2. Installing NetBSD

Installing NetBSD is usually quick and easy. Several methods are available for installing NetBSD. This chapter covers installing NetBSD from CD and shows the *sysinst* installer for interactive operating system installation. It also covers a few common installation ideas and issues.

2.1. Getting NetBSD

The NetBSD project provides free downloads of the NetBSD operating system. Usually the easiest way to install NetBSD (on most ports) is to boot from the installation CD. While some vendors sell official NetBSD CDs, you can always download official ISO images direct from NetBSD. The official master site for the ISO images is at `ftp://iso.netbsd.org/pub/NetBSD/iso/` for FTP and `http://iso.netbsd.org/pub/NetBSD/iso/` for HTTP downloads. The list of FTP download mirrors that provide ISO images is at `http://www.netbsd.org/mirrors/#iso`.

Several supported release versions may be available. At the time of this book's printing, the supported releases include 4.0, 4.0.1, 5.0, 5.0.1, 5.0.2, and 5.1. (This book also introduces NetBSD 6.0.) The website at `http://www.netbsd.org/` lists the latest release version.

Use your preferred download client (or web browser) to download the ISO image. The release subdirectories (like 5.1) have the CD images with the ".iso" file name extension.

Choose the ".iso" file for your preferred platform. Note that the most popular are "i386cd" for the x86 family of processors found on common PCs and "amd64cd" for 64-bit AMD64 (or Intel EM64T) systems. Also available is the convenient "i386pkg.iso" download which contains the bootable installer for i386 platforms plus a useful collection of popular add-on software packages. (This packages CD will be introduced in Chapter 12, but this CD is not required for installing NetBSD or for installing packages.) The "multi-cd" downloads provide bootable installers for several ports per CD.

See Table A.1 for the list of NetBSD ports. If you don't know what port to download, visit the NetBSD Ports webpage at `http://www.netbsd.org/ports/#in-tree-ports` to learn more about these choices. The individual port webpages linked from there provide more details.

Note that the installation directions in this book do not cover specific installation techniques for non-popular platforms. Installation directions are available on the website and with the installation media for each port.

Also available are torrent files for downloading (and sharing) using the BitTorrent protocol.

Included at the download site are checksum files which are useful for verifying the integrity of the large downloads. For example, the following shows the SHA1 checksum of a downloaded file and the contents of the corresponding ".SHA1" file:

```
$ sha1sum i386cd-4.0.iso
7e79081ebbbc8ad33bcdc3bfc888bce3059d21ec    i386cd-4.0.iso
$ cat i386cd-4.0.iso.SHA1
SHA1 (i386cd-4.0.iso) = 7e79081ebbbc8ad33bcdc3bfc888bce3059d21ec
```

(The above example is on a Linux system; on BSD systems the tool is called **sha1**.)

After successfully downloading the ISO image, burn it to a CD using your preferred CD writing software. (Section 29.3 has examples of burning CDs on NetBSD itself.)

NetBSD often can be installed using network boot, where a physical CD is not needed.

2.2. Starting installation

Installing NetBSD will overwrite data on your hard disk. The installer can format your entire disk or just a single partition. The NetBSD installation CD does not provide a tool to resize file systems; changing sizes of disk partitions using the NetBSD installer will cause data loss. Be sure to back up any or all data on the disk first if needed.

To start your installation reboot (or power up) your computer with the bootable NetBSD CD inserted. Also be sure that your system knows to boot from CD first (at least for now).

When the CD initially boots it will show something like:

```
Booting from CD-Rom...

NetBSD/i386 cd9660 Primary Bootstrap


>> NetBSD/i386 BIOS Boot, Revision 3.3
>> (builds@wb34, Sat Dec 15 23:17:28 PST 2007)
>> Memory:  639/31744 k
Press return to boot now, any other key for boot menu
booting cd0a:netbsd - starting in 5
```

Simply press the **Enter** key or wait five seconds for it to boot the NetBSD kernel. (The boot loader is covered later in Section 7.6.)

When NetBSD boots many messages are printed to the console. Figure 2.1 shows an example of some of these initial boot messages from the NetBSD kernel and from **init**. (More details about the boot process are covered in chapter 4.)

Depending on the system, you may be prompted to choose your terminal type. It may list a default in brackets, like:

```
Terminal type?  [vt100]
```

Press **Enter** to choose the default, or type in the known terminal type. (Some terminal types are introduced in Section 5.2.1.)

Some ports may show a prompt like:

```
(I)nstall, (S)hell or (H)alt ?
```

Type **I** and press **Enter** to continue to the installer. (Or advanced users may use the shell to install NetBSD manually.)

