NAME

INSTALL — Installation procedure for NetBSD/cats.

CONTENTS

DESCRIPTION

About this Document

This document describes the installation procedure for NetBSD 11.1 on the *cats* 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 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 many different different system architectures (ports) across a variety of distinct CPU families, and is being ported to more. The NetBSD 11.1 release contains complete binary releases for most of these system architectures, with preliminary support for the others included in source form. For more information please visit **https://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, NetBSD would not exist.

Changes Between The NetBSD 10 and 11 Releases

The NetBSD 11.1 release provides many significant changes, including support for many new devices, hundreds of bug fixes, new and updated kernel subsystems, and numerous userland enhancements. The result of these improvements is a stable operating system fit for production use that rivals most commercially available systems.

One important new feature in this release is the support for extended attributes and access control lists on FFS file systems.

For new installations the installer will by default disable these features, so the file system is compatible with older NetBSD releases (before 10), and allow other operating systems to mount this file systems at least in read-only mode.

If you want a new installed file system to support extended attributes, change the file system type from "FFSv2" to "FFSv2ea" in the partitioning menu. You can also convert file systems later, using the `fsck_ffs`(8) utility. More details are available in *this guide:*

https://wiki.netbsd.org/tutorials/acls_and_extended_attributes_on_ffs.

If you are upgrading from a version of NetBSD-current please also check the **Compatibility Issues With Previous NetBSD Releases**. It is impossible to completely summarize the massive development that went into the NetBSD 11.1 release. The complete list of changes can be found in

CHANGES:

https://cdn.NetBSD.org/pub/NetBSD/NetBSD-11.1/CHANGES

CHANGES-11.1:

https://cdn.NetBSD.org/pub/NetBSD/NetBSD-11.1/CHANGES-11.1

which are also present in the top level directory of the NetBSD 11.1 release tree.

Features to be removed in a later release

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

- groff(1). Man pages are now handled with mandoc(1), and groff(1) can still be found in pkgsrc as textproc/groff.
- pf(4). This packet filter is obsolete and unmaintained in NetBSD. It will be eventually removed due to possible long-standing security issues and lack of multiprocessor support. New installations should use npf(7).

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: **https://www.NetBSD.org/foundation/**

Sources of NetBSD

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

NetBSD 11.1 Release Contents

The root directory of the NetBSD 11.1 release is organized as follows:

.../NetBSD-11.1/

CHANGES	Changes between the 10.0 and 11.0 releases.
CHANGES-11.0	Changes between the initial 11.0 branch and final release of 11.0.
CHANGES-11.1	Changes between the 11.0 and the 11.1 release.
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.
images/	Images (ISO 9660 or USB) for installing NetBSD. Depending on your system, these may be bootable.
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 11.1 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.

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

src This set contains all of the base NetBSD 11.1 sources which are not in **gnusrc**, **sharesrc**, or **syssrc**.

syssrc This set contains the sources to the NetBSD 11.1 kernel for all architectures as well as the `config`(1) utility.

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

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

The source sets are distributed as compressed tar files. Individual 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/cats subdirectory structure

The cats-specific portion of the NetBSD 11.1 release is found in the `cats` subdirectory of the distribution: `.../NetBSD-11.1/cats/`. It contains the following files and directories:

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

`binary/`
- `kernel/`
  - `netbsd-GENERIC.gz` A gzipped NetBSD kernel containing code for everything supported in this release.
- `sets/` cats binary distribution sets; see below.

`installation/`
- `kernel/` cats installation kernels.

Binary distribution sets

The NetBSD cats binary distribution sets contain the binaries which comprise the NetBSD 11.1 release for cats. The binary distribution sets can be found in the `cats/binary/sets` subdirectory of the NetBSD 11.1 distribution tree, and are as follows:

base The NetBSD 11.1 cats **base** binary distribution. You *must* install this distribution set. It contains the base NetBSD utilities that are necessary for the system to run and be minimally functional.

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

debug This distribution set contains debug information for all base system utilities. It is useful when reporting issues with binaries or during development. This set is huge, if the target disk is small, do not install it.

