SEVENTH EDITION

"I have found this book to be a very useful classroom text, as well as a great Linux resource. It teaches Linux using a ground-up approach that gives students the chance to progress with their skills and grow into the Linux world. I have often pointed to this book when asked to recommend a solid Linux reference."

—**Eric Hartwell,** Chair, School of Information Technology, ITT Technical Institute

A Practical Guide to Fedora™ and Red Hat® Enterprise Linux®

Includes Full Fedora on DVD

- **The #1 Fedora and RHEL resource**—a tutorial AND on-the-job reference
- **Master Linux administration and security** using the command line, GUI tools, Python, systemd, and **firewalld**
- **Set up key Internet servers,** step by step, including Samba, Apache, MariaDB/MySQL, **sendmail**, OpenSSH, DNS, LDAP, and more
- **Brand-new chapter** on Virtual Machines and Cloud Computing!

Mark G. Sobell

Praise for Previous Editions of *A Practical Guide to Fedora™ and Red Hat® Enterprise Linux®*

"Sobell tackles a massive subject, the vast details of a Linux operating system, and manages to keep the material clear, interesting and engaging. . . . If you want to know how to get the most out of your Red Hat, Fedora, or CentOS system, then this one of the best texts available, in my opinion."

—Jesse Smith
Feature Writer for DistroWatch

"Since I'm in an educational environment, I found the content of Sobell's book to be right on target and very helpful for anyone managing Linux in the enterprise. His style of writing is very clear. He builds up to the chapter exercises, which I find to be relevant to real-world scenarios a user or admin would encounter. An IT/IS student would find this book a valuable complement to their education. The vast amount of information is extremely well balanced and Sobell manages to present the content without complicated asides and meandering prose. This is a 'must have' for anyone managing Linux systems in a networked environment or anyone running a Linux server. I would also highly recommend it to an experienced computer user who is moving to the Linux platform."

—Mary Norbury
IT Director
Barbara Davis Center
University of Colorado at Denver
from a review posted on slashdot.org

"I had the chance to use your UNIX books when I when was in college years ago at Cal Poly, San Luis Obispo, CA. I have to say that your books are among the best! They're quality books that teach the theoretical aspects and applications of the operating system."

—Benton Chan
IS Engineer

"The book has more than lived up to my expectations from the many reviews I read, even though it targets FC2. I have found something very rare with your book: It doesn't read like the standard technical text, it reads more like a story. It's a pleasure to read and hard to put down. Did I say that?! :-)"

—David Hopkins
Business Process Architect

Practical Guide to Fedora and Red Hat Enterprise Linux, A

Table of Contents

Cover
Half Title
Title Page
Copyright Page
CONTENTS
PREFACE
CHAPTER 1: WELCOME TO LINUX
- The History of UNIX and GNULinux
  - The Heritage of Linux: UNIX
  - Fade to 1983
  - Next Scene, 1991
  - The Code Is Free
  - Linux Is More than a Kernel
  - Open-Source Software and Licensing
  - What Is So Good About Linux?
- Overview of Linux
  - Linux Has a Kernel Programming Interface
  - Linux Can Support Many Users
  - Linux Can Run Many Tasks
  - Linux Provides a Secure Hierarchical Filesystem
  - The Shell: Command Interpreter and Programming Language
  - X Window System
  - GUIs: Graphical User Interfaces

Pearson

Table of Contents

A Large Collection of Useful Utilities

Interprocess Communication

(Inter)Networking Utilities

System Administration

Software Development

Choosing an Operating System

Chapter Summary

Exercises

PART I: INSTALLING FEDORA AND RED HAT ENTERPRISE LINUX

CHAPTER 2: INSTALLATION OVERVIEW

Conventions Used in This Book

LPI and CompTIA Certification Icons

More Information

Planning the Installation

The Installation Process

Downloading an Installation Image File and Writing to/Burning the Installation Medium

Gathering Information About the System

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 3: STEP-BY-STEP INSTALLATION

The New Anaconda Installer

Running a Fedora Live Session

Installing Fedora/RHEL

Installation Tasks

Chapter Summary

Exercises

Advanced Exercises

Pearson

Table of Contents

PART II: USING FEDORA AND RED HAT ENTERPRISE LINUX

CHAPTER 4: INTRODUCTION TO FEDORA AND RED HAT ENTERPRISE LINUX

Curbing Your Power (Superuser/root Privileges)

Logging In on the System

The GNOME 3 Standard and Classic Desktops

Working with the Desktop

Using the Nautilus File Manager

The Settings Window

Getting Help

Updating, Installing, and Removing Software Packages

Working from the Command Line

More About Logging In and Passwords

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 5: THE SHELL

Special Characters

Ordinary Files and Directory Files

The Command Line

Standard Input and Standard Output

Running a Command in the Background

Filename Generation/Pathname Expansion

Builtins

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 6: THE LINUX FILESYSTEM

The Hierarchical Filesystem

Ordinary Files and Directory Files

Pearson

Table of Contents

Pathnames
Working with Directories
Access Permissions
ACLs: Access Control Lists
Links
Chapter Summary
Exercises
Advanced Exercises