2.3. sysinst

The **sysinst** program is the standard NetBSD system installation wizard. It is a menu-driven, text-based utility for choosing how to install NetBSD. You can use letters to select corresponding menu choices, less than (<) and greater than (>) keys to page up or down for long menus, **Ctrl-N** to highlight next entry and **Ctrl-P** to highlight previous entry, press **Enter** to

```
vga0 at isa0 port 0x3b0-0x3df iomem 0xa0000-0xbffff
wsdisplay0 at vga0 kbdmux 1: console (80x25, vt100 emulation), using wskbd0
wsmux1: connecting to wsdisplay0
isapnp0 at isa0 port 0x279: ISA Plug 'n Play device support
npx0 at isa0 port 0xf0-0xff
fdc0 at isa0 port 0x3f0-0x3f7 irq 6 drq 2
isapnp0: no ISA Plug 'n Play devices found
timecounter: Timecounter "TSC" frequency 2000560 Hz quality 800
timecounter: Timecounter "clockinterrupt" frequency 100 Hz quality 0
Kernelized RAIDframe activated
md0: internal 5000 KB image area
atapibus0 at atabus0: 2 targets
cd0 at atapibus0 drive 1: <Generic 1234, BXCD00001, ALPHA1> cdrom removable
cd0: drive supports PIO mode 3, DMA mode 1
wd0 at atabus0 drive 0: <Generic 1234>
wd0: drive supports 16-sector PIO transfers, LBA48 addressing
wd0: 58512 KB, 1219 cyl, 16 head, 6 sec, 512 bytes/sect x 117024 sectors
boot device: <unknown>
root on md0a dumps on md0b
root file system type: ffs
WARNING: clock gained 8 days
WARNING: CHECK AND RESET THE DATE!
warning: no /dev/console
init: Creating mfs /dev (488 blocks, 1280 inodes)
```

Figure 2.1.: NetBSD boot messages

activate or toggle selections, and on some keyboards you may use arrow keys and page up and page down keys to move within menus.

In most menus, pressing **Ctrl-C** will abort **sysinst** and you will be at a simple shell prompt. You can type **sysinst** to restart the installer. (In some installation screens, pressing **Ctrl-C** will just abort the current task.)

2.3.1. Language and keyboard for installer

The first installer screen is for choosing the language for the **sysinst** messages. The choices — as shown in Figure 2.2 — are English, French, German, Polish, and Spanish. Highlight your choice and then press **Enter**.

Note that the language choice does not affect the actual NetBSD configuration. NetBSD will default to English in its first boot. For information about configuring internationalization and localization later, see Section 32.3.

```
Welcome to sysinst, the NetBSD-4.0 system installation tool.  This
menu-driven tool is designed to help you install NetBSD to a hard disk, or
upgrade an existing NetBSD system, with a minimum of work.
In the following menus type the reference letter (a, b, c, ...) to select an
item, or type CTRL+N/CTRL+P to select the next/previous item.
The arrow keys and Page-up/Page-down may also work.
Activate the current selection from the menu by typing the enter key.




            >a: Installation messages in English
             b: Messages d'installation en français
             c: Installation auf Deutsch
             d: Komunikaty instalacyjne w jezyku polskim
             e: Mensajes de instalación en castellano
```

Figure 2.2.: Choose language for sysinst

The next menu (on i386, amd64, and shark platforms) is for choosing your keyboard type. Press **Enter** to use the default "unchanged" or select your desired keyboard type, such as UK-English, Swiss German, Ukrainian, and others. If you choose a non-default encoding, after the distribution sets are extracted (in Section 2.3.18), it is recorded in your /etc/wscons.conf file so your keyboard will work correctly when you boot NetBSD. Console configurations are covered in Section 5.1.

2.3.2. Main installer menu

The main **sysinst** menu is shown in Figure 2.3. The main menu choices are: install to hard disk, upgrade NetBSD, install sets, reboot, utilities, and exit. The utilities submenu — covered in Section 2.3.32 — provides access to the shell, allows you to set the timezone, configure networking, and enable logging of **sysinst** installation steps.

To install NetBSD for the first time, just press **Enter** to select the default "Install NetBSD to

hard disk."

```
Welcome to sysinst, the NetBSD-4.0_RC4 system installation tool.  This
menu-driven tool is designed to help you install NetBSD to a hard disk, or
upgrade an existing NetBSD system, with a minimum of work.
In the following menus type the reference letter (a, b, c, ...) to select an
item, or type CTRL+N/CTRL+P to select the next/previous item.
The arrow keys and Page-up/Page-down may also work.
Activate the current selection from the menu by typing the enter key.

If you booted from a floppy, you may now remove the disk.

Thank you for using NetBSD!

              NetBSD-4.0_RC4 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
```

Figure 2.3.: Main sysinst menu

2.3.3. Okay to install

As mentioned earlier, the next screen warns about modifying the hard disk, suggests you should have made a full backup, and briefly explains the upcoming procedure (which includes partitioning the disk and creating new file system). Since you are ready to install NetBSD, specifically select "Yes" and press **Enter** to continue.

2.3.4. Hard disk to install on

The next **sysinst** display will show the hard disk (or disks) it found, such as wd0, wd1, or sd0.[1] These disks are identified by their NetBSD device name and disk number. (Details

---

[1]These are only examples, not an exhaustive list.

8

about disk names are found in Chapter 20.)

Press **Enter** to continue to install NetBSD on the detected disk. Or if you have multiple choices, first select the desired disk to install on.