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

games This set includes the games and their manual pages.

kern-GENERIC
This set contains a NetBSD/cats 11.1 `GENERIC` kernel, named `/netbsd`. You *must* install this distribution set. This set also contains an a.out kernel named `/netbsd.aout` that your system may need to boot.

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

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

modules This set includes kernel modules to add functionality to a running system.

rescue This set includes the statically linked emergency recovery binaries installed in `/rescue`.

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

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

xbase The basic files needed for a complete X client environment. This does not include the X servers.

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

xdebug This distribution set contains debug information for all X11 binaries. It is useful when reporting issues with these binaries or during development. This set is huge, if the target disk is small, do not install it.

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

xetc Configuration files for X which could be locally modified.

xserver The X server.

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

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

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

NetBSD/cats System Requirements and Supported Devices

NetBSD/cats 11.1 runs on a Chalice CATS systems from Simtec Electronics and Intel EBSA boards. The minimal configuration is said to require 8 MB of RAM and 100 MB of disk space, though we do not know of anyone running with a system quite this minimal today. To install the entire system requires much more disk space. 8 MB of RAM might actually allow you to run X and/or compile, but it won't be speedy. Note that until you have around 16 MB of RAM, getting more RAM is more important than getting a faster CPU.

Supported Chalice CATS devices

- ALI M1543 southbridge inc PS/2 keyboard & mouse, ide, serial
- Parallel, USB and ISA bus
- RTC

Supported Intel EBSA285 & Chalice CATS PCI devices

- PCI - PCI bridges
  - DC21150
  - DC21152
  - DC21153
  - DC21154
  - Hint HB1
- Digital DC21x4x-based PCI Ethernet adapters
  - Cogent EM1X0, EM960 (a.k.a. Adaptec ANA-69XX)
  - Cogent EM964 [b]
  - Cogent EM4XX [b]
  - Compex Readylink PCI
  - DANPEX EN-9400P3
  - Digital Celebris GL, GLST on-board ethernet
  - DEC (Digital) PCI Ethernet/Fast Ethernet adapters (all)
  - JCIS Condor JC1260
  - Linksys PCI Fast Ethernet
  - SMC EtherPower 10, 10/100 (PCI only!)
  - SMC EtherPower
  - SVEC
  - PN0455
  - SVEC FD1000-TP
  - Znyx ZX34X
- Adaptec AHA-2910, 2915, 2920, and 2930C adapters
- Adaptec AHA-2x4x[U][2][W] cards and onboard PCI designs using the AIC-7770, AIC-7850, AIC-7860, AIC-7870, AIC-7880 and AIC-789x chipsets
- Adaptec AHA-394x[U][W] cards [b]
- Adaptec AHA-3950U2 cards
- Adaptec AHA-3960, 19160 and 29160 Ultra-160 adapters
- NE2000 PCI ethernet adapters
- Universal Serial Bus
  - UHCI host controllers
  - OHCI host controllers
  - Hubs
  - Keyboards using the boot protocol
  - Mice
  - Printers
  - Generic support for HID devices
- Video cards

- Diamond Stealth 3D 2000 Pro
- ATI Charger 4MB
- STB Velocity 128
- Cirrus Logic 5446
- IGS 2010
- IGS 5000
- S3 based interfaces

Drivers for hardware marked with "[∗]" are *not* present in installation kernels.

Other PCI devices may be supported by Intel EBSA285 & Chalice CATS but have not been tested.

Getting the NetBSD System on to Useful Media

You will need to create a CD with an install kernel on it or have another machine available to allow net booting.

Installation is supported from several media types, including:

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

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

CD-ROM / DVD / USB stick Find out where the distribution set files are on the CD-ROM, DVD or USB stick. Likely locations are `binary/sets` and `cats/binary/sets`. (You only need to know this if you are mixing installer and installation media from different versions - the installer will know the proper default location for the sets it comes with).

Proceed to the instructions on installation.

FTP The preparations for this installation/upgrade method are easy; all you need to do is make sure that there's an FTP site from which you can retrieve the NetBSD distribution when you're about to install or upgrade. If you don't have DHCP available on your network, you will need to know the numeric IP address of that site, and, if it's not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself.

