

# Preface

---

**The book** Whether you are an end user, a system administrator, or a little of each, this book explains, with step-by-step examples, how to get the most out of your Fedora Core or Red Hat Enterprise Linux system. In 28 chapters, this book takes you from installing a Fedora Core or Red Hat Enterprise Linux system through understanding its inner workings, to setting up secure servers.

**The audience** This book is designed for a wide range of readers; it does not require programming experience, but some experience using a general-purpose computer is helpful. This book is appropriate for

- **Students** taking a class in which they use Linux
- **Home users** who want to set up and/or run Linux
- **Professionals** who use Linux at work
- **System administrators** who need an understanding of Linux and the tools that are available to them
- **Computer science students** studying the Linux operating system
- **Programmers** who need to understand the Linux programming environment
- **Technical executives** who want to get a grounding in Linux

**Benefits** *A Practical Guide to Red Hat® Linux®, Second Edition: Fedora Core™ and Red Hat Enterprise Linux* gives you a broad understanding of many facets of Linux, from installing Red Hat linux through using and customizing it. Regardless of your background, this book gives you the knowledge you need to get on with your work: You will come away from this book understanding how to use Linux, and this book will remain a valuable reference for years to come.

---

## This Book Includes the Full Fedora Core 2 on Four CDs

**tip ||****The CDs in This Book Hold the *Full Release* of Fedora Core 2**

---

This book includes the full Fedora Core version 2 CDs, not the truncated publisher's edition CDs. These four CDs include the complete release of Red Hat's Fedora Core 2. See [fedora.redhat.com](http://fedora.redhat.com) for details.

---

*A Practical Guide to Red Hat® Linux®, Second Edition*, includes CDs that you can use to install or upgrade to Fedora Core 2. Chapter 2 helps you get ready to install, and Chapter 3 provides step-by-step instructions on installing, Fedora Core from these CDs. This book guides you through learning about, using, and administrating Fedora Core or Red Hat Enterprise Linux.

This book covers Fedora Core 2 and Red Hat Enterprise Linux version 3.

---

## Features of This Book

This book is designed and organized so you can get the most out of it in the shortest amount of time. You do not have to read this book in page order. Once you are comfortable using Linux, you can use this book as a reference: Look up a topic of interest in the table of contents or index and read about it. Or think of this book as a catalog of Linux topics: Flip through the pages until a topic catches your eye. This book has many pointers to Web sites where you can get additional information: Consider the Web an extension of this book.

*A Practical Guide to Red Hat® Linux®, Second Edition*, is structured with the following features:

- In this book, the term **Red Hat Linux** refers to both **Fedora Core** and **Red Hat Enterprise Linux**. Features that apply to one operating system or the other only are marked as such using these markers: *FEDORA* or *RHEL*.
- **Optional sections** mean you can read the book at different levels, returning to more difficult material when you are ready.
- **Caution boxes** highlight procedures that can easily go wrong, giving you guidance before you run into trouble.
- **Tip boxes** highlight places in the text where you can save time by doing something differently or when it may be useful or just interesting to have additional information.
- **Security boxes** point out places where you can make your system more secure. The **security appendix** gives you a quick background in system security issues.

- Concepts are illustrated by **practical examples** throughout the book.
- **Chapter summaries** provide a review of the important points covered in each chapter.
- **Review exercises** are included at the end of each chapter for readers who want to hone their skills. Answers to even-numbered exercises are at [www.sobell.com](http://www.sobell.com).
- This book provides resources for **finding, downloading, and installing software**: Web sites, Apt, yum, BitTorrent, and Red Hat Network (RHN).
- Important **GNU tools**, including gcc, gdb, GNU Configure and Build System, make, gzip, and many others are described in detail.
- Pointers throughout provide help in obtaining **online documentation** from many sources including the local system, the Red Hat Web site, and other locations on the Internet.
- Many useful URLs (Internet addresses) point to sites where you can obtain software, security programs and information, and more.