If you don't know which disk is which, you may be able to find out. Temporarily suspend the installer by pressing **Ctrl-Z**. This will give you a Unix shell prompt. Then search for the hardware in the kernel boot messages; for example to search for all "wd" disks:

```
# dmesg | grep wd[0-9]
```

If your system has one or more "wd" disks, the output may tell you details about that hardware including its size.

To get back to **sysinst**, type **fg** (and press **Enter**) at the shell prompt to bring the installer back to the foreground.

2.3.5. Distribution sets

NetBSD is made up of several *distribution sets.* These sets include required base software, a kernel, and default configurations. There are also various optional sets for compilers and development files, X Windowing System programs and servers, documentation, and more. (Note that this core operating system can be extended with thousands of third-party software packages easily installable after NetBSD is installed. The package system is introduced in Chapter 12.)

The installer asks if you want a full or minimal installation or allows you to choose your own sets. To view the available installation sets choose the "Custom installation" choice in the menu. The sets selection screen is shown in Figure 2.4; this example displays the custom selection menu with all sets and the default kernel selected.

The sets include one or more kernel choices. Only one may be selected. On most platforms, the default kernel is selected. But note that some ports don't have an appropriate default kernel so the you need to select the kernel specific to your actual hardware. (NetBSD 6 also provides a separate kernel modules set.)

The set choices also include:

  base – Required for installation. Includes standard Unix shells, tools, libraries, and services.

comp – Various development tools: NetBSD tools for configuring kernel and making crunched binaries, GNU assembler, GNU linker, GNU binary utilities, CVS suite, GNU gettext tools for providing messages in different languages, GNU debugger, fast lexical analyzer generator (lex), Yacc, make build files, many include headers, developer manual pages, GCC compiler suite (without Java or Fortran), and more.

etc – Default system configurations and startup scripts in the `/etc` directory, **MAKEDEV** script, root's default dot files, default crontab, and miscellaneous files and directories under `/var`. This is not needed for upgrades but is required for installs.

games – Various activities, amusements, quizzes, and games. Also includes the **fortune** program and its various databases.

man – Manual pages and documentation in the "texinfo" format. Pre-formatted man pages are also included (in addition to original "roff" source). NetBSD includes over 2000 manual pages. (Other sets include other manual pages also.)

misc – Dictionaries, various documentation (including HTML and old historical documentation), various configuration examples, and miscellaneous text files of phone area codes, zip codes, meanings of flowers, etc.

tests – Various Automated Testing Framework (atf) test suites for NetBSD. This was introduced in NetBSD 5.

text – Text processing tools for groff/nroff/troff, Texinfo documentation tools, groff fonts, various roff macros, and related documentation.

xbase – Standard X11 clients and X11-related tools, bitmap files, locale files, X keyboard definitions, standard X11 shared libraries, Expat XML parser library, Fontconfig, and related manual pages.

xcomp – Various tools for X11-related programming, including development headers, X11 function manual pages, and X11 library archive files.

xetc – Default X11 and Fontconfig configuration files.

xfont – Numerous fonts and related files for X11, including PostScript outline fonts, bitmap fonts, character encoding maps, font alias definitions, font cache files, etc.

xserver – X11 servers (and modules depending on platform), related utilities, and corresponding manual pages. Platform-specific X servers may be included. Some platforms may not include the xserver distribution set. For more details about available X servers see Chapter 27.

The minimal installation just selects a kernel (GENERIC on most platforms), the base set, and the etc set. Note that the minimal choice does not include manual pages. Also select the "Online Manual Pages" for a lightweight install.

The full installation includes all the distribution sets that are likely needed for your platform. On most platforms, this includes the first kernel choice and all available sets. Note that some ports don't have a default kernel and some may not have a frame buffer device and therefore don't include an X server.

```
The following is the list of distribution sets that will be used.

    Distribution set          Selected
    ----------------------- --------
a: Kernel (GENERIC)             Yes
b: Kernel (GENERIC.MP)          No
c: Kernel (GENERIC_LAPTOP)      No
d: Kernel (GENERIC_DIAGNOSTIC)  No
e: Kernel (GENERIC.NOACPI)      No
f: Base                         Yes
g: System (/etc)                Yes
h: Compiler Tools               Yes
i: Games                        Yes
j: Online Manual Pages          Yes
k: Miscellaneous                Yes
l: Text Processing Tools        Yes
m: X11 sets                     All
x: Install selected sets
```

Figure 2.4.: Distribution sets

The custom installation option defaults to just the minimal sets. Toggle sets by pressing **Enter** on the selected set. Set to "Yes" for **sysinst** to later install the corresponding set.

The "X11 sets" choice will open a sub-menu to choose the X11 sets. (Select "x: Install selected sets" to return to the main distribution sets menu.) NetBSD 4 uses XFree86 for its X11 implementation. On NetBSD 5 and 6, various NetBSD platforms use X.org instead. This is explained in Chapter 27.

Choose "x: Install selected sets" to continue.

2.3.6. Disk geometry

On some platforms, the installer will attempt to detect the geometry (cylinders, heads, sectors) for the hard disk to install on and it will show the settings.

If you need to change this, select "Set the geometry by hand".

