Part I

Getting off the Ground with Linux

IN THIS PART

Chapter 1

Starting with Linux

In only a few years, Linux has advanced from being considered a specialty operating system into the mainstream. Precompiled and configured Linux systems can be installed with no technical expertise. Versions of Linux run on all kinds of devices, from PCs to handhelds (see `www.linuxdevices.com`) to game consoles (such as PlayStation 3) to supercomputers. In short, Linux has become a system that can be run almost anywhere by almost anyone.

On both desktop and server computers Linux has become a formidable operating system across a variety of business applications. Today, large enterprises can deploy thousands of systems using Linux distributions from companies such as Red Hat, Inc. and Novell, Inc. Small businesses can put together the mixture of office and Internet services they need to keep their costs down.

The free and open source software (FOSS) development model that espoused sharing, freedom, and openness is now on a trajectory to surpass the quality of other operating systems outside of the traditional Linux servers and technical workstations. What were once weak components of Linux, such as easy-to-use desktops and personal productivity applications, have improved at a rapid pace. In areas of security, usability, connectivity, and network services, Linux has continued to improve and outshine the competition.

Computer industry heavy-hitters such as Microsoft and Oracle have taken notice of Linux. Microsoft has struck agreements with Linux companies including Novell and Xandros to form partnerships that primarily protect those companies against threatened Microsoft lawsuits. Oracle began producing its own Linux system called Unbreakable Linux, to try to stem the flow of customers to Red Hat Enterprise Linux.

IN THIS CHAPTER

What does this all add up to? A growing swirl of excitement around the operating system that the big guys can't seem to get rid of. For people like you, who want the freedom to use your computer software as you like, it means great prospects for the future.

Let this book help you grab your first look at the distributions, applications, services, and community that make up the phenomenon that has become Linux.

Taking Your First Step

In your hands, you have 18 different Linux distributions (on CD and DVD), thousands of applications, and descriptions for getting it all running on your own computer. For you right now, the worldwide Linux phenomenon is just a reboot away.

Linux Bible 2009 Edition brings you into the world of free and open source software that, through some strange twists and turns, has fallen most publicly under the "Linux" banner. Through descriptions and procedures, this book helps you:

- Understand what people do with Linux and how you can use Linux for all your computing tasks.
- Sort through the various distributions of Linux to choose one (or more) that is right for you. You get several Linux systems on this book's CD and DVD. (Linux is all about choice, too!)
- Try out Linux as a desktop computer, server computer, or programmer's workstation.
- Become connected to the open source software movement, as well as many separate high-quality software projects that are included with Linux.

What Comes in Linux Systems?

Whether you are using Linux for the first time or just want to try out a new Linux distribution, *Linux Bible 2009 Edition* is your guide to using Linux and the latest open source technology. While different Linux distributions vary in the exact software they include, this book describes the most popular software available for Linux to:

- Manage your desktop (menus, icons, windows, and so on)
- Listen to music, watch video, and store and arrange digital photos
- Create, lay out, manipulate, and publish documents and images on paper or on the Web
- Browse the Web and send e-mail
- Play games
- Find thousands of other open source software packages you can get for free

Because most Linux distributions also include features that let them act as servers (in fact, that's one of the things Linux has always been best at), you'll also learn about software available for Linux that lets you do the following:

- Connect to the Internet or other network
- Use Linux as a firewall and router to protect and manage your private network
- Run a Web server (using Apache, MySQL, and PHP)
- Run a mail server (using Exim or other mail transfer agent)
- Run a print server (using Samba or CUPS)
- Run a file server (using FTP or Samba)
- Use the exact same enterprise-quality software used by major corporations (such as Google and Amazon.com), universities, and businesses of all sizes.

This book guides you through the basics of getting started with these Linux features, plus many more. Once you've been through the book, you should be proficient enough in the basics to track down answers to your more advanced questions through the volumes of man pages, FAQs, HOWTOs, and forums that cover different aspects of the Linux operating system.

