

Introduction

Red Hat continues to improve its version of Linux. The recently released Red Hat Linux 8 comes with many new system components including the Linux 2.4.18 kernel, XFree86 4.2.0, GNOME 2.0, KDE 3.0, GCC 3.2 compiler, and the glibc 2.2.93 system libraries. This version supports USB hard disks and includes many new system configuration tools.

Red Hat Linux 8 also includes the recently released OpenOffice.org office suite. To top it off, Red Hat Linux 8 comes with a new and improved graphical installation program that's truly new!

About Red Hat Linux All-in-One

Red Hat Linux All-in-One Desk Reference For Dummies follows the successful model of the All-in-One Desk Reference and gives you eight different quick-reference guides in a single book. Taken together, these eight books provide detailed information on installing, configuring, and using Red Hat Linux.

What you'll like most about this book is that you don't have to read it sequentially chapter by chapter, or, for that matter, even the sections in a chapter. You can pretty much turn to the topic you want and quickly get the answer to your pressing questions about Red Hat Linux, be it about using the OpenOffice.org word processor or setting up the Apache Web server.

Here are some of the things you can do with this book:

- ◆ Install and configure Red Hat Linux from the CD-ROMs included with the book.
- ◆ Connect the Red Hat Linux PC to the Internet through a DSL or cable modem.
- ◆ Set up dial-up networking with PPP.
- ◆ Get tips, techniques, and shortcuts for specific uses of Red Hat Linux, such as
 - Setting up and using Internet services such as Web, Mail, News, FTP, NFS, NIS, and DNS
 - Setting up a Windows server using Samba
 - Using Red Hat Linux commands
 - Using Perl, shell, and C programming on Red Hat Linux
 - Using the applications that come with Red Hat Linux

- ◆ Understanding the basics of system and network security
- ◆ Performing system administration tasks

Conventions Used in This Book

I use a simple notational style in this book. All listings, filenames, function names, variable names, and keywords are typeset in a monospace font for ease of reading. I italicize the first occurrences of new terms and concepts and then provide a definition right there. The output of commands follows the typed command and the output is shown in a monospace font.

What You Don't Have to Read

Each mini reference book zeros in on a specific task area such as using the Internet or running Internet servers and then provides hands-on instructions on how to perform a series of related tasks. You can jump right to a section and read about a specific task. You don't have to read anything but the few paragraphs or the list of steps that relate to your question. Use the Table of Contents or the Index to locate the pages that are relevant to your question.

You can safely ignore text next to the Technical Stuff icons as well as the sidebars.

Who Are You?

I assume that you are somewhat familiar with a PC — you know how to turn it on and off and you have dabbled a bit with Windows. Considering that most new PCs come preloaded with Windows, this should be a safe assumption, right?

When it comes to installing Red Hat Linux on your PC, if you want to retain your Windows 2000 or Windows XP installations intact, I assume you won't mind investing in a good disk-partitioning tool such as PowerQuest's PartitionMagic, available at www.powerquest.com/partitionmagic (no, I don't have any connections with PowerQuest).

I also assume that you are willing to accept the risk that when you try to install Red Hat Linux, some things may not quite work. This can happen if you have some uncommon types of hardware. If you are afraid of ruining your system, try finding a slightly older spare Pentium PC that you can sacrifice and then install Red Hat Linux on that PC.

How This Book Is Organized

Red Hat Linux All-in-One Desk Reference For Dummies has eight books, each of which focuses on a small set of related topics. If you are looking for information on a specific topic, check the book names on the spine or consult the Table of Contents.

This desktop reference starts with a minibook that explains the basics of Red Hat Linux and guides you through the installation process (this is a unique aspect of this book because you typically do not purchase a PC with Red Hat Linux preinstalled). The second minibook serves as a user's guide to Red Hat Linux — it focuses on exploring various aspects of a Red Hat Linux workstation, including the GNOME and KDE GUIs and many of the applications that come bundled with Red Hat Linux. The third minibook covers networking and Book IV goes into using the Internet. Book V introduces system administration. The sixth minibook turns to the important subject of securing a Red Hat Linux system and its associated network. Book VII teaches how to run a variety of Internet servers from mail to Web server. The eighth and final minibook introduces you to programming.

Here's a quick overview of the eight books and what they contain:

Book I: Red Hat Basics: What is Red Hat Linux? Installing, configuring, and troubleshooting Red Hat Linux. Taking Red Hat Linux for a test drive.