Or select "This is the correct geometry" to continue.

In the case that it can't determine the BIOS geometry for the disk, it will prompt for the sectors and heads. You may press **Enter** for the defaults or enter your required settings for number of sectors per track (maximum 63) and number of heads (maximum 256).

2.3.7. Master Boot Record

Several platforms do not have a DOS-style Master Boot Record (MBR). If **sysinst** doesn't have the "Edit the MBR partition table" choice, skip this section and continue in Section 2.3.11.

On many platforms (including i386 and amd64), NetBSD uses an MBR. The MBR includes bootable code and a partition table. NetBSD is installed in a fdisk-style partition — often called a "slice" — recorded in the MBR. This partition will also be divided up into further sub-partitions later.

As shown in Figure 2.5, you can choose to modify or create your own MBR partitions, or let **sysinst** use the entire hard disk (which will create a single partition).

Normally you would choose "b: Use the entire disk" unless you have existing partitions with data or other operating systems or you plan to multi-boot the system (boot other operating systems from the same hard disk).

2.3.8. Install boot code

After you make your selection (edit partition table or use entire disk), **sysinst** will attempt to detect if your Master Boot Record is valid and will prompt to install the NetBSD bootcode, update the bootcode, or — if you chose to use a boot selector — ask if you want to install the NetBSD bootselect code.

```
We are now going to install NetBSD on the disk wd0.

NetBSD requires a single partition in the disk's MBR partition table, this is
split further by the NetBSD disklabel.  NetBSD can also access file systems
in other MBR partitions.

If you select 'Use the entire disk' then the previous contents of the disk
will be overwritten and a single MBR partition used to cover the entire disk.
If you want to install more than one operating system then edit the MBR
partition table and create a partition for NetBSD.

A few hundred MB is enough for a basic installation, but you should allow
extra for additional software and user files.
Allow at least 5GB if you want to build NetBSD itself.

        Which would you like to do?

        a: Edit the MBR partition table
       >b: Use the entire disk
```

Figure 2.5.: Use entire disk or MBR partitions

Normally you would just choose "yes" unless you have a boot selector already installed that you don't want to overwrite. If you don't install a boot code, it may be difficult to convince your system to actually boot NetBSD even though it is installed.

Note that some platforms (like arc, hpcmips, cats, and others) don't provide a choice for choosing a boot loader.

2.3.9. MBR Partition Editor

This menu is skipped if you chose to use the entire disk — or if your platform doesn't use the Master Boot Record.

The MBR editor shows the "Current MBR partition table". You can select different input units to show in sectors or cylinders instead of default megabytes (MB).

Many i386 and amd64 platforms offer a "Bootmenu" field and a "bootselect default" choice.

(Other platforms normally don't support the boot selector.)

You can modify the four partitions (labeled "a" through "d"). When you select one of the partitions, **sysinst** will open a submenu to modify various attributes:

type – This identifies the file system type of the operating system using the partition (displayed as "Kind" on the previous menu). If this is selected, a submenu will open. For your NetBSD installation, choose "NetBSD". Other types are available too — use the **<** or **>** (or PageUp or PageDown keys) to scroll through a long list of types. You can choose "Other, input number" to optionally enter an identification by decimal number.

start – Beginning of the partition. If input unit is MB, then default for beginning of disk is "0". Or if sectors, beginning of disk is at sector 63.

size – Length of the partition. If the disk didn't have an MBR partition table, the installer may default this to the size of the whole disk when a new "type" is added. Or it may default to the leftover size.

end – This field is just informational and you can't select it. To adjust it, simply edit the size field instead.

active – This is the partition that the MBR boot code will boot by default. Only one can be marked active. Selecting this field will toggle between "Yes" and "No".

install – Choose to actually install on this partition. Selecting this field will also toggle between "Yes" and "No".

input units – Show the sizes in sectors, cylinders, or megabytes.

In addition, most i386 and amd64 ports will also have these boot selector fields:

bootmenu – This is used to enter a boot menu identification for a partition.

default – This defines the default partition to boot from.

Note that you do not need to create separate partitions for swap or multiple NetBSD file systems during this step as that is done in the disklabel partitions later during the installation.

You can delete the partition by choosing the "type" field and then selecting "Delete partition".

When finished setting up a partition in the submenu, choose "x: Partition OK". Then you can continue with other partitions if desired.

Extended partitions are done via the "type" submenu.

When finished with this MBR partition editor, choose "x: Partition table OK".

Note that if you have multiple NetBSD slices defined for your MBR partition table, **sysinst** will complain. It will ask you to edit it again, so choose "Yes" to go back to the MBR partition editor. (If you choose "No" it will continue to the disklabel editor.) And then select the partition and then toggle the "install" field to "Yes".

2.3.10. Check boot code

Some platforms require special partitions to install a native bootloader. For example, the arc port needs a FAT12 file system and cobalt needs a Linux Extfs file system. The installer will warn about this and prompt to re-edit the MBR partition table. (If this happens to you, choose the default "Yes" and add the needed partition.)