To get started with Linux right now, all you need is a standard PC with a bootable CD or DVD drive.

What Do You Need to Get Started?

Although Linux will run great on many low-end computers (even some old 486s and early Pentiums), if you are completely new to Linux, I recommend that you start with a PC that has a little more muscle. Here's why:

- Full-blown Linux operating systems with complete GNOME or KDE desktop environments (see Chapter 3) perform poorly on slow CPUs and less than the recommended amount of RAM. The bells and whistles come at the price of processing power. Lighter-weight options do exist if you have limited resources.
- You can use streamlined graphical Linux installations that will fit on small hard disks (as small as 100MB) and run fairly well on slow processors. Also, there are small live CD Linux distributions, such as Damn Small Linux (DSL), that can be copied to hard disk and run from there (read about some of these small "bootables" in Chapter 28). The 50MB DSL desktop system will run fine on old Pentium machines with little RAM. But if you want to add some of the more demanding applications to these small systems, such as OpenOffice.org office applications, you will find you need more than minimal computer hardware.

If you are starting with a 400 MHz Pentium II, your desktop will run slowly in default KDE or GNOME configurations with less than 128MB of RAM. A simpler desktop system, with just X and a window manager, will work, but won't give you the full flavor of a Linux desktop. (See Chapter 3 for information about different desktop choices and features.)

The good news is that cheap computers that you can buy from Wal-Mart or other retailers start at less than $300. Those systems will perform better than most PCs you have laying around that are more than a few years old, and some even come with Linux pre-installed. The bottom line is that the less you know about Linux, the more you should try to have computer hardware that is up to spec in order to have a pleasant experience.

Starting Right Now

If you are anxious to get started, insert either the DVD or CD accompanying this book into the appropriate drive on your PC and reboot. When you see the boot screen, press Enter. When the DVD or CD boots, the following happens, respectively:

- **KNOPPIX starts up.** A fully functional KNOPPIX desktop Linux system will boot directly from the DVD. From that Linux system, you can do everything you'd expect to do from a modern desktop computing system: write documents, play music, communicate over the Internet, work with images, and so on. If you have a wired Ethernet connection that connects to the Internet when you start up Windows, most likely it will also connect automatically when KNOPPIX starts.
- **Damn Small Linux (DSL) starts up.** This small, amazing desktop-oriented Linux system starts up directly from the CD that comes with this book. Besides being expandable and adaptable, DSL runs on everything from low-end PCs to powerful workstation hardware while being small enough to fit on a mini CD (only about 50MB in size).

What you have in front of you is a functioning desktop system that can be installed to your hard disk to use permanently, if you like. Thousands of software packages available for Linux can be added. Depending on your Linux system, installing extra software might just take a few clicks.

The next sections step you through a few things you can do with KNOPPIX and DSL.

Trying KNOPPIX

When KNOPPIX starts up, you bypass a login screen and go directly to a K Desktop Environment (KDE) that is loaded with free software for you to try. Figure 1-1 shows an example of the KNOPPIX KDE desktop with several applications running.

