

Learning Debian GNU/Linux

By [Bill McCarty](#)

1st Edition September 1999

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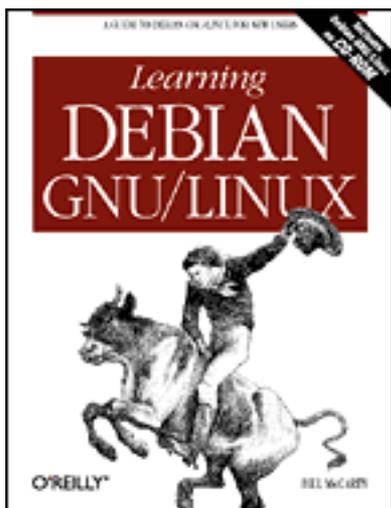
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Learning Debian GNU/Linux

By Bill McCarty

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Dieses Produkt ist vergriffen und nicht mehr lieferbar.

Learning Debian GNU/Linux guides the new user of Linux through the installation and configuration of Debian GNU/Linux. Debian is the purely Open Source Linux distribution, crafted and maintained by a worldwide network of volunteers. Windows users will gain a gentle introduction to this exciting computing world guided by Bill McCarty in *Learning Debian GNU/Linux*.

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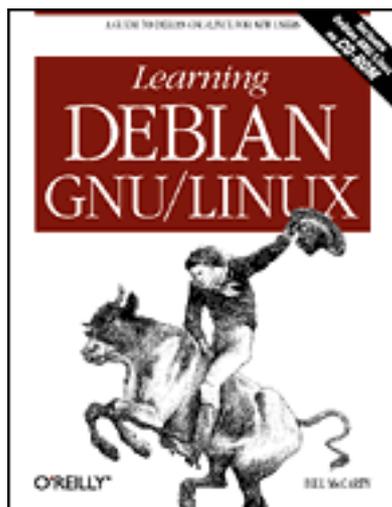
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Preface

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Lately it seems that two topics crop up in conversation after conversation: the stock market and Linux. As for the stock market, I'm something of a pessimist. When friends and even perfect strangers continually recount their recent financial successes, I conclude that a stock market correction is overdue. (I've shifted my investments to bonds.)

As for Linux, I'm considerably more - perhaps wildly - optimistic. When my realtor tells me about the TV feature on Linux she saw on CNN, I see it as a harbinger of Linux Spring. Like her, my cable TV repairman, and my colleague in the next office, you've probably heard about Linux from a magazine, radio or TV program, or a friend. You're wondering what Linux is about and whether you should give it a try. If so, particularly if you currently use Microsoft Windows, this book was written for you.

Not long ago, Linux was the plaything of the technical elite. Today, however, Linux is much easier to use. Every day brings a new tool or feature designed for ease of use. If you work with Microsoft Windows and have dabbled a bit in MS-DOS, or are curious

about what happens inside Windows, you can install and configure Linux. Thousands of people from all walks of life - even journalists, who are notorious for their technical ineptitude - have already done so.

This book will make your Linux journey easier, by giving you the big picture, providing you with step-by-step procedures, and getting you started doing useful or fun activities, such as word processing or games. This book focuses on the needs of the new Linux user and on desktop Linux applications. You'll learn about networks and servers, but the details of those topics are left for more advanced books.

This book includes a CD-ROM that contains Debian GNU/Linux, so you have in your hand all you need to get started using Linux. Much of the material in this book applies to Linux generally and not merely to Debian GNU/Linux; so, even if you prefer to use another Linux distribution, you'll probably find this book useful.

Organization of This Book

Chapter 1, *Why Run Linux?*, is designed to introduce you to Linux and help you determine whether Linux is appropriate for you.

Chapter 2, *Preparing to Install Linux*, helps you understand what's involved in installing Linux and guides you through a procedure to gather information needed to successfully install Linux.

Chapter 3, *Installing Linux*, takes you step-by-step through the installation of Linux.

Chapter 4, *Issuing Linux Commands*, describes the basics of how to use the Linux command-line interface, which resembles MS-DOS but is much more powerful and sophisticated.

Chapter 5, *Installing and Configuring the X Window System*, shows you how to install and configure X.

Chapter 6, *Using the X Window System*, shows you how to use X, the graphical user interface included with Debian GNU/Linux. If you've used Microsoft Windows, you'll find X familiar and easy to use.

Chapter 7, *Configuring and Administering Linux*, shows you how to configure your Linux system. Administering a multi-user operating system such as Linux is somewhat more complicated than administering a single-user operating system, but Linux includes tools that simplify the work.

Chapter 8, *Using Linux Applications and Clients*, describes several of the most popular applications available for Linux, including desktop suites and word processors.

Chapter 9, *Playing Linux Games*, describes several of the most popular games available for Linux. The chapter also shows you how to run your favorite Microsoft Windows games under Linux.

Chapter 10, *Setting Up a Linux-Based LAN*, shows you how to connect your Linux system to other systems on your local area network.

Chapter 11, *Getting Connected to the Internet*, shows you how to connect via your Internet Service Provider (ISP) to the Internet. Once connected, you can use your Linux system to surf the Web and access other familiar Internet services.

Chapter 12, *Setting Up a Linux-Based WAN*, shows you how to set up servers that users around the world can access via the Internet. For example, you'll learn how to install and configure Apache, the world's most popular web server.

Chapter 13, *Conquering the BASH Shell*, digs deeper into the BASH shell, the Linux command-line interface first introduced in **Chapter 4**. Here you'll see firsthand just how powerful and easy to use Linux can be.

Appendix A, *Linux Directory Tree*, describes the structure of the principal Debian GNU/Linux directories.

Appendix B, *Principal Linux Files*, describes the principal Debian GNU/Linux configuration files.

Appendix C, *The Debian Package Management Utilities*, describes the utilities provided by Debian GNU/Linux for working with packages. These utilities let you install applications, uninstall applications, and query a database that describes installed applications. This appendix also includes commands for installing the applications described in this book.

Appendix D, *Managing the Boot Process*, explains how PCs boot and describes how to configure your system to conveniently boot Linux.

Appendix E, *Linux Command Quick Reference*, briefly describes the most useful Linux commands. It also presents Linux equivalents for common MS-DOS commands.

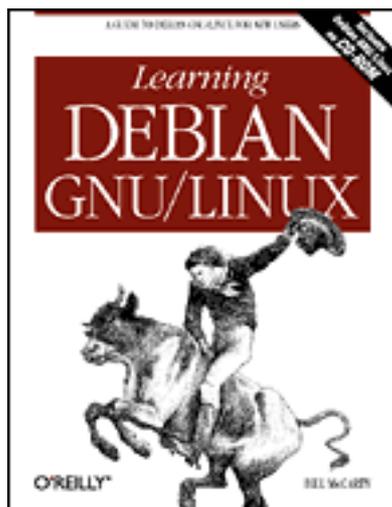
Appendix F, *Open Publication License*, describes the Open Publication License this book is distributed under.

The glossary defines terms used in the book. Use it to spare yourself the effort of searching the index to discover the page on which a term is defined.

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1. Why Run Linux?

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[What is Linux?](#)

[Reasons to Choose or Not Choose Linux](#)

[Linux Resources on the Internet](#)

This chapter introduces you to the upstart operating system Linux. It helps you determine whether Linux is right for you, by surveying the features and performance that Linux offers. It demonstrates that choosing Linux is a practical - even wise - decision for many computer users. The chapter also helps you feel at home with Linux and other Linux users, by introducing you to the history and culture of Linux. Finally, it points you to some popular gathering places on the Internet where you can correspond with other Linux users, get up-to-the-minute Linux news and information, and obtain free technical support.

1.1 Linux at Home and at Work

Perhaps you learned about Linux from a trusted friend, whose enthusiasm and ready answers convinced you to learn more about Linux, or perhaps an article or anecdote that mentioned Linux simply sparked your curiosity. In any case, you may find it interesting to learn what other computer users, ranging from PC hobbyist to guru, have

accomplished by using Linux:

- Tired of slow telephone modem transfer rates, a PC owner leases a cable modem that provides high-speed transfers. He installs the new modem in a Linux system that routes packets to and from the computers of other family members. Now the entire family can simultaneously surf the Web at warp speed.
- Struggling to complete a dissertation, a graduate student determines that most of his problems stem from bugs and inadequate features of his word processing program. Dumping Microsoft Windows and Microsoft Word, he loads Linux onto his computer and uses free text processing software he downloads from the Web. In contrast to the frequent system hangs and lost work he experienced with Windows, his new system runs for over 100 days before needing to be shutdown for installation of new hardware.
- Considered among the world's best, the experienced graphics artists at Digital Domain have generated visual effects for such films as *Apollo 13*, *Dante's Peak*, *The Fifth Element*, *Interview with the Vampire*, and *True Lies*. But when director James Cameron selected Digital Domain to conjure visual effects for *Titanic*, the artists faced a task of unprecedented size and complexity. Concerned to obtain enormous computing power at the lowest cost, they purchased 160 DEC Alpha computers. Most DEC Alpha users run Microsoft Windows NT or Digital Unix as an operating system. However, Digital Domain chose to run Linux on 105 of their new computers. If you've seen *Titanic* and Digital Domain's breathtaking effects, you know what a good decision this was.
- Needing a supercomputer, but having a budget sufficient for only a minicomputer, scientists at the Los Alamos National Laboratory created Avalon, a system of 70 networked computers that run Linux. Instead of millions of dollars, the scientists spent only about \$152,000 - none of it on software, because Linux is free. Their Avalon system performs more than 10 billion floating-point operations per second, roughly on par with the Silicon Graphics Origin2000 system, which costs \$1.8 million. Linux-based Avalon ranks as the 315th fastest computer in the world.

Linux began as a hacker's playground, but has become progressively easier to use and consequently more popular: today, perhaps as many as 7.5 million computers run Linux. Many Linux users are not hackers, but relatively ordinary computer users. Linux has become an operating system of formidable appeal and potential:

- In 1996, computing trade magazine *Infoworld* named Linux "Best Computer Desktop Operating System." A year later, they named the Linux community "Best Tech Support Organization."
- The cover of the August 10, 1998, issue of the influential business magazine *Forbes* featured super-programmer Linus Torvalds, author of the Linux kernel. The article pointed out that Intel, IBM, Netscape, Oracle, and other computing industry giants have taken a keen commercial interest in Linux and other open-source software.
- Market research firm International Data Corporation reported that in 1998,

Linux held 17.2% of the server operating system market, up 212% from 1997. In contrast, Microsoft's flagship operating system, Windows NT, held a 36% market share - barely twice as great.

- Lawyers defending Microsoft against the U.S. government's antitrust charges argued that Linux poses a real threat to Microsoft's domination of the desktop operating systems market.

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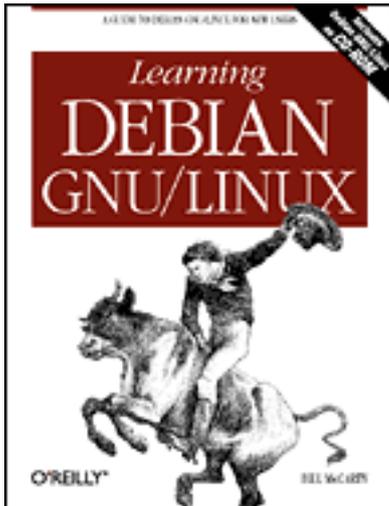
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2. Preparing to Install Linux

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This chapter presents information you need to know and tasks you need to perform before installing Linux. It helps you make certain that your IBM-compatible PC meets the minimum hardware requirements for Linux. It shows you how to document your system configuration so that you can respond to questions presented by the Linux install procedure. Finally, it shows you how to prepare your hard disk for Linux.

2.1 Minimum Hardware Requirements

Linux supports a wide range of PC hardware; but not even Linux supports every known device and system. Your PC must meet certain minimum requirements in order to run Linux. The following sections present these minimum requirements; however, for the latest and most complete information, you should check the Debian Project web site at <http://www.debian.org/>. The Debian web site will also help you determine if Linux supports all the devices installed in your system.

2.1.1 Central Processing Unit (CPU)

Linux does not support the Intel 286 and earlier processors. However, it fully supports the Intel 80386, 80486, Pentium, Pentium Pro, Pentium II, and Pentium III processors. Nevertheless, some users feel that their 80386 Linux systems respond sluggishly, particularly when running X. So, if you want optimum performance, you should install Linux on a PC having an 80486 processor or better.

Linux also supports non-Intel processors such as the Cyrix 6x86 and the AMD K5 and K6. Most Linux users have systems that use Intel chips; if your system uses a non-Intel chip, you may find it more difficult to resolve possible problems.

2.1.2 Motherboard

Linux supports the standard ISA, EISA, PCI, and VESA (VLB) system buses used on most IBM-compatible PCs. Linux recently gained support for IBM's MCA bus, used in IBM's PS/2 series of computers. However, at the time of this writing, Debian GNU/Linux does not yet support the MCA bus. If you have an IBM PS/2, you may be unable to install Debian GNU/Linux (check the Debian Project web site for the latest available information on support for the MCA bus).

Your motherboard should include at least 16 MB of RAM for optimum Linux performance. Some users have managed to coax Linux into working on systems with as little as 4 MB of RAM. However, if your system has less than 16 MB of RAM, you probably won't be pleased with its performance. If you plan to run X, you may wish to install more than 16 MB of RAM - perhaps 64 MB. Although X operates well with 16 MB of RAM, you can open more windows and switch between them more quickly if you have additional memory.

A handful of motherboards presents special problems when installing Linux. Generally, the problem stems from a bad BIOS, for which a fix is often available. Check the Debian Project web site for details.

2.1.3 Drives

An anonymous wag once quipped that one can never be too thin, too rich, or have too much hard disk space. Fortunately, Linux is not too hungry for disk space. To install and use Linux, you should have at least 250 MB of free hard disk space. (The minimum is about 100 MB, but installing Linux on a system with so little disk space will compel you to omit many useful applications and will leave you with little room to work.)

More realistically, if you plan to use your Linux system as a workstation, you should have at least 600 MB of free disk space; if you plan to use your Linux system as a server, you should have at least 1.6 GB (1,600 MB) of free disk space.

For convenient installation using the CD-ROM included with this book, your system should include an IDE or SCSI CD-ROM drive. It's also possible to install Linux from a PCMCIA CD-ROM drive, an FTP site, an NFS server, an SMB shared volume, or a hard drive. Consult the Debian Project web site for details.

Your system should also include a 3.5-inch floppy drive. You'll use the floppy drive to boot your system from a special Linux diskette you create.

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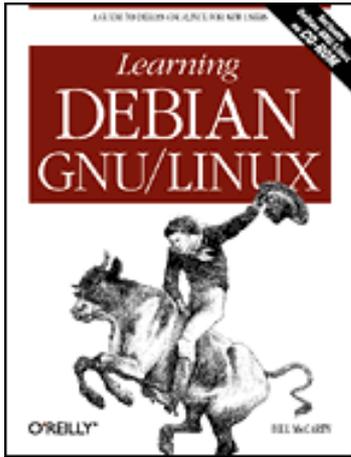
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3. Installing Linux

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[Installing the Operating System and Applications](#)

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In this chapter, you'll learn how to install Linux by following a simple, step-by-step procedure. Most users will be able to complete the installation procedure without difficulty; however, the chapter includes a section that describes how you can obtain help if you encounter installation problems. Once you successfully complete the installation procedure, you'll have your own working Linux system.

3.1 Installing the Operating System and Applications

To install Linux, you follow a simple, step-by-step procedure that has three main phases:

- Installing the operating system kernel and base system
- Configuring the new Linux system
- Installing applications

WARNING: Although the Linux installation procedure is generally troublefree, errors or malfunctions that occur during the installation of an operating system can result in loss of data. You should not begin the installation procedure until you have backed up all data on your system and determined that your backup is error-free.

3.1.1 The Installation Program User Interface

Like other modern Linux distributions, Debian GNU/Linux includes a screen-based install program that simplifies the installation and initial configuration of Linux. However, the install program works somewhat differently than a typical Microsoft Windows application. For instance, it does not support use of a mouse or other pointing device; all input is via the keyboard. So that you can make effective use of the install program, the next three subsections describe the user-interface controls used by the install program, present the special keystrokes recognized by the install program, and explain the use of Linux's virtual consoles.

3.1.1.1 User-interface controls

[Figure 3.1](#) shows a typical screen displayed by the install program. This screen includes the following controls:

A main window

The install program runs in a full screen window. The top line of the window displays the name of the current installation step. In [Figure 3.1](#), the current step is "Select CD Interface Type." You cannot minimize or change the size of the install program's main window.

The cursor

Like Windows programs, the installation program has a cursor on screen. Unlike Windows, the cursor movement and cursor actions are controlled by the keyboard, rather than by the mouse. The location of the cursor is called the input focus. At any time, exactly one control has the *input focus*, which lets it respond to keyboard input. The install program displays a rectangular blue cursor that identifies the field having the input focus. In [Figure 3.1](#), the list item named `/dev/hdc` has the input focus.

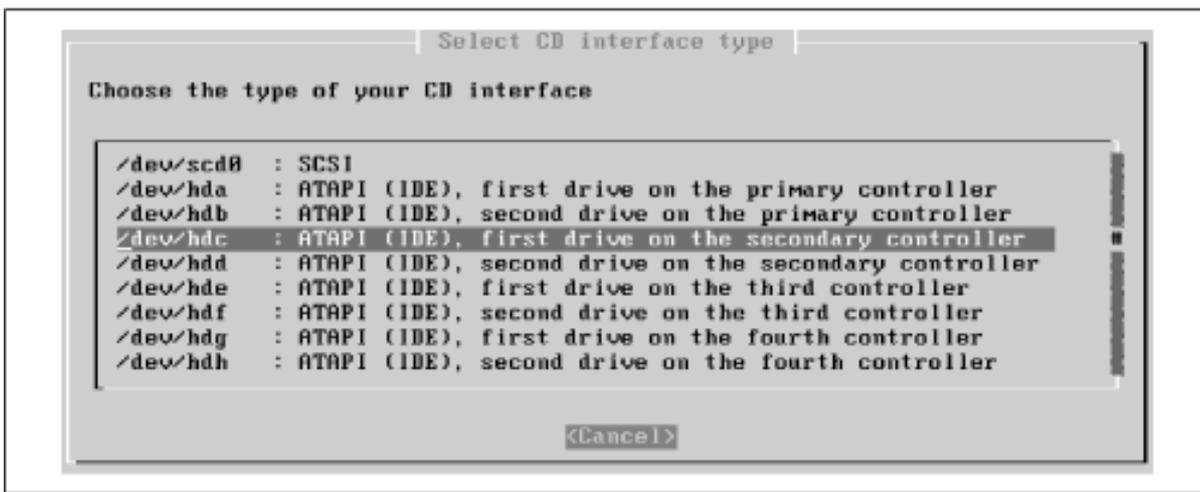
A scrollable list

Scrollable lists let you page through a list of items that may be too long to display all at once. At any time, one line in the scrollable list is active, as indicated by blue highlighting. When a scrollable list has the input focus the Up and Down arrow keys let you choose a different active item. Some scrollable lists associate actions with items; you can initiate the action associated with the active item by pressing **Enter**.

Buttons

Many install program windows include one or more buttons. You can make a button active by pressing the **Tab** key to move the cursor to the button. When a button is active, pressing **Enter** initiates the action associated with it.

Figure 3.1: A typical screen displayed by the install program



Although [Figure 3.1](#) does not show a text box, some install program windows include one. Text boxes let you type text that is sent to the install program when you press the Ok button. You can recognize a text box by the underscores that define its input area.

3.1.1.2 Common keystrokes

Several keystrokes let you direct the operation of the install program. For example, you can use the **Tab** key to move the input focus from one control to the next. [Table 3.1](#) summarizes the keystrokes that the install program recognizes. You may want to keep this table handy as you work with the install program.

Table 3.1: Keystrokes Recognized by the Install Program

Keystroke	Meaning
Enter	Send a button press to the install program.
Tab	Move the input focus to the next field.
Down	Move the cursor down.
Up	Move the cursor up.
Left	Move the cursor left.
Right	Move the cursor right.

WARNING: You should press keys only when an installation program dialog box is active. Pressing keys at other times can send keystrokes to programs invoked by the install program, which may interpret your input in an unpredictable fashion.

3.1.1.3 Using virtual consoles

A console is a combination of a keyboard and a display device, such as a video monitor. A console provides a basic user interface adequate to communicate with a computer: you can type characters on the keyboard and view text on the display device.

Although a home computer system seldom has more than one console, Linux systems provide

several virtual consoles. By pressing a special combination of keys, you can control which console your system's keyboard and monitor are connected to. [Table 3.2](#) describes the virtual consoles used by the install program. The main installation dialog appears in virtual console 1. The contents of other virtual consoles can be useful in troubleshooting; however, you will not usually need to switch from one virtual console to another. Nevertheless, you may find it interesting to view the contents of the virtual consoles.

Table 3.2: Virtual Consoles Used by the Install Program

Console	Keystroke	Contents
1	ALT-F1	The installation dialog.
2	ALT-F2	A shell prompt, which lets you enter commands to be processed by Linux.
3	ALT-F3	The installation status log, containing termination messages of launched programs.
4	ALT-F4	The installation log, containing messages from the install program.

3.1.2 Installing the Kernel and Base System

If your system can boot from a CD-ROM, you can boot Linux directly from the CD that accompanies this book, which is by far the simplest way to boot Linux. If your system supports booting from a CD-ROM, configure your system to do so and boot Linux now.

3.1.2.1 Booting from MS-DOS or Windows 9x

If your system can't boot from a CD-ROM, you can boot Linux by first booting MS-DOS or Windows 9x. To do so, use File Manager to copy the following files from the *install* directory of the CD-ROM that accompanies this book, to your Windows desktop:

boot.bat

linux

loadlin.exe

root.bin

Next, right click on the [boot.bat](#) file on your desktop - not the one on the CD-ROM - and select the Create Shortcut menu item. Windows creates a desktop icon named *Shortcut to boot.bat*. Right click on this icon and select the Properties menu item. A Properties dialog appears. Click on the Program tab and then click on the Advanced button. Click on the check box marked "MS-DOS mode" and then click on OK. Finally, click on OK to exit the Properties dialog.

To boot Linux, double click on the *Shortcut to boot.bat* desktop icon. A dialog box asks if you want to close all other programs and continue. Close any important applications and then click on Yes to boot Linux.

3.1.2.2 Booting from floppy diskettes

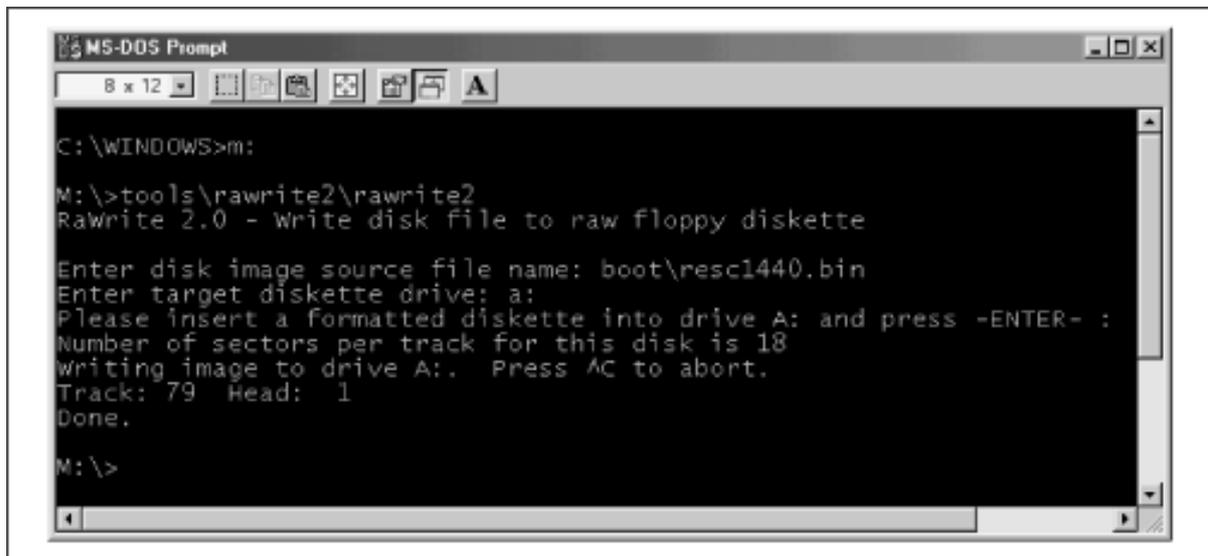
If your system can't boot from a CD-ROM diskette and you have difficulty booting Linux from MS-DOS or Windows 9x, you can boot Linux from floppy diskettes. Before beginning the installation, obtain two floppy disks. You'll use one to create the Linux installation disk and another from which to boot your Linux system.

To begin installing Linux, you must boot your system from a floppy diskette containing the boot kernel. Creating the boot disk requires some special measures; you can't simply copy files onto a disk and then boot it.

To create the boot disk, perform the following steps:

1. Insert the Linux CD-ROM in your CD-ROM drive.
2. Start an MS-DOS Prompt window by clicking on Start, selecting Programs, and clicking on MS-DOS Prompt.
3. In the MS-DOS window, change to the drive letter that corresponds to your CD-ROM drive, for example, *m*: (see [Figure 3.2](#)).

Figure 3.2: Using rawrite2 to make a boot disk



```
MS-DOS Prompt
8 x 12
C:\WINDOWS>m:
M:\>tools\rawrite2\rawrite2
Rawrite 2.0 - Write disk file to raw floppy diskette

Enter disk image source file name: boot\rescl440.bin
Enter target diskette drive: a:
Please insert a formatted diskette into drive A: and press -ENTER- :
Number of sectors per track for this disk is 18
Writing image to drive A:. Press ^C to abort.
Track: 79 Head: 1
Done.

M:\>
```

4. In the MS-DOS window, type the command `cd tools\rawrite2\rawrite2` and press **Enter**.
5. When prompted, specify the file name of the disk image source as *boot\rescl440.bin* and press **Enter**.
6. When prompted, specify the drive letter of your floppy drive, for example, *a*:.
7. As instructed by the program, place a formatted floppy diskette in your floppy drive and press **Enter**.

It takes perhaps a minute or so for the `rawrite2` utility to create the floppy diskette. Wait for the utility to complete and then restart your system using the floppy diskette.

3.1.2.3 Starting the installation procedure

When Linux boots, you should see the `boot :` prompt shown in [Figure 3.3](#). Press **Enter** to begin the installation process.

Figure 3.3: The boot prompt



The boot : prompt lets you enter various kernel options. Most systems can be started without using any kernel options. However, if you cannot successfully boot your system from a CD-ROM or floppy diskette, you should suspect that a kernel option is needed. Pressing **F1** in response to the boot prompt will access some help pages. If the information in the help pages is not sufficient to resolve your problem, seek help as described in the section titled [Section 3.2, "Getting Help](#), near the end of this chapter.

3.1.2.4 Choosing color versus monochrome

Once the install program starts, it first displays the Select Color or Monochrome Display screen, shown in [Figure 3.4](#), which asks whether subsequent install program screens should appear in color or monochrome (black and white). Use the Up and Down keys to move to the type of monitor attached to your system and press **Enter** to select it. If you selected Color, the screen reappears in color. To move forward to the next screen, highlight Next and press **Enter**.