On i386 and amd64 platforms, the installer will attempt to check if the "NetBSD part of the disk lies outside of the range that the BIOS on your machine can address." It will tell you if it thinks booting may not be possible. If you choose the default "No", it will take you back to the MBR partition editor so you can re-order and resize your partitions as appropriate. Or you can choose "Yes" to continue.

The installer also checks to see if the boot code in the MBR is valid.

2.3.11. sysinst and disklabel partitions

The next step is to create the disklabel or BSD partitions. (If your platform uses MBR partitions, then these are partitions within partitions.) The **sysinst** program has two disklabel editors. You can get to the simple menu by choosing "Set sizes of NetBSD partitions". The advanced editor is "Use existing partition sizes".

Note that if this is the first installation of any BSD or no disklabel exists on the NetBSD part of the disk, then the "existing partition sizes" will be unset or may result in invalid values. It is often easier to use the simple editor first. And even if you choose the simple editor, when it exits, you can double-check or modify the settings in the advanced editor.

2.3.12. Simple disklabel editor

The simple system partitions editor (as seen in Figure 2.6) defaults to one partition for the root file system (/) and one partition for the swap file system (for virtual memory). These will have computed values if you previously selected to use the entire disk. The rest of the disk (the free space) will be used for the / file system. The /tmp directory defaults as a memory-based file system. While the default interface shows /usr, /var, and /home — these default to 0 MB and no partitions are created for them (so they end up on the / file system).

This menu doesn't have letters to correspond with menu choices — so if your arrow keys don't work, use **Ctrl-N** to highlight next entry and **Ctrl-P** to highlight previous entry.

```
You can now change the sizes for the system partitions.  The default is to
allocate all the space to the root file system, however you may wish to have
separate /usr (additional system files), /var (log files etc) or /home
(users' home directories).

Free space will be added to the partition marked with a '+'.

        MB          Cylinders    Sectors      Filesystem
>      467   (871)        949     956592   +  /
       128                261     263088      swap
         0                  0          0      tmp (mfs)
         0                  0          0      /usr
         0                  0          0      /var
         0                  0          0      /home
   Add a user defined partition
   Change input units (sectors/cylinders/MB)
   Accept partition sizes.  Free space 404 MB, 12 free partitions.
```

Figure 2.6.: Simple disklabel editor

If you press enter on one of the file system entries, you will be prompted for the size in megabytes (just type the number). If you include the plus sign (+) as the suffix of the number size, it will mean that any free space after your partitioning will go to that file system. The number in parentheses in the partitions display is the total size which includes the free space.

If you plan to later use extra disk space for other partitions, select the one partition marked to use the free space and press **Enter**. Then re-enter the size without appending the "+". Make sure it is large enough for your needs.

Note that this simple editor doesn't provide an option to delete existing or default partitions. Don't worry as any partition marked as 0 MB won't be created — and the upcoming advanced editor can be used (if needed) to finetune the partitioning.

You can create a partition by selecting "Add a user defined partition". It will prompt you for a mount point — enter a directory name there starting with a slash. Then enter the size in megabytes. (If you enter "0" for the size in the user-defined partitions, it will delete it.) If you have many partitions, you may need to scroll down to access them.

You can also select "Change input units (sectors/cylinders/MB)" to choose sectors or cylinders instead of megabytes for the inputs.

Scroll down to "Accept partition sizes" when done with this simple editor. This option will not be available and will show "Reduce partition sizes" with an amount if the defined sizes are too large (so adjust as needed).

2.3.13. Advanced disklabel editor

The advanced disklabel partition editor provides a better view of the partitions to be created. If you only have a few partitions, you can select "Show all unused partitions" to access more potential partitions. Note that the letters correspond with the real partition names. For example, on wd0 the "a" represents wd0a. Historically, "a" is the root (/) file system and "b" is the swap (virtual memory) partition.

On non-MBR systems, the "c" represents the entire disk. On platforms that use MBR partitions, the "c" represents the entire MBR partition and the "d" represents the entire disk. (Note that you can't select these special partitions as they can not be modified.)

If you have multiple disks or MBR partitions, the **sysinst** disklabel editor will detect and list the multiple disklabel partitions.

If needed, select a partition to modify it. A new menu will be displayed to modify various fields. Depending on the file system type or partition, some fields may be blank. The possible fields include:

FStype – The file system type. Choosing this brings up another submenu. If you choose "unused" then this partition is not created. Various file system types are available from this submenu or by choosing "other types". NetBSD's standard file system is "FFSv1".

start – The starting point of the partition. Using "-1" means to start at the beginning of the NetBSD part of the disk. Using a letter like "a" or "e" (or other previous disklabel letters) means to start at the end of that corresponding partition.

size – The size of the partition. (Default units are in megabytes.) Entering "-1" means to use the rest of the NetBSD part of the disk. Or using a letter like "g" or "o" (or other disklabel letter) means to end the partition where that corresponding partition begins.

end – This field may not be modified. It just shows the end point in megabytes, cylinders, and sectors.

newfs – Only for FFS, UFS, and LFS file systems, this field is for choosing to initialize a new file system for the corresponding partition. Selecting this option toggles from "Yes" to "No". Set to "Yes" to later create the new file system. Or choose "No" to not destroy an existing file system. (Choosing "Yes" will destroy the filesystem, and "No" leaves it.)