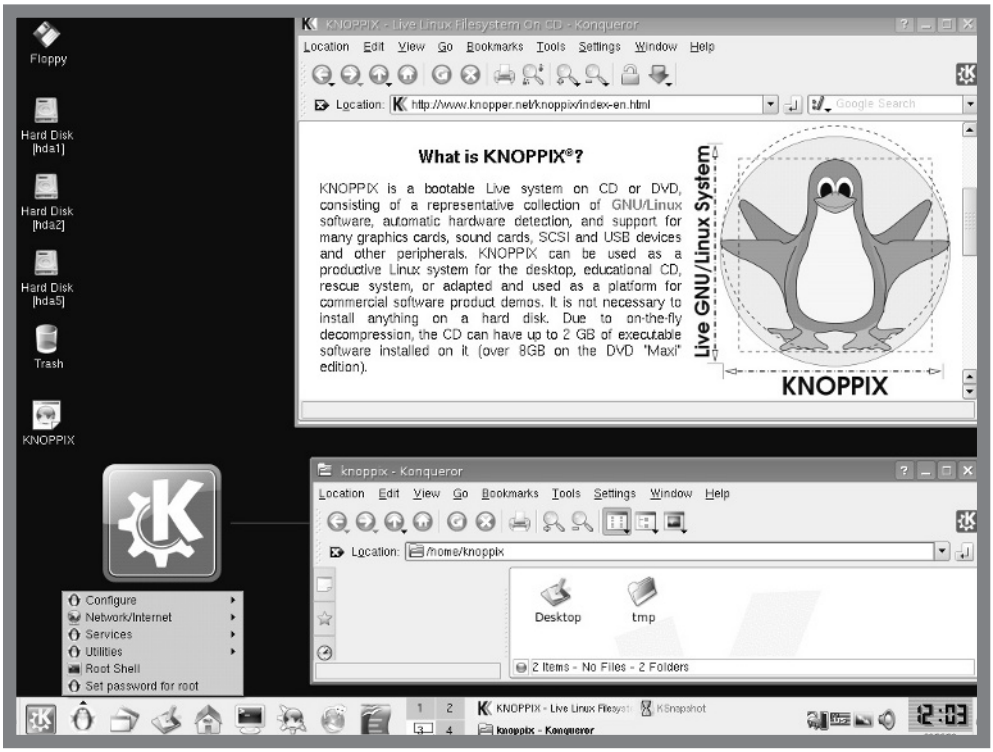
NOTE **If you have any trouble starting KNOPPIX, refer to Chapter 21 for descriptions of boot options to help you overcome certain problems (such as a garbled screen or hanging when certain hardware is encountered). That chapter also describes other KNOPPIX features.**

Here is a quick tour of the KNOPPIX desktop:

- **Browsing —** Select the Konqueror icon from the bottom panel to open the Konqueror Web browser/file manager. The Konqueror window shown in Figure 1-1 displays the English version of the KNOPPIX Web site (`http://knopper.net`).

FIGURE 1-1

The KNOPPIX Live Linux CD or DVD contains the KDE desktop and hundreds of applications.



- **Managing files —** Select the Home icon from the bottom panel. A Konqueror window opens to show your home folder (`/home/knoppix`). You will typically save files and folders to your home folder. Because you are running KNOPPIX as a live CD, any files you create will be lost when you reboot if you don't explicitly save them. Chapter 21 describes how to make a persistent desktop, so the files you create in KNOPPIX can be saved permanently.
- **Accessing disks —** A live CD, such as KNOPPIX, is designed to run without touching the contents of your hard disk. However, if you have something on your hard disk you want to use with KNOPPIX (such as a music file or document), KNOPPIX makes it easy to do that.

  Icons on the left side of the desktop appear, representing every partition on your hard disk, as well as detected removable media (such as a USB flash drive). In Figure 1-1, Hard Disk icons hda1, hda2, and hda5 represent several partitions on your hard disk. Select an icon to display the contents of the partition in a file manager window. To be able to add content to that disk partition, right-click the partition and select Change Read/Write Mode.

- **Special Knoppix features —** Because of the temporary nature of a live CD, settings have to be configured each time you boot, unless you take steps to save those settings. From the small penguin icon on the left side of the bottom panel, you can see a menu of selections to do special things to make the live CD work better. Select Configure ➪ Save KNOPPIX Configuration to save your settings to your hard disk or a USB drive so you can use those settings later.

  Other KNOPPIX features are also available from that menu. You can configure a persistent disk image, make a swap file, or configure printers, TV cards, or sound cards. You can also configure different services. Many of these features are described in Chapter 21.

