

Introduction

Welcome to *Red Hat Fedora 6 Unleashed!* This book covers the free Linux distribution named Fedora Core and includes a fully functional and complete operating system produced by the Fedora Project, sponsored by Red Hat.

Fedora Core, or more simply *Fedora*, is directly descended from one of the most popular Linux distributions ever: Red Hat Linux. Those of you who know nothing about Linux might have heard of Red Hat; it is enough to know that it is the largest Linux vendor in North America. Fedora benefits directly from many Red Hat engineers as well as the wider contributions from free software developers across the world.

If you are new to Linux, you have made a great decision by choosing this book. Sams Publishing's *Unleashed* books offer an in-depth look at their subject, taking in both beginner and advanced users and moving them to a new level in knowledge and expertise. Fedora is a fast-changing distribution that can be updated at least twice a year. Thankfully we have tracked the development of Fedora from very early on to make sure that the information contained in this book mirrors closely the development of the distribution. A full copy of Fedora is included on the DVD, making it possible for you to install Linux in less than an hour!

No longer an upstart, Linux now has an enviable position in today's modern computing world. It can be found on machines as diverse as mobile phones and wristwatches, all the way up to supercomputers—in fact, Linux currently runs on the world's fastest computer, IBM's Blue Gene/L. Do not let the reputation of Linux put you off, though. Most people who have heard of Linux think that it is only found on servers, looking after websites and emails. Nothing could be further from the truth because Linux is making huge inroads in to the desktop market, too. Corporations are realizing the benefits of running a stable and powerful operating system that is easy to maintain and easy to secure. Add to that the hundreds of improvements in useability, and it becomes an attractive proposition that tempts many CIOs. The best bit is that as large Linux vendors improve Linux, the majority of those improvements make it into freely available distributions, allowing you to benefit from the additions and refinements made. You can put Fedora to work today and be assured of a great user experience.

This book provides all the information that you need to get up and running with Fedora. It even tells you how to keep Fedora running in top shape, as well as adapt Fedora to changes in your needs and requirements. Fedora can be used at home, in the workplace, or, with permission, at your school and college. In fact, you might want to poke around your school's computer rooms: You will probably find that someone has already beaten you to the punch—Linux is commonly found in academic institutions. Feel free to make as many copies of the software as you want. No copyright lawyers are going to pound on your door because Fedora is freely distributable all over the world.

After an introduction to Linux and Fedora, you will find out how to get started with Fedora, including installation and initial configuration. We will also take you through

installing software, managing users, and other common administrative tasks. For the more technically minded, we cover some starting steps in programming across several languages—why not pick one and give it a go! Through the book you will also find information on multimedia applications, digital graphics, and even gaming for after-hours when you are finished tinkering. After you make it through the book, you will be well equipped with the knowledge needed to use Linux successfully. We do assume that you are at least familiar with an operating system already (even if it is not with Linux), and have some basic computer knowledge.

What Is Linux?

Linux is the core, or *kernel*, of a free operating system first developed and released to the world by Linus Benedict Torvalds in 1991. Torvalds, then a graduate student at the University of Helsinki, Finland, is now a Fellow at the Open Source Development Lab (<http://www.osdl.org/>). He is an engineer and previously worked for the CPU design and fabrication company Transmeta, Inc. Fortunately for all Linux users, Torvalds chose to distribute Linux under a free software license named the GNU General Public License (GPL).

NOTE

The free online resource Wikipedia has a great biography of Linus Torvalds that examines his life and notable achievements. It can be found at http://en.wikipedia.org/wiki/Linux_Torvalds. Or you can head on over to <http://groups.google.com/group/comp.os.minix/msg/b813d52cbc5a044b?hl=en> to read a copy of Linus's first post about Linux to the world.