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

NFS Place the NetBSD distribution sets you wish to install into a directory on an NFS server, and make that directory mountable by the machine on which you are installing or upgrading NetBSD. This will probably require modifying the `/etc/exports` file on the NFS server and resetting its mount daemon (mountd). (Both of these actions will probably require superuser privileges on the server.)

You need to know the numeric IP address of the NFS server, and, if you don't have DHCP available on your network and the server is not on a network directly connected to the machine on which you're installing or upgrading NetBSD, you need to know the numeric IP address of the router closest to the NetBSD machine. Finally, you need to know the numeric IP address of the NetBSD machine itself.

Once the NFS server is set up properly and you have the information mentioned above, you can proceed to the next step in the installation or upgrade process. If you're installing NetBSD from scratch, go to the section on preparing your hard disk, below. If you're upgrading an existing installation, go directly to the section on upgrading.

Tape

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

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

```
# tar -cf tape_device dist_sets
```

where `tape_device` is the name of the tape device that represents the tape drive you're using. This might be `/dev/rst0`, or something similar, but it will vary from system to system. In the above example, `dist_sets` is a list of filenames corresponding to the distribution sets that you wish to place on the tape. For instance, to put the **kern-GENERIC, base,** and **etc** distributions on tape (the absolute minimum required for installation), you would do the following:

```
# cd .../NetBSD-11.1
# cd cats/binary
# tar -cf tape_device kern-GENERIC.tgz
base.tgz etc.tgz
```

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

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

Preparing your System for NetBSD installation

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

Available Boot Media

Currently the cats Cyclone firmware allows for system booting using:

- Ethernet (netboot) using DHCP, BOOTP, TFTP, or NFS.
- Local hard disk or CD-ROM with the following file systems:
  - Berkeley FFS
  - Linux ext2
  - ISO9660 CD-ROM file system

– MS-DOS file system

Booting from floppy disk is not currently supported.

Preparing the Bootable Media

This section describes how to get a NetBSD/cats install kernel onto a CD-R.

Go to one of the NetBSD mirror sites and download CD-R image from the `pub/NetBSD/images` directory. **http://www.NetBSD.org/mirrors/#iso**

Get and install cdrecord. This is available in the packages collection under pkgsrc/sysutils/cdrtools. Systems not supported by the packages collection should get it from the official website:

https://cdn.NetBSD.org/pub/NetBSD/packages/pkgsrc/sysutils/cdrtools/
http://www.fokus.gmd.de/research/cc/glone/employees/joerg.schilling/private/cdrecord.html

```
# cdrecord -v speed=4 dev=/dev/cd1d NetBSD-11.1-cats.iso
```

You will need to substitute the correct speed for your CD writer, as well as the correct device for your system (for i386 it would be `/dev/cd1d`).

Booting from CD-ROM

To boot from a CD-ROM simply issue the following command

```
boot> boot cd0:/netbsd
```

Installing the NetBSD System

Running the sysinst installation program

1. *Introduction*

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

2. *Possible hardware problems*

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

3. *General*

   The following is a walk-through of the steps you will take while installing NetBSD on your hard disk. **sysinst** is a menu-driven program that guides you through the installation process. 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 / DVD as the install medium.

   • What you need.

  - The distribution sets (in this example, they are on the CD or DVD).
  - Some form of bootable media, described above.
  - A minimum of 8 MB of memory installed.
  - An optical drive.
  - A hard drive with at least 500 MB of free space for a complete base install, not including room for swap. If you wish to install the X Window System as well, you will need at least 225 MB more.