---

## Key Topics This Book Covers

This book contains a lot of information. This section distills and summarizes what is in the book. You may also want to review the table of contents for more detail. This book

### Installation

- Describes how to download from the Internet and burn Fedora Core Installation CDs.
- Helps you plan your hard disk layout and use Disk Druid or fdisk to partition disks.
- Explains the use of the Logical Volume Manager (LVM) to grow and migrate partitions without interrupting users.
- Describes in detail how to install Red Hat Linux from CDs, a hard disk, or over a network using FTP, NFS, or HTTP. Covers responses to the **boot:** prompt and how to work with **Anaconda**, Red Hat's graphical installer.
- Covers the details of installing and customizing the X Window System, including XFree86 (*RHEL*) and the new X.org (*FEDORA*) version of X.

### Working with Red Hat Linux

- Introduces the graphical desktop and explains how to use desktop tools including the Panel, Panel menu, Main menu, Window Operations menu, Desktop menu, Desktop switcher, and terminal emulator.
- Presents the KDE desktop and covers using Konqueror to manage files, start programs, and browse the Web.

## System administration

- Covers the GNOME desktop and the Nautilus file manager.
- Explains how to customize your desktop.
- Covers the Bourne Again Shell (**bash**) in three chapters, including a full chapter on shell programming that includes many sample scripts.
- Explains the command line interface and covers 30+ command line utilities.
- Presents a tutorial on the vim (vi work-alike) editor.
- Covers networks and network protocols.
- Explains hostnames, IP addresses, subnets, and how to look up domain names and IP addresses on the Internet.
- Covers distributed computing and the client/server model.
- Explains how to use the Red Hat **system-config-\*** tools to configure the display, DNS, Apache, a network interface, and more. You can also use the tools to add users and manage local and remote printers. See page 393 for a list.
- Describes how to use the following tools to download software and keep a system current:
  - **yum** Downloads software from the Internet, keeping a system up-to-date and resolving dependencies as it goes.
  - **Apt** An alternative to yum. You can also use **synaptic**, a graphical interface to Apt.
  - **BitTorrent** Good for distributing large amounts of data such as the Fedora installation CDs.
  - **up2date** Red Hat's tool for keeping system software current.
- Covers graphical system administration tools, including the Main menu, GNOME and KDE menu systems, KDE Control Center, and KDE Control Panel.
- Explains system operation, including the boot process, init scripts, emergency mode, single- and multiuser mode, and what to do if the system crashes.
- Describes files, directories, and filesystems, including types of files and filesystems, **fstab**, automatically mounted filesystems, filesystem integrity checks, filesystem utilities, and how to tune filesystems.
- Covers backup utilities, including **tar**, **cpio**, **dump**, and **restore**.
- Explains how to rebuild the kernel.

- 
- |                     |  |
|---------------------|--|
| Security            | <ul style="list-style-type: none"> <li>• Helps you manage basic system security issues using <b>ssh</b> (secure shell), <b>vsftpd</b> (secure FTP server), <b>Apache</b> (Web server), <b>iptables</b> (firewall), and more.</li> <li>• Describes how to set up a <b>chroot</b> jail to protect a server.</li> <li>• Explains how to use TCP wrappers to control who can access a server.</li> <li>• Covers controlling servers using the <b>xinetd</b> super server.</li> </ul> |
| Clients and Servers | <ul style="list-style-type: none"> <li>• Explains how to set up and use the most popular Linux servers, providing a chapter on each: <b>Apache</b>, <b>Samba</b>, <b>OpenSSH</b>, <b>sendmail</b>, <b>DNS</b>, <b>NFS</b>, <b>FTP</b>, <b>iptables</b>, and <b>NIS</b>, all included with Red Hat Linux.</li> <li>• Covers setting up a <b>CUPS</b> print server.</li> <li>• Describes how to set up and use a <b>DHCP</b> server.</li> </ul>                                    |
| Programming         | <ul style="list-style-type: none"> <li>• Covers programming tools including the GNU <b>gcc</b> compiler, <b>make</b>, and <b>CVS</b> for managing source code.</li> <li>• Explains how to debug a C program.</li> <li>• Describes how to work with shared libraries.</li> <li>• Provides a complete chapter on shell programming using <b>bash</b>, including many examples.</li> </ul>  |