Figure 3.4: The Select Color or Monochrome Display screen



3.1.2.5 Release notes

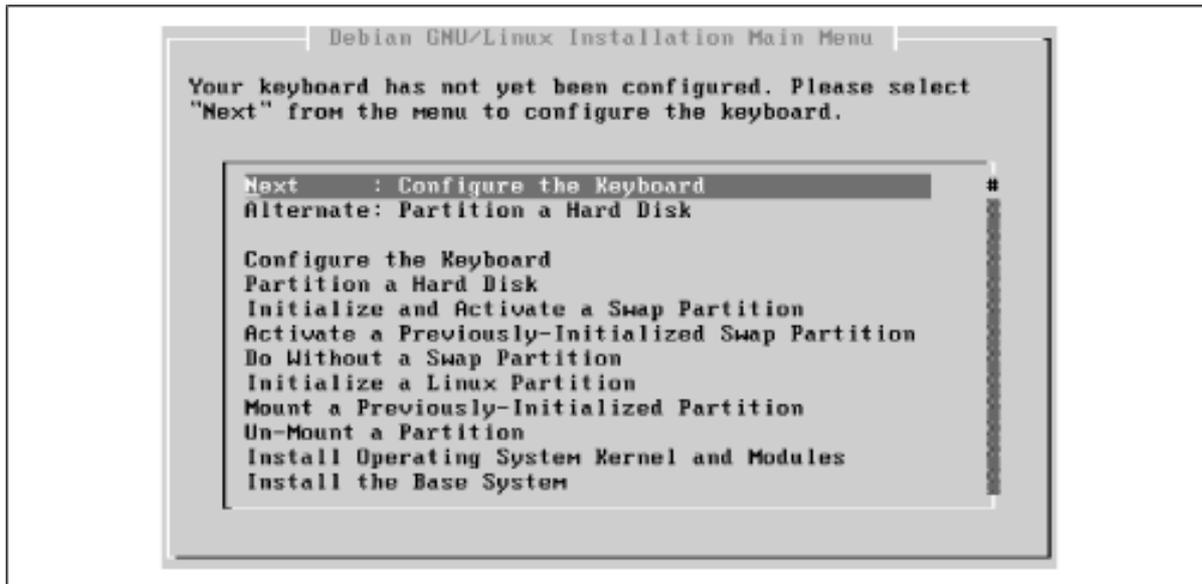
The install program displays the current release notes. These identify the diskette used to boot the system, point you to the Debian web site, and explain the Debian mission. Use the Up and Down

arrow keys to read text beyond the first page. When you've read the release notes, highlight Continue and press **Enter**.

3.1.2.6 The Installation Main Menu

The install program now displays the Installation Main Menu, shown in [Figure 3.5](#). This menu guides you through the installation process; it reappears in slightly different form after each installation step is completed.

Figure 3.5: The Installation Main Menu



The only control on the menu is a scrollable list. The first few items of the list present the installation steps that you should most likely perform next. The most likely step is labeled Next.

The remaining items of the list present other installation steps. If an installation goes awry, you can manually select the proper sequence of steps to quickly get things back on track.

However, you'll seldom, if ever, need this capability; choosing Next is almost always the appropriate action. To continue by configuring your system's keyboard, highlight Next and press **Enter**.

3.1.2.7 Selecting a keyboard

The install program displays the Select a Keyboard screen, shown in [Figure 3.6](#). Use the Up and Down arrow keys to select the appropriate keyboard. Most U.S. users will prefer the pre-selected choice, U.S. English (QWERTY). When you've selected the proper keyboard, press ENTER to continue.

Figure 3.6: The Select a Keyboard screen



The installation main menu re-appears, with the Next choice designated Partition a Hard Disk. Press **Enter** to continue.

3.1.2.8 Selecting the hard drive

The Select Disk Drive screen, shown in [Figure 3.7](#), appears. The screen contains a scrollable list that lets you choose the drive to be partitioned. Drives are named by using the standard Linux method. IDE hard drives are named `hd x`, where *x* is a letter from *a* to *z*. Drive `hda` is your system's first IDE hard drive, drive `hdb` is your system's second IDE hard drive, and so on. SCSI drives are named `sd x`, where *x* is a letter from *a* to *z* that corresponds to the SCSI drive's disk ID number. As explained on the screen, the install program may mistakenly identify a CD-ROM drive as a hard drive.

Figure 3.7: The Select Disk Drive screen

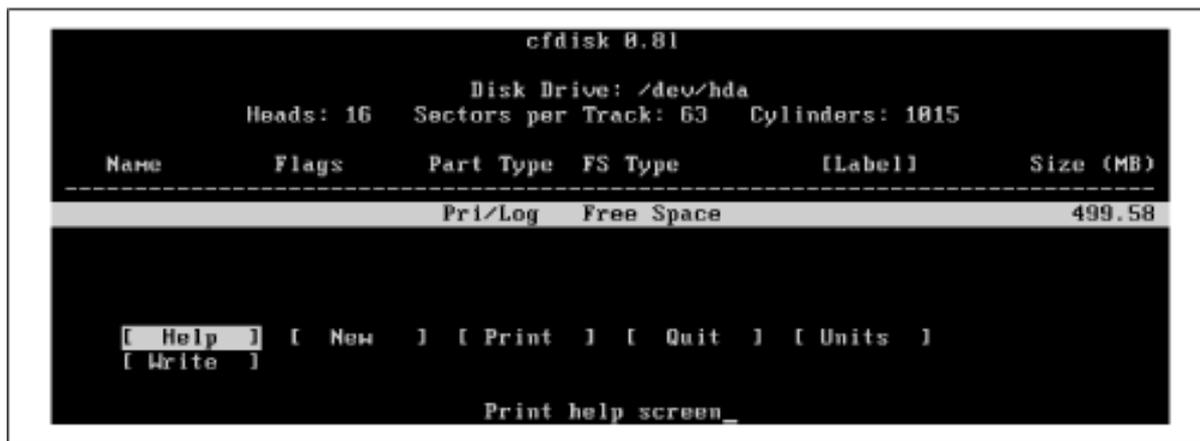


Choose the drive that you want to partition and press **Enter**.

3.1.2.9 Partitioning a hard drive

The install program launches `cfdisk`, a Linux program for partitioning hard drives. [Figure 3.8](#) shows the initial `cfdisk` screen. The screen shows the partitions and free space residing on the hard disk. In the figure, the hard disk contains only free space.

Figure 3.8: The initial cfdisk screen

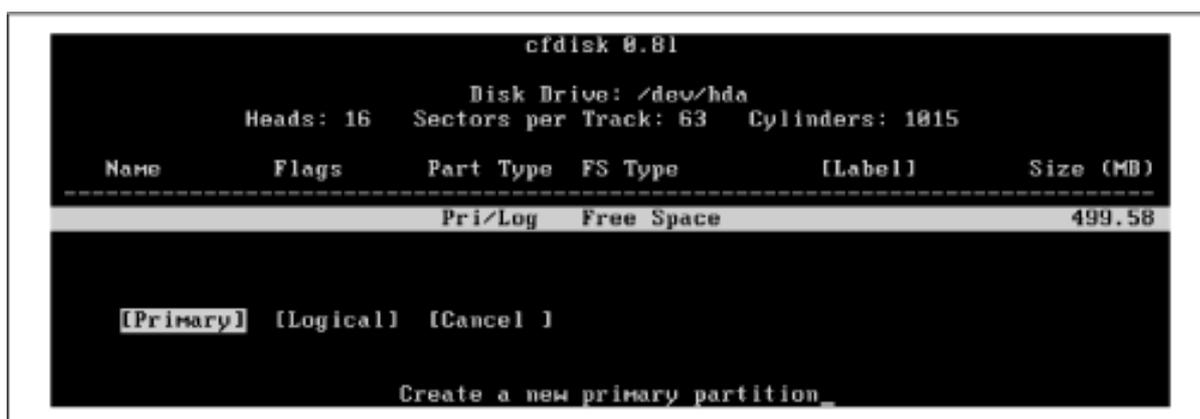


To create a new partition from the available free space, use the Up and Down arrow keys to select a free space entry. Then use the Left and Right arrow keys to select the New menu item at the bottom of the screen. Press **Enter** to create the partition.

As shown in [Figure 3.9](#), cfdisk asks whether the new partition should be a primary or logical partition. Choose Primary and press **Enter**.

A hard disk can have a maximum of four primary partitions; a logical partition lets you escape this limitation. After creating a logical partition, you can create several extended partitions within it. However, cfdisk is not able to create extended partitions. If your hard disk already contains several partitions, you'll need to seek help in using a program other than cfdisk to partition your hard disk. See the section titled [Section 3.2](#), near the end of this chapter.

Figure 3.9: Specifying the partition type



Next, cfdisk asks you to specify the size (in MB) of the new partition. As a rule of thumb, you should leave 50-100 MB of free space in which to establish a Linux swap partition. Type the desired size, which must not exceed the available free space, and press **Enter**.

Next, if the new partition is smaller than the available free space, you're asked whether the new partition should be created at the beginning or the end of the available space. It generally makes little difference. Select Beginning or End, according to your preference, and press **Enter**.

An updated display appears, as shown in [Figure 3.10](#). The updated display shows the new partition, which was created as a Linux partition. Next, you must specify the Linux partition as bootable.

Select the Bootable menu item by using the **Left** and **Right** arrow keys and press **Enter**. The screen is updated to reflect the new status of the partition. Notice how the new partition is named by using the name of the hard disk (hda) and a sequential number (1). Make a note of the name of the Linux partition.

Figure 3.10: The updated display

```
          cfdisk 0.81
          Disk Drive: /dev/hda
          Heads: 16   Sectors per Track: 63   Cylinders: 1015

-----
Name      Flags      Part Type  FS Type      [Label]      Size (MB)
-----
hda1     Primary  Linux      449.86
          Pri/Log  Free Space  49.72

[Bootable] [ Delete ] [ Help ] [Maximize] [ Print ]
[ Quit ]   [ Type ]  [ Units ] [ Write ]

Toggle bootable flag of the current partition_
```

Now, you must create a Linux swap partition from the remaining free space. Use the Up and Down arrow keys to select the free space and use the Left and Right arrow keys to select the New menu item. Press **Enter**.

Create the swap partition as a primary partition, with a size of 50-100 MB. Make a note of the name of the swap partition, which will be something like hda2.

Next, you must identify the new partition as a swap partition. Use the **Left** and **Right** arrow keys to select the Type menu item and press **Enter**. Type the code that corresponds to a Linux swap partition (82) and press **Enter**.

Finally, you must write the modified partition table to the hard disk. Use the **Left** and **Right** arrow keys to select the Write menu item and press **Enter**. The program tells you that erroneous changes to the partition table can destroy data. Check your work and, if the partition information is correct, type Yes and press **Enter**.

If the partition information is not correct, you can easily revise it. Select the erroneous partition and use the Delete menu item to delete the partition. You can then use the New menu item to recreate the partition with the proper size and type.

The program confirms that the partition table was written by displaying a message near the bottom of the screen. Exit the program by using the **Left** and **Right** arrow keys to select the Quit menu item and pressing **Enter**.

The main menu appears, with the Next item designated Initialize and Activate a Swap Partition. Press **Enter** to proceed.

3.1.2.10 Initializing and activating a swap partition

The install program asks you to identify the swap partition. Using your notes, select the proper partition - the smaller of the two partitions you just created - and press **Enter**.

The install program asks if you want the partition scanned for bad blocks. For a small partition such as a swap partition, this takes only a few moments and can help you avoid puzzling problems. Select Yes and press **Enter**.

The install program then informs you that all data on the swap partition will be destroyed. Make certain that you've correctly identified the partition, select Yes, and press **Enter** to begin the initialization. The display helps you keep track of the progress of the task.

When initialization is complete, the main menu reappears, with the Next item designated Initialize a Linux Partition. Press **Enter** to proceed.

3.1.2.11 Initializing a Linux partition

The install program asks you to identify the Linux partition. Using your notes, select the proper partition - the larger of the two partitions you earlier created - and press **Enter**.

The install program asks if you want the partition scanned for bad blocks. For a large partition, this can take several minutes. However, identifying and marking bad blocks can help you avoid puzzling problems, particularly if your hard disk hasn't been previously used. Select Yes and press **Enter**.

The install program then informs you that all data on the Linux partition will be destroyed. Make certain that you've correctly identified the partition, select Yes, and press **Enter** to begin the initialization. The display helps you keep track of the progress of the task.

When initialization is complete, the install program asks whether the Linux partition should be mounted as the root file system, the one to which programs will be installed. Select Yes and press **Enter** to mount the partition.

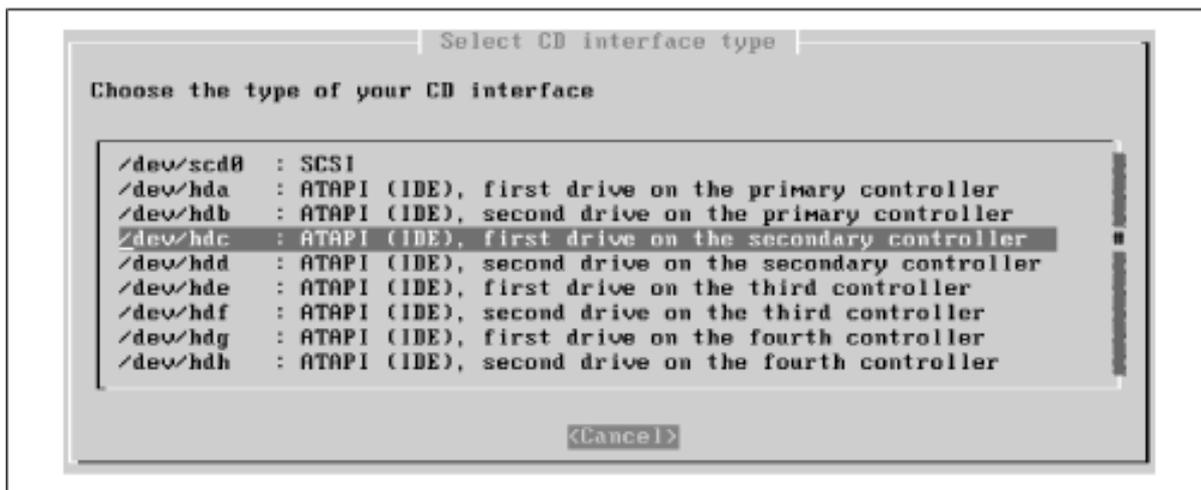
When the partition has been mounted, the main menu reappears, with the Next item designated Install Operating System Kernel and Modules. Press **ENTER** to proceed.

3.1.2.12 Installing the Operating System Kernel and Modules

The install program asks you to specify the medium which contains the Linux distribution. Use the Up and Down arrow keys to select CDROM and press **Enter**.

As shown in [Figure 3.11](#), the install program asks you to identify the CD-ROM drive that contains the distribution. Highlight the appropriate device and press **Enter**. If you can't confidently identify the device, don't fret. If the install program fails to find the distribution, you'll get another chance to identify the device.

Figure 3.11: Selecting the CD interface type



The install program prompts you to place the distribution CD-ROM in the CD-ROM drive. Do so and then press **Enter**.

The install program prompts you to specify the CD-ROM directory that contains the distribution files. The text box is initialized with the default directory */debian*, which is the appropriate choice for the CD-ROM that accompanies this book. Simply use the Up and Down arrow keys to highlight Ok and press **Enter**.

The install program next asks how you want to specify the location of the *resc1440.bin* file that contains the kernel. Select the item designated List and press **Enter**.

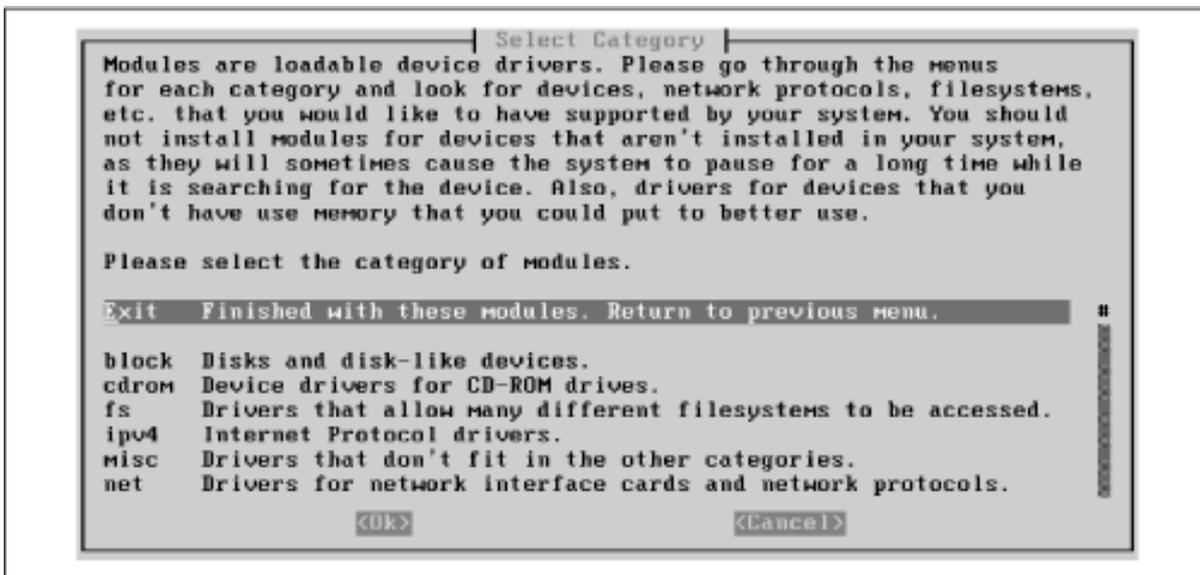
The install program builds a list that contains the name of each directory that contains a file named *resc1440.bin*. The CD-ROM that accompanies this book includes only one such directory, so you can simply press **Enter** to select that directory.

The install program copies the kernel and modules to the hard drive. Then the main menu reappears, with the Next item designated Configure Device Driver Modules. Press **Enter** to proceed.

3.1.2.13 Configuring device driver modules

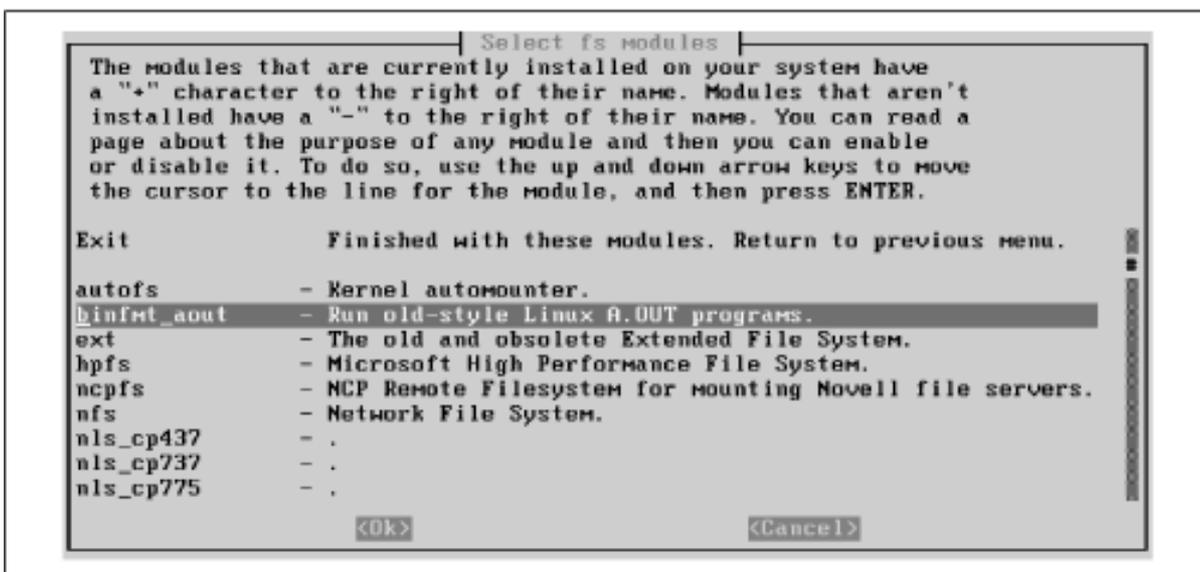
The install program prompts you to select a module category, by presenting the screen shown in [Figure 3.12](#). Each category contains a list of modules, small programs that extend the capability of the kernel to accommodate special devices and functions. By using the Select Category screen and its subscreens, you can specify which modules should be automatically loaded when you boot your Linux system.

Figure 3.12: Selecting a module category



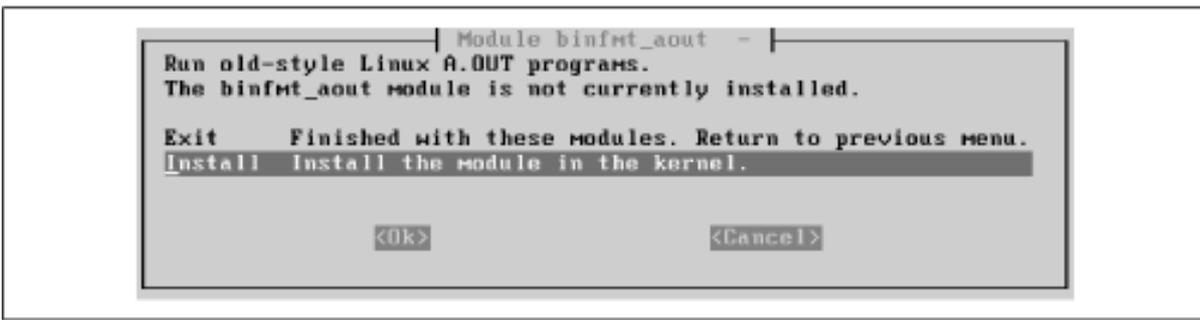
To see how this works, select the item designated "fs" and press **Enter**. The screen shown as [Figure 3.13](#) appears. As the screen explains, you can specify that a module should be loaded by selecting the corresponding list item, and pressing **Enter**. Select the item designated "binfmt_aout" and press **Enter**.

Figure 3.13: Selecting fs modules



A confirmation screen, shown in [Figure 3.14](#) appears. To install the module, select the Install item and press **Enter**. A text-mode screen appears briefly to display the progress and result of installing the module. When the module has been installed, press **Enter** to return to the module selection screen.

Figure 3.14: Installing a module



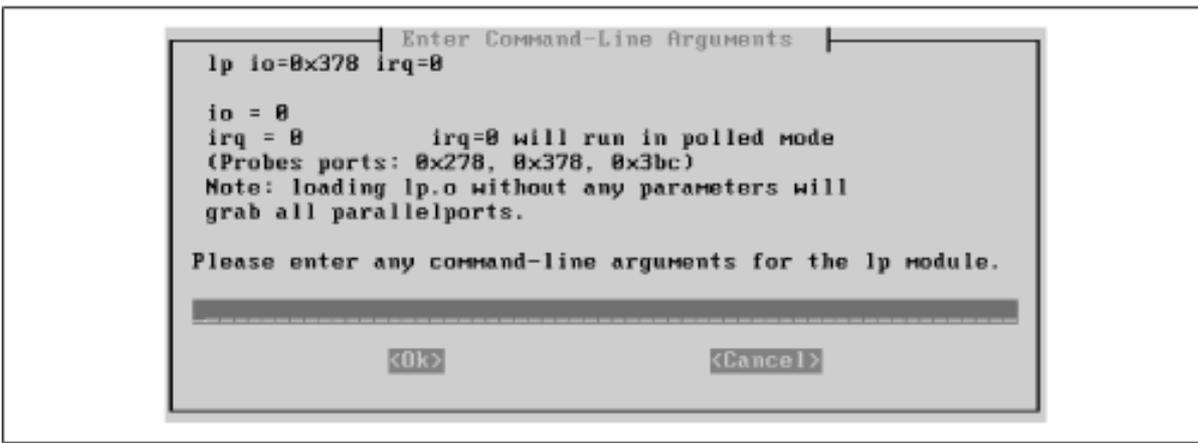
[Table 3.3](#) shows the modules you should install. If your computer has a network adapter, you should also install the proper module from the net category. If your computer has a CD-ROM with a proprietary interface (one other than ATAPI or SCSI), you should also install the proper module from the cdrom category. If you fail to install the proper modules, you can easily install them later. However, the device corresponding to a module will not function until the module has been installed.

When installing some modules, such as the lp module, the install program may prompt you for additional information, using a screen similar to that shown in [Figure 3.15](#). Most modules will load and operate correctly even if you specify no command-line arguments. So, the simplest approach is to forego them. If a device associated with a module fails to operate correctly, you should suspect that command-line arguments are needed. Use the information in the [Section 3.2](#)" section to learn what arguments to specify and how to specify them.

Table 3.3: Modules To Install

Category	Module
fs	binfmt_aout
fs	smbfs
fs	vfat
misc	lp
misc	serial
net	bsd_comp
net	dummy
net	ppp

Figure 3.15: Entering command-line arguments

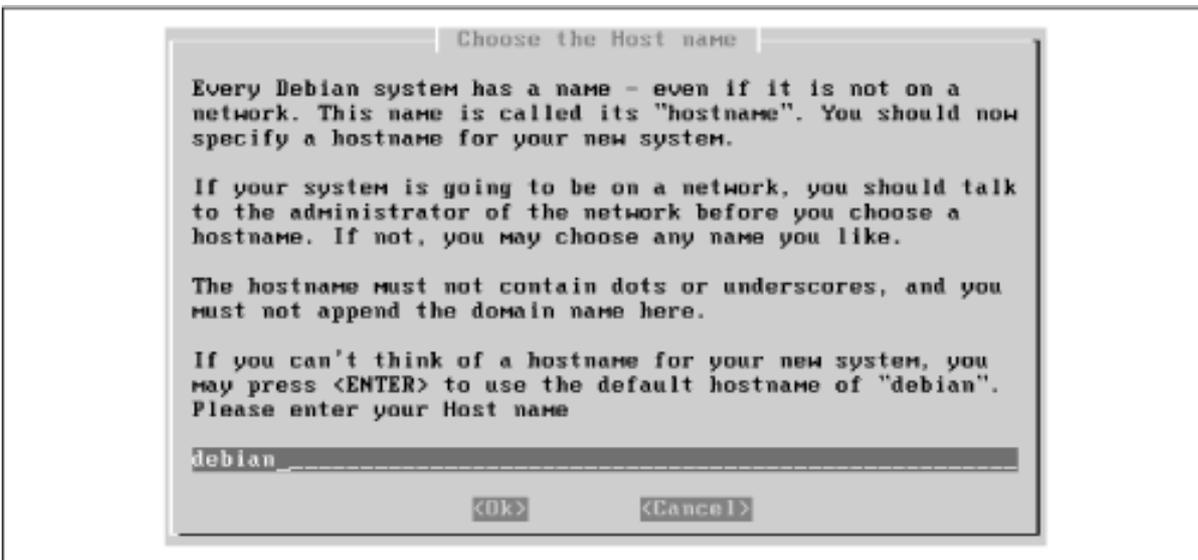


When you've specified all the necessary modules, exit the Select Category screen by highlighting Exit and pressing **Enter**. Then the main menu reappears, with the Next item designated Configure the Network. Press **Enter** to proceed.

3.1.2.14 Configuring the network

The install program presents a screen, shown in [Figure 3.16](#) that lets you choose a hostname for your system. If your system is attached to a network, the network administrator has likely assigned a hostname; in that case, you should specify that hostname here. Otherwise, you may select a hostname of your own choosing. Simply type the hostname in the text box, use the Up and Down arrow keys to highlight the Ok button, and press **Enter**.

Figure 3.16: Choosing the hostname



The install program asks whether your computer is connected to a network. If your computer is permanently connected to a network, highlight Yes and press **Enter**. Otherwise, even if your computer temporarily connects to a network via a dialup connection, highlight No and press **Enter**.

If you specified that your computer is connected to a network, the install program presents a series of screens that prompt you for information describing your system and the network to which it connects. Your network administrator should provide you with the information required by the install program, including:

- Domain Name, the domain name of your system (for example, *debian.org*).

- IP Address, the network address of your system (for example, 192.168.1.2).
- Netmask, a bitmask that specifies the portion of your system's network address that uniquely identifies the network (for example, 255.255.255.0).
- Broadcast Address, which specifies the network address to which broadcast messages will be sent.
- Gateway, the network address of the router your system uses to send packets beyond its local network (for example, 192.168.1.1).
- Nameservers, the network addresses of the systems that provide hostname lookup services to your system (for example, 192.168.1.1).
- Type of primary network interface (for example, Ethernet or token ring).

