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## Starting with BSD Systems

Whether you use BSD systems every day or just tweak one once in a while, a book that presents efficient ways to use, check, fix, secure, and enhance your system can be an invaluable resource.

*BSD UNIX Toolbox* is that resource.

*BSD UNIX Toolbox* is aimed primarily at BSD power users and systems administrators. To give you what you need, we tell you how to quickly locate and get software, monitor the health and security of your systems, and access network resources. In short, we cut to the most efficient ways of using BSD systems.

Our goal with *BSD UNIX Toolbox* is to pack a lot of useful information for using BSD systems into a small package that you can carry around with you. To that end, we describe:

- ❑ **Commands** — Tons of command line examples to use BSD systems in helpful and clever ways
- ❑ **GUI Tools** — Quick pointers to graphical administration tools to configure your system
- ❑ **Software packages** — Short procedures to find and download tons of applications
- ❑ **Online resources** — Listings of the best locations to find BSD forums, mailing lists, IRC channels, and other online resources
- ❑ **Local documentation** — Tools for gathering more information from man pages, doc directories, help commands, and other resources on your BSD system

Because you're not a beginner with BSD systems, you won't see a lot of screenshots of windows, icons, and menus. What you will see, however,

### IN THIS CHAPTER

**Find BSD resources**

**Learn quick and powerful commands**

**Have a handy reference to many useful utilities**

**Work as BSD gurus do**

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is the quickest path to getting the information you need to use your BSD system to its fullest extent.

If this sounds useful to you, please read on.

### About FreeBSD, NetBSD, and OpenBSD

In the early 1970s, AT&T released the UNIX source code to several colleges and universities, allowing them to begin changing, adapting, and improving that code as they pleased. That decision has led to the development of every major free and open source software operating system today, not least of which are the systems based on the Berkeley Software Distribution (BSD).

The twisty history of BSD is easy to Google for, if you care to learn the details. For our purposes, let's just say that:

- ❑ BSD began as a set of software add-ons to AT&T's Sixth Edition UNIX.
- ❑ Over the years, BSD developers split off on their own development path, rewriting software with the intention of replacing all AT&T copyrighted code.
- ❑ In the early 1990s, AT&T's UNIX System Laboratories sued BSD developers (Berkeley Software Design, Inc.) for copyright infringement.
- ❑ Although the lawsuit was eventually settled (with only a few files needing to be changed from the BSD code), the Linux operating system was able to become a leader of open source software development while questions surrounding free BSD were being threshed out.
- ❑ In 1995, the final version of BSD from Berkeley was released under the name 4.4BSD-Lite, release 2. Today's BSD operating systems, including FreeBSD, NetBSD, and OpenBSD, are all based to some extent on 4.4BSD-Lite.

Operating systems derived from BSD have a well-earned reputation for stability and security. BSD was developed at a time when computing resources (disk space, network bandwidth, and memory) were meager by today's standards. So BSD systems were operated by efficient commands, instead of the bloated applications and dumbed-down graphical interfaces often seen today.

Because of the nature of BSD systems, people running those systems required a high level of expertise. Even when simplified graphical user interfaces based on the X Window System began to appear, to effectively operate a BSD system you still needed to know about such things as kernels, device drivers, modules, and daemons. Because security came before ease-of-use, a BSD expert needed to know how to deal with the fact that many features they may have wanted were not installed, or were turned off, by default.

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If you are someone who has used Linux before, transitioning to a BSD system shouldn't be too hard. However, BSD systems tend to behave a bit more like older UNIX systems than they do like Linux. Many interfaces are text-based, offering lots of power if you know what you are doing. Despite that fact, however, all the major desktop components that, for example, you get with the GNOME desktop environment are available with BSD systems. So you don't have to live on the command line.