The GNU GPL is the brainchild of Richard M. Stallman, the founder of the Free Software Foundation. Stallman, the famous author of the Emacs editing environment and GCC compiler system, crafted the GPL to ensure that software that used the GPL for licensing would always be free and available in source code form. The GPL is the guiding document for Linux and its ownership, distribution, and copyright. Torvalds holds the rights to the Linux trademark, but thanks to a combination of his generosity, the Internet, thousands of programmers around the world, GNU software, and the GNU GPL, Linux will remain forever free and unencumbered by licensing or royalty issues. See the “Licensing” section later in this Introduction to learn more about the GNU GPL and other software licenses.

Linux, pronounced “lih-nucks,” is free software. Combining the Linux kernel with GNU software tools—drivers, utilities, user interfaces, and other software such as The X.Org Foundation's X Window System—creates a Linux distribution. There are many different Linux distributions from different vendors, but many are derived from or closely mimic Red Hat's distribution of Linux: Red Hat Linux.

NOTE

To see just how many distributions are based on Red Hat Linux, go to <http://www.linux.org/>, click Distributions, and search for “Red Hat-based.” At the time of writing, 36 distributions owe their existence to Red Hat Linux and 11 are based directly on Fedora.

What Is Fedora?

Fedora is an operating system based on the Linux kernel, created, improved, refined, and distributed by the Fedora Project at <http://fedora.redhat.com/>. The Fedora Project, sponsored by Red Hat, is an open source project supported by a worldwide community of software developers. Although Fedora is not supported by Red Hat, it incorporates improvements made to the Linux kernel and helps contribute to Red Hat's commercial Linux distributions and software. At the same time, Fedora also benefits from improvements made by Red Hat software engineers to Red Hat's products. Despite this symbiotic relationship, Fedora is a free operating system, built entirely from free software, and is guided by a process open to all free software developers.

Roots of Red Hat and Fedora

In 1994, Marc Ewing and Bob Young combined forces to create Red Hat (named after a Cornell University lacrosse team hat) to develop, release, and market an easily installed, easily managed, and easy-to-use Linux distribution. Five years later, Durham, North Carolina-based Red Hat would have one of the most successful initial public offerings (IPOs) on the stock market. In 2001, Red Hat introduced a line of products aimed at the corporate and enterprise markets and created versions of its Red Hat Linux distributions and associated software in a product line known as Red Hat Enterprise Linux. Additional software, services, and distributions were added to the product over the next several years, such as the Advanced Server (with support for seven CPU architectures), ES (for small- to mid-range enterprise use), and WorkStation (WS) releases.

Following the release of Red Hat Linux 9 in mid-2003, Red Hat announced that it was discontinuing the sale of consumer-based Linux distributions. Previously, the distributions had been available in boxed sets with manuals on store shelves or in CD-ROM image format for free download over the Internet. Red Hat then created the Fedora Project and formally opened its doors on October 22, 2003.

Today, the company has grown from a handful of employees to more than 1100 in 51 locations around the world.

Red Hat was one of the first companies to adopt, promote, and use open source as a business model for supporting development, technical service, support, and sales of free software to the computer industry. Its business practices have spawned a shift in paradigm of proprietary attitudes prevalent in the monopolistic software industry, and the company is a role model and business leader in the open source movement. You learn more about Red Hat and Fedora in Chapter 1, "Introducing Fedora."

CAUTION

The Fedora DVD included with this book is not supported by Red Hat. If you want technical support when using a Red Hat release, purchase a copy of Red Hat Enterprise Linux from Red Hat at <http://www.redhat.com/>.

You can also call to order. In the United States, call 1-866-273-3428, extension 4555.

Elsewhere in the world, check <http://www.redhat.com/about/corporate/wwoffices/> for a list of local offices.

Red Hat is a trademark of Red Hat. Linux is a trademark owned by Linus Torvalds.

Do NOT contact Red Hat for any type of support when using or attempting to install the software included with this book. Although every effort has been made to ensure that information in this book matches the included software, you should instead contact Sams Publishing for any problems related to the DVD contained in this book:

userservices@sampublishing.com

Only users who purchase the “official” Red Hat Enterprise Linux products from Red Hat are entitled to support from Red Hat.