- **Running applications —** Select the K icon from the lower-left corner of the panel to see a menu of available applications. Choose Settings to configure your desktop. Choose Office to select from several OpenOffice.org office applications for writing documents, using spreadsheets, drawing pictures, and building presentations. Try out some games from the Games menu.

When you are done trying KNOPPIX, select Log Out from the K menu and choose Turn Off Computer. After KNOPPIX shuts down, it will eject the disc. After you remove the disc, you can use your computer again with whatever operating system you have installed there.

Trying Damn Small Linux

Because Damn Small Linux (DSL) is based on KNOPPIX, you may notice some similarities. DSL is smaller and faster, however, so you should get to the DSL desktop screen quicker. Instead of KDE, the DSL desktop features a lightweight window manager. Figure 1-2 shows an example of a DSL desktop with several applications open.

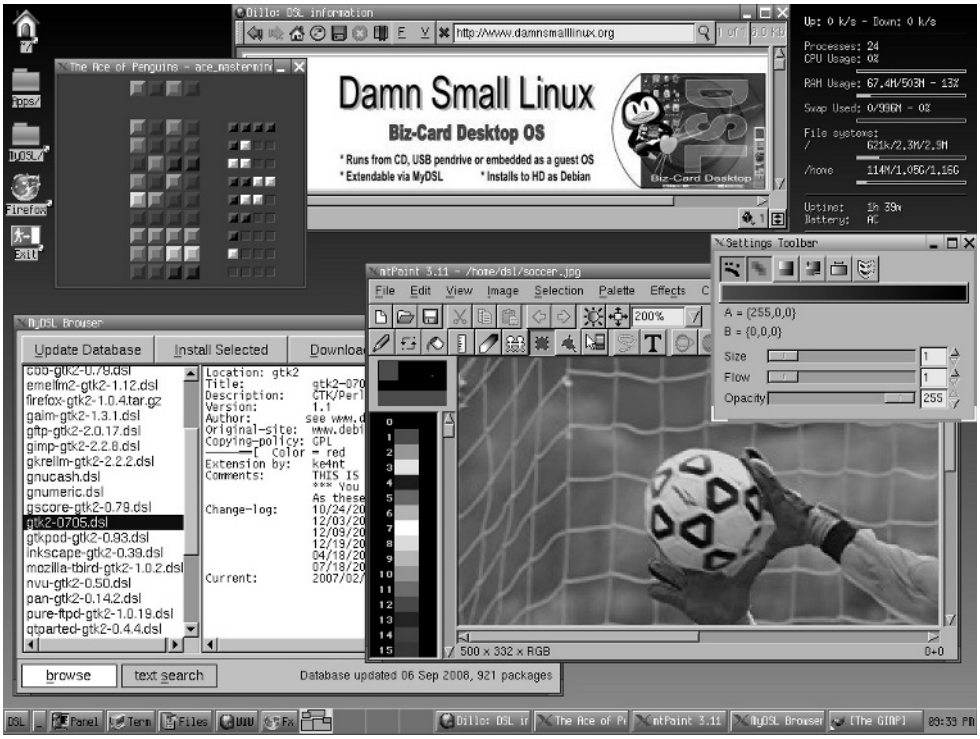
NOTE **Many of the same boot options that come with KNOPPIX will work with DSL, so check Chapter 21 if you have trouble booting DSL. For other descriptions of DSL, see Chapter 28.**

Here are some things to try on your DSL desktop:

- **Web browsing —** With an active wired Internet connection, you should be able to connect to the Internet automatically when DSL boots up. The Dillo Web browser opens to a page of basic DSL information. Continue to browse the Web from Dillo, or open the Firefox icon from the desktop to browse with Firefox instead.
- **Install applications —** Open the MyDSL icon from the desktop and then, when prompted, download the applications database. After that, select categories from the left column to look through listings of hundreds of applications you can add to DSL. When you find one you like, choose Install Selected to download and install it.
- **Check out the desktop —** On the desktop itself, view information about your computer (CPU Usage, RAM Usage, Swap Used, File systems, and so on) in the upper-right corner. Select DSL in the lower-left corner of the bottom panel to see a menu of available applications. Then try a few applications. You can view the same menu by right-clicking on the desktop.