The first such screen prompts you to specify the domain name associated with the network. Domain names are often - though not always - two words separated by a dot: for example, *oreilly.com*. Type the domain name associated with your network, highlight the Ok button, and press **Enter**. The install program asks you to verify the full name of your computer, which consists of the hostname and the domain name. Check your work. If the full name is correct, highlight Yes and press **Enter**. Otherwise, highlight No and press **Enter**; doing so will allow you to re-specify the erroneous information.

The install program next asks you to specify the IP address of your computer, which usually consists of four one- to three-digit numbers, separated by dots: for example, 192.168.1.1. Type the IP address, highlight the Ok button, and press **Enter**.

Next, the install program asks you to specify the netmask, which has a form resembling that of the IP address. Generally, the netmask value includes only the numbers 0 and 255. Type the netmask, highlight the Ok button, and press **Enter**. If you don't know the netmask, you can try the value 255.255.255.0, which is often correct.

Next, the install program asks you to specify your system's broadcast address. Generally, the first item - which specifies that the broadcast address is formed by setting the last several bits of the IP address to one - is the correct choice. Highlight the desired item and press **Enter**.

Next, the install program asks whether your computer connects via a gateway to networks other than its local network. If a gateway exists, highlight Yes and press **Enter**; otherwise highlight No and press **Enter**.

If you specified that a gateway exists, the install program prompts you for the IP address of the gateway system. Type the IP address, highlight the Ok button, and press **Enter**.

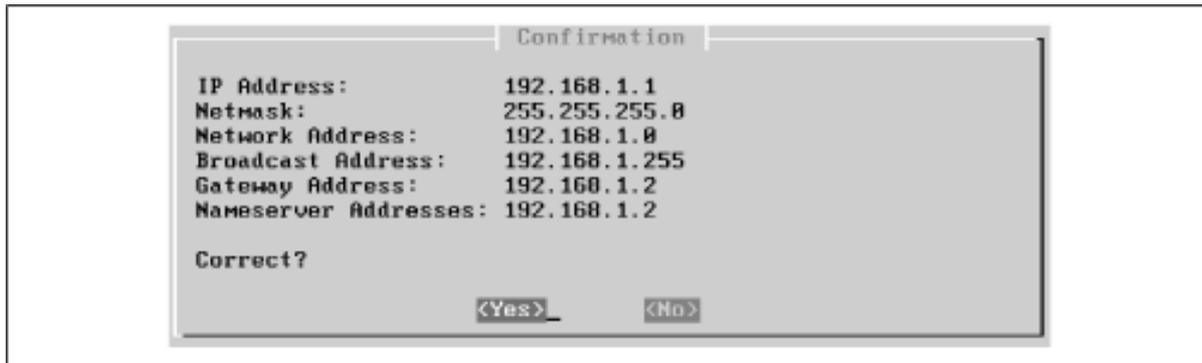
Next, the install program asks about nameservers. Generally, another system acts as the nameserver for a desktop system; therefore, unless your network administrator suggests otherwise, select the first item and press **Enter**.

If you specified that your system uses a nameserver, the install program asks for the nameserver's IP address. You can actually specify as many as five nameservers so that if one server is unavailable, your system can use another. Type one or more IP address, separating each address from the next by a space. Then, highlight the Ok button and press **Enter**.

The install program presents a confirmation screen, like that shown in [Figure 3.17](#), which summarizes your system's network configuration. If the configuration information is correct,

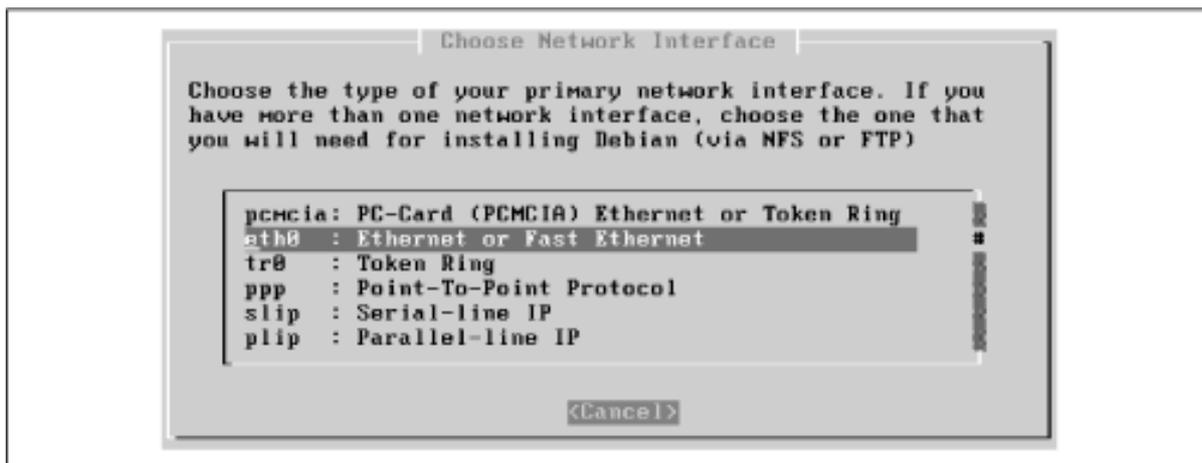
highlight Yes and press **Enter** to proceed. Otherwise, highlight No and press **Enter** in order to be able to correct the erroneous information.

Figure 3.17: Confirming the network configuration



When you've confirmed the network configuration, the install program asks you to specify the type of the primary network interface, by presenting the screen shown in [Figure 3.18](#). Generally, systems are connected to their network via an Ethernet card. Unless your network administrator suggests differently, select the "eth0" entry and press **Enter**.

Figure 3.18: Choosing the network interface



After you select the network interface, the main menu reappears, with the Next item designated Install the Base System. Press **Enter** to proceed.

3.1.2.15 Installing the base system

The sequence of screens that follows resembles the sequence that appeared earlier when you installed the operating system kernel and modules. The install program first asks what medium contains the Linux distribution; select cdrom and press **Enter**.

Next, the install program asks you to identify the CD-ROM drive that contains the distribution. Highlight the appropriate device and press **Enter**. If you can't confidently identify the device, don't fret. If the install program fails to find the distribution, you'll get another chance to identify the device.

The install program prompts you to place the distribution CD-ROM in the CD-ROM drive. Do so and then press **Enter**.

The install program prompts you to specify the CD-ROM directory that contains the distribution files. The text box is initialized with the default directory `/debian`, which is the appropriate choice for the CD-ROM that accompanies this book. Simply use the Up and Down arrow keys to highlight Ok and press **Enter**.

The install program next asks how you want to specify the location of the `base2_1.tgz` file that contains the first part of the base system. Select the item designated List and press **Enter**.

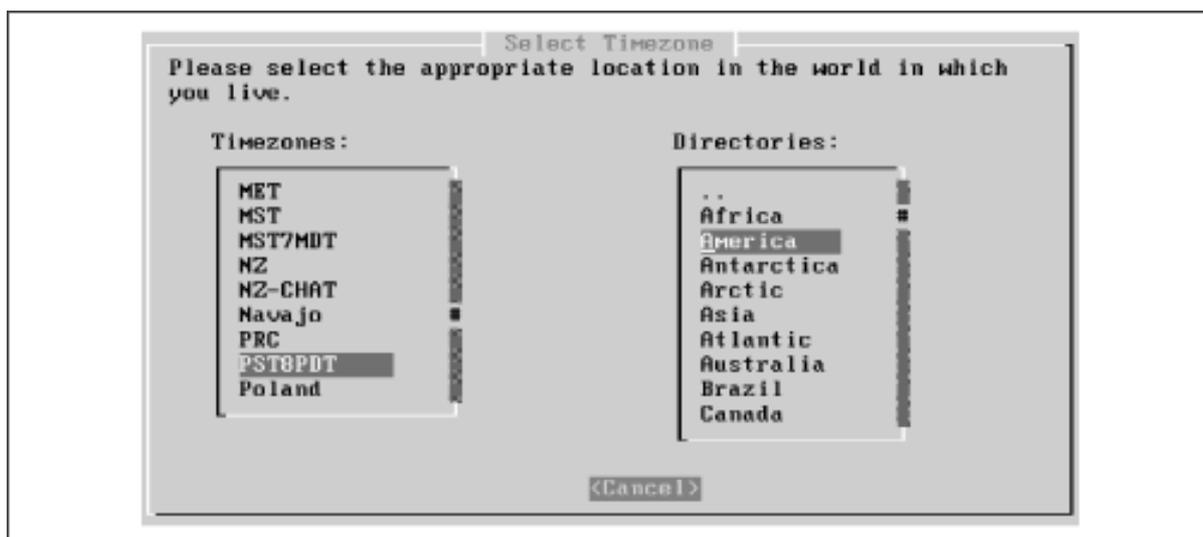
The install program builds a list that contains the name of each directory that contains a file named `base2_1.tgz`. The CD-ROM that accompanies this book includes only one such directory, so you can simply press **Enter** to select that directory.

The install program copies the base system to the hard drive. Then the main menu reappears, with the Next item designated Configure the Base System. Press **Enter** to proceed.

3.1.2.16 Configuring the base system

To configure the base system, you must first select the time zone associated with the system's location. You can do this either of two ways, by using the screen shown in [Figure 3.19](#). The list at the left of the screen (titled *Timezones*) lets you select a time zone by its coded designation. The list at the right of the screen (cryptically titled *Directories*) lets you select a time zone by location, using familiar geographical names. Use the Left and Right arrow keys to select the list you want to use, then use the Up and Down arrow keys to select the appropriate list item and press **Enter**. If you selected a location, the install program may present a second screen that lets you more precisely designate the location. Use the Up and Down arrow keys to select the desired item and press **Enter**.

Figure 3.19: Selecting the Time Zone



Next, the install program presents a screen that explains that Unix system clocks are generally set to Universal Time (GMT), rather than local time. However, you're free to set your system clock any way you like. Most desktop users prefer to set their system's clock to local time, particularly if their system contains multiple operating systems. Press **Enter** to move forward to the screen that lets you specify how you want your system's clock to be interpreted. If you plan to set your system's clock to GMT, select Yes and press **Enter**; otherwise, select No and press **Enter**.

The main menu reappears, with the Next item designated Make Linux Bootable Directly from Hard Disk.

Do not press **Enter**. Instead, use the Up and Down arrow keys to select the Alternate item, designated Make a Boot Floppy. By booting Linux from a floppy, you avoid several potential problems. For further information on booting Linux, including information on booting Linux directly from a hard disk, see **Appendix D, *Managing the Boot Process***.

3.1.2.17 Making a boot floppy

Next, the install program instructs you to place a blank floppy diskette in your system's first floppy disk drive. Insert a floppy diskette - it need not be formatted - and press **Enter**. The install program creates the boot floppy.

WARNING: All data on the floppy disk will be lost.

After the floppy diskette has been created, the main menu appears, with the Next item designated Reboot the System. Press **Enter**.

The install program asks you to confirm your decision to reboot the system. Leave the newly created boot floppy in the floppy disk drive, highlight Yes, and press **Enter**. Your system should restart. If - after a minute or so - it hasn't restarted, press the system's reset button or cycle power to the system.

A boot prompt should appear shortly after your system completes its power-on self test. Press **Enter** to boot Linux from the floppy diskette. Linux should load, causing a series of messages to cascade off the screen.

3.1.3 Configuring the New System

Once your system has booted, you'll see a series of screens that prompt you to configure your new system. First, you're prompted to establish a password for the `root` user.

3.1.3.1 Establishing a root password

When your system has booted, you should see the screen shown in [Figure 3.20](#). This screen lets you establish a password for the `root` user, the master user who administers the system. Follow the on-screen instructions, by typing a password consisting of from five to eight characters. If you choose a password that the install program regards as insecure, the system will prompt you to type another password. If you really want the original password, simply type it again; the system will not object a second time. For security, the system will not display a password as it's typed. Instead, it will prompt you to enter the password a second time, helping you avoid typing a password other than the one you intend.

Figure 3.20: Setting a password for root

```
Before proceeding, you need to set a password for 'root', the system
administrative account. (The root account is the account that you're
currently using). The root password shouldn't be easy to guess, and
it shouldn't be a word found in the dictionary, or a word that could
be easily associated with you, like your middle name. A good password
will contain a mixture of letters, numbers and punctuation and will be
changed at regular intervals. The root password is changed by running
the 'passwd' program as root.
Why such caution? The root account doesn't have the restrictions that
normal user accounts have. root can read, modify or erase any file on
the system, change the ownerships and permissions of any file, and run
programs that require special privileges (such as programs that format
the hard disk!). A malicious or unqualified user with root access can
have disastrous results.
For the same reason, it's a bad idea to use the root account for normal
day-to-day activities, such as the reading of electronic mail, because
even a small mistake can result in disaster. As soon as you're logged
in as root, you should create a normal user account. You should use the
normal user account whenever you're not maintaining the system. (How to
do this will be described in a minute.)

Changing password for root
Enter the new password (minimum of 5, maximum of 8 characters)
Please use a combination of upper and lower case letters and numbers.
New password: _
```

3.1.3.2 Establishing a normal user account

Next, the install program asks whether you want to create a normal user account, in addition to the root user account. Respond by typing Y and pressing **Enter**. Then type a username, consisting of eight characters or less and including only letters and digits. Many Linux users create usernames that consist of the first letter of their first name followed by their last name, or the first seven characters of their last name if their last name has eight or more characters. For example, the author often uses the username `bmccarty`. After typing the username, press **Enter**. If you make a mistake, use the backspace key to erase the erroneous letters.

The system will ask you to establish a password for the new user account, much as it did for the root account. It then asks you to supply the following additional information:

Full Name

Your full name, including your first and last name

Room Number

The room number of your office

Work Phone

Your work phone number

Home Phone

Your home phone number

Other

Other brief information about the user

You should supply the full name. You can supply or omit the other information as you see fit. Once you've entered all the information, the system asks you to confirm your entries. Type Y and press **Enter** to confirm your choices; or, type N and press **Enter** to revise your choices.

3.1.3.3 Configuring shadow passwords

Next, the system asks whether to configure shadow passwords. Unless you have a good reason for doing otherwise, you should configure shadow passwords by typing **Y** and pressing **Enter**. That way, your system's encrypted passwords are stored in a file that only the `root` user can read, making your system much less susceptible to break-ins.

3.1.3.4 Removing PCMCIA support

If your system doesn't require PCMCIA support, the system prompts you to allow it to remove the PCMCIA modules. So long as you don't actually require PCMCIA support, you should type **Y** and press **Enter**.

3.1.3.5 Connecting via PPP

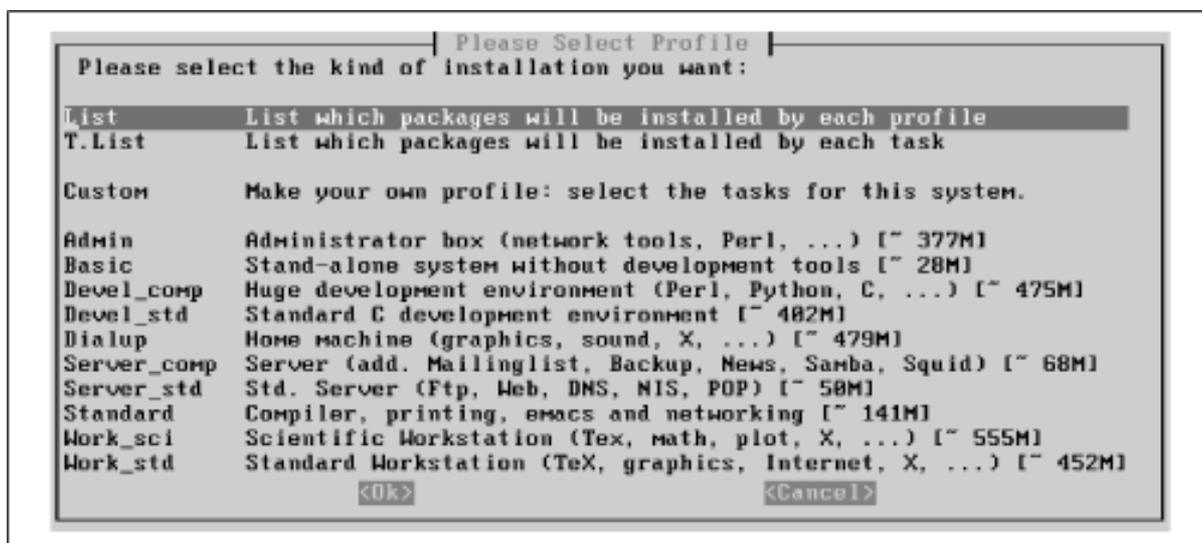
At this point, depending on options you previously selected, the system may prompt you to allow it to connect via PPP to download requested packages. If this prompt appears, respond by typing **N** and pressing **Enter**. Downloading the packages over a dial-up connection would be a very time-consuming operation; it's much quicker to access the packages from the CD-ROM that accompanies this book.

3.1.3.6 Choosing Packages

Next, the system asks whether you'd like to use a speedy way of specifying what applications (packages) you want to install. Type **Y** and press **Enter** to take the fast route, which lets you select from a set of system profiles or tasks.

The screen shown in [Figure 3.21](#) appears. This screen lets you choose profiles that describe the kind of system you want, or tasks that describe the kinds of operations you want your system to perform. The system associates a set of applications with each profile or task; selecting a profile or task instructs the system to install the associated applications in an upcoming step.

Figure 3.21: Selecting a profile



The most appropriate profile for most initial users of Linux is Basic. To choose that profile, use the Up and Down arrow keys to select the Basic item. Then select the Ok button and press **Enter**.

Next, the system informs you that it's about to start the `dselect` program, which actually installs the selected applications. Press **Enter** to begin.

3.1.4 Installing the Applications

The initial `dselect` screen, the program's main menu, is shown in [Figure 3.22](#). You can use the Up and Down arrow keys to highlight a menu item. You can select the highlighted menu item by pressing **Enter**. The on-screen instructions earlier advised that you should skip Access and Update: *ignore these instructions*.

Instead, you'll generally select the menu items in order in which they appear. However, you'll skip menu item 2 (Select), menu item 4 (Config), and menu item 5 (Remove).

Figure 3.22: The `dselect` main menu



3.1.4.1 Accessing the packages

Highlight the Access menu item and press **Enter**. The program presents a list of methods for accessing the applications to be installed. Use the Up and Down arrow keys to highlight the entry designated `apt` and press **Enter**.

Next, you'll be asked if you want to change the source list. Respond *Yes*, which initiates a dialog that builds a simple configuration. Here's a sample dialog that shows the responses you should give to install packages from the CD-ROM diskette that accompanies this book:

```
I see you already have a source list.
-----
source list displayed here: contents vary
-----
Do you wish to change it?[y/N]

y
    Set up a list of distribution source locations

Please give the base URL of the debian distribution.
The access schemes I know about are: http ftp file
```

For example:

```
file:/mnt/debian,  
ftp://ftp.debian.org/debian,  
http://ftp.de.debian.org/debian,
```

URL [http://http.us.debian.org/debian]:

file:/cdrom

Please give the distribution tag to get or a path to the package file ending in a /. The distribution tags are typically something like: stable unstable frozen non-US

Distribution [stable]:

stable

Please give the components to get

The components are typically something like: main contrib non-free

Components [main contrib non-free]:

main contrib

Would you like to add another source?[y/N]

N

3.1.4.2 Mounting the CD-ROM

Access the second virtual console by pressing **Alt-F2**. Login as root and issue the following commands:

```
mkdir /cdrom  
mount -t iso9660 -o ro /dev/  
hdx /cdrom
```

where *hdx* represents the Linux designation of the CD-ROM drive that contains the diskette that accompanies this book. For example, *hdb* is the secondary drive on the first controller. See [Figure 3.1](#) for other common designations.

If the command succeeds, return to the first virtual console by pressing **Alt-F1**. Otherwise, check the arguments and try again.

3.1.4.3 Updating the list of available packages

Highlight the Update menu item and press **Enter**. The program will update its list of available packages. When prompted to do so, press **Enter** to return to the main menu.

3.1.4.4 Installing the selected packages

Skip the Select menu item, by highlighting the Install menu item. Press **Enter** to begin installing the selected packages.

A mail package called `exim` will request configuration information as it's installed. [Table 3.4](#) summarizes these requests and provides the information with which you should respond.

Table 3.4: Configuration Information for `exim`

Prompt	Response
Select a number from 1 to 5....	2
Visible mail name of your system	Enter
Other system names appearing on incoming names	Enter
Domains for which mail is relayed	Enter
Local machines for which mail is relayed	Enter
RBL (sites from which mail will not be accepted)	Enter
Smart host handling outgoing mail	The outgoing mail host provided by your Internet service provider, if any
User account for system administration mail	Enter

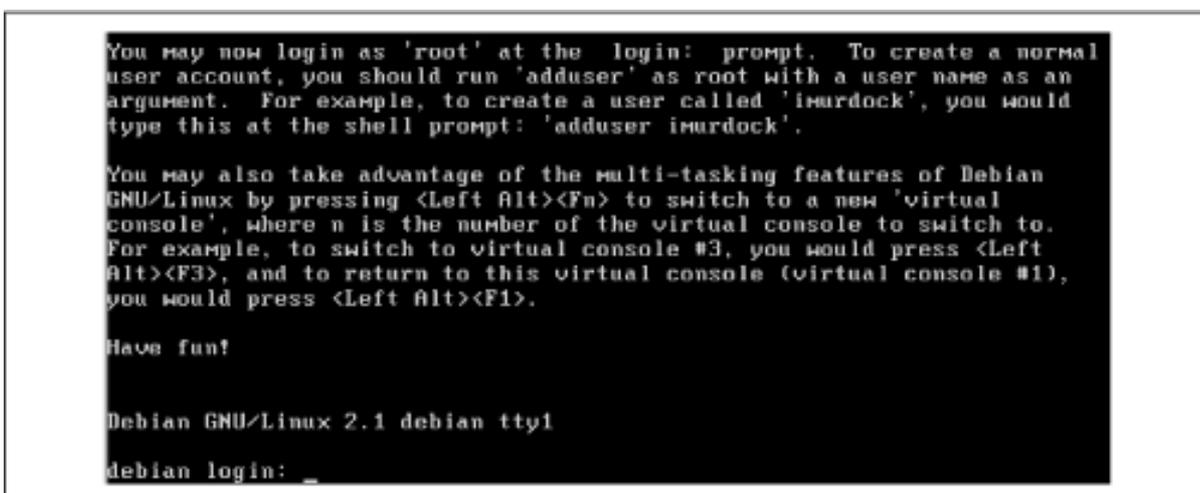
You can revise the configuration of `exim` after installation by issuing the command `eximconfig`.

When all the selected packages have been installed, the program will display the message "Installation OK." Press **Enter** to return to the main menu.

3.1.4.5 Exiting `dselect`

Exit the `dselect` program by highlighting the Quit menu item and pressing **Enter**. The screen shown in [Figure 3.23](#) appears.

Figure 3.23: The Linux login prompt



```
You may now login as 'root' at the login: prompt. To create a normal
user account, you should run 'adduser' as root with a user name as an
argument. For example, to create a user called 'imurdock', you would
type this at the shell prompt: 'adduser imurdock'.

You may also take advantage of the multi-tasking features of Debian
GNU/Linux by pressing <Left Alt><Fn> to switch to a new 'virtual
console', where n is the number of the virtual console to switch to.
For example, to switch to virtual console #3, you would press <Left
Alt><F3>, and to return to this virtual console (virtual console #1),
you would press <Left Alt><F1>.

Have fun!

Debian GNU/Linux 2.1 debian tty1
debian login: _
```

To login to Linux for the first time, type *root* or the name of the user account you earlier created, and then press **Enter**. When the system prompts for the password, type the password and press **Enter**. You should then see a shell prompt, consisting of a pound sign (#) or dollar sign (\$), as shown in [Figure 3.24](#). Congratulations: you've just installed and configured Linux.

Figure 3.24: The Linux shell prompt

```
console', where n is the number of the virtual console to switch to.
For example, to switch to virtual console #3, you would press <Left
Alt><F3>, and to return to this virtual console (virtual console #1),
you would press <Left Alt><F1>.

Have fun!

Debian GNU/Linux 2.1 debian tty1

debian login: root
Password:
Linux debian 2.0.36 #2 Sun Feb 21 15:55:27 EST 1999 i586 unknown

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freely redistributable; the exact distribution terms for each program
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Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Sat Jul 17 17:59:25 on tty2.
No mail.
debian:~# _
```

If you don't see a shell prompt, or if something went wrong earlier in the installation process, don't despair. The next section will show you how to obtain the help you need to get your Linux system up and running.

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2.3 Preparing Your Hard Disk

HOME

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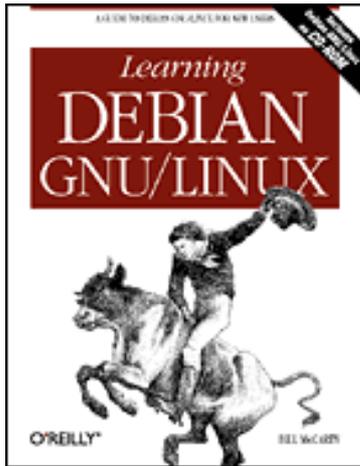
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3.2 Getting Help

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Chapter 4

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4. Issuing Linux Commands

Contents:

[The System Use Cycle](#)

[Working with the Linux Command Prompt](#)

[How Linux Organizes Data](#)

[Working with Devices](#)

[Useful Linux Programs](#)

This chapter shows you how to begin using your Linux system. It shows you how to boot your system, log in, issue commands, log out, and shut down your system. It also explains how to use the `man` command, which provides help on using other commands. The chapter describes how Linux organizes data as filesystems, directories, and files and how you can work with removable media, such as diskettes. It describes how to query the status of your system. And, finally, it explains how to use `picco`, a simple text editor.

4.1 The System Use Cycle

This section introduces you to the cycle of Linux system use. If you're a user of Microsoft Windows, you're accustomed to a pattern of system use that forms a cycle:

- Boot the system
- Identify yourself to the system
- Use the system
- Shutdown the system

The cycle of Linux system use is similar, even though you perform the tasks somewhat

differently.

4.1.1 Booting the System

Most Linux users boot their system from its hard drive. Of course, if you made a boot diskette during system installation, you can use it to boot your system.

First, you must prepare your system for booting. If your system is running, you must shut it down by following the proper procedure for shutting down the operating system that's active. For example, if you're running Microsoft Windows, click Start → Shut Down and select the Shut Down option in the Shut Down dialog box. Press OK to begin the system shutdown. After a few seconds, Windows displays a screen telling you that it's safe to turn off power to your system. Turn off the power or, if your system automatically powers down, wait a few seconds until the system powers itself down.

Next, you must set your system to boot from the desired device. To boot your system from its hard drive, remove any floppy diskette from your system's floppy drive. To boot your system from a floppy diskette, insert your Linux boot diskette into your system's floppy drive.

Now, you're ready to boot your system. Switch your system on (or press your system's reset button, if your system is powered on) and watch as it performs its self test. Shortly thereafter, you should see a `boot :` prompt on the system's monitor. If you like, you can list the available boot configurations stored on the boot device by pressing **Tab**. To boot the system, type the name of the desired configuration and press **Enter**, or simply press **Enter** to boot using the default configuration.

Once it loads, Linux begins probing your system and its devices, printing status information on your system's monitor. This status information is helpful if your system fails to boot properly, because it discloses the point in the boot process where the problem occurred.

When Linux has completed its boot process, your system's monitor will display a login prompt similar to this:

```
Debian GNU/Linux 2.1 desktop tty1
desktop login:
```

4.1.2 Logging In

Before you can use the system, you must identify yourself by logging in. The install program created a special user named `root`; by identifying yourself as the `root` user, you can gain access to the system. Normally, you use the `root` userid only when performing system administration tasks, because the `root` user has special capabilities that other users lack.

To log on, type `root` and press **Enter**. The system prompts you for the password associated with the `root` userid. Type the password you established during the installation process and press **Enter**. To prevent anyone nearby from learning your password, Linux does not display it as you type. If you suspect you've typed it incorrectly, simply press **Enter** and start over; or press **Backspace** once (or more) for each character you've entered and then re-enter it. If you type the userid or password incorrectly, Linux displays the message "login incorrect" and prompts you to

try again.