avg file size – Only applicable for FFS file systems. This is for bytes per inode. Defaults to 4 fragments. Use a smaller number for more inodes (many small files or symlinks) or larger number for less inodes.

block size – Only applicable for FFS and LFS file systems. The default block size depends on the size of the file system and the default fragment size. Selecting this provides a submenu with four choices: 4096, 8192, 16384, and 32768 bytes.

fragment size – Only applicable for FFS file systems. The default file system fragment size is 2048 bytes for file system sizes over 1 GB (or 1024 bytes for smaller file systems). Selecting this provides a submenu with these choices: 512, 1024, 2048, 4096, 8192, 16384, and 32768 bytes.

mount – Tells **sysinst** to mount the file system at installation time and also via `/etc/fstab` for the future. Selecting this option toggles for "Yes" or "No".

mount options – Selecting this opens a submenu to toggle special mount options: async, noatime, nodev, nodevmtime, noexec, and nosuid. The installer will also create a default `/etc/fstab` file which will include the mount options. See Section 20.5 for

more details about mount options. The submenu exits after each selection. Or choose "x: unchanged" to exit the submenu.

mount point – Select the directory name where this partition's file system should be mounted. One some ports (like on arc, cobalt, and ofppc), it may automatically assign mount points for required native bootloader partitions.

For the average file size, block size, and fragment size (on supported file systems), you can almost always use the suggested defaults. For more information about **newfs** and file system tuning, see Section 20.11.

As in the previous disklabel editor (and MBR editor), you can change the input units.

Be sure to have a "/" (slash) file system, as that will be used for the base installation. Also make sure the "newfs" and "mount" options are enabled for new installs.

You can reset your changes by choosing "Restore original values". Exit this submenu to continue to the next step (or to return to the advanced disklabel partition view) by selecting "x: Partition sizes ok".

2.3.14. Name your NetBSD disk

At this point, **sysinst** will ask you to choose a name for your NetBSD disk. You may press **Enter** to use the default which is the detected hardware name. This is later useful to distinguish identical disks.

2.3.15. Write to disk

Up this point, your hard disk has not been formatted yet. The installer will ask if it is okay to install NetBSD. Specifically choose "Yes" and the installer will:

- Write the edited MBR to the disk / setup the DOS partition table (if your platform uses that).

- Create the BSD disklabel.

- Format the needed partition(s) for BSD file systems. (Some platforms may support creating other file systems at this time also.) Note that only partitions previously marked as "Yes" for "newfs" in the disklabel editor are formatted.

- Mount the new file system(s).

- Create the `/etc/fstab` file. This contains information so that the required file systems are mounted at boot. For more details, see Section 20.4. In addition, new mount point directories are created (if needed).

(In NetBSD 4, **sysinst** will prompt you between steps — so press **Enter** to continue.)

2.3.16. Choosing bootblocks

The bootblock is a small amount of executable code on the disk for beginning to load the operating system. This primary bootstrap then loads a more advanced, customizable, and larger boot loader — the secondary bootstrap.

On i386 and amd64 platforms, you can choose between your console at boot as either the normal BIOS console (like physical keyboard and video display) or using serial communications for the console.

The default is what is currently being used by the installer (and in most cases is the BIOS console).

From the menu, you can select to use the BIOS console or various serial ports (com0 through com3). You can also choose the desired baud rate for the serial connection if needed. 9600 is pretty much the standard — settings on both ends have to be the same so deviating from that standard is risky.

If you already have a boot loader installed, then select "Use existing bootblock".

After your selection, choose "x: Exit".

2.3.17. Installing boot blocks

On most platforms, the disk "bootstrap" software is then installed and/or a boot loader is copied into place.

2.3.18. Fetch and extract sets

You can choose how verbose the installation of the files is, such as listing every file name (verbose), showing an updated time estimate (progress), or being silent. Just press **Enter** to use the default progress bar.

2.3.19. Media choices

The desired sets were selected earlier in Section 2.3.5. Even if you booted from a CD, you can choose an alternative location for the sets, such as an FTP server on the internet. The media choices are: **CD** or **DVD**, **FTP**, **HTTP**, **NFS** (network file system), **floppy disk**, **unmounted file system**, and **local directory**. (NetBSD 4 versions also include a **none** choice.)

This installer screen also shows a count of how many sets were previously selected and how many are left to install with the name of the next set to retrieve.

2.3.20. CD-ROM

If installing from a CD-ROM, then press **Enter** to install from that default choice.

The next screen will allow you to select the device and directory on the CD where the tarball set files are located. With standard NetBSD ISOs, the defaults should be correct. For example, the device may show "cd0a" and the set directory may point to /pmax/binary/sets.

Note: don't include /dev/ as part of device name as that is prepended automatically.

Choose "x: Continue" to use the defined settings.

It will mount the CD. (On NetBSD 4, it will prompt you to press **Enter** to start the extraction from it.)