Book II: Workstations and Applications: Exploring GNOME and KDE. Learning how to use the shell (what's a shell anyway?). Learning to navigate the Red Hat Linux file system. Exploring the applications such as OpenOffice.org as well as the text editors (`vi` and Emacs).

Book III: Networking: Connecting the Red Hat Linux PC to the Internet through a dial-up connection or a high-speed always-on connection such as DSL or cable modem. Configuring and managing TCP/IP networks.

Book IV: Internet: Using various Internet services such as e-mail, Web surfing, and reading newsgroups. Transferring files with FTP.

Book V: Administration: Learning to perform basic system administration. Managing user accounts and the file system. Installing applications. Working with devices and printers. Upgrading and customizing the Linux kernel.

Book VI: Security: Understanding network and host security. Learning the techniques to secure the host and the network. Performing security audits.

Book VII: Internet Servers: Managing the Internet services. Configuring the Apache Web server. Setting up the FTP server (including anonymous FTP). Configuring the mail and news servers. Providing DNS and NIS. File sharing with NFS. Using Samba to set up a Windows server.

Book VIII: Programming: Learning the basics of programming. Exploring the software development tools in Red Hat Linux. Writing shell scripts. Learning C and Perl programming.

Appendix: About the CDs: Summarizes the contents of the book's companion CD-ROMs.

What's on the CDs?

The CDs contain the Publisher's Edition of Red Hat Linux 8 from Red Hat, Inc. You may use the CDs in accordance with the license agreements accompanying the software. To learn more about the contents of the CDs, please consult the appendix.

Icons Used in This Book

Following the time-honored tradition of the *All-in-One Desktop Reference For Dummies* series, I use icons to help you quickly pinpoint useful information. The icons include the following:



The Remember icon marks a general interesting fact — something that I thought you'd like to know and remember.



The Tip icon marks things that you can do to make your job easier.



The Warning icon highlights potential pitfalls. With this icon, I'm telling you: "Watch out! This could hurt your system!"



The Technical Stuff icon marks technical information that could be of interest to an advanced user (or those of us aspiring to be advanced users).

Sidebars

I use sidebars throughout the book to highlight interesting, but not critical, information. Sidebars explain concepts you may not have encountered

before or give a little insight into a related topic. If you're in a hurry, you can safely skip the sidebars.

Where to Go from Here

It's time to get started on your Red Hat Linux adventure. Take out the CDs and install Red Hat Linux. Then, turn to a relevant chapter and let the fun begin. Use the Table of Contents and the Index to figure out where you want to go. Before you know it, you'll become an expert at Red Hat Linux!

I hope you enjoy consulting this book as much as I enjoyed writing it!

Book I

Red Hat Basics

The 5th Wave By Rich Tennant



"When we started the company, we weren't going to call it 'Red Hat'. But eventually we decided it sounded better than 'Beard of Bees Linux'."

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Chapter 1: Introducing Red Hat Linux

In This Chapter

- ✓ Explaining what Red Hat Linux is
- ✓ Going over what Red Hat Linux includes
- ✓ Discovering how Red Hat Linux helps you manage
- ✓ Getting started

I bet you have heard about Linux, and you probably know the Red Hat name as well. If you're wondering what exactly Red Hat Linux is and what it can help you do, this chapter is all about answering those questions. I provide a broad-brushstroke picture of Red Hat Linux and tell you how you can start using Red Hat Linux. By the way, this book covers Red Hat Linux for Intel 80x86 and Pentium processors (basically any PC that can run any flavor of Windows).

What Is Red Hat Linux?

Trying to describe Red Hat Linux is a bit like that story of six blind men trying to describe an elephant. You know the one — one blind man touches the elephant's side and says that the elephant is like a wall. The other checks out the tusk and concludes that an elephant is like a spear, and so on. Along those lines, Red Hat Linux appears to be many different things depending on what you experience. You can think of it as the graphical user interface or just a PC to run your e-mail program, but, at its heart, it's an operating system. The following sections explain what I mean by this statement.

Operating systems and Linux

You know that your PC is a bunch of *hardware* — things you can touch like the system box, the monitor, the keyboard, and mouse. The system box contains the most important hardware of all — the central processing unit (CPU) that runs the *software* (these are the things you cannot touch). In a typical Pentium 4 PC, the Pentium 4 microprocessor is the CPU. Other important hardware in the system box are the memory and the disk.

Does Linux really run on any computer?