Like other members of the Unix family, the Linux operating system is case sensitive. Be sure to type the userid `root` just as it appears, using all lowercase characters. Similarly, you must type the password exactly as you entered it in the Root Password dialog box during system installation.

Also, some Linux programs require you to type `Ctrl-BACKSPACE`, rather than `BACKSPACE`. If you press `BACKSPACE` and see `^H` echoed to the console, try pressing `Ctrl-BACKSPACE` instead.

When you've successfully logged in, you'll see a command prompt that looks something like this:

```
root@desktop:/root#
```

This prompt tells you that the Linux `bash` shell is ready to accept your commands.

4.1.3 Issuing Commands

The component of Linux that interprets and executes commands is called the *shell*. Linux supports a variety of different shells, but the most popular is the `bash` shell. This chapter presents the basics of using the `bash` shell; you'll learn more about the shell in **Chapter 13, *Conquering the BASH Shell***.

The Linux `bash` shell presents the user with a command-line interface (CLI). CLIs are familiar to Windows users who have worked in the MS-DOS Prompt window, and indeed the Microsoft Windows MS-DOS Prompt window is a kind of command-line shell for Windows. The Linux `bash` shell works much like the MS-DOS Prompt window. You type text commands and the system responds by displaying text replies. As your first Linux command, type `w` and press **Enter**. Your screen should look something like this:

```
root@desktop:/root#
```

```
w
11:12am up 6 min, 1 user, load average: 0.00, 0.08, 0.05
USER      TTY      FROM          LOGIN@      IDLE        JCPU        PCPU        WHAT
root      tty1                    11:13am    0.00s    0.20s    0.11s    -bash
```

The `w` command tells Linux to display the system status and a list of all system users. In the example, the output of the command tells you that it's now 11:12 a.m., that the system has been up for 6 minutes, and that only one user - `root` - is currently logged in. Notice that the command output is very terse, packing much information into a few lines. Such output is typical of Linux commands. At first, you may find Linux output cryptic and difficult to read, but over time you'll grow to appreciate the efficiency with which Linux communicates information.

Linux provides many commands besides the `w` command; so many that you may despair of learning and recalling them. Actually, the number of commands you'll use regularly is fairly small. Soon, these will become second nature to you.

Now try a second command, the `date` command:

```
root@desktop:/root#
```

```
date
```

```
Tue Feb 23 11:15:20 PST 1999
```

The `date` command displays the current date and time.

If you find working with MS-DOS distasteful or intimidating, you may not immediately enjoy working with the Linux command line. However, give yourself some time to adjust. The Linux command line has several features that make it easier to use, and more powerful, than MS-DOS. If, after working with the Linux command line for several days, you don't find yourself at home, don't despair. Linux provides a graphical user interface in addition to its command-line interface. You'll learn about the graphical user interface in **Chapter 6, *Using the X Window System***.

4.1.4 Correcting Commands

Sometimes you may type a command incorrectly, causing Linux to display an error message. For example, suppose you typed `dat` instead of `date`:

```
root@desktop:/root#
```

```
dat
```

```
bash: dat: command not found
```

In such a case, carefully check the spelling of the command and try again. If you notice an error before pressing **Enter**, you can use the **Backspace** key to return to the point of the error and then type the correct characters.

Just as a web browser keeps track of recently visited sites, Linux's BASH shell keeps track of recently issued commands. This list is called the history list, and you can scroll back through it using the Up arrow key, or back down using the Down arrow key, just as you would with the Back and Forward buttons on a web browser. In fact, the history list provides several powerful ways to remember and reuse frequently issued commands, as we'll see in **Chapter 13**.

The Up and Down arrow keys let you scroll through a list of commands recently issued. This feature is handy when you want to repeat a command. Simply use the Up arrow key to find the command and press **Enter** to re-execute it. You can also use this feature when you want to issue a command similar to one you recently issued. Use the Up arrow key to find the original command. Then, use the Left and Right arrow keys to position the cursor and make whatever changes to the command you like. Finally, press **Enter** to execute the command.

4.1.5 Using Virtual Consoles

In Microsoft Windows, you can have several MS-DOS Prompt windows simultaneously active. Although the `bash` shell doesn't have a graphical user interface, you can nevertheless work with several instances of the shell, by using Linux virtual consoles. Linux provides six virtual consoles; you can use special keystrokes to switch between them. The keystroke **Alt-F *n***, where *n*

is the number of a virtual console (1-6), causes Linux to display virtual console *n*. For example, you can display virtual console 2 by typing **Alt-F2**. You can view only a single console at a time, but you can switch rapidly between consoles by using the appropriate keystroke.

Virtual consoles are handy when you've started a time-consuming task and want to be able to perform an unrelated task while the original task is working. You'll also find them useful after you've established several userids on your system, because you can log on as one userid on one virtual console while you're logged on as another userid on a different console.

Virtual consoles have a screen saver feature like that found on Microsoft Windows. If a virtual console is inactive for an extended period, Linux blanks the monitor screen. To restore the screen without disturbing its contents, press the **Shift** key.

4.1.6 Logging Out

When you're done using a virtual console, you should log out by typing the command `exit` and pressing **Enter**. When you log out, the system frees memory and other resources that were allocated when you logged in, making those resources available to other users.

When the system logs you out, it immediately displays a login prompt. If you change your mind and want to access the system, you can login simply by supplying your userid and password.

4.1.7 Shutting Down the System

You shouldn't turn off power to a computer while it's running Linux; instead, you should shut down the operating system and then turn off power. To shut down a Linux system, you use the `shutdown` command, which resides in a directory named `/sbin`:

```
root@desktop: /root#
```

```
/sbin/shutdown -h now
```

Don't type the prompt, which automatically appears on the command line. Only the `root` user can issue the `shutdown` command. If you want to restart a Linux system, you can use an alternative form of the `shutdown` command:

```
root@desktop: /root#
```

```
/sbin/shutdown -r now
```

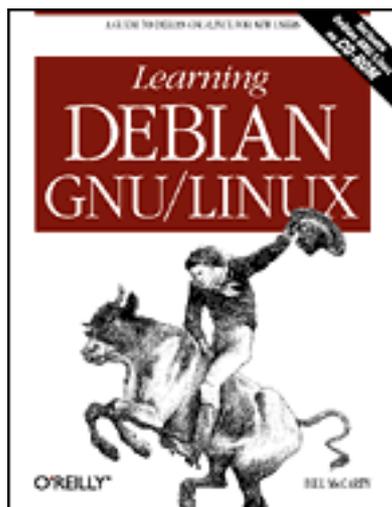
Or, even more conveniently, you can use the familiar MS-DOS "three-finger salute": **Ctrl-Alt-Del**, which simply issues a `shutdown` command on your behalf.

When you shut down a system, Linux automatically logs off all users, terminates all running programs, and closes all open files. Before shutting down a system, you should check each virtual console to determine if an important operation is in progress. If so, you should delay shutting the system down until the operation completes.

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Chapter 5

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5. Installing and Configuring the X Window System

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[What is X?](#)

[Installing X](#)

[Configuring X](#)

[Starting and Stopping X](#)

This chapter helps you install, configure, and use the X Window System (often known simply as X). Once X is up and running, you can choose how to start X. This chapter explains your options and also gives some tips on optimizing the performance of X.

5.1 What is X?

X is the standard graphical user interface for Linux. Like other graphical user interfaces such as Microsoft Windows and Mac OS, X lets you interact with programs by using a mouse (or other pointing device) to point and click, providing a simple means of communicating with your computer.

Originally implemented as a collaborative effort of Digital Equipment Corporation and Massachusetts Institute of Technology, X was first released in 1987. Subsequently, the

X Consortium, Inc. became responsible for the continued development and publication of X.

Despite its age, X is a remarkable and very modern software system: a cross-platform, network-oriented graphical user interface. It runs on a wide variety of platforms, including essentially every variety of Unix. X Clients are available for use, for example, under Windows 3.x, 9x, and NT. The sophisticated networking capabilities of X let you run a program on one computer while viewing the graphical output on another computer, connected to the first via a network. With the advent of the Internet, which interconnected a sizable fraction of the computers on the planet, X achieved a new height of importance and power.

Most Linux users run XFree86, a freely available software system compatible with X. XFree86 was developed by the XFree86 software team, which began work in 1992. In 1994, The XFree86 Project assumed responsibility for ongoing research and development of XFree86.

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4.5 Useful Linux Programs

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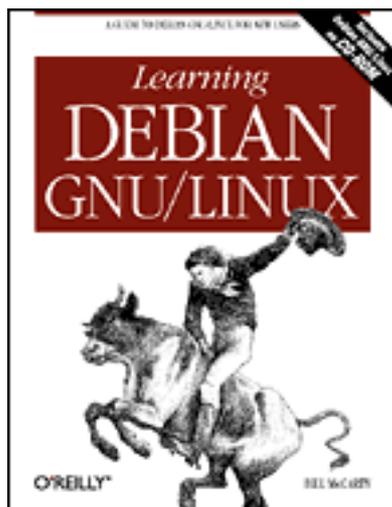
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5.2 Installing X

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6. Using the X Window System

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[Keyboard Operations](#)

[Mouse Operations](#)

[Window Managers](#)

[Desktops](#)

[Using GNOME](#)

[Using GNOME Applets and Applications](#)

[Configuring GNOME](#)

Using the X Window System means interacting with Linux on several different levels. X itself simply provides the graphics for displaying components of a graphical user interface: X draws the screen, draws objects on the screen, and tracks user input actions such as keyboard input and mouse operations. To organize all of this into familiar objects like windows, menus, and scrollbars, X relies on a separate program called a window manager. A window manager alone won't necessarily assure tight integration between applications running under X; that higher degree of integration comes from something called a desktop environment. While X itself is a single program, X under Linux supports several popular window managers, and two popular desktop environments.

To use X effectively, you'll learn the basic keyboard and mouse operations for communicating with X. If you're like most X users, you'll find it helpful to use a

window manager and a desktop with X. You'll learn why window managers and desktops are useful and get help in choosing and setting up a window manager and a desktop.

6.1 Keyboard Operations

Using the keyboard with X closely resembles using the keyboard with Microsoft Windows. X sends your keyboard input to the active window, which is said to have the *input focus*. The active window is usually the window in which you most recently clicked the mouse; however, under some circumstances, it can be the window beneath the mouse cursor.

This chapter refers to your pointing device as a *mouse*. However, like Microsoft Windows, X supports a variety of pointing devices.

Microsoft Windows lets you choose to perform most operations by using the keyboard or mouse. In contrast, X was designed for use with a mouse. If your mouse isn't functioning, you'll find it quite challenging or even impossible to use most X programs.

Similarly, X provides a few important functions that you can access only via the keyboard:

- Using virtual consoles
- Switching video modes

In addition, you can use the keyboard to terminate X.

6.1.1 Switching Video Modes

When you configured X, you specified the video modes in which X can operate. Recall that the current video mode determines the resolution and color depth of the image displayed by your monitor - for example 16 bits per pixel color depth and 1024×768 pixels screen resolution.

By pressing **Shift-Alt+** (using the plus key on the numeric keypad), you command X to switch to the next video mode in sequence. X treats the video modes as a cycle: If X is operating in the last video mode, this key sequence causes X to return to the first video mode.

The similar key sequence **Shift-Alt-** (using the minus key on the numeric keypad) causes X to switch to the previous video mode. If you switch to a video mode that your monitor doesn't support - as demonstrated by a unsteady or garbled image - you can use this key sequence to return to a supported video mode, avoiding the inconvenience of terminating X.

6.1.2 Using Virtual Consoles with X

Even while X is running, you can access the Linux virtual consoles. To switch from graphical mode to a virtual console running in text mode, type **Ctrl-Alt-F *n***, where **F *n*** is a function key and *n* is the number of the desired virtual console. X uses virtual console 7, so only virtual consoles 1-6 are accessible while running X.

To switch from a virtual console back to X, type **Alt-F7**. Nothing is lost when you switch from X to a virtual console or back, so you can move freely between the graphical and text operating modes.

6.1.3 Terminating X

As you learned in the previous chapter, you can terminate X by typing **Ctrl-Alt-Backspace**. X immediately terminates each program running under X, closes each open window, and returns your system to text mode.

This key sequence terminates X abruptly; most window managers support gentler ways of terminating X. You'll learn about these later in this chapter.

While X is running, you cannot use the **Ctrl-Alt-Del** sequence to reboot your system. To reboot your system, you can terminate X and then use the **Ctrl-Alt-Del** sequence, or access a terminal window and enter the command:

```
shutdown -r now
```

The `shutdown` command terminates X and then reboots your system.

6.1.4 Terminal Windows

In Windows, you need not restart in DOS mode simply to have access to the DOS command line. Similarly, in X you need not switch to a virtual console simply to have access to the command line. X enables you to open a terminal window. A terminal window resembles the familiar Microsoft Windows MS-DOS Prompt window; like the Linux shell, it lets you type commands and view command output. Various window managers support different ways of accessing a terminal window.

6.1.5 Pop-Up Menus

The terminal window is just one example of a frequently used program under X that you'll want to access. Most window managers install with a default set of common programs that can be accessed by left- or right-clicking with the mouse on the desktop.

Most window managers, for example, let you click on the desktop and select a terminal window program from the pop-up menu that appears. However, the pop-up menu displayed by a window manager may display program names rather than program functions. In this case, you may have some difficulty determining which entry on the pop-up menu corresponds to a terminal program. Many programs that provide terminal windows have names that include the sequences *xt* or *xterm*. Selecting such an entry will probably launch a terminal window. You'll learn more about window managers and how to use them later in this chapter.

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5.4 Starting and Stopping X

HOME

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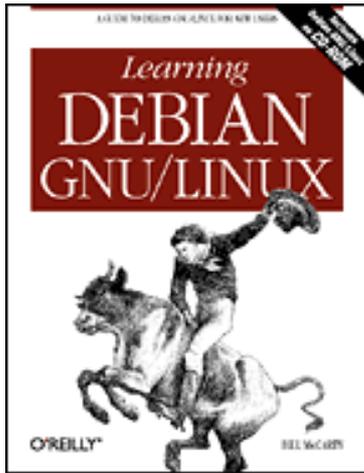
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6.2 Mouse Operations

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7. Configuring and Administering Linux

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[User and Group Administration](#)

[Filesystem Administration](#)

[Starting and Stopping the System and Services](#)

[Viewing System Messages and Logs](#)

[Setting the System Time and Time Zone](#)

This chapter equips you to perform common system administration tasks. By using a few simple commands and a text editor, you can override many configuration choices made during system installation. You'll learn how to add, delete, and modify user accounts, and how to add and delete groups and change their membership. You'll learn how to configure swap space and how to cause Linux to automatically mount filesystems. This chapter doesn't deal with the configuration and administration of network facilities, such as servers. Those topics are covered in Chapters 10, 11, and 12.

7.1 User and Group Administration

In this section, you'll learn how to perform common administrative tasks affecting users and groups. Most system administration tasks require that you login as `root`. Throughout this section and subsequent section, you should assume that you must be logged in as `root`, unless directed otherwise.

7.1.1 Creating a User Account

To create a user account, you use the `adduser` command, which has the form:

```
adduser  
userid
```

where *userid* specifies the name of the user account that you want to create. The command prompts you for the information needed to create the account.

Here's a typical example of using the command, which creates a user account named `newbie`:

```
debian:~#  
  
adduser newbie  
Adding user newbie...  
Adding new group newbie (1001).  
Adding new user newbie (1001) with group newbie.  
Creating home directory /home/newbie.  
Copying files from /etc/skel  
Changing password for newbie  
Enter the new password (minimum of 5, maximum of 8 characters)  
Please use a combination of upper and lower case letters and numbers.  
Re-enter new password:  
Password changed.  
Changing the user information for newbie  
Enter the new value, or press return for the default  
  
    Full Name []:  
  
Newbie Dewbie  
    Room Number []:  
    Work Phone []:  
    Home Phone []:  
    Other []:  
Is the information correct? [y/n]  
  
y  
debian:~#
```

Notice that the lines where the password was typed were overwritten by the subsequent lines. Moreover, for security, passwords are not echoed to the console as they are typed.

Notice also that several of the information fields were omitted - for example, Room Number. You can specify such information if you think it may be useful, but the system makes no use of the information and doesn't require you to provide it.

The similarly named `useradd` command also creates a user account, but does not prompt you for the password or other information.

When the command establishes a user account, it creates a home directory for the user. In the previous example, the command would have created the directory `/home/newbie`. It also places several configuration files in the home directory, copying them from the directory `/etc/skel`. These files generally have names beginning with the dot (.) character, so they are hidden from an ordinary `ls` command. Use the `-a` argument of `ls` to list the names of the files. The files are generally ordinary text files, which you can view with a text editor, such as `ae`. By modifying the contents of such files, you can control the operation of the associated application. For example, the `.bashrc` file controls the operation of the BASH shell, which you'll learn more about in **Chapter 13, Conquering the BASH Shell**.

7.1.2 Changing a User's Name

You can change the name associated with a user account, by using the `chfn` command:

```
chfn -f  
name userid
```

where *name* specifies the new name and *userid* specifies the account to be modified. If the name contains spaces or other special characters, it should be enclosed in double quotes ("). For example, to change the name associated with the account `newbie` to Dewbie Newbie, you would enter the following command:

```
chfn -f "Dewbie Newbie" newbie
```

7.1.3 Changing a User Account Password

From time to time, you should change your password, making it more difficult for others to break into your system. As system administrator, you may sometimes need to change the password associated with a user's account. For instance, some users have a bad habit of forgetting their password. They'll come to you, the system administrator, seeking help in accessing their account.

To change a password, you use the `passwd` command. To change your own password, enter a command like this one:

```
passwd
```

This command changes the password associated with the current user account. You don't have to be logged in as `root` to change a password. Because of this, users can change their own passwords without the help of the system administrator. The `root` user, however, can change the password associated with any user account, as you'll see shortly. Of course, *only* `root` can do so - other users can change only their own password.

The `passwd` command initiates a simple dialog that resembles the following:

```
$
```

passwd

Changing password for newbie

Old password:

Enter the new password (minimum of 5, maximum of 8 characters)

Please use a combination of upper and lower case letters and numbers.

New password:

Re-enter new password:

Password changed.

Notice the restrictions governing the choice of password, which are designed to prohibit passwords that might be easily guessed. If you choose a password that violates these restrictions, the command will refuse the password, prompting you for another.

As the `root` user, you can change the password associated with any user account. The system doesn't ask you for the current password, it immediately prompts for the new password:

```
debian:~# passwd newbie
```

Changing password for newbie

Enter the new password (minimum of 5, maximum of 8 characters)

Please use a combination of upper and lower case letters and numbers.

New password:

Re-enter new password:

Password changed.

Information on users is stored in the file `/etc/passwd`, which you can view using a text editor. Any user can read this file, though only the `root` user can modify it. If you selected shadow passwords, passwords are encrypted and stored in the file `/etc/shadow`, which can be read only by the `root` user.

7.1.4 Configuring Group Definitions

Recall from **Chapter 4, *Issuing Linux Commands*** that Linux uses groups to define a set of related user accounts that can share access to a file or directory. You probably won't often find it necessary to configure group definitions, particularly if you use your system as a desktop system rather than a server. However, when you wish, you create and delete groups and modify their membership lists.

7.1.4.1 Creating a group

To create a new group, use the `groupadd` command:

```
groupadd  
group
```

where `group` specifies the name of the group to be added. Groups are stored in the file `/etc/group`, which can be read by any user but modified only by `root`.

For example, to add a group named `newbies`, you would enter the following command:

```
groupadd newbies
```

7.1.4.2 Deleting a group

To delete a group, user the `groupdel` command:

```
groupdel  
group
```

where *group* specifies the name of the group to be deleted. For example, to delete the group named `newbies`, you would enter the following command:

```
groupdel newbies
```

7.1.4.3 Adding a member to a group

To add a member to a group, you use a special form of the `adduser` command:

```
adduser  
user group
```

where *user* specifies the member and *group* specifies the group to which the member is added. For example, to add the user `newbie01` to the group `newbies`, you would enter the following command:

```
adduser newbie01 newbies
```

7.1.4.4 Removing a member from a group

Unfortunately, no command removes a user from a specified group. The easiest way to remove a member from a group is by editing the `/etc/group` file. Here's an excerpt from a typical `/etc/group` file:

```
users:x:100:  
nogroup:x:65534:  
bmccarty:x:1000:  
newbies:x:1002:newbie01,newbie02,newbie03
```

Each line in the file describes a single group and has the same form as other lines, consisting of a series of fields separated by colons (:). The fields are:

Group name

The name of the group.

Password

The encrypted password associated with the group. This field is not generally used,

containing an *x* instead.

Group ID

The unique numeric ID associated with the group.

Member list

A list of user accounts, with a comma (,) separating each user account from the next.

To remove a member from a group, first create a backup copy of the */etc/group* file:

```
cp /etc/group /etc/group.SAVE
```

The backup can prove helpful if you modify the file incorrectly. Next, open the */etc/group* file in a text editor. Locate the line that describes the group and delete the user name and the following comma, if any. Save the file, exit the editor, and check your work.

7.1.5 Deleting a User Account

To delete a user account, use the `userdel` command:

```
userdel  
user
```

where *user* specifies the account to be deleted. If you want to delete the user's home directory, its files and subdirectories, use this form of the command:

```
userdel -r  
user
```

WARNING: Because deleted files can't generally be recovered, you should backup potentially useful files before deleting a user account.

7.1.6 Configuring Access to Shells

The BASH shell, which you met in **Chapter 4**, is the most popular, but not the only Linux shell. Others include:

ash

a version of the `sh` shell that resembles the System V shell

csh

the C shell, favored by many users for interactive use

ksh

the Korn shell, the third major Unix shell

sh

tosh the Bourne shell, a precursor of BASH, also known as the bsh shell

zsh an enhanced version of csh

zsh the Z shell, a feature-packed version of the Korn shell

When you create a new user, the system automatically assigns the shell (command interpreter) that Linux presents to the user when the user logs in. Debian GNU/Linux assigns the BASH shell, as specified by the file */etc/adduser.conf*. However, you can assign another shell, if you prefer. The shell must be on the list of available shells, which resides in the file */etc/shells*.

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6.7 Configuring GNOME

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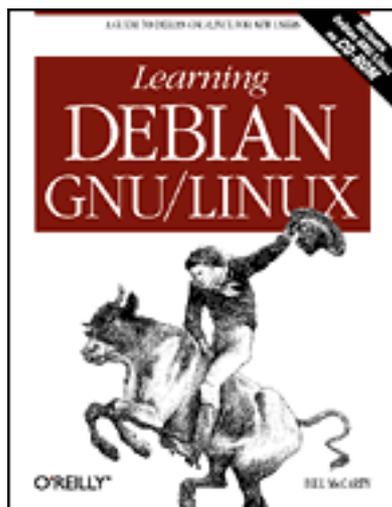
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7.2 Filesystem Administration

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Chapter 8

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8. Using Linux Applications and Clients

Contents:

[Linux Desktop Applications](#)

[Other Approaches to Desktop Computing](#)

This chapter describes how you can use Linux for common desktop computing tasks. You'll learn about popular desktop suites and applications. This chapter also introduces VMWare, a program that lets you run Microsoft Windows and Linux simultaneously, and WINE, a program that lets you run some Microsoft applications under Linux.

The Debian Project is firmly committed to including only truly Open Source software in its main distribution. Not all the programs mentioned in this chapter and the next meet the Open Source definition. Part of the beauty of Linux, though, is the ease with which it can be enhanced. The Contributed and Non-free archives on the Debian site include a wealth of additional software, and some programs are available direct from third party providers.

8.1 Linux Desktop Applications

Not long ago, running Linux meant abandoning your easy-to-use WYSIWYG word

processor or configuring your system for dual boot, so that you could boot Microsoft Windows or IBM OS/2 to access friendly and familiar desktop applications. At that time, Linux supported no robust, full-featured graphical desktop suites.

Today, Linux supports several desktop suites; several more are under development. Apparently, if rumors are to be believed, even Microsoft is considering adapting their Office desktop suite to run under Linux. Whether or not Linux users can expect to soon run Microsoft Office for Linux (or whatever name Microsoft might give this potential product), Linux users who prefer to avoid other operating systems can now do so without compromising their ability to produce first-rate documents, spreadsheets, and graphics.

This section describes the three most popular desktop applications for Linux:

- Applix Applixware
- Corel WordPerfect for Linux
- Sun's StarOffice

In addition, this section briefly describes other desktop options:

- Angoss SmartWare
- Axene Xclamation
- KOffice
- Lotus eSuite
- Quadratron Cliq
- TeX

The final section presents two entirely different approaches to desktop computing:

- The VMware virtual platform, which lets you run Windows and Linux simultaneously on a single computer
- WINE, which lets you run DOS and Windows programs under Linux

8.1.1 Applix Applixware

Applix distributes Applixware, a desktop suite available for a variety of platforms, including Microsoft Windows 9x, Microsoft Windows NT, and several varieties of UNIX, including Linux. Applixware is commercial software, but much less expensive than Microsoft Word. Currently, Applixware for Linux is priced at \$99 (US); you can purchase it from the Applix web site, <http://www.applix.com/>. Print documentation and support programs are also available, at additional cost. If you prefer to try before buying, you can download a feature-disabled demo version; however, the download is quite large (over 38 MB) and therefore time-consuming (over 3 hours at 28.8 Kbps) unless you have a high-speed connection to the Internet.

Appixware includes eight main components:

- Words, a WYSIWYG word processor
- Spreadsheets, a graphical spreadsheet application
- Presents, a presentation graphics application
- Graphics, a drawing, charting, and graphics editing application
- Mail, an email client
- HTML Author, an application for authoring web documents
- Data, an application for accessing data held in Oracle, Informix, Sybase, or CA-Ingres databases
- Builder, an application development environment for decision support systems

8.1.1.1 Running Appixware

Once you've installed Appixware, you can run it by starting X and using a terminal window to issue the following commands:

```
DISPLAY=localhost:0  
/opt/applix/applix
```

If you installed Appixware to a directory other than */opt/applix*, you'll need to adapt the second command accordingly.

When Appixware starts up, it displays a window containing the Appixware main menu, shown in [Figure 8.1](#). From the toolbar of the main menu, you can simply click to launch Words, Graphics and Presents, Spreadsheets, Mail, or Data. Alternatively, you can click on the asterisk icon, causing Appixware to display a menu, as shown in [Figure 8.2](#).