2.3.21. Networking setup

The other common media choice is "FTP" to retrieve sets over the network.

If you choose FTP, HTTP, or NFS for your installation media (or if you choose "Configure network" from the Utilities menu), then you will be prompted to setup your networking.

It will first detect and list the usable network interfaces, such as *le0*, *tlp0*, *ne0*, or many other supported NetBSD drivers for detected network devices. Type in the device you want to use or press **Enter** if **sysinst** only detected one device.

It will then prompt for the network media type. Press **Enter** to use default "autoselect" or enter the appropriate interface media type (which, in most cases, is not needed).

DHCP for automated assignment of some network settings is available for the amd64, cats, evbarm, evbsh3, hp700, hpcarm, hpcmips, hpcsh, i386, landisk, mac68k, ofppc, sgimips,

shark, sparc64, and zaurus platforms. (Some platforms do not include the **dhcpcd** due to size issues.)

If using DHCP, choose the default "Yes" when asked to perform DHCP autoconfiguration, else choose "No".

If you chose DHCP, the installer will run the DHCP client and will display your DNS domain, your host name, and the IPv4 address for your name server. Or you can manually set these.

IPv6 is available in the installer for the amd64, cats, hp700, i386, ibmnws, macppc, ofppc, rs6000, sparc64 (since NetBSD 6), x68k, and zaurus ports. Their installers will ask if you want to perform IPv6 autoconfiguration and then prompt for an IPv6 name server.

If not using DHCP, it will also prompt for your IPv4 address, as well as its IPv4 netmask and the IPv4 gateway address (the default route).

Then you will be shown the values you entered or were detected, for example as shown in Figure 2.7.

If not okay, then choose "No" to start again with choosing interface device, network media type, DHCP (or not), and other network details. Note that it will remember your previous choices as new defaults (and display them within brackets), so you can press **Enter** for them as appropriate.

Choose "Yes" when ready. There may be a slight delay as it configures your networking. If not using DHCP, it may show the **ifconfig** command to configure the network interface — press **Enter** to continue. It will then show it running **route** and then a **ping** to verify that the network is up. Press **Enter** again to continue.

If there was a networking problem, you will be prompted to continue or not. If this happens, you can select "Yes" to reconfigure your networking or "No" to ignore the error and continue to next step.

If you choose to continue, it will then prompt again if you want to continue; select "Yes" to continue or "No" to exit the installer.

2.3.22. Download details

When using FTP, HTTP, or NFS as the installation media — and after the networking is enabled — the next display will allow you to select where to download the distribution sets from.

```
The following are the values you entered.

DNS Domain:             reedmedia.net
Host Name:              cats
Primary Interface:      tlp0
Host IP:                10.0.0.1
Netmask:                255.0.0.0
IPv4 Nameserver:        10.0.0.254
IPv4 Gateway:           10.0.0.254
Media type:             autoselect
                        +-----------------+
                        ¦ Are they OK?    ¦
                        ¦                 ¦
                        ¦>a: Yes          ¦
                        ¦ b: No           ¦
                        +-----------------+
```

Figure 2.7.: Network values

The menu choices are:

- **Host** – For FTP and HTTP, this will have a default hostname for the download site, `ftp.NetBSD.org`. (Note the hostname says "ftp" but if you chose HTTP it will use "http://" for it. Some of the FTP download mirrors also provide HTTP service.)

  If using NFS, the Host field will initially be blank; so select it and enter the hostname for the NFS server hosting the distribution sets.

- **Base directory** – Top level of directory on FTP server before the ports specific location, such as `pub/NetBSD/NetBSD-4.0.1`.

  For NFS, this is the directory to mount on the remote file server and the default is `/bsd/release`.

- **Set directory** – The port's specific directory, such as `/cats/binary/sets`.

- **User** – The login username to use for FTP authentication. The default *ftp* is standard for anonymous FTP access. (This field is not shown when doing NFS install.)

- **Password** – Not set by default since it is not needed for anonymous FTP, but enter a password if needed. (This field is not shown when doing an NFS install.)

- **Proxy** – This is the URL to use for an FTP or HTTP proxy to use for FTP or HTTP URL requests. By default, this is not set (empty) and is not used. (This field is not shown when doing NFS install.)

- **Transfer directory** – The directory to store downloaded files. The default is `/usr/INSTALL`. (This field is not shown when doing NFS install.)

- **Delete after install** – This opens a sub-menu to choose "Yes" or "No". The default is to delete the downloaded sets after extracting them. (This field is not shown when doing NFS install.)

You can select an item to change it; for example, you could select "Host" and then type in `ftp.de.NetBSD.org`.

The final location will be created from several components; for example, for HTTP, it will combine the `http://` with the *Host*, *Base directory*, *Set directory*, and the final distribution set name (which has `.tgz` appended).

Usually the defaults are correct.

Choose "Get distribution" to begin downloading the files, and **sysinst** will show you its download progress.