## Details

- Part I Part I, “Installing Red Hat Linux,” discusses how to install either version of Red Hat Linux. **Chapter 2** presents an overview of installing Red Hat Linux, including hardware requirements, downloading and burning CD-ROMs, and planning the layout of the hard disk. **Chapter 3** is a step-by-step guide to installing either version of Red Hat Linux and covers installing from CDs, from a local hard disk, and over the network using FTP, NFS, or HTTP, as well as how to set up the X Window System for a customized graphical user interface (GUI).
- Part II Part II, “Getting Started with Red Hat Linux,” familiarizes you with Red Hat Linux, covering logging in, the graphical user interface, utilities, the filesystem, and the shell. **Chapter 4** introduces desktop features, including the panel and the Main menu, explains how to use Konqueror to manage files, run programs, and browse the Web, and covers finding documentation, login problems, and using the window manager. **Chapter 5** introduces the shell command line interface, describes over 30 useful utilities, and presents a tutorial on the **vim** (**vi**) text editor. **Chapter 6** discusses the Linux hierarchical filesystem, covering files, filenames, pathnames, working with directories, access permissions, and hard and symbolic links. **Chapter 7** introduces the Bourne Again Shell (**bash**) and discusses command line arguments and options, how to redirect input to and output from commands, running programs in the background, and using the shell to generate and expand filenames.

**tip ||****Experienced Users May Want to Skim Part II**

If you have used a UNIX/Linux system before, you may want to skim over or skip some or all of the chapters in Part II. All readers should take a look at “Conventions Used in This Book” (page 16), which explains the typographic and layout conventions that this book uses, and “Getting the Facts: Where to Find Documentation” (page 94) which points you toward both local and remote sources of Linux and Red Hat documentation.

---

- Part III Part III, “Digging Into Red Hat Linux,” goes into more detail about working with Red Hat Linux. **Chapter 8** discusses the graphical user interface and includes a section on how to run a graphical program on a remote system and have the display appear locally. The section on GNOME talks about GNOME utilities and explains how to use the Nautilus file manager, including its new spatial view, while the section on KDE explains more about Konqueror and the KDE utilities. **Chapter 9** extends the `bash` shell coverage from Chapter 7, explaining how to redirect errors, avoid overwriting files, and how to work with job control, processes, startup files, important shell builtin commands, parameters, shell variables, and aliases. **Chapter 10** explains networks, network security, and the Internet and discusses types of networks, subnets, protocols, addresses, hostnames, and various network utilities. The section on distributed computing describes the client/server model and some of the servers you can use on a network. Details of setting up and using clients and servers is reserved for Part V.
- Part IV In seven chapters, Part IV covers system administration. **Chapter 11** discusses core concepts such as Superuser, SELinux (Security Enhanced Linux), system operation, general information about how to set up a server, DHCP, and PAM. **Chapter 12** explains the Linux filesystem, going into detail about types of files, including special and device files, how to use `fsck` to verify filesystems, and using `tune2fs` to change filesystem parameters. **Chapter 13** explains how to keep a system up-to-date by downloading software from the Internet and installing it, including examples of using Red Hat’s `up2date` utility, `yum`, `Apt`, and BitTorrent. **Chapter 14** explains how to set up the CUPS printing system so you can print on the local system and on remote systems. **Chapter 15** details rebuilding the Linux kernel. **Chapter 16** covers additional administration tasks, including setting up user accounts, backing up files, scheduling automated tasks, tracking disk usage, and general problem solving. **Chapter 17** explains how to set up a local area network (LAN), covering hardware (including wireless) and software setup.
- Part V Part V goes into detail about setting up servers and connecting to them with clients. With one chapter apiece, this part of the book covers the following clients/servers:
- **OpenSSH** Set up an OpenSSH server and use `sh`, `scp`, and `sftp` to communicate securely over the Internet.
  - **FTP** Set up a `vsftpd` secure FTP server and use any of several FTP clients to exchange files.