Figure 8.1: The Appixware main menu

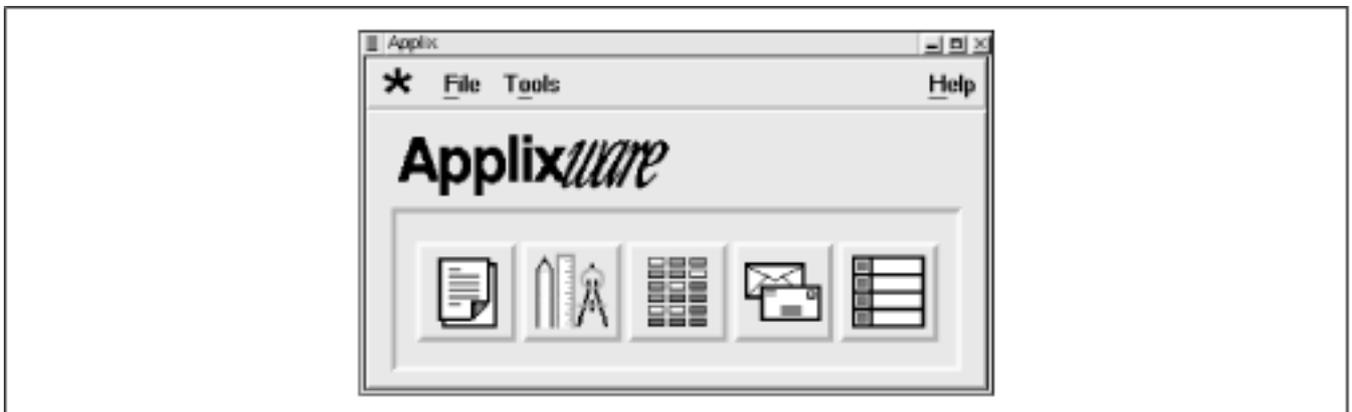
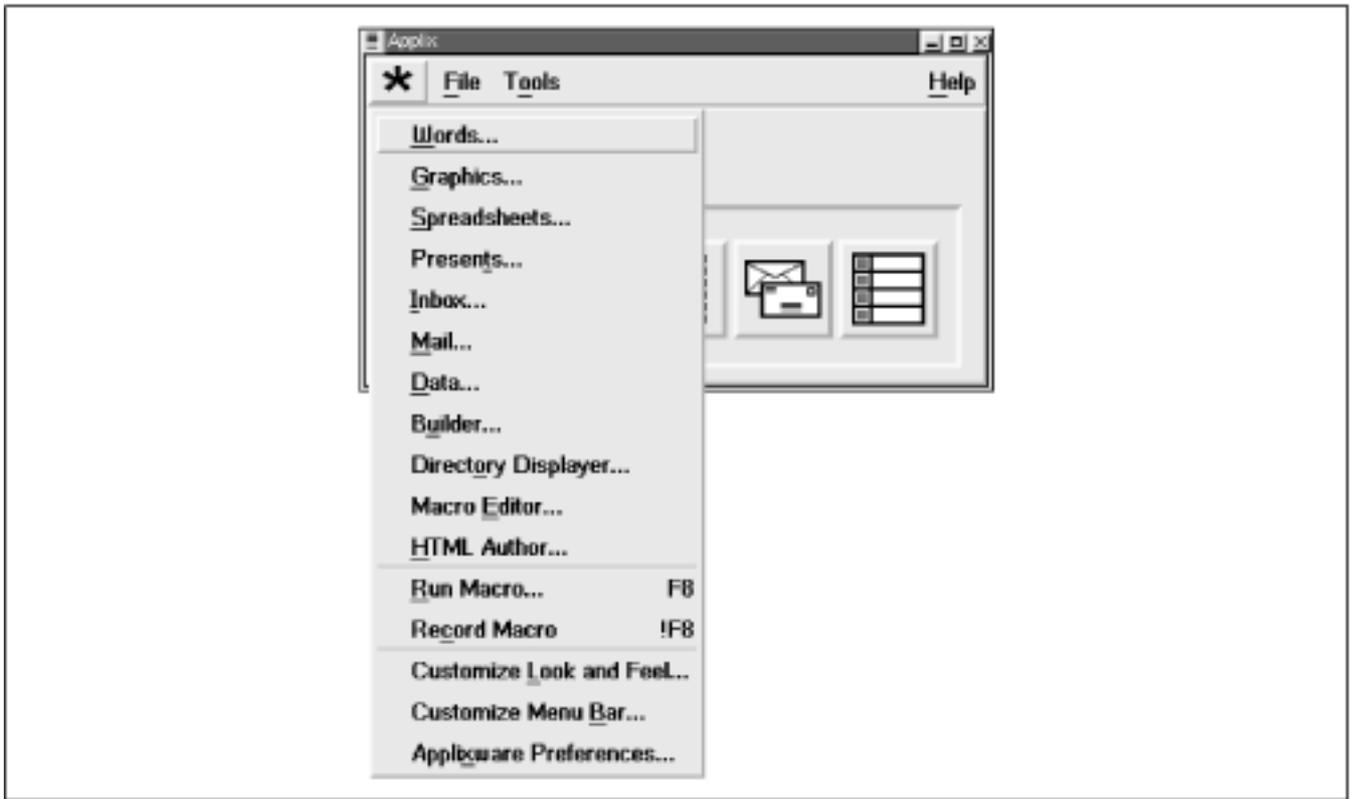


Figure 8.2: The Appixware application menu



[Figure 8.3](#) shows the Words application. Words includes a spelling checker and supports document templates, tables, multimedia, and live links to Applicware and third-party documents. Moreover, it lets you import and export a variety of document formats, including Microsoft Word 2.0, 6.0, 7.0/95, and 97.

Figure 8.3: The Words application



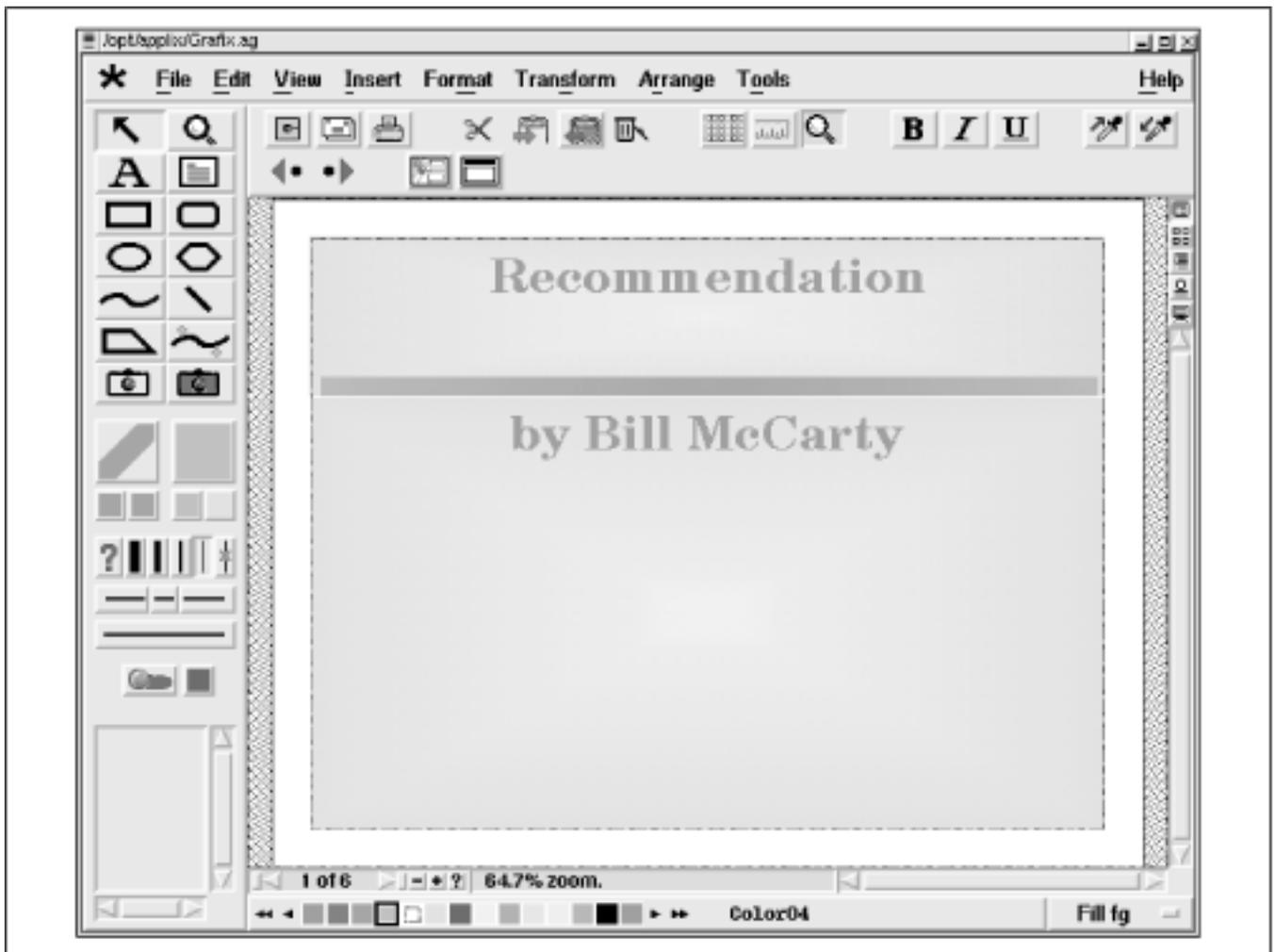
[Figure 8.4](#) shows the Presents application, which lets you create presentations in a way that resembles that provided by Microsoft PowerPoint. Presents provides features such as transitions and animation, HTML export, and templates. Its drawing tools let you draw lines, curves, and shapes, and perform other operations, such as rotations and fills. Presents can also import and export PowerPoint presentations and a variety of other document types.

Although a Linux application, such as Words or Presents, may be able to import a Microsoft Office document, the application may not be able to handle the full range of document and object types that can be embedded in an Office document. Some document and object types, for example, require access to a host application that runs only under Microsoft Windows.

Moreover, some Linux applications do not currently support all the styles and options of their Office counterparts. For example, if a document uses Microsoft's Visual Basic for Applications, the document will probably not function correctly under Linux.

If you plan on moving documents to and from Office, you may want to save your documents in a portable format (such as RTF), rather than a Microsoft proprietary format. This will significantly improve the chances that your document will work correctly both in Windows and Linux.

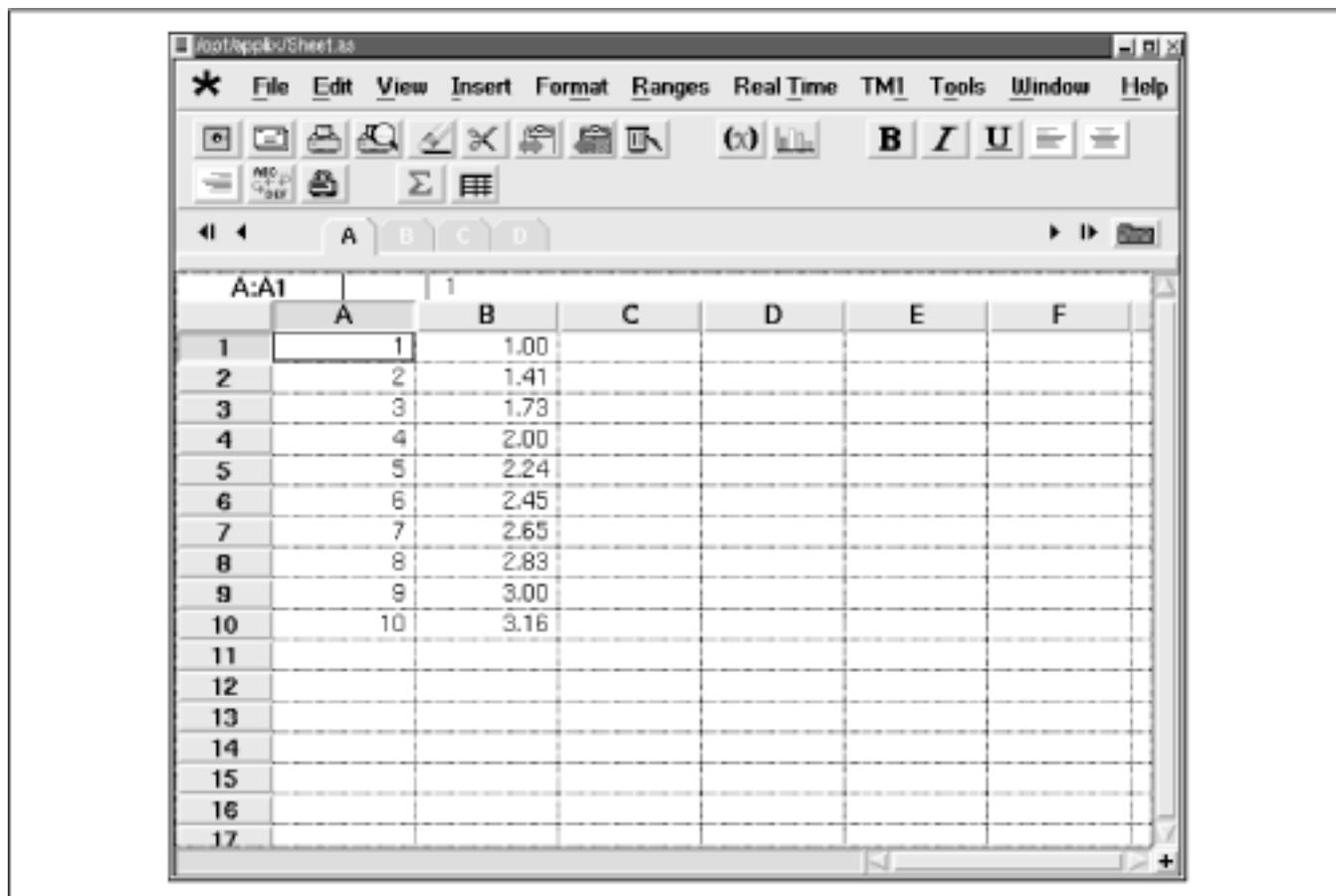
Figure 8.4: The Presents application



[Figure 8.5](#) shows the Spreadsheets application, which provides functions similar to those of Microsoft Excel. Spreadsheets lets you create ordinary spreadsheets as well as 3D charts and sheets, and supports live links to objects created by Applixware and third-party applications, including Applix Data, which provides access to relational

databases. Spreadsheets implements Applix's Extension Language Facility (ELF), which lets you add custom functions to the hundreds of built-in functions. Spreadsheets can import and export a variety of document types, including Lotus 1-2-3 (WKS, WK1, WK3, and WK4 files) and Microsoft Excel 3.0, 4.0, 5.0, 7.0/95, and 97.

Figure 8.5: The Spreadsheets application



8.1.2 StarOffice

Another popular Linux desktop suite is StarOffice, a product of Sun Microsystems. StarOffice is available free of charge from Sun's web site, <http://www.sun.com/products/staroffice/>. The download is about 70 MB, requiring over 6 hours at 28.8 Kbps. The office suite is also available on CD-ROM, for a cost of DM20,- plus shipping and handling.

StarOffice includes an extensive range of applications, including:

- StarDesktop, a file manager and desktop
- StarWriter, a word processor
- StarCalc, a spreadsheet application
- StarDraw, a drawing application
- StarImpress, a presentation graphics application
- StarBase, a relational database
- StarSchedule, a personal organizer that keeps track of events, tasks, contacts,

- and projects
- StarMail, an email client
- StarDiscussion, an Internet newsgroup reader
- SharChart, a business graphics application
- StarImage, an image editor that provides many special effects
- StarMath, a formula editor

8.1.2.1 Installing StarOffice

To install StarOffice from a StarOffice CD-ROM, log in, mount the CD-ROM, change to the directory that is the mount point of the CD-ROM device, change to the *Office50/english/prod_lnx* subdirectory, and issue the `setup` command:

```
su -
mount -t iso9660 /dev/cdrom /cdrom
cd /cdrom/Office50/english/prod_lnx
./setup
```

The install program will guide you through the installation process.

If you have downloaded the personal edition, you have a tar file, rather than a CD-ROM diskette. The tar file has a name similar to *so501_01.tar*. Change to the directory in which you saved the tar file (for example, */download*) and issue the following commands:

```
tar xvf so501_01.tar
cd so501_inst
./setup
```

If you saved your tar file using a name other than *so501_01.tar*, you'll need to adapt the first and second commands accordingly. As when you install from CD-ROM diskette, the install program will guide you through the installation process.

Whether you're installing from CD-ROM diskette or a downloaded file, you should check the *README* file in the *Office50* directory for additional information and instructions that will help you install and use StarOffice.

8.1.2.2 Running StarOffice

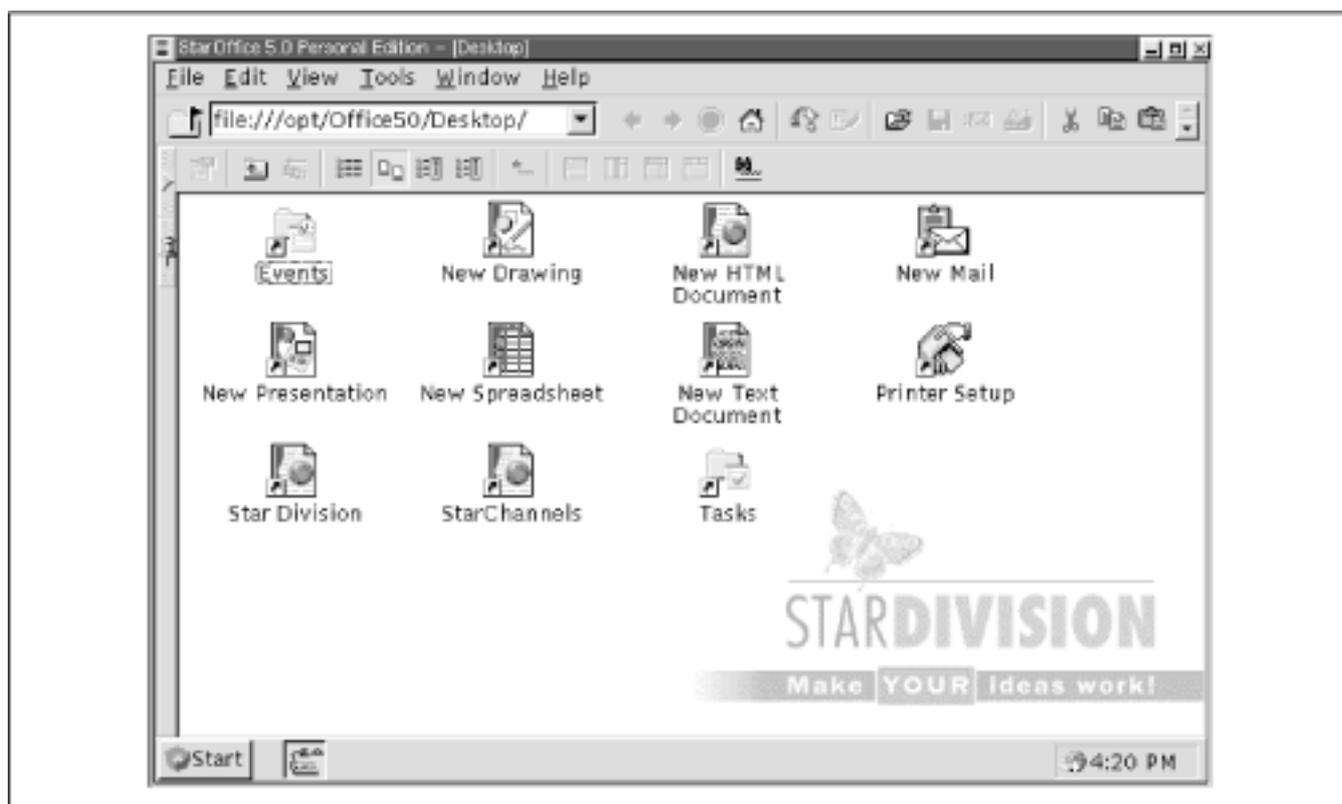
Once you have installed StarOffice, you can run it by starting X and using a terminal window to issue the following commands:

```
PATH=$PATH:/opt/Office50/bin
soffice
```

If you installed StarOffice into a directory other than `/opt/Office50`, you'll need to adapt the first command accordingly.

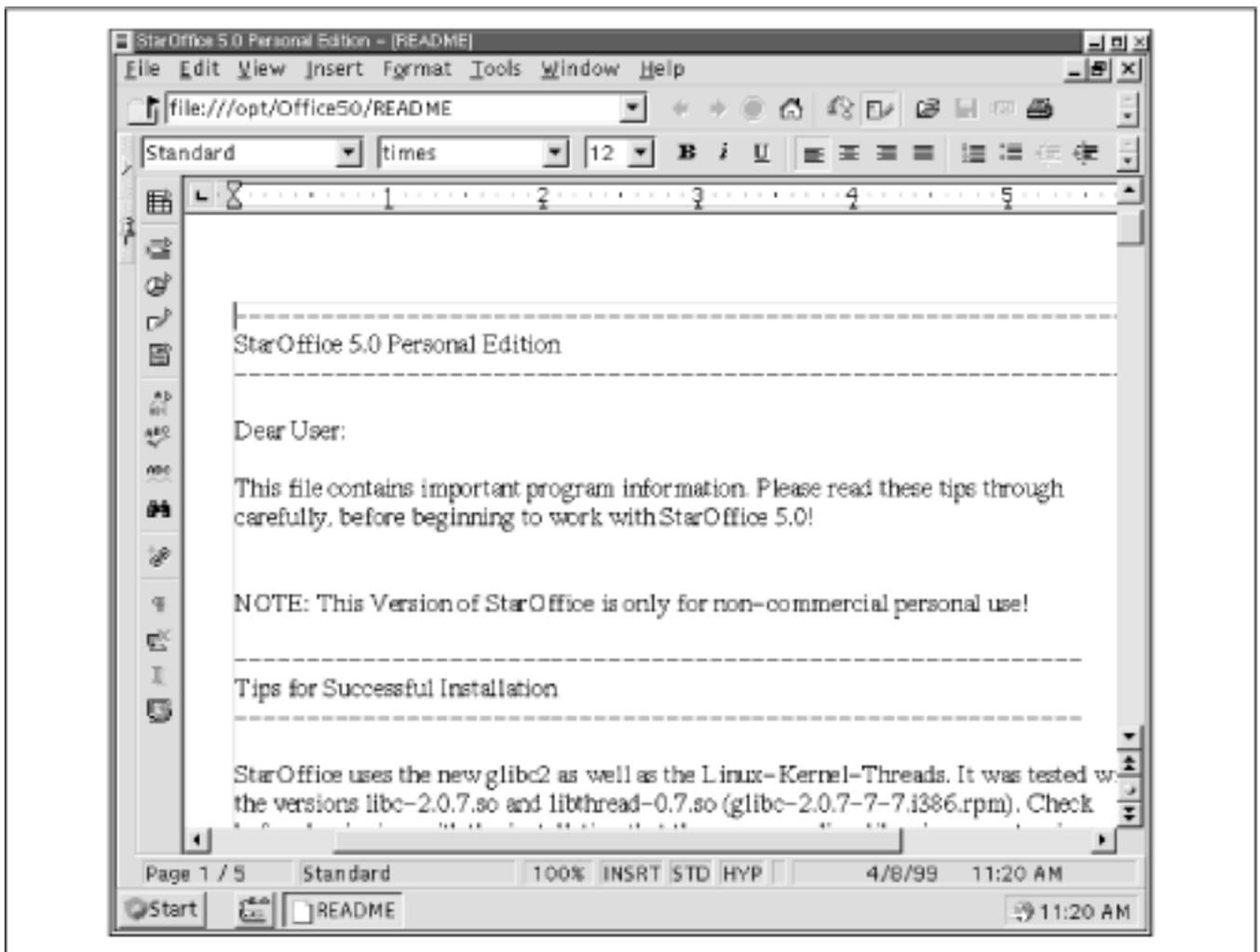
When StarOffice loads, it automatically launches the StarDesktop application, as shown in [Figure 8.6](#). StarDesktop resembles Windows Explorer and the GNOME File Manager. It lets you point, click, drag, and drop to open and manage document files and folders.

Figure 8.6: StarDesktop



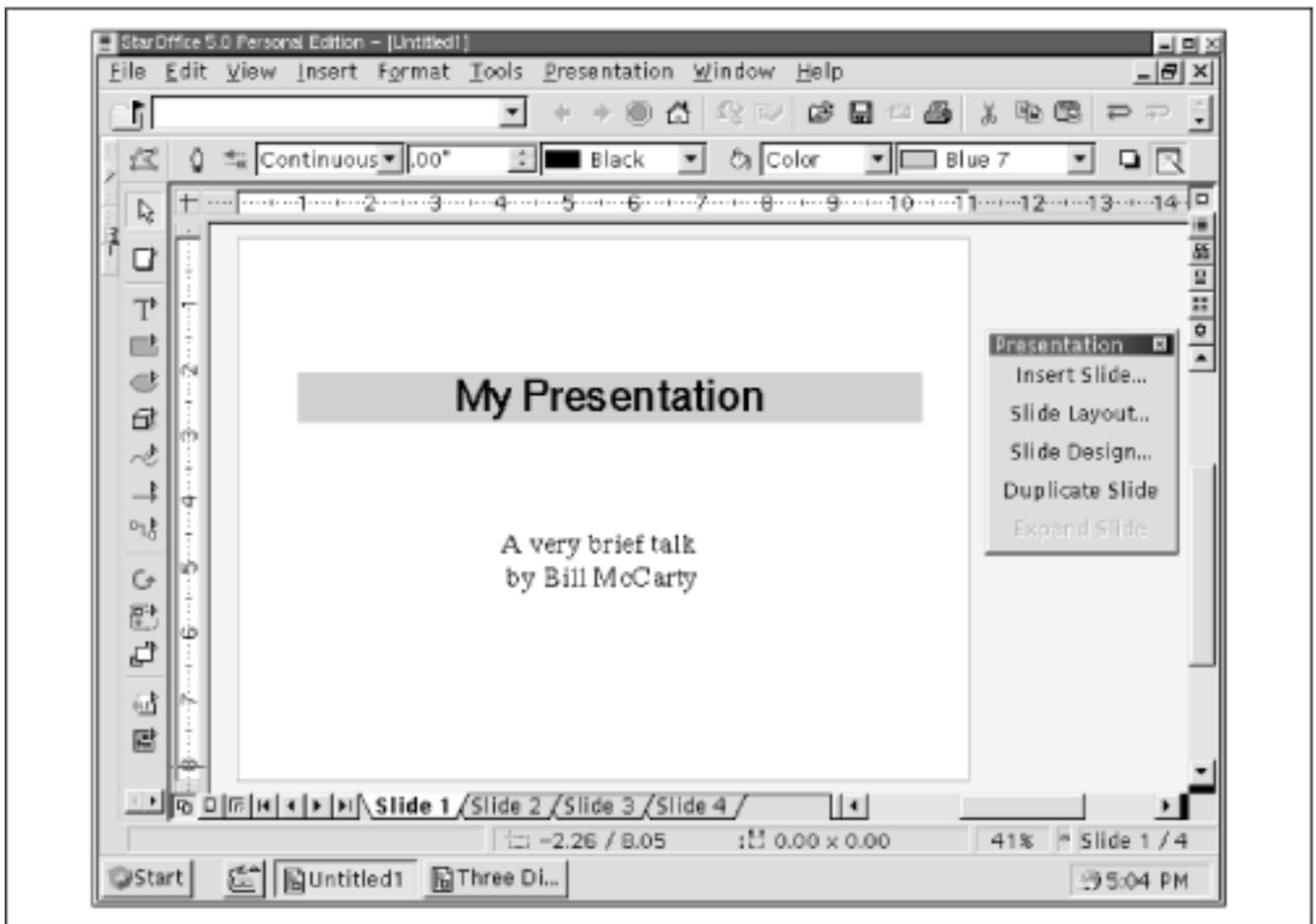
[Figure 8.7](#) shows StarWriter, StarOffice's word processor. StarWriter provides PGP-encrypted email and other features not found in Microsoft Office 97. Like Applixware's Words, it imports and exports a variety of document types, including Microsoft Word 97.