Linux runs on many different types of computer systems, and it does seem like it runs on nearly any type of computer. Linus Torvalds and other programmers originally developed Linux for the Intel 80x86 processor. Nowadays, Linux is also available for systems based on other processors, such as Intel's new 64-bit IA-64 architecture Itanium processor; Motorola 68000 family; Alpha AXP processor; Sun SPARC and

UltraSPARC processors; Hewlett-Packard's HP PA-RISC processor; the PowerPC and PowerPC64 processors; and the MIPS R4x00 and R5x00 processors. More recently, IBM has announced Linux for its S/390 mainframe. This book covers Red Hat Linux for Intel 80x86 and Pentium processors (these are known as the IA-32 architecture processors).

The *operating system* is the software that manages all the hardware and runs other software at your command. You, the user, provide those commands by clicking menus and icons or by typing some cryptic text. Linux is an operating system, just as UNIX, Windows 98, Windows 2000, and Windows XP are operating systems. The Linux operating system is modeled after UNIX and it also goes by the name *Linux kernel*.

It's the operating system that gives a computer its personality. For example, you can run Windows 98 or Windows XP on a PC. On that same PC, you can also install and run Linux. That means, depending on the operating system installed on it, a PC can be a Windows 98, Windows XP, or a Linux system.

The primary job of an operating system is to load software — computer programs — from the hard disk (or other permanent storage) into the memory and get the CPU to run those programs. Everything that you do with your computer is possible because of the operating system. So if the operating system somehow messes up, the whole system freezes up. You know how infuriating it is when your favorite operating system — maybe the one that came with your PC — suddenly calls it quits just as you were about to click the Send button after composing that long e-mail to your friend. You try the three-finger salute of Ctrl+Alt+Del, but nothing happens. And then it's time for the Reset button. Luckily, that sort of thing almost never happens with Linux — it has a reputation for being a very reliable operating system.



In technical mumbo jumbo, Linux is a multiuser, multitasking operating system. All this means is that Linux enables multiple users to log in, and Linux can run more than one program at the same time. Nearly all operating systems are multiuser and multitasking, but when Linux first started in 1994, being multiuser and multitasking was a big selling point.

Linux distributions

Red Hat Linux is a specific Linux distribution. A *Linux distribution* is essentially a package consisting of the Linux kernel — the operating system — and a collection of applications, together with an easy-to-use installation program.

There are many Linux distributions, and each includes the Linux operating system: the XFree86 X Window System that provides the graphical user interface; one or more graphical desktops, such as GNOME and KDE; and a huge selection of other computer programs (the applications). Everything comes in the form of ready-to-run software, but the source code and documentation are also included. By now, each Linux distribution includes so much software that it comes on multiple CD-ROMs (which this book includes).

Like many other Linux distributions, Red Hat Linux is a commercial distribution. You can buy Red Hat Linux in computer stores and bookstores. If you have heard about Open Source and the GNU (*GNU's Not UNIX*) license, you may assume that no one can sell Linux for profit. Luckily for companies such as Red Hat, the GNU license, called the GNU General Public License (GPL), does allow for commercial, for-profit distribution, but requires that the software be distributed in source-code form, and stipulates that anyone may copy and distribute the software in source-code form to anyone else. This means that my publisher may include the Red Hat Linux CD-ROMs with this book and you may make as many copies of the CDs as you like.

Making sense of version numbers

Both the Linux kernel and Red Hat Linux have their own version numbers, not to mention the many other software programs (such as GNOME and KDE) that come with Red Hat Linux. The version numbers for the Linux kernel and Red Hat Linux are unrelated, but each has particular significance.

Linux kernel version numbers

After Linux kernel version 1.0 was released on March 14, 1994, the loosely knit Linux development community adopted a version-numbering scheme. Version numbers such as 1.X.Y and 2.X.Y, where X is an even number, are considered to be the stable versions. The last number, Y, is the patch level, which is incremented as problems are fixed. For example, 2.4.18 is a typical stable version of the Linux kernel. Notice that these version numbers are in the form of three integers separated by periods — Major.Minor.Patch — where Major and Minor are numbers denoting the major and minor version numbers, and Patch is another number representing the patch level.

Version numbers of the form 2.X.Y with an odd X number are beta releases for developers only; they may be unstable, so you should not adopt these

versions for day-to-day use. For example, 2.5.37 is a beta release of the Linux kernel. Developers add new features to these odd-numbered versions of Linux.