- The Quick Installation

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

```
.***********************************************.
* NetBSD-11.1 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                               *
* f: Config menu                                *
* x: Exit Install System                        *
.***********************************************.
```

  - If you wish, you can configure some network settings immediately by choosing the **Utility menu** and then **Configure network**. It isn't actually required at this point, but it may be more convenient. Go back to the main menu.
  - Choose **Install**.
  - You will be guided through the setup of your disk.
  - You will be asked to choose which distribution sets to install.
  - When prompted, choose **CD-ROM** as the install medium if booted from CD-ROM. The default values for the path and device should be OK.
  - After the installation process has completed, you will be brought back to the main menu, where you should select **Reboot**, after you have removed the bootfloppy from the drive.
  - NetBSD will now boot. If you didn't set a password for the `root` user when prompted by **sysinst**, logging in as `root` and setting a password should be your first task. You are also advised to read `afterboot`(8).

5. *Booting NetBSD*

   You may want to read the boot messages, to notice your disk's name and capacity. Its name will be something like `sd0` or `wd0` and the geometry will be printed on a line that begins with its name. As mentioned above, you may need your disk's geometry when creating NetBSD's partitions. You will also need to know the name, to tell **sysinst** which disk to use. The most important thing to know is that `wd0` is NetBSD's name for your first IDE disk, `wd1` the second, etc. `sd0` is your first SCSI disk, `sd1` the second, etc.

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

6. *Network configuration*

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

7. *Installation drive selection and parameters*

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

   The first thing is to identify the disk on which you want to install NetBSD. **sysinst** will report a list of disks it finds and ask you for your selection. You should see disk names like `wd0`, `wd1`, `sd0` or `sd1`.

8. *Selecting which sets to install*

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

9. *Partitioning the disk*

   - Choosing which portion of the disk to use.

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

10. *Editing the NetBSD disklabel*

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

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

    `a` Root partition (/)

    `b` Swap partition.

    `c` The entire disk.

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

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

11. *Preparing your hard disk*

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

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

12. *Getting the distribution sets*

    The NetBSD distribution consists of a number of *sets* that come in the form of gzipped tar files. 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 transfer the sets to your hard disk, others will extract the sets directly.

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

13. *Installation from CD-ROM*

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

    sysinst will then check that the files are actually present in the specified location and proceed to the extraction of the sets.

14. *Installation using FTP*

    To install using FTP, you first need to configure your network setup if you haven't already done so. **sysinst** will help you with this, asking 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 then transfer the set files from the remote site to your hard disk.

15. *Installation using NFS*

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

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

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

16. *Installation from an unmounted file system*

    In order to install from a local file system, you will need to specify the device that the file system resides on (for example `wd1e`), the type of the file system, and the directory on the specified file system where the sets are located. **sysinst** will then check if it can indeed access the sets at that location.

17. *Installation from a local directory*

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

18. *Extracting the distribution sets*

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

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

19. *Configure additional items*

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

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

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

20. *Finalizing your installation*

    Congratulations, you have successfully installed NetBSD 11.1.

    To finalize the installation of NetBSD/cats certain parameters on the Cyclone firmware need to changed. The reason is that the Cyclone firmware is unable to boot anything other than an a.out format kernels.

    Kernels created on a NetBSD/cats 11.1 system are natively ELF and converted to a.out. This conversion process loses the symbol information used for, amongst other things, kernel memory grovelers such as vmstat. The workaround to the problem is to provide both the native ELF kernel (with all the symbol information) and the a.out kernel. These are available as /netbsd and /netbsd.aout respectively. As the a.out format kernel is not named in such a way that the Cyclone firmware will automatically find it the following command should be issued as the firmware prompt.

    ```
    boot> set boot wd0:/netbsd.aout
    ```

    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. Before all else, read `postinstall`(8).

2. Configuring `/etc/rc.conf`

    If you or the installation software haven't done any configuration of `/etc/rc.conf` (**sysinst** normally 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_tlp0="inet 192.0.2.123 netmask 255.255.255.0"
```

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

```
ifconfig_tlp0="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 networking, DHCP can be used by setting `dhcpcd=YES` in `/etc/rc.conf`.

For the `savecore`(8) facility to work with the a.out and elf kernel images supplied with cats installations you will need to set `savecore_flags="-z -N /netbsd"`

3. Logging in

   After reboot, you can log in as `root` at the login prompt. If you didn't 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.

4. 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.