Here is a list of popular BSD-based operating systems that are still being developed today:

- ❑ **FreeBSD** ([www.freebsd.org](http://www.freebsd.org)) is the most popular of the BSD operating system distributions. It can be operated as a server, workstation, or desktop system, but has also been used in network appliances and special-purpose embedded systems. It has a reputation for maximum performance.
- ❑ **NetBSD** ([www.netbsd.org](http://www.netbsd.org)) has a reputation for being very portable, with versions of NetBSD running as an embedded system on a variety of hardware. NetBSD can run on anything from 32-bit and 64-bit PCs to personal digital assistants (PDAs) to VAX minicomputers.
- ❑ **OpenBSD** ([www.netbsd.org](http://www.netbsd.org)) is a popular system for network servers, although it can operate as a workstation or network appliance as well. The goal of OpenBSD is to attain maximum security. Unlike FreeBSD and NetBSD, which are covered under the BSD license, OpenBSD is covered primarily under the more-permissive Internet Systems Consortium (ISC) license.
- ❑ **DragonFly BSD** ([www.dragonflybsd.org](http://www.dragonflybsd.org)) was originally based on FreeBSD. Its goal was to develop technologies different from FreeBSD in such areas as symmetric multiprocessing and concurrency. So the focus has been on expanding features in the kernel.

Other free (as in no cost, as well as freedom to do what you like with the code) operating systems based on BSD include Darwin (on which Mac OS X is based) and desktop-oriented systems such as PC-BSD and DesktopBSD. FreeSBIE is a live CD BSD system. Proprietary operating systems that have been derived from BSD include:

- ❑ **Mac OS X** ([www.apple.com/macosx](http://www.apple.com/macosx)) is produced by Apple, Inc. and focuses on adding an easy-to-use graphical interface to sell with its line of computers. There is also a Mac OS X Server product available. Although Mac OS X was originally based on Darwin, it is considered a closed-source operating system with open source components.
- ❑ **SunOS** ([www.sun.com](http://www.sun.com)) was developed by Sun Microsystems and was very popular as a professional workstation system. Sun stopped development of SunOS in favor of Solaris. However, because Solaris represented a merging of SunOS and UNIX System V, many BSD features made their way into Solaris.

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There is a larger list of BSD distributions that you can find at the DistroWatch site (<http://distrowatch.com/search.php?category=BSD>). Besides offering descriptions of those BSD distributions, you can also find links to where you can purchase or download the software.

### Finding BSD Resources

Although there is still a BSD web site ([www.bsd.org](http://www.bsd.org)), it largely acts as a pointer to BSD resources related to particular BSD distributions. The following sections contain useful links related to the FreeBSD, NetBSD, and OpenBSD sites.

#### FreeBSD Resources

Here are links to useful resources from the FreeBSD site ([www.freebsd.org](http://www.freebsd.org)):

- ❑ **Support for FreeBSD** ([freebsd.org/support.html](http://freebsd.org/support.html)) — You can find connections to both community and commercial support for FreeBSD.
- ❑ **Getting FreeBSD software** ([freebsd.org/where.html](http://freebsd.org/where.html)) — Links to information for downloading or purchasing FreeBSD installation CDs or DVDs are listed on this site. This includes links to software for different architectures (i386, amd64, powerpc, and so on).
- ❑ **FreeBSD features list** ([freebsd.org/about.html](http://freebsd.org/about.html)) — Describes the key features of FreeBSD.
- ❑ **News on FreeBSD** ([freebsd.org/news/](http://freebsd.org/news/)) — This is a gathering point for news about FreeBSD. There are links to news flashes, press releases, articles, and development status. You can also find links here to development sites and forums related to FreeBSD and BSD in general.
- ❑ **FreeBSD projects** ([freebsd.org/projects/](http://freebsd.org/projects/)) — Provides information about FreeBSD development projects. Besides basic development projects for FreeBSD, you can also find links to special projects (such as Google Summer of Code) and FreeBSD initiatives associated with established open source projects (such as Java, GNOME, KDE, and OpenOffice.org).

#### NetBSD Resources

Here are links to useful resources from the NetBSD site ([www.netbsd.org](http://www.netbsd.org)):

- ❑ **NetBSD support** ([netbsd.org/support](http://netbsd.org/support)) — Provides information about community and professional support, supported hardware, bug submissions, and security.
- ❑ **Getting NetBSD software** ([netbsd.org/releases](http://netbsd.org/releases)) — Links to information for downloading NetBSD CDs or DVDs are listed on this site. There are bittorrent, FTP, and HTTP methods for downloading software.
- ❑ **About NetBSD** ([netbsd.org/about](http://netbsd.org/about)) — Describes the key features of NetBSD.