If you purchase an official Red Hat Enterprise Linux distribution from Red Hat, you might find commercial software included on the distribution’s CD-ROMs. These software packages are often included as an enticement to purchase more feature-laden or corporate versions, but you should carefully read any accompanying licensing agreements and be careful to not make unauthorized copies.

Licensing

Software licensing is an important issue for all computer users and can entail moral, legal, and financial considerations. Many consumers think that purchasing a copy of a commercial or proprietary operating system, productivity application, utility, or game conveys ownership, but this is not true. In the majority of cases, the end user license agreement (EULA) included with a commercial software package states that you have paid only for the right to use the software according to specific terms. This generally means you may not examine, make copies, share, resell, or transfer ownership of the software package. More onerous software licenses enforce terms that preclude you from distributing or publishing comparative performance reviews of the software. Even more insidious licensing schemes (and supporting legislation, especially in the United States), contain provisions allowing onsite auditing of the software’s use!

This is not the case with the software included with this book. You are entirely free to make copies, share them with friends, and install the software on as many computers as you want—we encourage you to purchase additional copies of this book to give them as gifts, however. Be sure to read the README file on the DVD included with this book for important information regarding the included software and disk contents. Look under the `/usr/share/apps/LICENSES` directory after you install Fedora to find a copy of the GNU GPL (along with copies of other software licenses). You will see that the GPL provides unrestricted freedom to use, duplicate, share, study, modify, improve, and even sell the software.

You can put your copy of Fedora to work right away in your home or at your place of business without worrying about software licensing, per-seat workstation or client licenses, software auditing, royalty payments, or any other types of payments to third parties. However, you should be aware that although much of the software included with Fedora is licensed under the GPL, some packages on this book’s DVD are licensed under other terms. There is a variety of related software licenses, and many software packages

fall under a broad definition known as *open source*. Some of these include the Artistic License, the BSD License, the Mozilla Public License, and the Q Public License.

For additional information about the various GNU software licenses, browse to <http://www.gnu.org/>. For a definition of open source and licensing guidelines, along with links to the terms of nearly three dozen open source licenses, browse to <http://www.opensource.org/>.

Why Use Linux?

Millions of savvy computer users have been putting Linux to work for more than 14 years. Over the last year, many individuals; small office/home office (SOHO) users; businesses; corporations; colleges; nonprofits; and local, state, and federal agencies in a number of countries have incorporated Linux with great success. And today, Linux is being incorporated into many IS/IT environments as part of improvements in efficiency, security, and cost savings. Using Linux is a good idea for a number of reasons. These reasons include

- **Linux provides an excellent return on investment (ROI)**—There is little or no cost on a per-seat basis. Unlike commercial operating systems, Linux has no royalty or licensing fees and a single Linux distribution on CD-ROM or network shared folder can form the basis of an enterprisewide software distribution, replete with applications and productivity software. Custom corporate CD-ROMs can be easily crafted or network shares can be created to provide specific installs on enterprisewide hardware. This feature alone can save hundreds of thousands, if not millions, of dollars in information service/information technology costs—all without the threat of a software audit from the commercial software monopoly or the need for licensing accounting and controls of base operating system installations.
- **Linux can be put to work on the desktop**—Linux, in conjunction with its supporting graphical networking protocol and interface (the X Window System), has worked well as a consumer Unix-like desktop operating system since the mid-1990s. The fact that Unix is ready for the consumer desktop is now confirmed with the introduction, adoption, and rapid maturation of Apple Computer's BSD Unix-based Mac OS X—supported, according to Apple, by more than 3,000 Mac OS X-specific programs that are known as *native applications*. This book's DVD contains more than 1,300 software packages, including Internet connection utilities, games, a choice of three office suites, thousands of fonts, and hundreds of graphics applications.
- **Linux can be put to work as a server platform**—Linux is fast, secure, stable, scalable, and robust. The latest versions of the Linux kernel easily support multiple-processor computers (optimized for eight CPUs), large amounts of system memory (up to 64GB RAM), individual file sizes in excess of hundreds of gigabytes, a choice of modern journaling file systems, hundreds of process monitoring and control utilities, and the (theoretical) capability to simultaneously support more than four billion users. IBM, Oracle, and other major database vendors all have versions of their enterprise software available for Linux.