5. The X Window System

   If you installed the X Window System, you may want to read the chapter about X in the *NetBSD Guide:*
   https://www.NetBSD.org/docs/guide/en/chap-x.html:

6. 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 the software may depend upon.

- More information on the package system is available at
  https://www.NetBSD.org/docs/software/packages.html
- A list of available packages suitable for browsing is at
  https://cdn.NetBSD.org/pub/pkgsrc/current/pkgsrc/README.html
- Precompiled binaries can be found at
  https://cdn.NetBSD.org/pub/pkgsrc/packages/NetBSD/
  usually in the `cats/11.1/All` subdir. If you installed `pkgin`(1) in the **sysinst** post-installation configuration menu, you can use it to automatically install binary packages over the network. Assuming that `/usr/pkg/etc/pkgin/repositories.conf` is correctly configured, you can install them with the following commands:

  ```
  # pkgin install tcsh bash perl apache xfce4 firefox
  ...
  ```

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

  If it was not automatically installed, `pkgin`(1) can be installed on a fresh NetBSD system with `pkg_add`(1):

  ```
  export PKG_PATH=https://cdn.netbsd.org/pub/pkgsrc/packages/NetBSD/$(uname -p)/$
  pkg_add pkgin
  ```
- If you wish to use the `pkgsrc`(7) framework for compiling packages and did not install it from the `sysinst`(8) post-installation configuration menu, you can obtain it by retrieving the file
  https://cdn.NetBSD.org/pub/pkgsrc/stable/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.

7. Misc
   - Edit `/etc/mail/aliases` to forward root mail to the right place. Don't forget to run `newaliases`(1) afterwards.
   - Edit `/etc/rc.local` to run any local daemons you use.
   - Many of the `/etc` files are documented in section 5 of the manual; so just invoking

     ```
     # man 5 filename
     ```

     is likely to give you more information on these files.

Upgrading a previously-installed NetBSD System

The easiest way to upgrade to NetBSD 11.1 is with binaries, and that is the method documented here.

To do the upgrade, you must have one form of boot media available. You must also have at least the **base** and **kern** binary distribution sets available. Finally, you must have sufficient disk space available to install the new binaries. Since files already installed on the system are overwritten in place, you only need additional free space for files which weren't previously installed or to account for growth of the sets between releases.

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

The upgrade procedure is similar to an installation, but without the hard disk partitioning.

Fetching the binary sets is done in the same manner as the installation procedure; refer to the installation part of the document for help. 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 11.1 system. However, that doesn't mean that you're finished with the upgrade process. You will probably want to update the set of device nodes you have in `/dev`. If you've changed the contents of `/dev` by hand, you will need to be careful about this, but if not, you can just cd into `/dev`, and run the command:

```
# sh MAKEDEV all
```

sysinst will attempt to merge the settings stored in your `/etc` directory with the new version of NetBSD using the `postinstall`(8) utility. However, `postinstall`(8) is only able to deal with changes that are easily automated. It is recommended that you use the `etcupdate`(8) tool to merge any remaining configuration changes.

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 11.1.

Note that **sysinst** will automatically invoke

```
postinstall fix
```

and thus all issues that are fixed by **postinstall** by default will be handled.

In NetBSD 9 and earlier, filesystems listed in `/etc/fstab` would be mounted before non-legacy **zfs** filesystems. Starting from NetBSD 10 this order has been reversed.

If you have ever run a version of NetBSD-current between April 18, 2020 and September 23, 2022 (the version numbers used in the affected time range are between 9.99.56 and 9.99.106) your FFS file systems might have broken extended attributes stored.

You should follow this *guide:*

https://wiki.netbsd.org/features/UFS2ea/

before booting the updated system multi-user for the first time.

Note that you do not need to do anything special if you never did run any affected kernel, especially if you have never run NetBSD-current.

A number of things have been removed from the NetBSD 11.1 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. See **https://www.NetBSD.org/mailinglists/** for details.

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
https://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 **https://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 NetBSD, 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. If you'd rather not do that, mail the list saying you'll send the data to those who want it.

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- We list the individuals and organizations that have made donations or loans of hardware and/or money, to support NetBSD development, and deserve credit for it at **https://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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