You can find out about the latest version of the Linux kernel online at www.kernel.org.

Red Hat Linux version numbers

Red Hat assigns the Red Hat Linux version numbers, such as 7.3 or 8.0. They are of the form X.Y, where X is the major version and Y the minor version. Unlike with the Linux kernel version numbers, there is no special meaning associated with odd and even minor versions. Each version of Red Hat Linux includes specific versions of the Linux kernel and other major components, such as GNOME, KDE, and various applications.

Red Hat releases new versions of Red Hat Linux on a regular basis. For example, Red Hat Linux 6.0 came out in April 1999 and 7.3 in May 2002. Typically, each new major version of Red Hat Linux provides significant new features.

What Red Hat Linux Includes

Red Hat Linux comes with the Linux kernel and a whole lot more software. These software packages include everything from the graphical desktops to Internet servers and programming tools to create new software. In this section, I briefly describe some of the major software packages that come bundled with Red Hat Linux. Without this bundled software, Red Hat Linux wouldn't be as popular as it is today.

What is the GNU Project?

GNU is a recursive acronym that stands for *GNU's Not UNIX*. The GNU Project was launched in 1984 by Richard Stallman to develop a complete UNIX-like operating system. The GNU Project developed nearly everything needed for a complete operating system except for the operating system kernel. All GNU software was distributed under the GNU General Public License (GPL). GPL essentially requires that the software is distributed in source-code form and stipulates that any user may copy, modify, and

distribute the software to anyone else in source-code form. Users may, however, have to pay for their copy of GNU software.

The Free Software Foundation (FSF) is a tax-exempt charity that raises funds for work on the GNU Project. To find out more about the GNU Project, visit its home page at www.gnu.org. There you can find information about how to contact the Free Software Foundation and how you may help the GNU Project.

GNU software

I'll start with a collection of software that came from the GNU Project. You get to know these GNU utilities only if you use your Red Hat Linux system through a text terminal (or a graphical window that mimics a text terminal), but the GNU software is one of the basic parts of Red Hat Linux.

As a Red Hat Linux user, you may not realize the extent to which Red Hat Linux (and, for that matter, all Linux distributions) relies on GNU software. Nearly all tasks you perform in a Red Hat Linux system involve one or more GNU software packages. For example, the GNOME graphical user interface (GUI) and the command interpreter, Bash shell, are both GNU software. If you rebuild the kernel or develop software, you do so with the GNU C and C++ compiler that is part of the GNU software that accompany Red Hat Linux. If you edit text files with the `ed` or Emacs editor, you are again using a GNU software package. The list goes on and on.



Table 1-1 lists some of the well-known GNU software packages that come with Red Hat Linux. I show this table only to give you a feel for all the different kinds of things you can do with GNU software. Depending on your interests, you may never need to use many of these packages, but it's good to know they are there in case you ever need them.

| Software Package | Description |
|-------------------------|--|
| Autoconf | Generates shell scripts that automatically configure source-code packages. |
| Automake | Generates <code>Makefile.in</code> files for use with Autoconf. |
| Bash | The default shell — command interpreter — in Red Hat Linux |
| Bc | An interactive calculator with arbitrary precision numbers |
| Binutils | A package that includes several utilities for working with binary files: <code>ar</code> , <code>as</code> , <code>gasp</code> , <code>gprof</code> , <code>ld</code> , <code>nm</code> , <code>objcopy</code> , <code>objdump</code> , <code>ranlib</code> , <code>readelf</code> , <code>size</code> , <code>strings</code> , and <code>strip</code> |
| Gnuchess | A chess-playing program |
| GNU C Library | For use with all Linux programs |
| Cpio | Copies file archives to and from disk or to another part of the file system. |
| Diff | Compares files, showing line-by-line changes in several different formats. |
| Ed | A line-oriented text editor |
| Emacs | An extensible, customizable full-screen text editor and computing environment |

(continued)