Figure 8.7: StarWriter



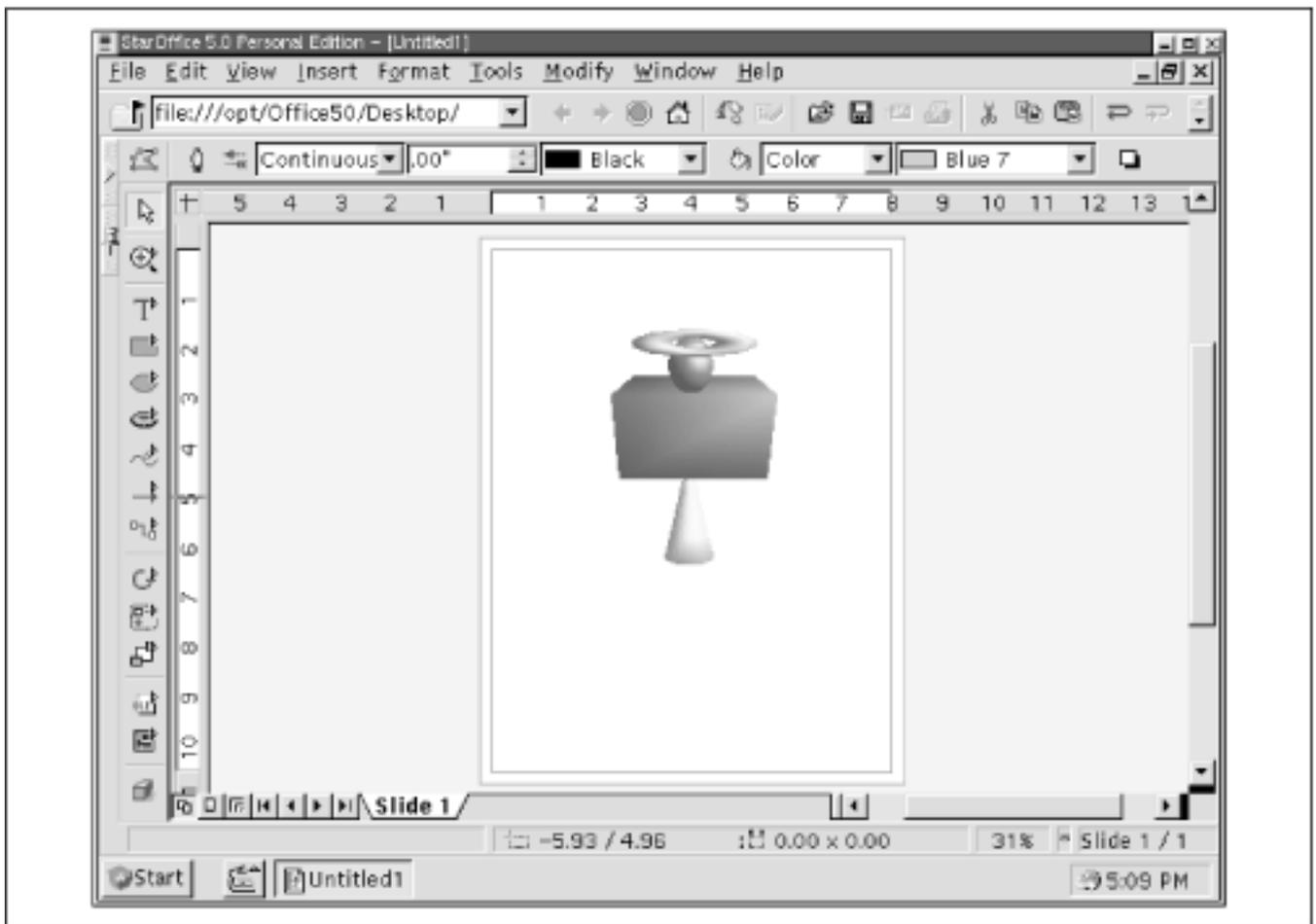
[Figure 8.8](#) shows StarImpress, the presentation graphics application included in StarOffice. Like Applixware's Presents, StarImpress imports and exports a variety of document types, including PowerPoint 97. StarImpress provides templates, animation and transitions, 3D effects, charts, and many other features.

Figure 8.8: StarImpress



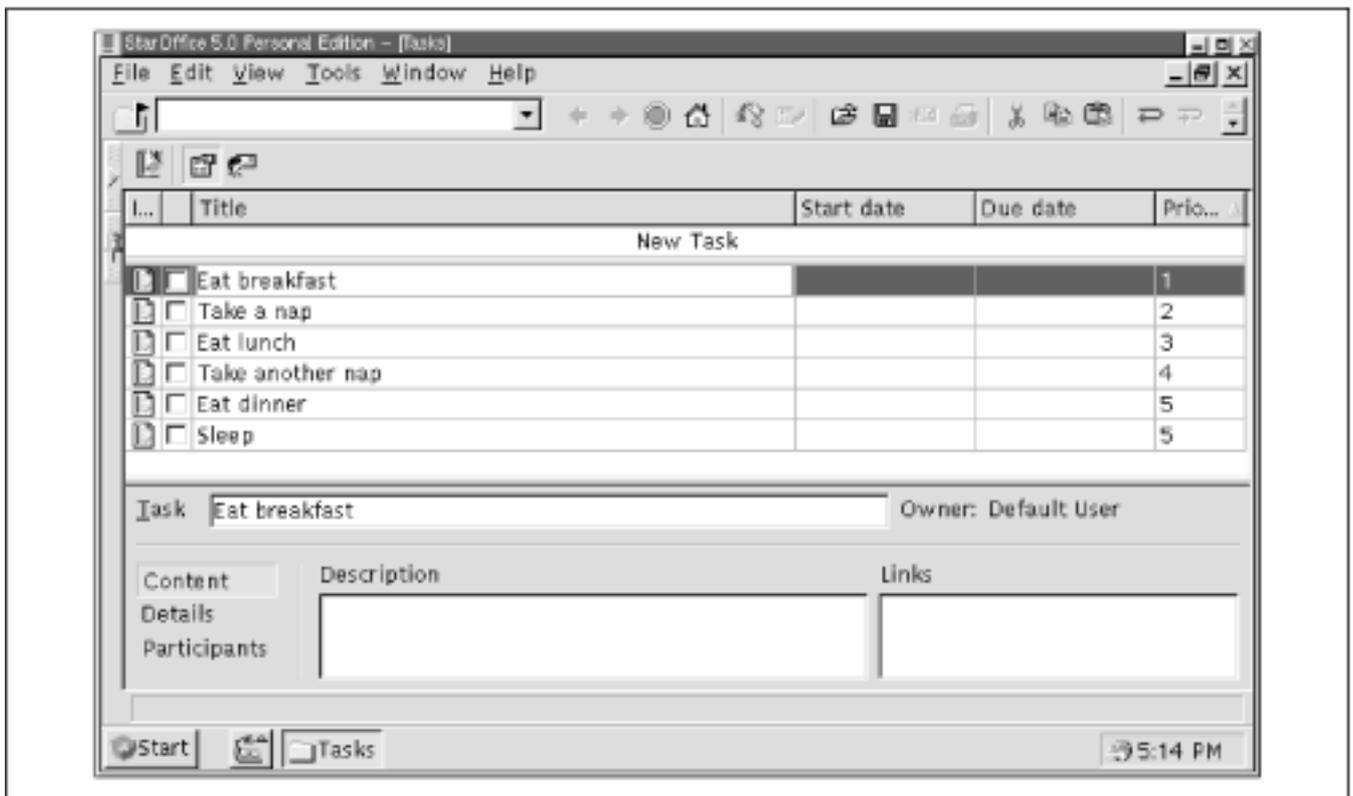
[Figure 8.9](#) shows StarDraw, StarOffice's drawing program. StarDraw provides a wide range of drawing tools and effects, and works with a variety of file types, including even Windows Metafile (WMF).

Figure 8.9: StarDraw



In addition to the bread-and-butter applications provided by Applixware, StarOffice provides several smaller, but quite useful, applications. For example, [Figure 8.10](#) shows StarSchedule, which can help you keep track of the tasks on your to do list.

Figure 8.10: StarSchedule



8.1.3 Corel WordPerfect for Linux

Another popular desktop application is Corel's WordPerfect for Linux, available free of charge for personal use from Corel's web site, <http://www.corel.com/>. WordPerfect is more a word processor than a complete desktop suite; for example, no spreadsheet application accompanies it. However, WordPerfect does provide many functions and features, including:

- a file manager
- drawing and charting
- spreadsheet functions in tables
- HTML authoring

A personal retail version (currently available for DM139,- US) adds features such as:

- advanced drawing and charting functions
- version control
- clipart images, photos, textures, templates, and fonts

The downloadable version is about 24 MB in size, about a 2 hour download at 28.8 Kbps.

8.1.3.1 Installing WordPerfect for Linux

To install the downloaded version of WordPerfect for Linux, change to the directory that contains the downloaded file and issue the following command:

```
DISPLAY=localhost:0
```

Then start X, open a terminal window, and issue the following commands:

```
cd /download
tar zxvf wp.tgz
./Runme
```

If your downloaded file has a name other than *wp.tgz* or if it resides in a directory other than */download*, you'll need to adapt these commands accordingly.

The install program will guide you through the installation process.

To install the CD-ROM version of WordPerfect for Linux, follow the instructions that accompany the CD-ROM.

Some web sites, including the Corel web site, may provide WordPerfect for Linux as an uncompressed file. If the `tar` command fails with an error message indicating that the file is not in the gzip format, use the following command to unpack the file:

```
tar xvf wp.tgz
```

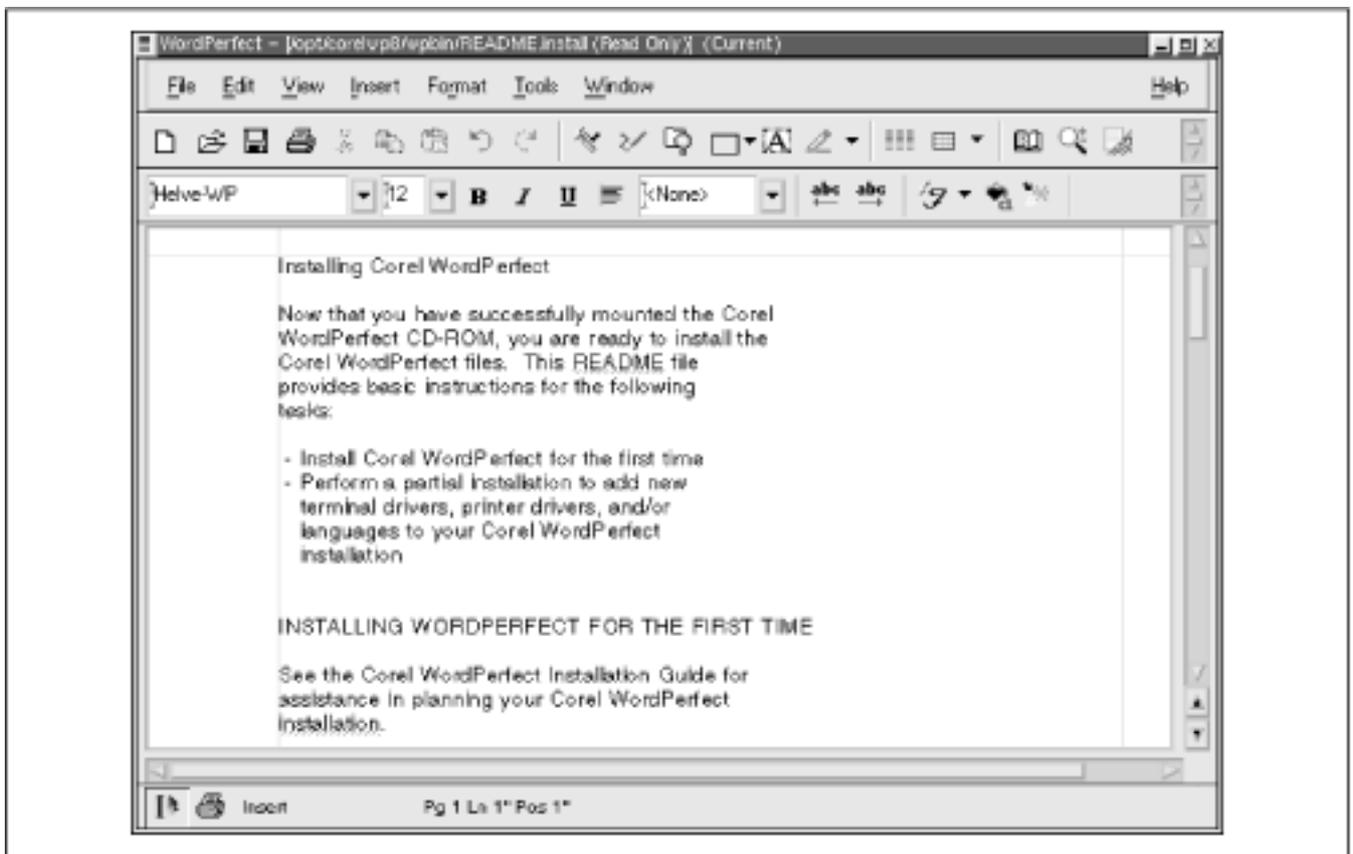
8.1.3.2 Running WordPerfect for Linux

Once you've installed WordPerfect for Linux, you can run it by starting X and using a terminal window to issue the command:

```
/opt/corelwp8/wpbin/xwp
```

[Figure 8.11](#) shows WordPerfect for Linux in operation.

Figure 8.11: WordPerfect for Linux



8.1.4 Other Desktop Applications

[Table 8.1](#) describes some other desktop applications available for Linux. Notable among these is TeX, a freely available desktop publishing package of unsurpassed power. Because of its powerful and sophisticated handling of formulas and mathematical notation, TeX is a favorite among scientists and mathematicians.

Table 8.1: Other Desktop Applications for Linux

Application	Web site	Description
Angoss SmartWare	http://www.angoss.com/	Includes a word processor, spreadsheet, and relational database. Print- and save-disabled demo version available for free download. Registration fee \$50 (US).

Axene Office	http://www.axene.com/	Includes a word processor, desktop publishing application, and spreadsheet. Linux license \$49 (US). Printed manuals \$60 (US) per application.
KOffice	http://koffice.kde.org/	GPLed desktop suite. Currently in alpha release.
Lotus eSuite	http://www.lotus.com/home.nsf/tabs/esuite1	Java applets that provide a word processor, spreadsheet, presentation graphics, project scheduler, chart, SQL/JDBC, and CGI gateway. Single-user license \$127 (US).
Quadratron Cliq	http://www.quad.com/	Character-based desktop suite. Single-user license \$49 (US).
TeX	http://www.ctan.org/	GPLed desktop publishing application. Sophisticated and powerful but somewhat cumbersome to use.

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7.5 Setting the System Time and Time Zone

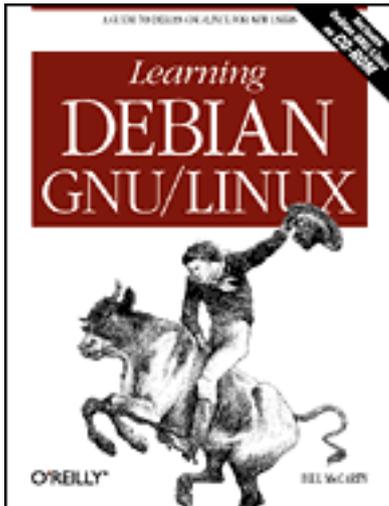
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Chapter 9

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9. Playing Linux Games

Contents:

[A Survey of Linux Games](#)

[Closeups of Some Popular Games](#)

In the last chapter you learned how to use Linux to help you work; in this chapter you'll learn how to use Linux to help you play. A variety of challenging and exciting games is available for Linux; many of them are free. In addition, you can use WINE to run a variety of commercial games originally written for Microsoft Windows.

9.1 A Survey of Linux Games

Linux includes several popular games. In addition, many Linux games are available on the Web. [Table 9.1](#) lists some of the most popular sites offering Linux games and [Table 9.2](#) describes some of the most popular Linux games. However, you'll find almost every game you could want on the Debian web site, <http://www.debian.org/>.

Table 9.1: Popular Linux Game Web Sites

Web Site	URL

Freshmeat	http://freshmeat.net/
Linux Game Tome	http://happypenguin.org/
Linux Games Page	http://www.linuxgames.com/
Linux Quake Page	http://www.planetquake.com/linux/
linuxquake.com	http://www.linuxquake.com/
Loki Games	http://www.lokigames.com/
Slashdot	http://www.slashdot.org/

Table 9.2: Some Popular Linux Games

Game	Type	Description
BZFlag	Action	Multi-player tank battle game.
Civilization: Call To Power	Strategy	A commercial Linux version of the sequel to Micropose's Civilization. Supports network play.
CrossFire	Role Playing	Resembles Rogue. Supports multi-player network play.
DOOM	Action	Classic action game. Requires <i>doom.wad</i> file from licensed copy of game.
Freeciv	Strategy	Resembles Microprose's Civilization. Supports network play.
Illust Logic	Puzzle	A paint-by-numbers puzzle, wherein you strive to paint cells of a canvas.
Koules	Arcade	Multi-player action game. Supports console or X11 play.
NetHack	Role Playing	A quest game resembling Rogue. Supports console or X11 play.
Netrek	Arcade	Multi-player 2-D battle simulation with a Star Trek theme.
PySol	Card	Twenty different versions of solitaire.

Quake	Action	A Linux version of the commercial game Quake. Requires the PAK file from the game CD-ROM diskette. Supports console or X11 play.
Quake II	Action	In the opinion of many, the definitive multi-player 3D action shoot 'em up. Requires license fee. Supports console or X11 play.
Snes9X	Utility	A portable, freeware emulator of the Super Nintendo Entertainment System (SNES). Allows you to run Nintendo64 games on a PC.
Starcraft Linux-installation HOWTO	Document	Describes the procedures for installing and running the commercial game Starcraft on a Linux system using WINE.
XBomber	Arcade	Resembles the classic Bomberman game.
Xmame	Arcade	Emulator for popular arcade games. Requires ROM image from the original game.
XPat2	Card	An assortment of solitaire games.
XShipWars	Action	A graphical MUD (multi-user dungeon) with a space exploration theme.

As you can see, many types of games are available, including action games, arcade games, card games, puzzles, role playing games, and strategy games. Some Linux games can be played from the console; others require X. Many Linux games let multiple players compete at separate computers connected via a network, such as the Internet. Linux games may be freeware, shareware, or commercial software. In addition, Linux software such as Snes9X and WINE lets you play games originally written for systems other than Linux.

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8.2 Other Approaches to Desktop Computing

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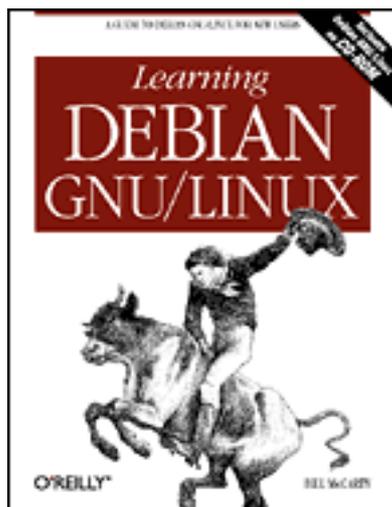
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9.2 Closeups of Some Popular Games

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10. Setting Up a Linux-Based LAN

Contents:

[Introduction](#)

[Network Administration](#)

[Samba](#)

[Samba Client Configuration and Use](#)

This chapter explains how to set up a local-area network (LAN) that includes a Linux Samba server, which lets Microsoft Windows and UNIX systems access shared files and printers hosted by your Linux system. The chapter explains how to administer a simple LAN and describes how to install, configure, and administer Samba servers and clients. Integrating your Linux system with an existing LAN is no more complicated than setting up your own LAN; the chapter also explains how to connect to an existing network. The chapter also explains how to use Linux backup and recovery utilities so that client systems can create and use backups stored on the server.

10.1 Introduction

One of the great strengths of Linux is its powerful and robust networking capabilities. The good news is that everything about Linux's networking setup is open to inspection and completely configurable. Nothing is hidden from the user, and no parameters are forced on you. The challenge is to get the most out of this setup for your needs.

Basic networking principles don't differ much between Windows and Linux, and indeed the principles aren't unfamiliar. This chapter starts with an overview of networking, and then looks in more detail at Linux networking on a Local Area Network (LAN). In the next two chapters, you'll learn about making a dialup Internet connection, and setting up Wide Area Network (WAN) services.

Most computers today handle network traffic much as the post office handles mail. Think, for example, of the steps involved in sending and receiving a letter. Your postal carrier must know where to drop off and where to pick up mail. So your home must have some kind of recognizable *interface*; we call this a mailbox. And whereas your postal carrier may know your neighborhood quite well, delivery in other areas will require other carriers. Mail is passed to these other carriers through a *gateway*; we call this the Post Office. Although you can think of the whole postal system as one big network, it's easier to understand if you think of it as a hierarchy of *subnetworks* (or *subnets*): the postal system is divided into states, states are divided by zip code, zip codes contain a number of streets, and each street contains unique addresses.

Computer networking mirrors this model. Let's trace an email message from you to a coworker. You compose the message and press Send. Your computer passes the message to a network interface. This interface may be a modem by which you dial up an ISP, or it may be an Ethernet card that connects you to a LAN. Either way, on the other side of the interface is a gateway machine. The gateway knows how to look at the address of the recipient on the email message, and interpret that message in terms of networks and subnets. Using this information, your gateway passes the message to other gateways until the message reaches the gateway for the destination machine. That gateway in turn delivers the message via a recognizable interface (such as modem or Ethernet card) to the recipient's inbox.

If you review this story, you can easily see what parts of networking you'll need to configure on your Linux system. You'll need to know the address of your machine. Just as the town name *Menlo Park* and the zip code *94025* are two different names for the same location, you may have both a name, called a *hostname*, and a number, called an *IP number*, that serve as the address for your machine.

To translate between these two notations, you may need to know the address of a *Domain Name Server*. This is a machine that matches IP numbers with hostnames. You'll also need to know the address of a gateway machine through which network traffic will be routed. Finally, you'll need to be able to bring up an interface on your system for networking, and you'll need to assign a route from that interface to the gateway.

While all of this can seem complex, it really isn't any more complex than the postal system, and functions in much the same way. Fortunately, Linux comes with tools to help you automate network configuration. In this chapter you'll look at networking on a LAN, and we'll start by looking at how to set up LAN networking.

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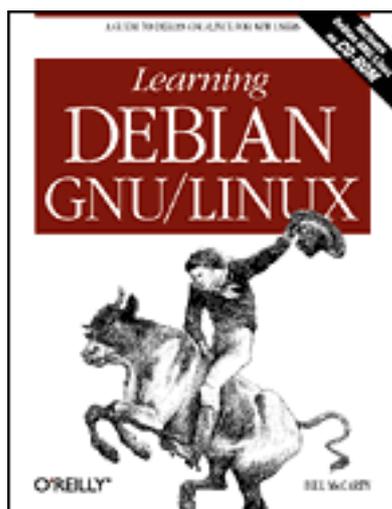
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10.2 Network Administration

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Chapter 11

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11. Getting Connected to the Internet

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[Configuring Your Modem](#)

[Using wvdial](#)

[PPP Client](#)

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[gFTP FTP client](#)

[Using minicom and seyon](#)

[Making a PPP Connection Manually](#)

This chapter explains how to use Linux to connect to remote servers. First, it explains how to use `wvdial`, a program that makes it easy to connect to the Internet via a PPP connection provided by an ISP. Then, the chapter explains basic TCP/IP network concepts that you must know in order to administer a Linux system connected to the Internet or a local area network. So that you can use your knowledge of TCP/IP effectively, the chapter explains how to use `pppconfig` to configure and administer a system that connects to a local area network and to a remote server via PPP. Next, the chapter describes several popular network client applications available under Linux, including a web browser and an FTP client. The chapter then describes the use of `minicom` and `seyon`, which provide dial-out capabilities like those of Window's

hyperterminal. Finally, the chapter shows how to make a PPP connection manually, by using minicom.

11.1 Connecting to the Internet

Most Internet service providers (ISPs) offer two primary types of service: shell accounts and PPP (point-to-point protocol) accounts. Shell accounts were more popular before the advent of the Web. A shell account lets you use your computer much as if it were a virtual console associated with a remote computer. You can type commands, which are interpreted by the remote computer, and view the resulting output on your computer. Although a few web browsers, such as Lynx, can operate via a shell account, they don't generally support the highly graphical, multimedia pages which web surfers have come to expect.

In contrast, a PPP account connects your computer directly to the Internet. While your computer is connected to the Internet, you can use it to surf the Web with your favorite browser. If your ISP allows, you can even run a web server, providing pages that can be viewed by others around the world.

You can compare the two types of Internet accounts - shell and PPP - with two kinds of postal service. Imagine that no mail carrier actually comes to your home to pick and deliver mail. Instead, every time you want to conduct postal business, you go to the post office. This resembles a shell account: The computer that connects you to the Internet is remote, and every time you want to do something on the Internet you must open a terminal, or telnet, session to that computer. PPP, on the other hand, is like home delivery: The Internet comes right to your doorstep, and your computer is literally placed on the Internet by the machine at your ISP that you connect to.

Under Microsoft Windows, you use hyperterminal to access a shell account and Dial-Up Networking to access a PPP account. Under Linux, you can choose from among several programs that let you access a shell account. The most commonly used programs are minicom and seyon. To access a PPP account under Linux, you use the PPP daemon, pppd. The next section describes how to use wvdial to make the process of establishing a PPP connection simple.

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10.4 Samba Client
Configuration and Use

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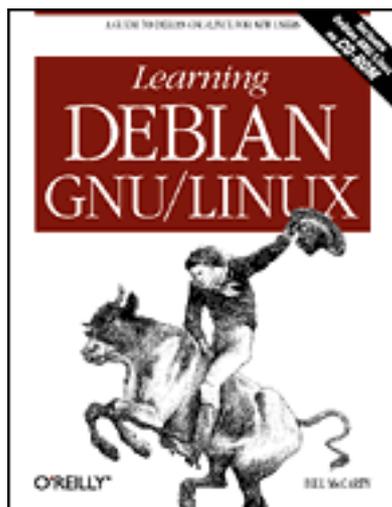
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Chapter 12

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12. Setting Up a Linux-Based WAN

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[An FTP Server](#)

[Installing and Configuring a Web Server](#)

[Using a Mail Server](#)

[Configuring a Secure Shell Server](#)

[Configuring a Dial-In Shell Server](#)

In the last chapter, you learned how to connect your Linux system to a local-area network or, via an Internet Service Provider, to the Internet. By doing so, you were able to access a plethora of services provided by others, including file transfers via FTP, web pages, email, and telnet. In this chapter you'll learn how to set up and use several Linux wide-area network servers, including an FTP server, a web server (Apache), an email (SMTP/POP) server, and a dial-in shell server. These applications let you and others access data on your Linux system from anywhere in the world via the Internet. These applications will be most useful if your system is connected to the Internet 24 hours a day, 7 days a week. But, even if your connection is intermittent, you and others can access the services these applications provide whenever the connection is active.

12.1 An FTP Server

An FTP server lets you transfer files from one system to another, via a network. When

two computers are connected to the Internet, you can use FTP to transfer files from one to the other even though the computers are not directly connected.

An FTP server attempts to authenticate users that request to use it. You can configure your FTP server to accept requests only from users who have an account on the system running the FTP server. Alternatively, you can configure the FTP server to accept requests from anyone, via a facility known as *anonymous FTP*. It's fairly simple to install and configure an anonymous FTP server; however, hackers regularly exploit vulnerabilities in anonymous FTP servers, breaking into systems and causing manifold mischief. Because it's difficult to protect a system running anonymous FTP from attack, this section does not describe the process for installing and configuring anonymous FTP.

Selecting the Basic profile during Debian GNU/Linux installation causes installation of a standard FTP server.

12.1.1 Testing the FTP Server

To test your FTP server, start an FTP client by issuing the following command:

```
ftp localhost
```

The FTP server should prompt you for a login userid and password. If you correctly supply them, you should see the FTP prompt that lets you know the FTP server is ready to execute FTP subsystem commands. Type `quit` and press **Enter** to exit the FTP client. Or, if you'd like to transfer some files, you can use the FTP subsystem commands described in [Table 12.1](#).

Table 12.1: Important FTP Subsystem Commands

Command	Function
<code>! <i>command</i></code>	Invokes a shell on the local system. You can use this command, for example, to obtain a listing of the current directory on the local system by issuing the command <code>!ls</code> , for a Unix system, or <code>!dir</code> , for a Microsoft system.
<code>ascii</code>	Specifies that files will be transferred in ASCII mode.
<code>binary</code>	Specifies that files will be transferred in binary mode, which performs no translation.
<code>cd <i>directory</i></code>	Changes to the specified directory of the remote system.
<code>delete <i>file</i></code>	Deletes the specified file from the remote system.