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- ❑ **NetBSD news** ([netbsd.org/changes/](http://netbsd.org/changes/)) — Contains the latest news about NetBSD. This includes ongoing lists of development changes to NetBSD.
- ❑ **Software packages** ([netbsd.org/docs/software/packages.html](http://netbsd.org/docs/software/packages.html)) — Find information about the NetBSD Packages Collection (pkgsrc). This includes information on available packages, documentation, and supported platforms.

### OpenBSD Resources

Here are links to useful resources from the OpenBSD site ([www.openbsd.org](http://www.openbsd.org)):

- ❑ **OpenBSD support** ([openbsd.org/support.html](http://openbsd.org/support.html)) — Provides information on commercial support and consulting available for OpenBSD around the world.
- ❑ **Getting OpenBSD software** ([openbsd.org/ftp.html](http://openbsd.org/ftp.html)) — Links to information for downloading OpenBSD CDs or DVDs are listed on this site. Software mirrors are available via FTP, HTTP, ASF, and RSYNC.
- ❑ **Goals of OpenBSD project** ([openbsd.org/goals.html](http://openbsd.org/goals.html)) — Describes the goals of the OpenBSD project.
- ❑ **OpenBSD News** ([openbsd.org/press.html](http://openbsd.org/press.html)) — Contains links to press coverage of OpenBSD.
- ❑ **Frequently asked questions** ([cvs.openbsd.org/faq](http://cvs.openbsd.org/faq)) — Contains the Frequently Asked Questions (FAQ) list for OpenBSD.

### BSD Community Connections

If you want to communicate with the FreeBSD, OpenBSD, or NetBSD communities, Table 1-1 shows a quick list of links to the most useful communications venues related to those projects.

**Table 1-1: Online Resources to Connect to BSD Communities**

BSD Activities	Internet Sites
Mailing lists	<a href="http://lists.freebsd.org/mailman/listinfo">lists.freebsd.org/mailman/listinfo</a> <a href="http://www.openbsd.org/mail.html">www.openbsd.org/mail.html</a> <a href="http://www.netbsd.org/maillinglists">www.netbsd.org/maillinglists</a>
IRC chats	<a href="http://www.netbsd.org/community/#chat">www.netbsd.org/community/#chat</a> <a href="http://www.freebsd.org/community/irc.html">www.freebsd.org/community/irc.html</a>
Forums	<a href="http://www.bsdforums.org">www.bsdforums.org</a> <a href="http://www.bsdnexus.com">www.bsdnexus.com</a> <a href="http://www.freebsdwiki.net">www.freebsdwiki.net</a>
Blogs	<a href="http://planet.freebsdish.org">planet.freebsdish.org</a>

*Continued*

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**Table 1-1: Online Resources to Connect to BSD Communities (*continued*)**

BSD Activities	Internet Sites
Community Wikis	wiki.netbsd.se
Usenet Newsgroups	News:comp.unix.bsd.freebsd.misc News:comp.unix.bsd.freebsd.announce News:comp.unix.bsd.netbsd.announce News:comp.unix.bsd.netbsd.misc News:comp.unix.bsd.misc
Documentation	www.freebsd.org/docs.html www.openbsd.org/cgi-bin/man.cgi netbsd.org/docs
News	news.vejas.lt

## Focusing on BSD Commands

These days, many important tasks in BSD can be done from both graphical interfaces and from commands. However, the command line has always been, and still remains, the interface of choice for BSD power users.