Table 1-1 (continued)

| <i>Software Package</i> | <i>Description</i> |
|-------------------------|--|
| Fileutils | A package that implements the following Linux commands: <code>chgrp</code> , <code>chmod</code> , <code>chown</code> , <code>cp</code> , <code>dd</code> , <code>df</code> , <code>dir</code> , <code>dircolors</code> , <code>du</code> , <code>install</code> , <code>ln</code> , <code>ls</code> , <code>mkdir</code> , <code>mkfifo</code> , <code>mknod</code> , <code>mv</code> , <code>rm</code> , <code>rmdir</code> , <code>sync</code> , <code>touch</code> , and <code>vdirc</code> |
| Findutils | A package that includes the <code>find</code> , <code>locate</code> , and <code>xargs</code> utilities |
| Finger | A utility program designed to enable users on the Internet to get information about one another |
| Gawk | The GNU Project's implementation of the AWK programming language |
| GCC | Compilers for C, C++, Objective C, and other languages |
| Gdb | Source-level debugger for C, C++ and Fortran |
| Gdbm | A replacement for the traditional <code>dbm</code> and <code>ndbm</code> database libraries |
| Gettext | A set of utilities that enables software maintainers to internationalize (that means make the software work with different languages such as English, French, Spanish, etc.) a software package's user messages |
| Ghostscript | An interpreter for the Postscript and Portable Document Format (PDF) languages |
| Ghostview | An X Window System application that provides a graphical front end to Ghostscript, and enables users to view Postscript or PDF files in a window |
| The GIMP | The GNU Image Manipulation Program is an Adobe Photoshop-like image-processing program |
| GNOME | Provides a graphical user interface (GUI) for a wide variety of tasks that a Linux user might perform. |
| Gnumeric | A graphical spreadsheet (similar to Microsoft Excel) that works in GNOME |
| grep package | Includes the <code>grep</code> , <code>egrep</code> , and <code>fgrep</code> commands that are used to find lines that match a specified text pattern |
| Groff | A document-formatting system similar to <code>troff</code> |
| GTK+ | A GUI toolkit for the X Window System (used to develop GNOME applications) |
| Gzip | A GNU utility for compressing and decompressing files |
| Indent | Formats C source code by indenting it in one of several different styles. |
| Less | A page-by-page display program similar to <code>more</code> , but with additional capabilities |
| Libpng | A library for image files in the Portable Network Graphics (PNG) format |

| <i>Software Package</i> | <i>Description</i> |
|-------------------------|---|
| m4 | An implementation of the traditional UNIX macro processor |
| Make | A utility that determines which files of a large software package need to be recompiled, and issues the commands to recompile them |
| Mtools | A set of programs that enables users to read, write, and manipulate files on a DOS file system (typically a floppy disk) |
| Ncurses | A package for displaying and updating text on text-only terminals |
| Patch | A GNU version of Larry Wall's program to take the output of diff and apply those differences to an original file to generate the modified version |
| RCS | The Revision Control System is used for version control and management of source files in software projects. |
| Sed | A stream-oriented version of the ed text editor |
| Sharutils | A package that includes <code>shar</code> (used to make shell archives out of many files) and <code>unshar</code> (to unpack these shell archives) |
| Shellutils | A package that includes the following utilities, which are part of the Bash shell: <code>basename</code> , <code>chroot</code> , <code>date</code> , <code>dirname</code> , <code>echo</code> , <code>env</code> , <code>expr</code> , <code>factor</code> , <code>false</code> , <code>groups</code> , <code>hostname</code> , <code>id</code> , <code>logname</code> , <code>nice</code> , <code>nohup</code> , <code>pathchk</code> , <code>printenv</code> , <code>printf</code> , <code>pwd</code> , <code>seq</code> , <code>sleep</code> , <code>stty</code> , <code>su</code> , <code>tee</code> , <code>test</code> , <code>true</code> , <code>tty</code> , <code>uname</code> , <code>uptime</code> , <code>users</code> , <code>who</code> , <code>whoami</code> , and <code>yes</code> |
| Tar | A tape archiving program that includes multivolume support; the capability to archive sparse files, handle compression and decompression, and create remote archives; and other special features for incremental and full backups |
| Texinfo | A set of utilities that generates printed manuals, plain ASCII text, and online hypertext documentation (called Info), and enables users to view and read online Info documents |
| Textutils | A set of utilities such as <code>cut</code> , <code>join</code> , <code>nl</code> , <code>split</code> , <code>tail</code> , <code>wc</code> , and so on, for manipulating text |
| Time | A utility that reports the user, system, and actual time that a process uses |

GUIs and applications

Let's face it — typing cryptic Linux commands on a terminal is boring. For average users like us, it's much easier if we can use the system through a graphical user interface (*GUI*, pronounced “gooey”). This is where the X Window System, or X, comes to our rescue.

X is kind of like Microsoft Windows, but the underlying details of how X works is completely different from Windows. Unlike Windows, X provides the basic features of displaying windows on the screen, but it does not come