<code>dir</code>	Displays the contents of the current directory of the remote system.
<code>get file</code>	Retrieves the specified file from the remote system.
<code>help</code>	Displays command help information.
<code>lcd directory</code>	Changes to the specified directory of the local system.
<code>mkdir directory</code>	Creates the specified directory on the remote system.
<code>put file</code>	Stores the specified local file on the remote system.
<code>pwd</code>	Displays the current working directory on the remote system.
<code>quit</code>	Exits the FTP subsystem.
<code>rmdir directory</code>	Removes the specified directory from the remote system.

If your FTP server fails to respond properly, check the line you added to the *inetd.conf* file. If you're unable to find an error, reboot your system. If that fails to solve the problem, post a message to the *comp.os.linux.setup* newsgroup.

Once your FTP server is working, try contacting it from a remote system. If you have a Microsoft Windows system, you can contact your server by using the built-in FTP client that works similarly to the Linux FTP client, interpreting the same FTP subsystem commands. Open an MS-DOS Prompt window and type the command:

```
ftp
server
```

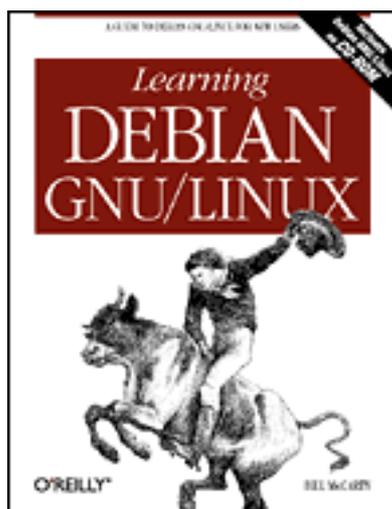
where *server* specifies the hostname or IP address of your Linux server. Generally, once the FTP subsystem prompt is available, you should immediately issue the `binary` command. This command specifies that files will be transferred verbatim; without it, executable files, documents, and other files that contain binary data will be scrambled when transferred.

Most Windows users prefer to use a graphical FTP client. Many such clients, including WS-FTP, are freely available and make FTP access easy for even novice Windows users. FTP provides a very fast and reliable way for a Linux server to share files with Windows clients, without the need to install and configure Samba.

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13. Conquering the BASH Shell

Contents:

[The Linux Shell](#)

[Using the Shell](#)

[Understanding Shell Scripts](#)

This chapter describes the powerful BASH shell, providing a much more detailed explanation than that provided in **Chapter 4, *Issuing Linux Commands***. The chapter also briefly explains shell variables, shell scripts, and shell aliases, preparing you for an in-depth, continuing study of Linux.

13.1 The Linux Shell

You met the Linux command interpreter, or shell, early in this book. Like an MS-DOS Prompt window, the shell lets you issue commands that it interprets, or executes. By means of the shell, you use and control your system.

13.1.1 A Variety of Shells

The MS-DOS shell has been fairly consistent over time; for example, the differences between MS-DOS v3 and MS-DOS v7 are few. The Unix shell, however, has experienced significantly more evolutionary development than MS-DOS. Today, you

find both versions and variants of the Unix shell. The Unix shell variants have much in common, but each has a different authorship and history, and each reflects a different view of how users should interact with Unix.

Linux includes the most popular Unix shells, as shown in [Table 13.1](#). The most popular Linux shell is the BASH shell (the "Bourne Again SHell"), based on the original Unix Bourne shell. The BASH shell is largely compliant with the POSIX standard, which specifies the syntax and operation of a standard Unix shell and which has been widely implemented. Because of the popularity of the POSIX standard and the obvious advantage of working with a shell that's consistent across a variety of computing platforms, this chapter focuses on the BASH shell. Most Linux systems are configured to automatically start a BASH shell on your behalf when you log in; so, you don't generally need to be much concerned about choosing a shell. However, for information about the other available shells, you can consult the Linux man pages.

Table 13.1: Common Linux Shells

Shell name	Program name(s)	Description
ASH shell	<i>/bin/ash</i> <i>/bin/bsh</i>	Resembles the shell used by AT&T's System V Unix.
BASH shell	<i>/bin/bash</i> <i>/bin/bash2</i>	The standard shell for Linux, based on the original Unix Bourne shell. According to its man page, BASH is "ultimately intended" to be POSIX compliant.
C shell	<i>/bin/csh</i> <i>/bin/tcsh</i>	The second Unix shell. Designed to facilitate interactive use, it added many new features and functions. Its syntax resembles that of the C programming language.
Korn shell	<i>/bin/ksh</i>	The third Unix shell, added many of the features of the C shell to the original Bourne shell.
Z shell	<i>/bin/zsh</i>	A feature-packed shell based on the Korn shell.

13.1.2 Why Learn to Use the Shell?

If you're accustomed to the point-and-click world of graphical user interfaces, you may question the value of learning to use the Linux shell. Many users initially find the shell cumbersome, and some retreat to the familiar comfort of the graphical user interface, avoiding the shell whenever possible.

While it's true that the shell is an older style of interacting with a computer than the graphical user interface, the graphical user interface is actually the more primitive interface. The graphical user interface is easy to learn and widely used, but the shell is vastly more sophisticated. Using a graphical user interface is somewhat like communicating in American Indian sign language. If your message is a simple one, like "we come in peace," you can communicate it by using a few gestures. However, if you attempted to give Lincoln's Gettysburg address - a notably short public discourse - by means of American Indian sign language, you'd find your task quite formidable.

American Sign Language, used to communicate with those who have a hearing impairment, is a much richer language than American Indian sign language. Unfortunately, programmers have not yet risen to the challenge of creating graphical user interfaces that are equally sophisticated. The designer of a program that provides a graphical user interface must anticipate all the possible ways in which the user will interact with the program and provide ways to trigger the appropriate program responses by means of pointing and clicking. Consequently, the user is constrained to working only in predicted ways. The user is therefore unable to adapt the graphical user interface program to accommodate unforeseen tasks and circumstances. In a nutshell, that's why many system administration tasks are performed using the shell: system administrators, in fulfilling their responsibility to keep a system up and running, must continually deal with and overcome the unforeseen.

The shell reflects the underlying philosophy of Unix, which provides a wide variety of small, simple tools (that is, programs), each performing a single task. When a complex operation is needed, the tools work together to accomplish the complex operation as a series of simple operations, one step at a time. Many Unix tools manipulate text and, since Unix stores its configuration data in text form rather than in binary form, the tools are ideally suited for manipulating Unix itself. The shell's ability to freely combine tools in novel ways is what makes Unix powerful and sophisticated. Moreover, as you'll learn, the shell is extensible: You can create shell scripts that let you store a series of commands for later execution, saving you the future tedium of typing or pointing and clicking to recall them.

The contrary philosophy is seen in operating systems such as Microsoft Windows, which employ elaborate, monolithic programs that provide menus, submenus, and dialog boxes. Such programs have no way to cooperate with one another to accomplish complex operations that weren't anticipated when the programs were designed. They're easy to use so long as you remain on the beaten path, but once you step off the trail you find yourself in a confusing wilderness.

Of course, not everyone shares this perspective. The USENET newsgroups, for example, are filled with postings debating the relative merits of graphical user interfaces. Some see the Unix shell as an arcane and intimidating monstrosity. But, even if they're correct, it's inarguable that when you learn to use the shell, you begin to see Unix as it was intended (whether that's for better or for worse).

The author's perspective is pragmatic: When performing common, routine operations, a graphical user interface that minimizes typing can be a relief; but, when faced with a complex, unstructured problem that requires creative solution, the shell is more often the tool of choice. By creating solutions in the form of shell scripts, solutions can be stored for subsequent reuse. Perhaps even more important, shell scripts can be studied to quickly bone up on forgotten details, expediting the solution of related problems.

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12.5 Configuring a Dial-In
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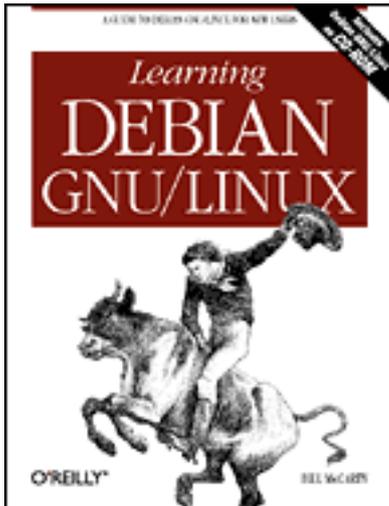
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13.2 Using the Shell

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A. Linux Directory Tree

Figure A.1: The Debian GNU/Linux directory tree

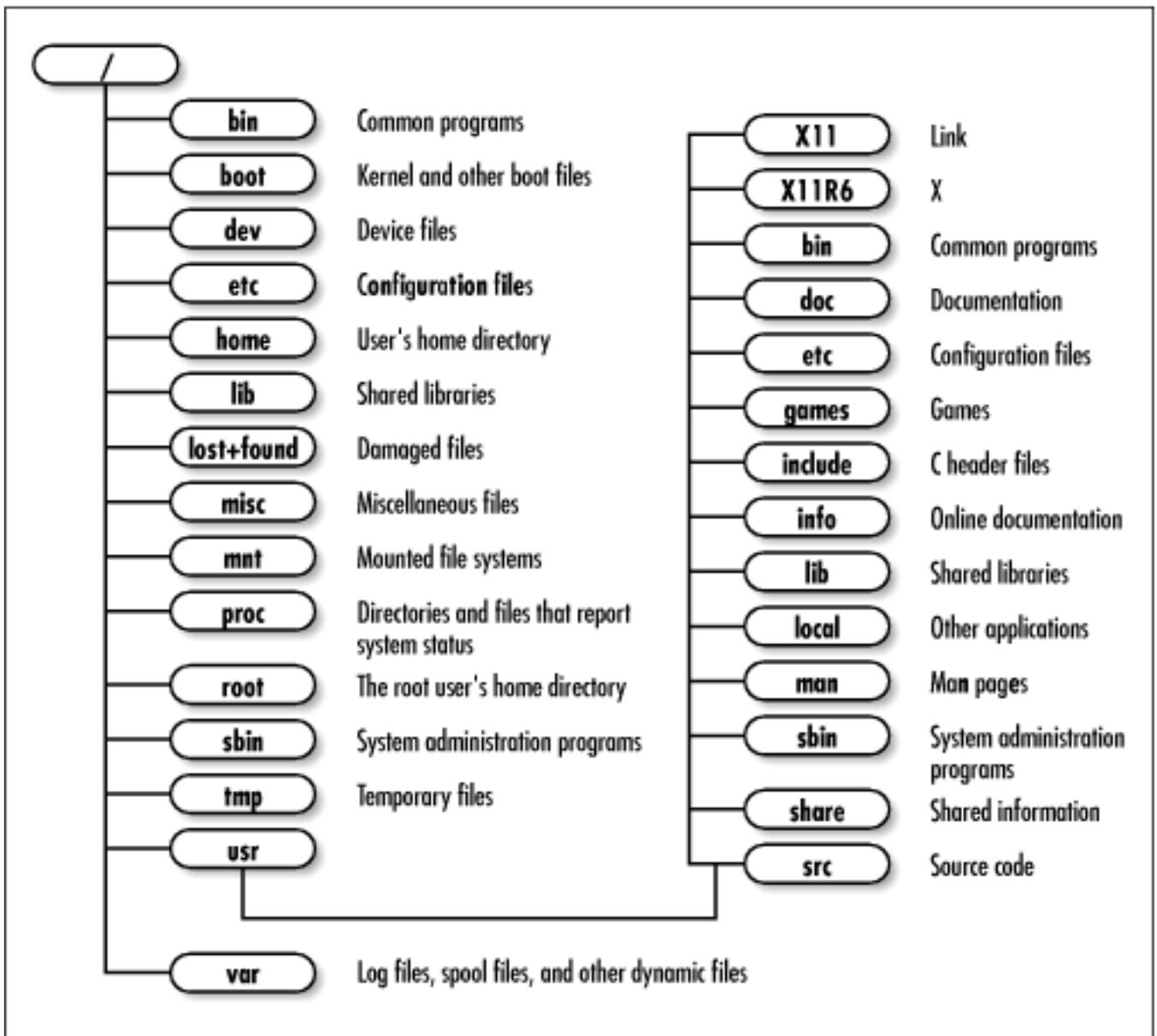


Figure A.1 shows the typical structure of the Linux directory tree. Only the principal directories are shown.

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13.3 Understanding Shell Scripts

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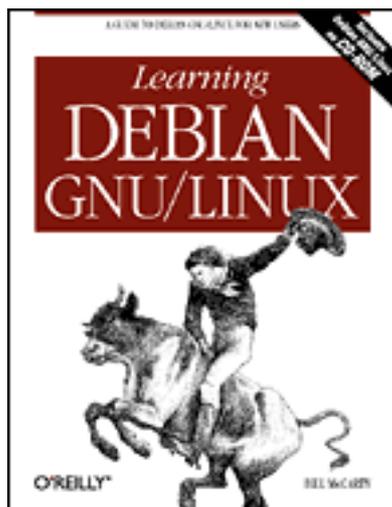
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B. Principal Linux Files

[Table B.1](#) describes the principal Linux files. You can use it, for example, to help you locate configuration files quickly.

Table B.1: Principal Linux Files

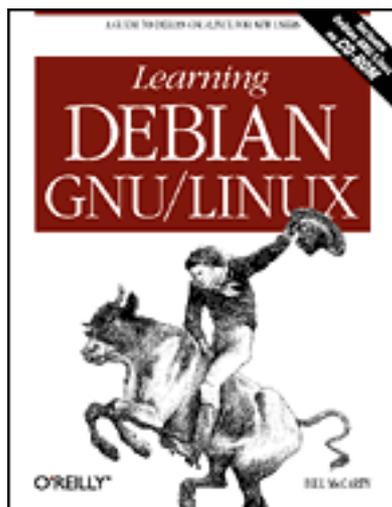
File	Description
<i>/boot/vmlinuz*</i>	Linux kernel
<i>/etc/smb.conf</i>	Configuration of smb (Samba) daemon
<i>/etc/smbpasswd</i>	Account information for Samba users
<i>/etc/apache/access.conf</i>	Web server configuration file
<i>/etc/apache/apache.conf</i>	Web server configuration file
<i>/etc/apache/srm.conf</i>	Web server configuration file
<i>/etc/conf.modules</i>	Aliases and options for loadable kernel modules
<i>/etc/fstab</i>	Filesystems mounted or available for mounting
<i>/etc/group</i>	Group information

<i>/etc/hosts</i>	Map of IP numbers to hostnames
<i>/etc/hosts.allow</i>	Hosts allowed to access Internet services
<i>/etc/hosts.deny</i>	Hosts forbidden to access Internet services
<i>/etc/inetd.conf</i>	Configuration for the <code>inetd</code> daemon, which controls access to Internet services
<i>/etc/inittab</i>	Configuration for the <code>init</code> daemon, which controls executing processes
<i>/etc/issue</i>	Linux kernel and distribution version
<i>/etc/lilo.conf</i>	Loader (<i>lilo</i>) configuration file
<i>/etc/login.defs</i>	Options for <code>useradd</code> and related commands
<i>/etc/minicom.users</i>	Userids allowed to use <code>minicom</code>
<i>/etc/mtab</i>	Mounted filesystems
<i>/etc/passwd</i>	User account information
<i>/etc/printcap</i>	Printer options and capabilities
<i>/etc/profile</i>	Default environment for users of BASH shell
<i>/etc/rc*.d</i>	Scripts for system and process startup and shutdown
<i>/etc/rc.boot</i>	Scripts for system boot
<i>/etc/shadow</i>	Secure user account information
<i>/etc/skel</i>	Skeleton files used to establish new user accounts
<i>/etc/terminfo</i>	Terminal capabilities and options
<i>/etc/X11/XF86Config</i>	X configuration file
<i>/var/log/apache/access.log</i>	Log of web server access
<i>/var/log/apache/error.log</i>	Log of web server errors
<i>/var/log/messages</i>	System log
<i>/var/spool/cron</i>	Directory for <code>at</code> and <code>cron</code> configuration files

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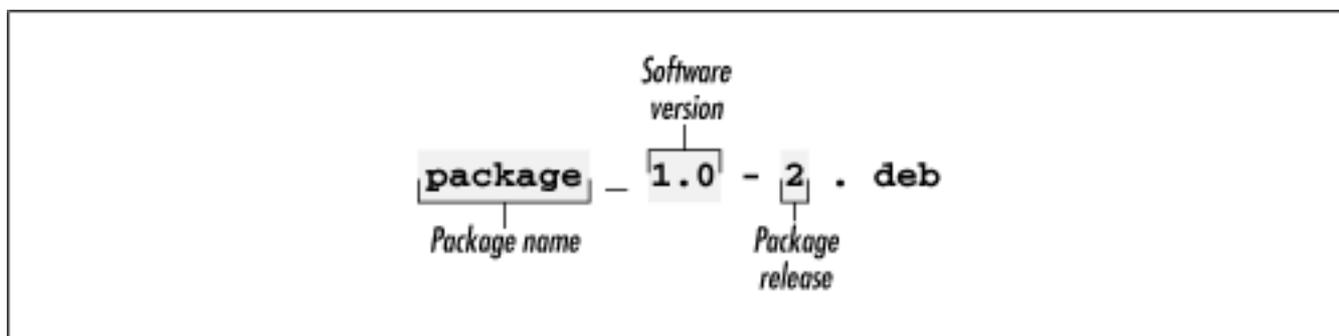
[Package Contents and Installation Commands](#)

This appendix introduces you to Debian's package management facilities, which help you manage software applications. Suppose, for example, that after installing Linux, you discover you need an application that you omitted; you can find the missing application's package and use the package management facilities to quickly and easily install the application. Similarly, when a new version of an application becomes available, the package management facilities helps you upgrade painlessly, by preserving the application's configuration files. The package management facilities also let you query the status of your system, helping you determine whether important files have been deleted.

C.1 Packages

A Debian package (or more simply, a package or a deb) is a file that contains files necessary to install an application or software unit. Debian packages are generally named using a convention that lets you determine the name of the package, the version of the software, and the release number of the package. [Figure C.1](#) shows how the components of a package name are arranged.

Figure C.1: The structure of a package name



The important virtue of packages is that they contain meta-information; that is, information about their contents. For example, each package contains a list of other packages needed for correct operation. Similarly, each package contains a list of other packages that conflict with its operation. This meta-information greatly simplifies system administration, which otherwise can become quite a challenge. Each package also contains a checksum, that helps protect package users against viruses and other sorts of tampering with package contents.

Debian packages have several important advantages relative to those used by other package management schemes. To learn more about these, see the comparison of package formats authored by Joey Hess, at <http://kitenet.net/~joey/pkg-comp/>.

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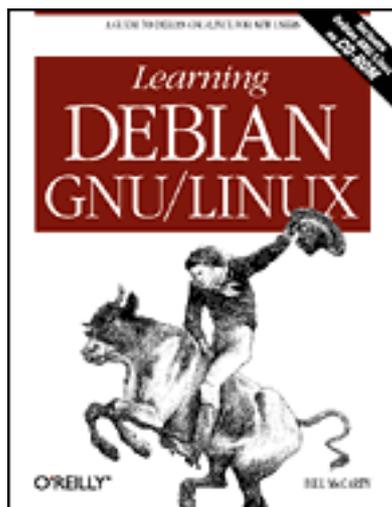
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D. Managing the Boot Process

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In this appendix, you'll learn more about how to boot a Linux system; in particular, you'll learn more about configuring your computer system to boot any of several operating systems. The chapter focuses on `lilo` and `loadlin`, the most popular utilities for booting Linux systems, explaining their capabilities and options in considerable detail.

D.1 Booting Linux

When you boot a PC, you cause it to execute a small program known as a *boot loader*. The purpose of the boot loader is to locate and read into memory the first stage of an operating system and transfer control to it. The operating system then locates and reads its remaining components as needed.

The simplest way to boot Linux is by using a floppy diskette. By doing so, you're able to leave the boot information on your hard drive untouched, ensuring that you can still boot Microsoft Windows or another operating system stored on the same hard drive. Moreover, some operating systems and virus protection programs prevent modification of the boot information on your hard drive. By booting from a floppy diskette, you avoid several potential problems.

However, many users find booting from a floppy diskette slow or inconvenient. You don't have to boot Linux from a floppy diskette; you can boot Linux in any of several other ways. The two most popular alternatives are by using `lilo`, which replaces the boot loader stored on your hard drive, or `loadlin`, which lets you first boot DOS and then boot Linux from DOS.

This chapter cannot describe the entire range of issues involved in booting Linux. Much of the information in this chapter is taken from several Linux HOWTOs that contain additional useful information on booting Linux:

- [BootPrompt-HOWTO](#)
- [CD-Writing-HOWTO](#)
- [CDROM-HOWTO](#)
- [Ethernet-HOWTO](#)
- [Ftape-HOWTO](#)
- [Hardware-HOWTO](#)
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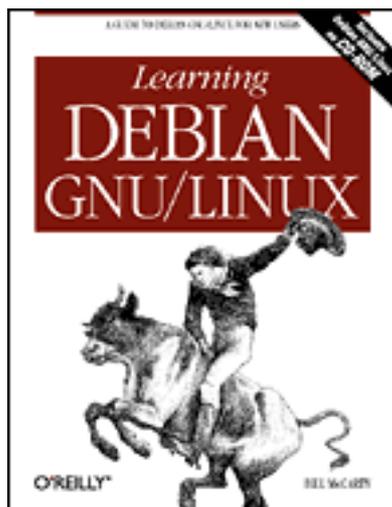
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E. Linux Command Quick Reference

The following list describes some of the most useful and popular Linux commands. Consult the man page for each command to learn about additional arguments and details of operation.

`adduser userid`

Creates a new `userid`, prompting for necessary information (requires `root` privileges).

`apropos keyword`

Searches the manual pages for occurrences of the specified `keyword` and prints short descriptions from the beginning of matching manual pages.

`at time`

`at -f file time`

Executes commands entered via `stdin` (or, by using the alternative form, the specified file) at the specified time. The time can be specified in a variety of ways; for example, in hour and minute format `hh: mm` or in hour, minute, month, day, and year format `hh: mm mm/ dd/ yy`.

`atq`

Prints descriptions of jobs pending via the `at` command.

```
atrm job
```

Cancels execution of a job scheduled via the `at` command. Use the `atq` command to discover the identities of scheduled jobs.

```
bg
```

```
bg jobs
```

Places the current job (or, by using the alternative form, the specified jobs) in the background, suspending its execution so that a new user prompt appears immediately. Use the `jobs` command to discover the identities of background jobs.

```
cal month year
```

Prints a calendar for the specified month of the specified year.

```
cat files
```

Prints the contents of the specified files.

```
cd
```

```
cd directory
```

Changes the current working directory to the user's home directory or the specified directory.

```
chgrp group files
```

```
chgrp -R group files
```

Changes the group of the specified files to the specified group. The alternative form of the command operates recursively, changing the group of subdirectories and files beneath a specified directory. The group must be named in the `/etc/groups` file, maintained by the `newgroup` command.

```
chmod mode files
```

```
chmod -R mode files
```

Changes the access mode of the specified files to the specified mode. The alternative form of the command operates recursively, changing the mode of subdirectories and files beneath a specified directory.

```
chown userid files
```

```
chown -R userid files
```

Changes the owner of the specified files to the specified userid. The alternative form of the command operates recursively, changing the owner of subdirectories and files beneath a specified directory

```
clear
```

Clears the terminal screen.

```
cmp file1 file2
```

Compares two files, reporting all discrepancies. Similar to the `diff` command, though the output format differs.

```
cp file1 file2  
cp files directory  
cp -R files directory
```

Copies a file to another file or directory, or copies a subdirectory and all its files to another directory.

```
date  
date date
```

Displays the current date and time or changes the system date and time to the specified value, of the form *MMddhhmmyy* or *MMddhhmmyyyy*.

```
df
```

Prints the amount of free disk space on each mounted filesystem.

```
diff file1 file2
```

Compares two files, reporting all discrepancies. Similar to the `cmp` command, though the output format differs.

```
dmesg
```

Prints the messages resulting from the most recent system boot.

```
du  
du directories
```

Prints the amount of disk space used by the current directory (or the specified directories) and its (their) subdirectories.

```
echo string  
echo -n string
```

Prints the specified text on the standard output stream. The `-n` option causes omission of the trailing newline character.

```
fdformat device
```

Formats the media inserted in the specified floppy disk drive. The command performs a low-level format only; it does not create a filesystem. To create a filesystem, issue the `mkfs` command after formatting the media.

```
fdisk device
```

Edits the partition table of the specified hard disk.

```
fg
```

`fg jobs`

Brings the current job (or the specified jobs) to the foreground.

`file files`

Determines and prints a description of the type of each specified file.

`find path -name pattern -print`

Searches the specified path for files with names matching the specified pattern (usually enclosed in single quotes) and prints their names. The `find` command has many other arguments and functions; see the online documentation.

`finger users`

Prints descriptions of the specified users.

`free`

Displays the amount of used and free system memory.

`ftp hostname`

Opens an FTP connection to the specified host, allowing files to be transferred. The FTP program provides subcommands for accomplishing file transfers; see the online documentation.

`grep pattern files`

`grep -i pattern files`

`grep -n pattern files`

`grep -v pattern files`

Search the specified files for text matching the specified pattern (usually enclosed in single quotes) and print matching lines. The `-i` option specifies that matching is performed without regard to case. The `-n` option specifies that each line of output is preceded by the file name and line number. The `-v` option reverses the matching, causing non-matched lines to be printed.

`gzip files`

`gunzip files`

Compress (or expand) the specified files. Generally, a compressed file has the same name as the original file, followed by `.gz`.

`head files`

Prints the first several lines of each specified file.

`hostname`

`hostname name`

Displays (or sets) the name of the host.

`info`

Launches the GNU Texinfo help system.

`init run_level`

Changes the system run level to the specified value (requires `root` privileges).

`insmod module`

Dynamically loads the specified module (requires `root` privileges).

`jobs`

Displays all background jobs.

`ispell files`

Checks the spelling of the contents of the specified files.

`kill process_ids`

`kill - signal process_ids`

`kill -l`

Kills the specified processes, sends the specified processes the specified signal (given as a number or name), or prints a list of available signals.

`killall program`

`killall - signal program`

Kills all processes that are instances of the specified program or sends the specified signal to all processes that are instances of the specified program.

`ln old new`

`ln -s old new`

Creates a hard (or soft) link associating a new name with an existing file or directory.

`locate pattern`

Locates files with names containing the specified pattern. Uses the database maintained by the `updatedb` command.

`lpq`

Prints the entries of the print queue.

`lpr files`

Prints the specified files.

`lprm job`

Cancels printing of the specified print queue entries. Use `lpq` to determine the contents of the print queue.

`ls`

```
ls files
ls -a files
ls -l files
ls -lR files
```

Lists (non-hidden) files in the current directory or the specified files or directories. The *-a* option lists hidden files as well as non-hidden files. The *-l* option causes the list to include descriptive information, such as file size and modification date. The *-R* option recursively lists the subdirectories of the specified directories.

```
mail
```

Launches a simple mail client that permits sending and receiving email messages.

```
man title
man section title
```

Prints the specified man page.

```
mkdir directories
mkdir -p directories
```

Creates the specified directories. The *-p* option causes creation of any parent directories needed to create a specified directory.

```
mkfs -t type device
```

Creates a file system of the specified type (such as *ext2* or *msdos*) on the specified device (requires *root* privileges).

```
mkswap device
```

Creates a Linux swap space on the specified hard disk partition (requires *root* privileges).

```
more file
```

Lets the user peruse a file too large to be displayed as a single screen (page) of output. The *more* command provides many subcommands that let the user navigate the file. For example, the **S**pace key moves forward one page, the **b** key moves back one page, and the **q** key exits the program.

```
mount
mount device directory
mount -o option -t type device directory
```

Prints the mounted devices or mounts the specified device at the specified mount point (generally a subdirectory of */mnt*). The *mount* command consults */etc/fstab* to determine standard options associated with a device. The command generally requires *root* privileges. The *-o* option allows specification of a variety of

options; for example, `ro` for read-only access. The `-t` option allows specification of the filesystem type (for example, `ext2`, `msdos`, or `iso9660`, the filesystem type generally used for CD-ROMs).

```
mv paths target
```

Moves the specified files or directories to the specified target.

```
newgroup group
```

Creates the specified group.

```
passwd
```

```
passwd user
```

Changes the current user's password, or that of the specified user (requires `root` privileges). The command prompts for the new password.

```
ping host
```

Sends an echo request via TCP/IP to the specified host. A response confirms that the host is operational.

```
pr files
```

Formats the specified files for printing, by inserting page breaks and so on. The command provides many arguments and functions.

```
ps
```

```
ps -Aux
```

Displays the processes associated with the current userid or displays a description of each process.

```
pwd
```

Prints the absolute path corresponding to the current working directory.

```
reboot
```

Reboots the system (requires `root` privileges).

```
reset
```

Clears the terminal screen and resets the terminal status.

```
rm files
```

```
rm -i files
```

```
rm -f files
```

```
rm -if files
```

```
rm -rf files
```

Deletes the specified files or (when the `-r` option is specified) recursively deletes all subdirectories of the specified files and directories. The `-i` option causes the command to prompt for confirmation; the `-f` option suppresses confirmation.