Graphical user interfaces (GUIs) are meant to be intuitive. With some computer experience, you can probably figure out, for example, how to add a user, change the time and date, and configure a sound card from a GUI. For these cases, we'll mention which graphical tool you could use for the job. For the following cases, however, you will probably need to rely on the command line:

- ❑ **Almost any time something goes wrong** — Ask a question at an online forum to solve some BSD problem you are having and the help you get will almost always come in the form of commands to run. Also, command line tools typically offer much more feedback if there is a problem configuring a device or accessing files and directories.
- ❑ **Remote systems administration** — If you are administering a remote server, you may not have graphical tools available. Although remote GUI access (using X applications or VNC) and web-based administration tools may be available, they usually run more slowly than what you can do from the command line.
- ❑ **Features not supported by GUI** — GUI administration tools tend to present the most basic ways of performing a task. More complex operations often require options that are only available from the command line.

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- ❑ **GUI is broken or not installed** — If no graphical interface is available, or if the installed GUI isn't working properly, you may be forced to work from the command line. Broken GUIs can happen for lots of reasons, such as when you use a third-party, binary-only driver from NVIDIA or ATI and a kernel upgrade makes the driver incompatible. Also, many BSD servers don't even have GUIs installed.

The bottom line is that to unlock the full power of your BSD system, you must be able to use shell commands. Thousands of commands are available for BSD to monitor and manage every aspect of your BSD system.

But whether you are a BSD guru or novice, one challenge looms large. How do you remember the most critical commands and options you need, when a command shell might only show you this:

\$

*BSD UNIX Toolbox* is not just another command reference or rehash of man pages. Instead, this book presents commands in BSD systems by the way you use them. In other words, instead of listing commands alphabetically, we group together commands for working with file systems, connecting to networks, and managing processes in their own sections, so you can access commands by what you want to do, not only by how they're named.

Likewise, we won't just give you a listing of every option available for every command. Instead, we'll show you working examples of the most important and useful options to use with each command. From there, we'll tell you quick ways to find more options, if you need them, from man pages, the info facility, and help options.

### Finding Commands

All the commands described in this book may not be installed when you go to run them. You might type a command and see a message similar to:

```
mycommand: command not found
```

This might happen for the following reasons:

- ❑ You mistyped the command name.
- ❑ The command is not in your PATH.
- ❑ You may need to be the root user for the command to be in your PATH.
- ❑ The command is not installed on your computer.

Table 1-2 shows some commands you can run to look for a command you want to use.

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**Table 1-2: Finding Commands**

Command and Sample Output	Description
\$ <b>type mount</b> mount is /sbin/mount	Show the first mount command in PATH.
\$ <b>whereis mount</b> mount: /sbin/mount /usr/share/man/man8/mount.8.gz	Show binary and man page for mount.
\$ <b>locate xrdp.1.gz</b> /usr/local/man/man1/xrdp.1.gz	Find xrdp.1.gz anywhere in file system.
\$ <b>which umount</b> /sbin/umount	Find umount command anywhere in your PATH or aliases.
\$ <b>pkg_info -W convert</b> /usr/local/bin/convert was installed by package ImageMagick-6.3.6.9	Find which package the convert command is from.

If you suspect that the command you want is not installed, you can search the ports database for the package that it is in. If you find the right package (for example, *bzflag*) and it isn't installed, install it from the Internet as root by typing the following:

```
# find /usr/ports | grep ImageMagick
/usr/ports/gtgraphics/ImageMagick
...
# pkg_add -r ImageMagick
```

The command just shown grabs the ImageMagick binary package (in *tar bzip2* format) from a BSD software repository and installs it from the local system. Refer to Chapter 2 for information on other methods of installing software, such as using the ports system.

## Command Reference Information in BSD

Original BSD, Linux and UNIX documentation was all done on manual pages, generally referred to as *man pages*. A slightly more sophisticated documentation effort came a bit later with the *info* facility. Within each command itself, help messages are almost always available.

This reference information is component oriented — in other words, there are separate man pages for nearly every command, file format, system call, device, and other component of a BSD system. Documentation more closely aligned to whole software packages is typically stored in a subdirectory of the */usr/local/share/doc* directory.

All three reference features — man pages, info documents, and help messages — are available in BSD systems.