- **Mail** Configure **sendmail** and use Webmail, POP3, or IMAP to retrieve email; use SpamAssassin to combat spam.
- **NIS** Set up NIS to make system administration of a LAN easier.
- **NFS** Share filesystems between systems on a network.
- **Samba** Share filesystems and printers between Windows and Linux systems.
- **DNS/BIND** Set up a domain name server to let other systems on the Internet know the names and IP addresses of your systems they may need to contact.
- **iptables** Set up a firewall to protect local systems.
- **Apache** Set up an HTTP server that serves Web pages that browsers can view.

Part VI Part VI covers programming. **Chapter 27** discusses programming tools and environments available under Red Hat Linux, including the C programming language and debugger, **make**, shared libraries, and source code management using CVS. **Chapter 28** goes into depth about shell programming using **bash**, with extensive examples.

Part VII Part VII includes appendixes on regular expressions, where to find help on the Web, system security, and free software. This part also includes an extensive glossary with over 500 entries and a comprehensive index.

---

## Supplements

My home page ([www.sobell.com](http://www.sobell.com)) contains downloadable listings of the longer programs from the book as well as pointers to many interesting and useful Linux sites on the World Wide Web, a list of corrections to the book, answers to even-numbered exercises, and a solicitation for corrections, comments, and suggestions.

---

## Thanks

First and foremost I want to thank my editor at Prentice Hall PTR, Mark L. Taub, who encouraged and prodded me (carrot and stick approach) and kept me on track. Mark is unique in my experience: An editor who works with the tools I am writing about. Because Mark runs Linux on his home computer, we could share experiences as I wrote. His comments and direction were invaluable. Thank you, Mark T.

A big “Thank You” to the folks who read through the drafts of the book and made comments that caused me to refocus parts of the book where things were not clear or were left out altogether.

First, I want to thank David Chisnall who helped with all parts of the book. David’s broad knowledge of computers and operating systems gives this edition a unique perspective that helps bring tough concepts into focus.

Thank you to Carsten Pfeiffer, Software Engineer and KDE Developer; Aaron Weber, Ximian; Matthew Miller, Boston University; Cristof Falk, Software Developer at CritterDesign; Scott Mann, IBM, Systems Management and Integration Professional; Steve Elgersma, Computer Science Department, Princeton University; Scott Dier, University of Minnesota; and Robert Haskins, Computer Net Works.

Thanks also to the folks at Prentice Hall PTR who helped bring this book to life, especially Tyrrell Albaugh, production manager, who gave me guidance and much latitude in producing the book; Heather Fox, publicist; Greg Yurchuk, college marketing manager; Dan DePasquale, marketing manager; Robin O’Brien, executive marketing manager; Noreen Regina, editorial assistant; and everyone else who worked behind the scenes to make this book happen.

I am also indebted to Denis Howe, the editor of *The Free On-line Dictionary of Computing* (FOLDOC). Dennis has graciously permitted me to use entries from his compilation. Be sure to look at the dictionary ([www.foldoc.org](http://www.foldoc.org)).