Because deleted files cannot generally be recovered, the *-f* option should be used only with extreme care, particularly when used by the `root` user.

```
rmdir directories  
rmdir -p directories
```

Deletes the specified empty directories or (when the *-p* option is specified) the empty directories along the specified path.

```
shutdown minutes  
shutdown -r minutes
```

Shuts down the system after the specified number of minutes elapses (requires `root` privileges). The *-r* option causes the system to be rebooted once it has shut down.

```
sleep time
```

Causes the command interpreter to pause for the specified number of seconds.

```
sort files
```

Sorts the specified files. The command has many useful arguments; see the online documentation.

```
split file
```

Splits a file into several smaller files. The command has many arguments; see the online documentation.

```
su  
su user  
su -  
su - user
```

Changes the current `userid` to `root` or to the specified `userid` (the latter requires `root` privileges). The *-* option establishes a default environment for the new `userid`.

```
swapon device
```

Enables use of the specified device for swapping (requires `root` privileges).

```
swapoff device
```

Disables use of the specified device for swapping (requires `root` privileges).

```
sync
```

Completes all pending input/output operations (requires `root` privileges).

```
tail file  
tail -n file  
tail -f file
```

Prints the last several lines of the specified files. The *-n* option specifies the number of lines to be printed. The *-f* option causes the command to continuously print additional lines as they are written to the file.

```
talk user
```

Launches a program that allows a chat-like dialog with the specified user.

```
tar cvf tar_file files
tar zcvf tar_file files
```

Creates a tar file with the specified name, containing the specified files and their subdirectories. The *z* option specified that the tar file will be compressed.

```
tar xvf tar_file
tar zxvf tar_file
```

Extracts the contents of the specified tar file. The *z* option specified that the tar file has been compressed.

```
telnet host
```

Opens a login session on the specified host.

```
top
```

Prints a display of system processes that's continually updated until the user presses the *q* key.

```
traceroute host
```

Uses echo requests to determine and print a network path to the host.

```
umount device
```

Unmounts the specified filesystem (generally requires *root* privileges).

```
uptime
```

Prints the system uptime.

```
w
```

Prints the current system users.

```
wall
```

Prints a message to each user except those who've disabled message reception. Type **Ctrl-D** to end the message.

```
wc files
```

Prints the number of characters, words, and lines in the specified files.

[Table E.1](#) identifies Linux commands that perform functions similar to MS-DOS

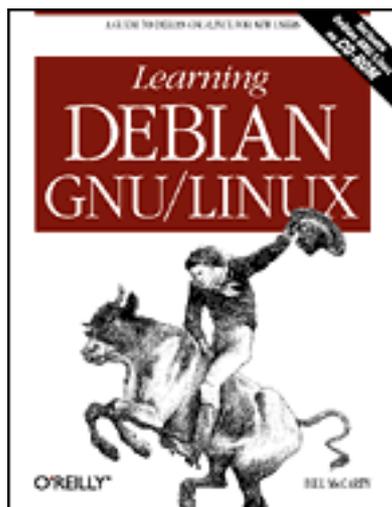
commands. The operation of the Linux command is not generally identical to that of the corresponding MS-DOS command. See the index to this book or the Linux online documentation for further information about Linux commands.

Table E.1: MS-DOS Commands and Related Linux Commands

MS-DOS	Linux
ATTRIB	chmod
CD	cd
CHKDSK	df, du
DELTREE	rm -R
DIR	ls -l
DOSKEY	(built-in; no need to launch separately)
EDIT	ae, vi, and so on
EXTRACT	tar
FC	cmp, diff
FDISK	fdisk
FIND	grep
FORMAT	fdformat
MORE	more
MOVE	mv
SORT	sort
START	at, bg
XCOPY, XCOPY32	cp

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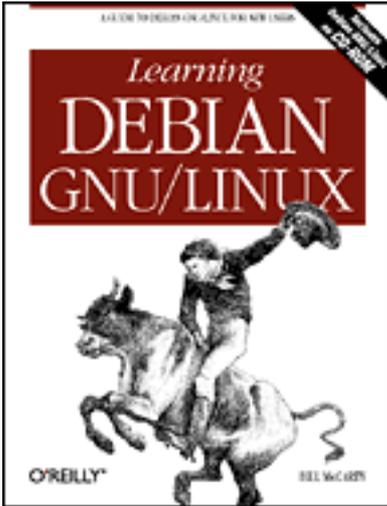
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Glossary

Glossary

Absolute Path

See Path.

Access Mode

An attribute of a file or directory, which determines what operations a user may perform on the file or directory.

Alias

An alternative name for a command.

Argument

A parameter that controls the operation of a program or command.

Background

A background program is temporarily suspended from execution and does not interact with the user. See Foreground.

BIOS (Basic Input/Output System)

The program built into a computer to control its operation, especially the booting of an operating system. Most computers let the user configure various BIOS options by means of a special screen or set of screens.

Boot diskette

A diskette that contains the parts of an operating system needed to start the operating system.

Boot Sector

A sector that contains a loader program for starting an operating system.

Browser

A client program that operates under user control, especially a web client.

Client

A program that makes a request (generally via a network) of a server.

Command Interpreter

A program that accepts commands and executes (interprets) them.

Daemon

A program that runs in the background; that is, without user interaction.

Desktop

A work environment provided by a graphical user interface, generally including a video monitor background, a screen saver, and one or more taskbars and icons.

Distribution

A combination of a Linux kernel, a suite of UNIX-like command programs, and other software for installing and maintaining a Linux system.

DNS (Domain Name Server)

A computer that translates hostnames to IP addresses on behalf of requesting clients.

Dotted Quad Notation

A form of representing a 32-bit IP address, consisting of 4 numbers from 0 to 255, each separated from the others by a dot.

EIDE (Enhanced Integrated Drive Electronics)

An incremental improvement of the IDE standard for hard drives, designed to better accommodate large capacity drives.

Ethernet

A standard for sending data packets across networks, focused on the electronic signaling issues.

Foreground

A foreground program runs and interacts with the user. See Background.

FTP (File Transfer Protocol)

A protocol for transferring data files across a TCP/IP network.

GNU

GNU stands for "GNU's not Unix," and refers generally to software distributed under the GNU Public License (GPL).

GPL (GNU Public License)

The GNU Public License provides for free access to software published under its terms. Users are allowed to copy, modify, and redistribute GPL software.

Graphical User Interface (GUI)

A graphical user interface is a program that lets the user interact with a computer system in a highly visual manner, with a minimum of typing. Graphical user interfaces usually require a high-resolution display and a pointing device, such as a computer mouse.

Hidden File

A file having a name that begins with a dot (.). Such files are not listed by the `ls` command unless a special argument (`-a`) is specified.

Home Directory

A directory provided for the personal files and directories of a user.

Host

A computer attached to a network.

Hostname

A name by which a host is known to other hosts on a network.

HTML

Hypertext Markup Language is the form in which web documents are transmitted and interpreted by browsers.

IDE

A popular standard for internal hard drives and CD-ROM drives of IBM-compatible systems.

Internet

A relatively loose federation of computer networks that permits data to be widely transferred among computers.

IP Number

A number that identifies a host, corresponding to a network interface associated with the host.

Kernel

The part of an operating system that contains the most primitive functions upon which other, more sophisticated functions depend.

Kill

To terminate a process.

LILO

A program often used to load the Linux kernel from a hard drive or boot diskette.

Man Page

A document that describes a Unix command or file, readable by using the man command.

Master Boot Record (MBR)

The first sector of a hard drive, which by convention contains a loader program for starting an operating system.

Mount

To make a filesystem available for use.

Operating System

A program that provides a user interface and an application interface (which makes it possible for application programs to run) and manages computer system resources.

Option

A command argument that takes one of a small number of values. Command arguments that specify files (for example) are not options.

Package

A file that contains a set of related files that can be installed as a unit.

Partition

An area of a hard disk, generally allocated to a specific operating system (though perhaps usable by multiple operating systems).

Path

A path denotes the location of a file or directory. The path is an absolute path if it gives the complete path, beginning with the root directory and including every subdirectory. Otherwise, the path is a relative path.

PPP

Point-to-point protocol, the most popular way of connecting a computer to the Internet via a dialup modem.

Process

An instance of a running program.

Prompt

A character or series of characters displayed by a command interpreter to inform the user that execution of a command has been completed and the interpreter is ready to accept a new command.

Relative Path

See Path.

root

The specially privileged userid used to perform Unix system administration.

Root Directory

The unique directory that has no parent directory. All other directories are children of the root directory or its subdirectories.

Route

A path along which data packets move from host to host across a network.

Run Level

The operating mode of a UNIX system; for example, single-user, multi-user without networking, or multi-user with networking.

Script

A series of commands, stored in a file for subsequent or repeated execution.

SCSI

A popular standard for internal and external hard drives and other peripherals.

Search Path

A series of directories automatically searched by a command interpreter in order to locate the program file that corresponds to a command to be executed.

Server

A program that responds to client requests, which are generally transmitted over a network.

Shell

A command interpreter.

Swap File

A disk file or partition used to temporarily store information when system memory runs low.

Symbolic Link

A filesystem entity that lets you associate an alternative name with a file or directory.

System Administrator

The user who installs, configures, and otherwise maintains the software (and possibly the hardware) associated with a computer system.

TCP/IP (Transmission Control Protocol/Internet Protocol)

A standard method of sending data packets across a computer network, focused on the routing and connection issues.

Terminal

A combination of a keyboard and monitor, which together provide the capability to interact with a computer system.

Text Editor

A program that lets you create and modify the contents of text files.

Telnet

A protocol for establishing a login session via TCP/IP on a remote system.

Userid

The unique identifier associated with a system user.

Window Manager

A program that manages a graphical user interface, determining the appearance of windows (by providing standard elements such as title bars, for example) and determining the response to operations such as clicking on the desktop.

Working Directory

The directory that is implicitly combined with a relative path reference to determine the corresponding absolute path reference.

X Server

A program that implements X for some platform and type of video hardware.

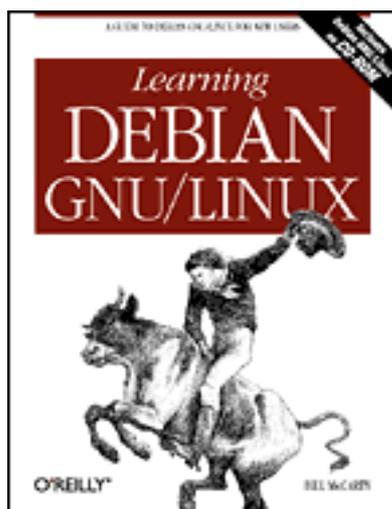
X

A sophisticated and powerful graphical user interface implemented on a variety of computer platforms.

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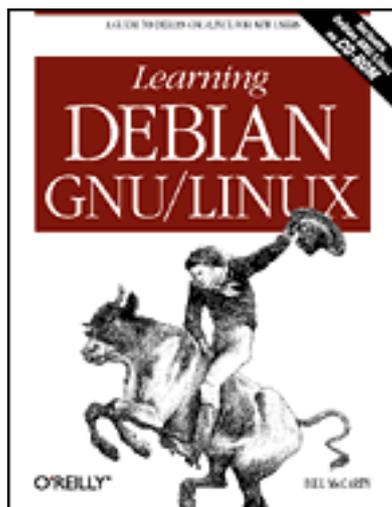
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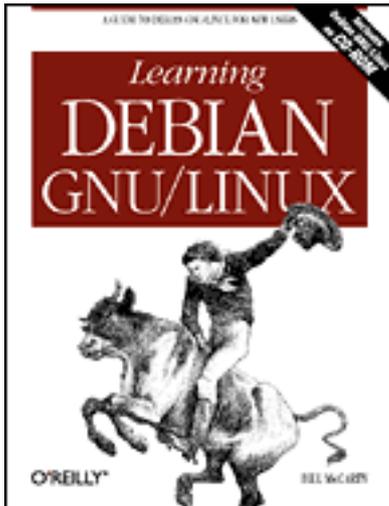
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By [Bill McCarty](#)

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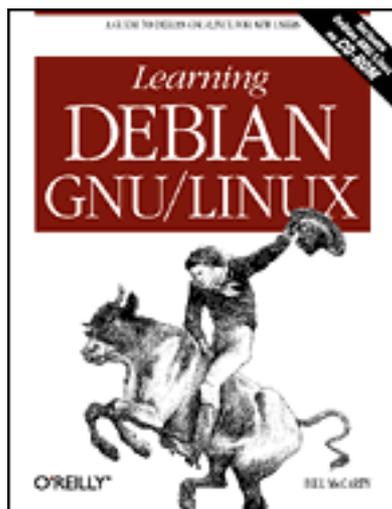
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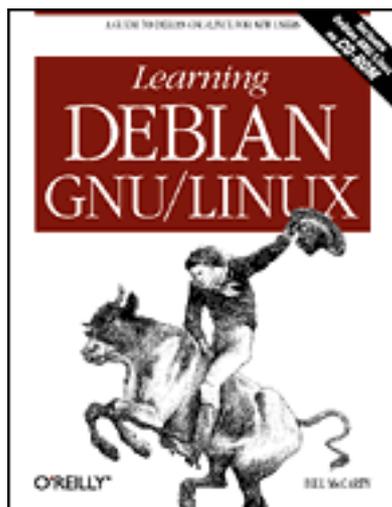
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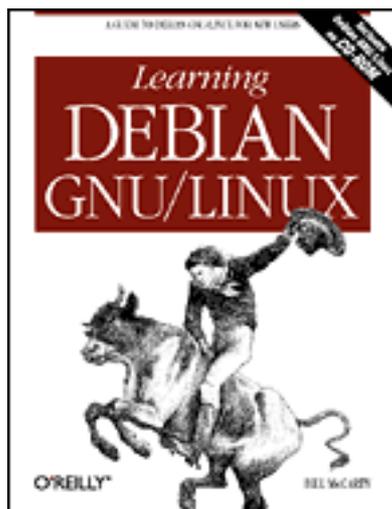
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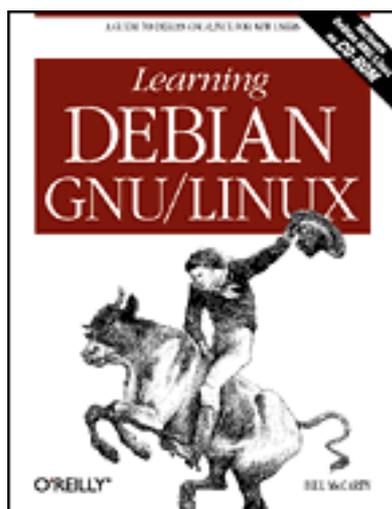
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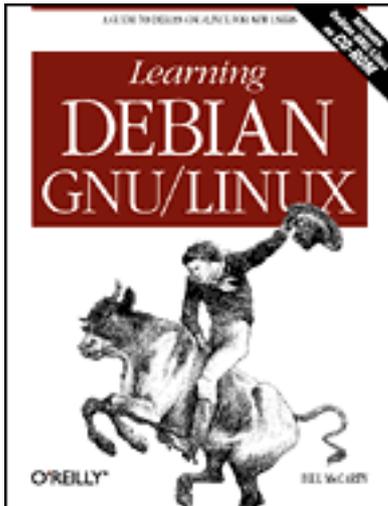
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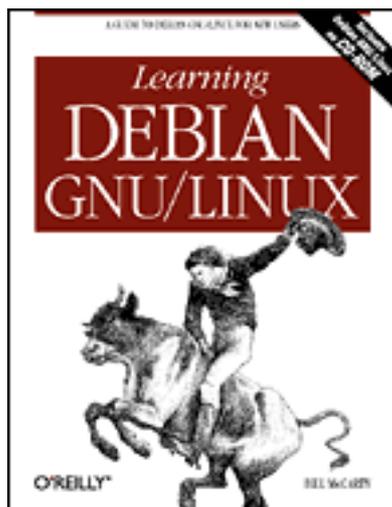
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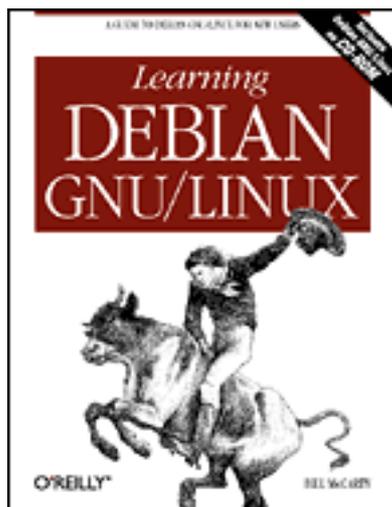
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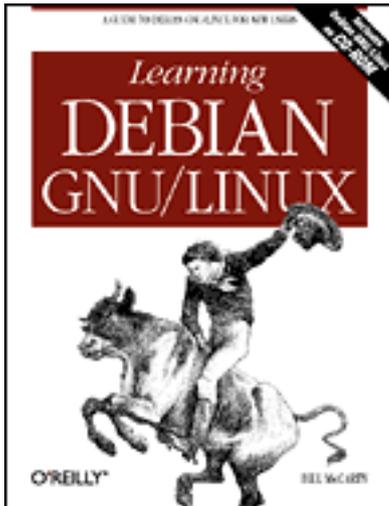
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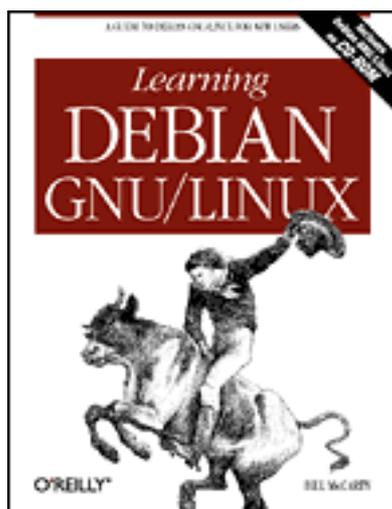
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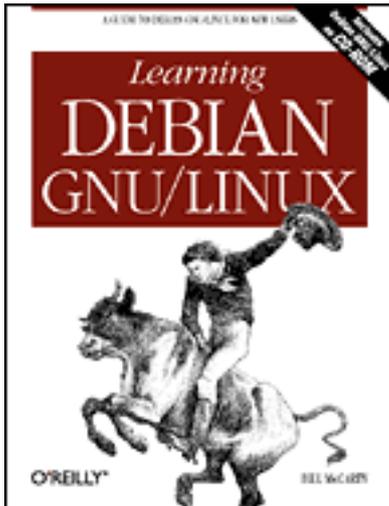
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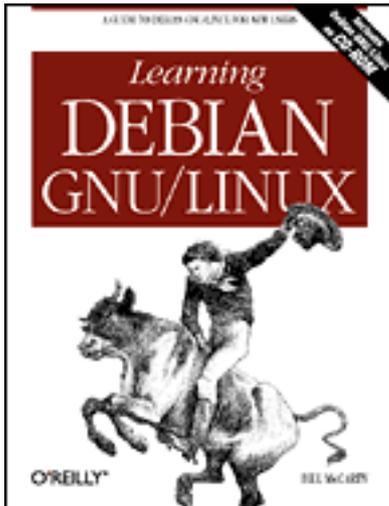
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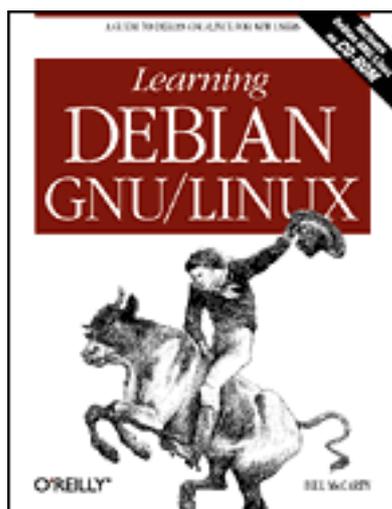
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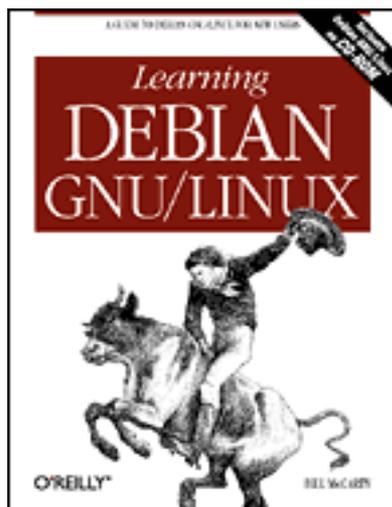
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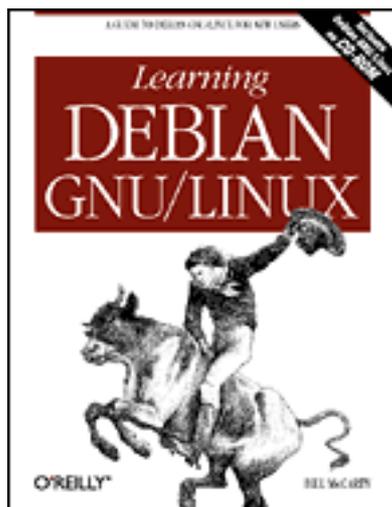
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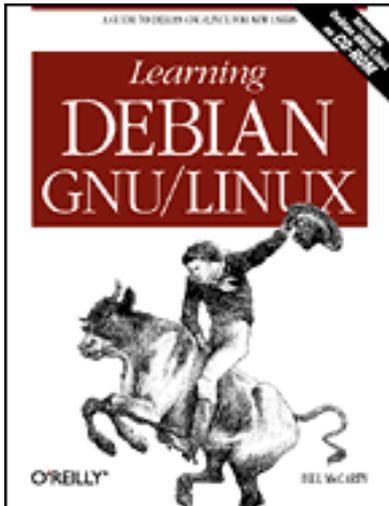
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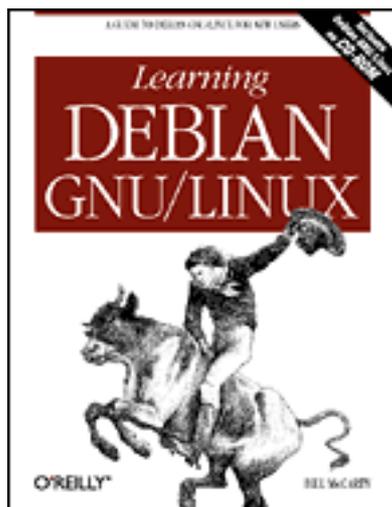
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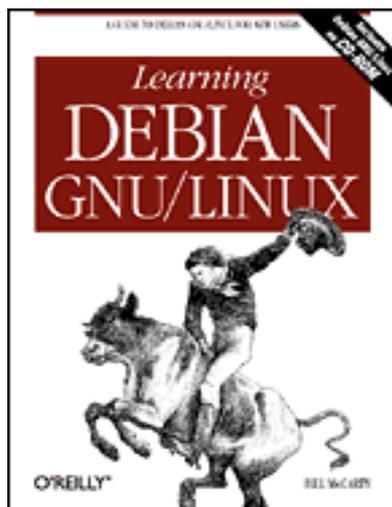
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By [Bill McCarty](#)

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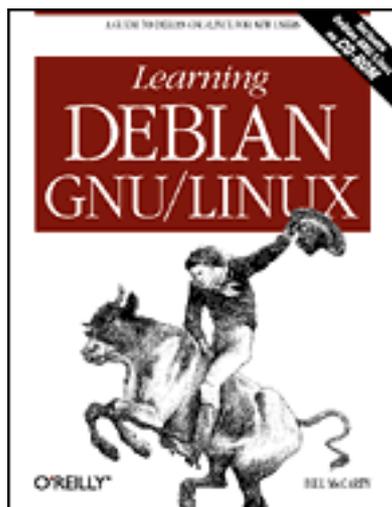
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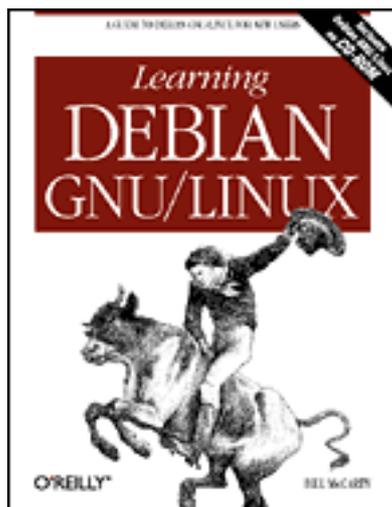
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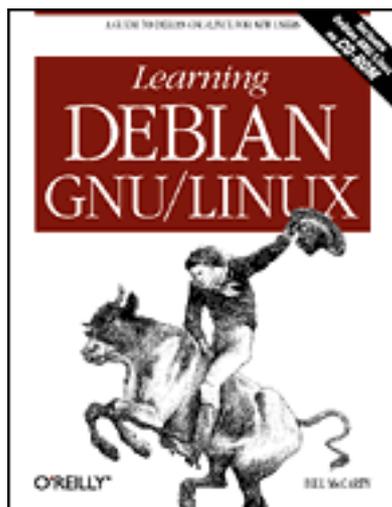
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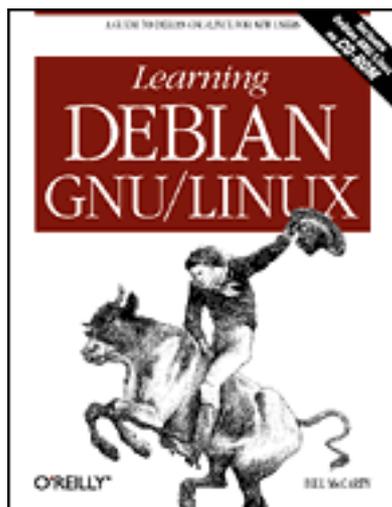
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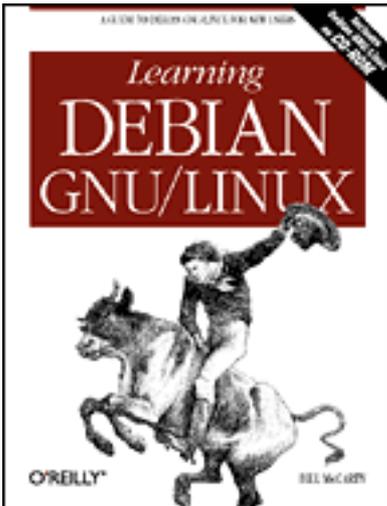
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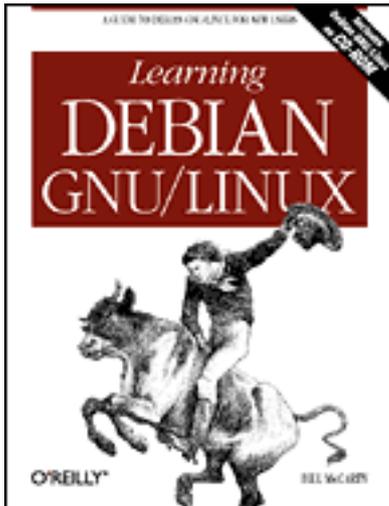
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