FIGURE 1-2

Damn Small Linux provides an efficient desktop Linux.



- **Change settings —** Select Setup from the main menu to adjust the date and time, change your desktop theme, configure your X display server, or set up a wireless or dial-up Internet connection.
- **Control the system —** Select System from the menu and choose Control Panel. From the Control Panel that appears, you can configure your printer, back up your files (remember that files disappear at reboot with live CDs if you don't save them to disk or removable media), or start login (SSH) or FTP services. Return to the main menu and select Apps ➪ Tools to do some cool, specialized DSL features, such as install to your hard disk or a portable USB flash drive (pendrive). You can also remaster a MyDSL CD or make a boot floppy.
- **Try applications —** Figure 1-2 shows a couple of applications open on the DSL desktop. Select Games from the menu, and then try out a game such as Ace of Penguins Mastermind (shown in the upper-left portion of the figure) to guess a sequence of four colored blocks. Select Apps ➪ Graphics ➪ mtPaint to open a nice graphics application for manipulating images and drawing (shown here with a soccer ball image).

Select the Exit icon from the desktop and choose Shutdown or Reboot to exit from DSL. Notice that the Backup box is checked. With that box checked, DSL gives you the option to save your files and settings (provided you set up a location to back up your files earlier from the Control Panel). With that information saved, the next time you boot DSL from that computer, you have those files and settings available.

Trying Other Linux Distributions

There are many other Linux distributions besides KNOPPIX and DSL that you can try from the CD and DVD that come with this book. Ubuntu has a large, active following and can be run live from the DVD. Try Fedora or openSUSE if you want to see a Linux system that is being prepared for enterprise distributions (Red Hat Enterprise Linux and SUSE Linux Enterprise, respectively).

Gentoo and Slackware often appeal to technically oriented users. On small machines, distributions such as Puppy Linux or BackTrack may interest you. See Appendix A for information on those and other Linux systems included with this book.

Understanding Linux

People who don't know what Linux is sometimes ask me if it's a program that runs on Microsoft Windows. When I tell them that Linux is, itself, an operating system like Windows and that they can remove (or never purchase) Windows, I sometimes get a surprised reaction: "A PC can run with nothing from Microsoft on it?" The answer is yes!

The next question about Linux is often: "How can Linux be free?" While the full answer to that is a bit longer (and covered later), the short answer is: "Because the people who write the code license it to be freely distributed." Keep in mind, however, that the critical issue relating to the word "free" is "freedom," meaning that you are free to rebuild, reuse, reconfigure, and otherwise do what you like with the code. The only major responsibility is that if you change the software, you pass it forward so that others may benefit from your work as well.

Linux is a full-blown operating system that is a free clone of the powerful and stable UNIX operating system. Start your computer with Linux, and Linux takes care of the operation of your PC and manages the following aspects of your computer:

- **Processor —** Because Linux can run many processes from many different users at the same time (even with multiple CPUs on the same machine), Linux needs to be able to manage those processes. The Linux scheduler sets the priorities for running tasks and manages which processes run on which CPUs (if multiple processors are present). The scheduler can be tuned differently for different types of Linux systems. If it's tuned properly, the most important processes get the quickest responses from the processor. For example, a Linux scheduler on a desktop system gives higher priority to things such as moving a window on the desktop than it does to a background file transfer.

