSD bugs database, and thus can't slip through the cracks.

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-help@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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(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 mentioned, tell us!)

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