Thanks also to the following people who helped with the first edition of this book: Dustin Puryear, Puryear Information Technology; Gabor Liptak, Independent Consultant; Bart Schaefer, Chief Technical Officer, iPost; Michael J. Jordan, Web Developer, Linux Online Inc.; Steven Gibson, owner of SuperAnt.com; John Viega, Founder and Chief Scientist, Secure Software, Inc.; K. Rachael Treu, Internet Security Analyst, Global Crossing; Kara Pritchard, K & S Pritchard Enterprises, Inc; Glen Wiley, Capitol One Finances; Karel Baloun, Senior Software Engineer, Looksmart, Ltd.; Matthew Whitworth; Dameon D. Welch-Abernathy, Nokia Systems; Josh Simon, Consultant; Stan Isaacs; and Dr. Eric H. Herrin, II, Vice President, Herrin Software Development, Inc. And thanks to Doug Hughes, long-time system designer and administrator, who gave me a big hand with the sections on system administration, networks, the Internet, and programming.

Thanks to Lorraine Callahan and Steve Wampler, who researched, wrote, analyzed reviews, and coordinated all the efforts that went into the first Linux book. Thanks for help on my first Linux book also goes to Ronald Hiller, Graburn Technology, Inc.; Charles A. Plater, Wayne State University; Bob Palowoda, Tom Bialaski, Sun Microsystems; Roger Hartmuller, TIS Labs at Network Associates; Kaowen Liu, Andy Spitzer, Rik Schneider, Jesse St. Laurent, Steve Bellenot, Ray W. Hiltbrand, Jennifer Witham, Gert-Jan Hagenaars, and Casper Dik.

*A Practical Guide to Red Hat® Linux®, Second Edition*, is based in part on two of my previous UNIX books: *UNIX System V: A Practical Guide* and *A Practical*

*Guide to the UNIX System*. Many people helped me with those books, and thanks here go to Pat Parseghian, Dr. Kathleen Hemenway, and Brian LaRose; Byron A. Jeff, Clark Atlanta University; Charles Stross; Jeff Gitlin, Lucent Technologies; Kurt Hockenbury; Maury Bach, Intel Israel Ltd.; Peter H. Salus; Rahul Dave, University of Pennsylvania; Sean Walton, Intelligent Algorithmic Solutions; Tim Segall, Computer Sciences Corporation; Behrouz Forouzan, DeAnza College; Mike Keenan, Virginia Polytechnic Institute and State University; Mike Johnson, Oregon State University; Jandelyn Plane, University of Maryland; Arnold Robbins and Sathis Menon, Georgia Institute of Technology; Cliff Shaffer, Virginia Polytechnic Institute and State University; and Steven Stepanek, California State University, Northridge, for reviewing the book.

I also continue to be grateful to the many people who helped with the early editions of my UNIX books. Special thanks to Roger Sippl, Laura King, and Roy Harrington for introducing me to the UNIX system. My mother, Dr. Helen Sobell, provided invaluable comments on the original manuscript at several junctures. Also thanks to Isaac Rabinovitch, Professor Raphael Finkel, Professor Randolph Benson, Bob Greenberg, Professor Udo Pooch, Judy Ross, Dr. Robert Veroff, Dr. Mike Denny, Joe DiMartino, Dr. John Mashey, Diane Schulz, Robert Jung, Charles Whitaker, Don Cragun, Brian Dougherty, Dr. Robert Fish, Guy Harris, Ping Liao, Gary Lindgren, Dr. Jarrett Rosenberg, Dr. Peter Smith, Bill Weber, Mike Bianchi, Scooter Morris, Clarke Echols, Oliver Grillmeyer, Dr. David Korn, Dr. Scott Weikart, and Dr. Richard Curtis.

Dr. Brian Kernighan and Rob Pike graciously allowed me to reprint the **bundle** script from their book *The UNIX Programming Environment* (Prentice Hall, 1984).

I take responsibility for errors and omissions. If you find one or just have a comment, let me know ([mgs@sobell.com](mailto:mgs@sobell.com)) and I'll fix it in the next printing. My home page ([www.sobell.com](http://www.sobell.com)) contains a list of errors and those who found them, as well as copies of the longer scripts from the book and pointers to many interesting Linux pages.

Mark G. Sobell  
San Francisco, California