- **Memory —** Linux tries to keep processes with the most immediate need in RAM, while managing how processes that exceed the available memory are moved to swap space. *Swap space* is a defined area on your hard disk that's used to handle the overflow of running processes and data. When RAM is full, processes are placed in swap space. When swap space is full (something that you don't want to happen), new processes can't start up.
- **Devices —** Linux supports thousands of hardware devices, yet keeps the kernel a manageable size by including only a small set of drivers in the active kernel. Using loadable modules, the kernel can add support for other hardware as needed. Modules can be loaded and unloaded on demand, as hardware is added and removed. (The kernel, described in detail a bit later on, is the heart of a Linux operating system.)
- **File systems —** File systems provide the structure in which files are stored on hard disk, CD, DVD, floppy disks, or other media. Linux knows about different file system types (such as Linux ext3 and reiserfs file systems, or VFAT and NTFS from Windows systems) and how to manage them.
- **Security —** Like UNIX, Linux was built from the ground up to enable multiple users to access the system simultaneously. To protect each user's resources, every file, directory, and application is assigned sets of read, write, and execute permissions that define who can access them. In a standard Linux system, the root user has access to the entire system, some special logins have access to control particular services (such as Apache for Web services), and users can be assigned permission individually or in groups. Recent features such as Security Enhanced Linux and AppArmor enable more refined tuning and protection in highly secure computing environments.

What I have just described are components that are primarily managed by what is referred to as the Linux ***kernel***. In fact, the Linux kernel (which is still maintained by Linus Torvalds, who created the Linux kernel as a graduate student in Finland) is what gives Linux its name. The kernel is the software that starts up when you boot your computer and interfaces with the programs you use so they can communicate effectively and simply with your computer hardware.

NOTE **See Appendix B for historic details on how the kernel and other free software came together to create the Linux phenomenon.**

Components such as administrative commands and applications from other free and open source software projects work with the kernel to make Linux a complete operating system. The GNU Project (`www.gnu.org`), in particular, contributed many implementations of standard UNIX components that are now in Linux. Apache, KDE, GNOME, and other major open source projects in Linux have also contributed to the success of Linux. (See Chapter 2 for an explanation of how open source projects work and how you can get involved in them.) Those other projects added such things as:

- **Graphical user interfaces (GUIs) —** Consisting of a graphical framework (typically the X Window System), window managers, panels, icons, and menus. GUIs enable you to use Linux with a keyboard and mouse combination, instead of just typing commands (as was done in the old days).

- **Administrative utilities** — Including hundreds (perhaps thousands) of commands and graphical windows to do such things as add users, manage disks, monitor the network, install software, and generally secure and manage your computer.
- **Applications** — Although no Linux distribution includes all of them, there are literally thousands of games, office productivity tools, Web browsers, chat windows, multimedia players, and other applications available for Linux.
- **Programming tools** — Including programming utilities for creating applications and libraries for implementing specialty interfaces.
- **Server features** — Enabling you to offer services from your Linux computer to another computer on the network. In other words, while Linux includes Web browsers to view Web pages, it can also be the computer that serves up Web pages to others. Popular server features include Web, mail, database, printer, file, DNS, and DHCP servers.

Once Linus Torvalds and friends had a working Linux kernel, pulling together a complete open source operating system was possible because so much of the available "free" software was:

- **Covered by the GNU Public License (GPL) or similar license** — That allowed the entire operating system to be freely distributed, provided guidelines were followed relating to how the source code for that software was made available going forward (see `http://www.gnu.org/licenses/gpl.html`).
- **Based on UNIX-like systems** — Clones of virtually all the other user-level components of a UNIX system had been created. Those and other utilities and applications were built to run on UNIX or other UNIX-like systems.

Linux has become one of the most popular culminations of the open source software movement. But the traditions of sharing code and building communities that made Linux possible started years before Linux was born. You could argue that it began in a comfortable think tank known as Bell Laboratories. Read Appendix B to learn more about the history of Linux.

Leveraging work done on UNIX and GNU projects helped to get Linux up and running quickly. The culture of sharing in the open source community and adoption of a wide array of tools for communicating on the Internet have helped Linux move quickly through infancy and adolescence to become a mature operating system.