- **Linux has a low entry and deployment cost barrier**—Maintenance costs can also be reduced because Linux works well on a variety of PCs, including legacy hardware, such as some Intel-based 486 and early Pentium CPUs. Although the best program performance will be realized with newer hardware because clients can be recompiled and optimized for Pentium-class CPUs, base installs can even be performed on lower-end computers or embedded devices with only 8MB of RAM. This feature provides for a much wider user base; extends the life of older working hardware; and can help save money for home, small business, and corporate users.
- **Linux appeals to a wide hardware and software industry audience**—Versions of Linux exist for nearly every CPU. Embedded systems developers now turn to Linux when crafting custom solutions using ARM, MIPS, and other low-power processors. Linux is the first full operating system available for Intel's Itanium CPU, as well as the AMD64 group of CPUs; ports have also been available for HP/Compaq's Alpha and Sun Microsystems' SPARC CPUs for some time. PowerPC users regularly use the PPC port of Linux on IBM and Apple hardware.
- **Linux provides a royalty-free development platform for cross-platform development**—Because of the open source development model and availability of free, high-quality development tools, Linux provides a low-cost entry point to budding developers and tech industry startups.
- **Big-player support in the computer hardware industry from such titans as IBM now lends credibility to Linux as a viable platform**—IBM has enabled Linux on the company's entire line of computers, from low-end laptops through "Big Iron" mainframes. New corporate customers are lining up and using Linux as part of enterprise-level computing solutions. It has been used on some of the world's fastest computers, including IBM's Blue Gene/L. HP also certifies Linux across a large portion of its hardware offering.

Look forward to even more support as usage spreads worldwide throughout all levels of business in search of lower costs, better performance, and stable and secure implementations.

Who This Book Is For

This book is for anyone searching for guidance on using Fedora, and primarily focuses on Intel-based PC platforms. Although the contents are aimed at intermediate to advanced users, even new users with a bit of computer savvy will benefit from the advice, tips, tricks, traps, and techniques presented in each chapter. Pointers to more detailed or related information are also provided at the end of each chapter.

Fedora's installer program, named Anaconda, makes the job of installing Linux as easy as possible. However, if you are new to Linux, you might need to learn some new computer skills, such as how to research your computer's hardware, how to partition a hard drive, and occasionally how to use a command line. This book will help you learn these skills and show you how to learn more about your computer, Linux, and the software included

with Fedora. System administrators with experience using other operating systems will be able to use the information presented in this book to install, set up, and run common Linux software services, such as the Network File System (NFS), a File Transfer Protocol (FTP) server, and a web server (using Apache, among others).

What This Book Contains

Red Hat Fedora 6 Unleashed is organized into seven parts, covering installation and configuration, Fedora on the desktop, system administration, Fedora as a server, programming and housekeeping, and a reference section. A DVD containing the entire distribution is included so that you will have everything you need to get started. This book starts by covering the initial and essential tasks required to get Fedora installed and running on a target system.

If you're new to Linux, and more specifically, Fedora, first read the chapters in Part I, "Installation and Configuration." You will get valuable information on

- An overview of Fedora and Linux and their roles in various computing environments
- Planning for an installation by examining hardware requirements and the need for organizing how the system is installed
- Detailed steps that take you by the hand through various types of installations
- Critical advice on key configuration steps to fully install and configure Linux to work with your system's subsystems or peripherals, such as pointers, keyboards, modems, USB devices, power management, and—for laptop users—PCMCIA devices
- Initial steps needed by new users transitioning from other computing environments
- Configuration and use of the X Window System, the graphical interface for Linux

Part II, "Desktop Fedora," is aimed at users that want to get productive with Fedora and covers the following:

- Becoming familiar with the X Window System and looking at GNOME and KDE
- Discovering the many productivity applications that come with Fedora
- Surfing the Internet and working with email and newsgroups
- Using Fedora to listen to music and watch video
- Using Fedora to download and manipulate images from digital cameras
- Setting up local printers for Fedora
- A look at the current state of gaming for Linux

Moving beyond the productivity and desktop areas of Fedora, Part III, “System Administration,” covers

- Managing users and groups
- Automating tasks and using shell scripts
- Monitoring system resources and availability
- Backup strategies and software
- Network connectivity, including sharing folders and securing the network
- Internet connectivity via dial-up and broadband connections

Part IV, “Fedora As a Server,” looks at the opportunities provided by every Fedora system by covering

- Building and deploying web servers
- Database creation, management, and manipulation
- File and print servers
- Using FTP for serving files across the Internet and local networks
- Building and deploying email servers using Postfix as well as managing mailing lists
- Creating remote access gateways and services
- Configuring DNS for your network
- Using LDAP for storing information on users and security
- Configuring a local news server

Part V, “Programming Linux,” provides a great introduction into ways in which you can extend Fedora’s capabilities even further using the development tools supplied with it. This part covers

- Programming in Perl, using variables and scripting
- An introduction to the Python language
- Writing PHP scripts and linking them to databases
- C and C++ programming tools available with Fedora, and how to use the GNU C Compiler (gcc)

Part VI, “Fedora Housekeeping,” looks at some of the more advanced skills you need to keep your system running in perfect condition, including

- Securing your machine against attack from outsiders and viruses
- Performance tuning

- Command-line masterclass
- Advanced yum
- Kernel and module management and compilation
- Managing the file system

There is also an extensive reference in Part VII, “Appendix,” which gives you scope to explore in even more depth some of the topics covered in this book.

Conventions Used in This Book

A lot of documentation is included with every Linux distribution, and Fedora is certainly no exception. Although the intent of *Red Hat Fedora 6 Unleashed* is to be as complete as possible, it is impossible to cover every option of every command included in the distribution. However, this book offers numerous tables of various options, commands, or keystrokes to help condense, organize, and present information about a variety of subjects.

This edition is also packed full of screenshots to illustrate nearly all Fedora-specific graphical utilities—especially those related to system administration or the configuration and administration of various system and network services.

To help you better understand code listing examples and sample command lines, several formatting techniques are used to show input and ownership. For example, if the command or code listing example shows typed input, the input is formatted in boldface like this:

```
$ ls
```

If typed input is required, as in response to a prompt, the sample typed input also is in boldface, like so:

```
Delete files? [Y/n] y
```

All statements, variables, and text that should appear on your display use the same boldface formatting. Additionally, command lines that require root or super-user access are prefaced with a pound sign like this:

```
# printtool &
```

Command-line examples that can be run by any user are prefaced with a dollar sign (\$), like so:

```
$ ls
```

The following elements provide you with useful tidbits of information that relate to the discussion of the text:

NOTE

A note provides additional information you might want to make note of as you are working; augment a discussion with ancillary details; or point you to an article, a whitepaper, or another online reference for more information about a specific topic.

TIP

A tip can contain special insight or a timesaving technique, as well as information about items of particular interest to you that you might not find elsewhere.

CAUTION

A caution warns you about pitfalls or problems before you run a command, edit a configuration file, or choose a setting when administering your system.

SIDEBARS CAN BE GOLDMINES

Just because it is in a sidebar does not mean that you will not find something new here. Be sure to watch for these elements that bring in outside content that is an aside to the discussion in the text. You will read about other technologies, Linux-based hardware, or special procedures to make your system more robust and efficient.

Other formatting techniques used to increase readability include the use of italics for placeholders in computer command syntax. Computer terms or concepts also are italicized upon first introduction in text.

Finally, you should know that all text, sample code, and screenshots in *Red Hat Fedora 6 Unleashed* were developed using Fedora and open source tools.

Read on to start learning about and using the latest version of Fedora. Experienced users will want to consider the new information presented in this edition when planning or considering upgrades. New users, or users new to Fedora, will benefit from the details presented in this book.