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### Using help Messages

The `-h` or `--help` options are often used to display help messages for a command. The following example illustrates how to display help for the `ogg123` command:

```
$ ogg123 --help | less
ogg123 from vorbis-tools 1.1.1
  by the Xiph.org Foundation (http://www.xiph.org/)

Usage: ogg123 [<options>] <input file> ...

  -h, --help      this help
  -V, --version   display Ogg123 version
  -d, --device=d  uses 'd' as an output device
                  Possible devices are ('*' = live, '@' = file):
                  oss* null* wav@ raw@ au@
  -f, --file=filename Set the output filename for a previously
                  specified file device (with -d).

...
```

The preceding output shows how the `ogg123` command line is used and lists available options. Piping the output to the `less` command lets you page through it.

### Using man Pages

Suppose you want to find man pages for commands related to a certain word. Use the `apropos` command to search the man page database. This shows man pages that have `crontab` in the man page NAME line:

```
$ apropos crontab
crontab(1) - maintain crontab files for individual users (V3)
crontab(5) - tables for driving cron
```

The `apropos` output here shows each man page NAME line that contains `crontab`. The number shows the man page section in which the man page appears. (We discuss sections shortly.)

The `whatis` command is a way to show NAME lines alone for commands that contain the word you enter:

```
$ whatis cat
cat      (1) - concatenate files and print on the standard output
```

The easiest way to display the man page for a term is with the `man` command and the command name. For example:

```
$ man find
FIND(1)      FreeBSD General Commands Manual      FIND(1)
NAME
    find -- walk a file hierarchy
```

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### SYNOPSIS

```
find [-H | -L | -P] [-EXdsx] [-f pathname] [pathname ...] expression
...
```

The preceding command displays the first man page found for the `find` command. As you saw in the earlier example, some terms have multiple man pages. For example, there is a man page for the `crontab` command and one for the `crontab` files. Man pages are organized into sections, as shown in Table 1-3.

**Table 1-3: man Page Sections**

Section	Description
1	General user commands
2	System calls
3	Programming routines / library functions
4	Devices
5	Configuration files and file formats
6	Games
7	Miscellaneous
8	Administrative commands and daemons
9	Kernel Interface

The following code shows some other examples of useful options with the `man` command.

```
$ man -a mount           Shows all man pages related to component
$ man 5 crontab           Shows section 5 man page for component
$ man mount -P more       Use more, not less to page through
$ man -f mount            Same as the whatis command
$ man -k mount            Same as the apropos command
```

Man pages are also available on the Internet. Here are some nice sites for finding BSD man pages:

```
http://www.freebsd.org/cgi/man.cgi
http://www.openbsd.org/cgi-bin/man.cgi
http://netbsd.gw.com/cgi-bin/man-cgi?++NetBSD-current
```

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### Using info Documents

In some cases, developers have put more complete descriptions of commands, file formats, devices, or other BSD components in the info database. You can enter the info database by simply typing the `info` command or by opening a particular component:

```
$ info ls
```

The previous command shows information on the `ls` command. Use up, down, left, and right arrows and Page Up and Page Down to move around the screen. Home and End keys go to the beginning and end of a node, respectively. When you are displaying info screen, you can get around using the keystrokes shown in Table 1-4.

**Table 1-4: Moving Through the Info Screen**

Keystroke	Movement
?	Display the basic commands to use in info windows.
L	Go back to the previous node you were viewing.
n, p, u	Go to the node that is next, previous, or up.
Tab	Go to the next hyperlink that is in this node.
Enter	Go to the hyperlink that is under the cursor.
R	Follow a cross-reference.
Q	Quit and exit from info.

Software packages that have particularly extensive text available in the info database include `gimp`, `festival`, `libc`, `automake`, `zsh`, `sed`, `tar`, and `bash`. Files used by the info database are stored in the `/usr/share/info` directory.

## Summary

Although you certainly can read this book from cover to cover if you like, the book is designed to be a reference to hundreds of features in BSD systems that are most useful to power users and systems administrators. Because information is organized by topic, instead of alphabetically, you don't have to know the commands in advance to find what you need to get the job done.

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Most of the features described in this book will work equally well in FreeBSD, NetBSD, OpenBSD, and other BSD systems. In fact, many of the commands described here are in such widespread use that you could use them exactly as described here on most Linux and UNIX systems as well.

The next chapter describes how to get and install BSD software.