The simple commitment to share code is probably the single most powerful contributor to the growth of the open source software movement in general, and Linux in particular. That commitment has also encouraged involvement from the kind of people who are willing to contribute back to that community in all kinds of ways. The willingness of Linus Torvalds to incorporate code from others in the Linux kernel has also been critical to the success of Linux.

What's So Great About Linux?

If you have not used Linux before, you should expect a few things to be different from using other operating systems. Here is a brief list of some Linux features that you might find cool:

- **No constant rebooting —** Uptime is valued as a matter of pride (remember, Linux and other UNIX systems are most often used as servers, which are expected to, and do, stay up 24/7/365). After the original installation, you can install or remove most software without having to reboot your computer.
- **Start/stop services without interrupting others —** You can start and stop individual services (such as Web, file, and e-mail services) without rebooting or even interrupting the work of any other users or features of the computer. In other words, you should not have to reboot your computer every time someone sneezes. (Installing a new kernel is just about the only reason you need to reboot.)
- **Portable software —** You can usually change to another Linux, UNIX, or BSD system and still use the exact same software! Most open source software projects were created to run on any UNIX-like system and many also run on Windows systems, if you need them to. If it won't run where you want it to, chances are that you, or someone you hire, can port it to the computer you want. (*Porting* refers to modifying an application or driver so it works in a different computer architecture or operating system.)
- **Downloadable applications —** If the applications you want are not delivered with your version of Linux, you can often download and install them with a single command, using tools such as apt, urpmi, and yum.
- **No settings hidden in code or registries —** Once you learn your way around Linux, you'll find that (given the right permissions on your computer) most configuration is done in plain text files that are easy to find and change. In recent years, simplified graphical interfaces have been added to make it even easier to work with configuration files. Because Linux is based on openness, nothing is hidden from you. Even the source code, for GPL-covered software, is available for your review.
- **Mature desktop —** The X Window System (providing the framework for your Linux desktop) has been around longer than Microsoft Windows. The KDE and GNOME desktop environments provide graphical interfaces (windows, menus, icons, and so forth) that rival those on Microsoft systems. You have the freedom to choose lightweight window managers instead as well. Ease-of-use problems with Linux systems are rapidly evaporating.
- **Freedom —** Linux, in its most basic form, has no corporate agenda or bottom line to meet. You are free to choose the Linux distribution that suits you, look at the code that runs the system, add and remove any software you like, and make your computer do what you want it to do. Linux runs on everything from supercomputers to cell phones and everything in between. Many countries are rediscovering their freedom of choice and making the switch at government and educational levels. France, Germany, Korea, and India are just a few that have taken notice of Linux. The list continues to grow.

There are some aspects of Linux that make it hard for some new users to get started. One is that Linux is typically set up to be secure by default, so you need to adjust to using an administrative login (root) to make most changes that affect the whole computer system. Although this can be a bit inconvenient, trust me, it makes your computer safer than just letting anyone do anything. This model was built around a true multi-user system. You can set up logins for everyone who uses your Linux computer, and you (and others) can customize your environment however you see fit without affecting anyone else's settings.

For the same reason, many services are off by default, so you need to turn them on and do at least minimal configuration to get them going. For someone who is used to Windows, Linux can be difficult just because it is different from Windows. But because you're reading this book, I assume you want to learn about those differences.

Summary

Getting started with Linux can be as easy as inserting the CD or DVD accompanying this book into your PC and rebooting. Using that media, you can try out 18 different Linux systems, either live or by installing them to your hard disk.

Linux can be used as a desktop system (like Microsoft Windows); as a Web, file, or print server; or as a programmer's workstation. You have a lot of flexibility when it comes to how Linux is configured and what software you install and run on it.

Because you are free to use open source software as you please—many Linux enthusiasts have come up with interesting and innovative ways to use Linux and benefit from it. Chapter 2 describes what you can do with Linux, what you can make with Linux, and what you can become with Linux.