2.3.23. Problems

The following are some example error messages for problems that may be encountered.

```
ftp:  Can't lookup 'ftp.NetBSD.org:ftp':  No address associated with
hostname

tar:  Cannot create ....  (no such file or directory)

d0 (pciide0:1:0):  medium error, info = 9408 (decimal), data=00 19 00 00
11 00 0
```

```
tar:  Unexpected EOF on archive file
```

If the extraction fails, it may prompt you to press **Enter** to continue – and then it will return you to the media choices menu where you can choose a different location to retrieve sets from or reconfigure your networking (if using a network-based location).

2.3.24. Extracting sets

Then, **sysinst** will show the outside commands it is running as it retrieves the tarballs and extracts them to your disk.

If the installation is incomplete or fails, **sysinst** will tell you.

After the sets are extracted to your disk, the device nodes are created.

2.3.25. Extraction complete

Then the installer will tell you the extraction is complete. Press **Enter** to continue on to some essential configurations.

2.3.26. Save network configuration

If you configured networking, the installer will ask if you want to save the network information for use at the first real boot.

It defaults to "No" — if you want it to save these details, select "Yes" and press **Enter**.

2.3.27. Timezone

The installer will show the default timezone, your current selected choice, and the local time and date using your selected time zone.

A menu shows a categorized list of timezones, organized by country or regions, and also by timezone names.[2] Navigate the choices and press **Enter** on your desired or local time zone and then the top of the display will be updated with this new selection (and the "Exit" option

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[2]Note that if the base set was not extracted, it won't have timezones to choose from.

on the menu will be highlighted). If your arrow keys don't work, use **Ctrl-N** to highlight next entry and **Ctrl-P** to highlight previous entry and use **<** and **>** for page up and page down.

Also if the menu of choices disappears, then press the spacebar.

Press **x** to jump to the "Exit" menu entry (at the end) and press **Enter** to accept the "Selected" choice and to go to the next menu.

2.3.28. Password cipher

This screen lets you choose what hash or cipher format to use for the user password database. NetBSD provides the historical DES format which is compatible with most other Unix systems, but it only takes advantage of the first eight letters of long passphrases. It also provides the MD5 and Blowfish password formats. (The latest versions of NetBSD also offer the SHA1 format.)

Choose your desired password hash format in the menu or — to just use the default — select "do not change".

If you choose a password cipher type, then it will save these details in your `/etc/passwd.conf` file.

More information about this is covered in Section 8.3.3.

2.3.29. Root password

This installation screen is for setting the password for the superuser (also known as "root") account.

If you don't set it, it will be empty and you can login without any password prompt.

If you select "yes" (the default) to set your password, the installer will prompt you for your new password. Note that it will not display any indication while you enter it. Press **Enter** when ready. It may complain if your password is not acceptable and you may need to type it again. You will be prompted to retype your password to confirm that it was entered as you expected.

2.3.30. Default shell for root

The default shell on NetBSD is the standard Bourne (or POSIX) shell (`/bin/sh`). Historically, BSD systems used **csh** as the default superuser shell.

In this menu, select your desired shell for your root user or simply press **Enter** to use the default. The choices are `/bin/sh`, `/bin/ksh` (the public domain Korn shell which is very similar to "sh"), and `/bin/csh`.

2.3.31. Installation complete

Behind the scenes the installer checks if the kernel and critical commands and configurations now exist in the destination disk partition.

Also on i386 and amd64 platforms it enables "wscons" for the first boot and enables getty (for logins) on four virtual terminals. (For more information, see Section 4.1.)

At this point, **sysinst** should say the installation is now complete and share a few suggestions for initial configuration (after the reboot).[3] Press the **Enter** key to continue.

Then it goes back to main Welcome screen. At this point, you may reboot the computer.

2.3.32. Utilities

The utilities menu provides a menu to run a shell, set your timezone, configure the networking, save installation logs and steps, and halt the system.

Configuring the network and timezone was covered earlier in Sections 2.3.21 and 2.3.27, respectively. You can use those menu selections to configure them also.

2.3.32.1. The shell

To access the command-line shell, choose "a: Run /bin/sh".

To return back to **sysinst**, type **exit** at the command line.

Note that this only provides a small set of standard Unix and NetBSD tools. More tools may be available if you mount the proper filesystems on an already installed system.

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[3]See Section 4.4 regarding `/etc/rc.conf`.

2.3.32.2. Logging and scripting

Under the "Utilities" menu select "Logging functions". To enable logging of various tasks done by **sysinst**, toggle the "Logging" option to "On" by selecting it and pressing **Enter**. The sysinst.log contains output from the installer and the commands it runs.

Note: Don't use progress bar with logging or it may fill up your memory disk.

To create a shell script of the installation steps, select the "Scripting" option and press **Enter** to toggle it to "On". The resulting sysinst.sh file contains the shell commands to reproduce most of the installation.

2.3.33. Halt and reboot

You can choose the "Halt the system" option from the utilities menu to halt the system. You may see a message in green writing like:

```
syncing disks...  done
unmounting file systems...  done
halted.
```

Then you can physically press your power button or reset button to reboot.

Or you can select "Reboot the computer" from the main menu.

Be sure to remove your CD or tell your system to boot from your hard disk first so it doesn't attempt to boot from the installer again.

The following chapter will explain some basics about the first boot.