CHAPTER 7: THE LINUX UTILITIES

Basic Utilities
Working with Files
Compressing and Archiving Files
Displaying User and System Information
Miscellaneous Utilities
Editing Files
Chapter Summary
Exercises
Advanced Exercises

CHAPTER 8: NETWORKING AND THE INTERNET

Introduction to Networking
Types of Networks and How They Work
Communicate over a Network
Network Utilities
Distributed Computing
WWW: World Wide Web
Chapter Summary
Exercises
Advanced Exercises

PART III: SYSTEM ADMINISTRATION

Pearson

Table of Contents

CHAPTER 9: THE BOURNE AGAIN SHELL (bash)

- Background
- Startup Files
- Commands That Are Symbols
- Redirecting Standard Error
- Writing and Executing a Shell Script
- Control Operators: Separate and Group Commands
- Job Control
- Manipulating the Directory Stack
- Parameters and Variables
- Special Characters
- Locale
- Time
- Processes
- History
- Aliases
- Functions
- Controlling bash: Features and Options
- Processing the Command Line
- Chapter Summary
- Exercises
- Advanced Exercises

CHAPTER 10: SYSTEM ADMINISTRATION: CORE CONCEPTS

- Running Commands with root Privileges
- The systemd init Daemon
- SysVinit (rc) Scripts: Start and Stop System Services
- System Operation
- System Administration Tools
- Setting Up a Server
- DHCP: Configures Network Interfaces

Pearson

Table of Contents

nsswitch.conf: Which Service to Look at First

Getting Help

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 11: FILES, DIRECTORIES, AND FILESYSTEMS

Important Files and Directories

File Types

Filesystems

The XFS Filesystem

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 12: FINDING, DOWNLOADING, AND INSTALLING SOFTWARE

Introduction

JumpStart: Installing and Removing Software Packages Using yum

Finding the Package That Holds an Application or File You Need

yum: Keeps the System Up-to-Date

BitTorrent

RPM: The RPM Package Manager

Installing Non-rpm Software

Keeping Software Up-to-Date

curl: Downloads Files Noninteractively

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 13: PRINTING WITH CUPS

Introduction

The System Configures a Local Printer Automatically

JumpStart I: Configuring a Printer Using system-config-printer

Pearson

Table of Contents

JumpStart II: Setting Up a Local or Remote Printer

Working with the CUPS Web Interface

Configuring Printers

Traditional UNIX Printing

Printing from Windows

Printing to Windows

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 14: BUILDING A LINUX KERNEL

Downloading, Installing, and Prepping the Kernel Source Code

Configuring and Compiling the Linux Kernel

Installing the Kernel, Modules, and Associated Files

GRUB: The Linux Boot Loader

dmesg: Displays Kernel Messages

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 15: ADMINISTRATION TASKS

Configuring User and Group Accounts

Backing Up Files

Scheduling Tasks

System Reports

Maintaining the System

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 16: CONFIGURING AND MONITORING A LAN

More Information

Setting Up the Hardware

Pearson

Table of Contents

Configuring the Systems

NetworkManager: Configures Network Connections

Setting Up Servers

Introduction to Cacti

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 17: SETTING UP VIRTUAL MACHINES LOCALLY AND IN THE CLOUD

VMs (Virtual Machines)

QEMU/KVM

VMware Player: Installing Fedora on VMware

Cloud Computing

Chapter Summary

Exercises

Advanced Exercises

PART IV: USING CLIENTS AND SETTING UP SERVERS

CHAPTER 18: OPENSSH: SECURE NETWORK COMMUNICATION

Introduction to OpenSSH

Running the ssh, scp, and sftp OpenSSH Clients

Setting Up an OpenSSH Server (sshd)

Troubleshooting

Tunneling/Port Forwarding

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 19: FTP: TRANSFERRING FILES ACROSS A NETWORK

Introduction to FTP

Running the ftp and sftp FTP Clients

Setting Up an FTP Server (vsftpd)

Pearson

Table of Contents

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 20: sendmail: SETTING UP MAIL SERVERS, CLIENTS, AND MORE

Introduction to sendmail

Setting Up a sendmail Mail Server

JumpStart I: Configuring sendmail on a Client

JumpStart II: Configuring sendmail on a Server

Working with sendmail Messages

Configuring sendmail

SpamAssassin

Additional Email Tools

Authenticated Relaying

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 21: NIS AND LDAP

Introduction to NIS

Running an NIS Client

Setting Up an NIS Server

LDAP

Setting Up an LDAP Server

Tools for Working with LDAP

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 22: NFS: SHARING DIRECTORY HIERARCHIES

Introduction to NFS

Running an NFS Client

Pearson

Table of Contents

Setting Up an NFS Server

automount: Mounts Directory Hierarchies on Demand

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 23: SAMBA: LINUX AND WINDOWS FILE AND PRINTER SHARING

Introduction to Samba

Running Samba Clients

Setting Up a Samba Server

Troubleshooting

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 24: DNS/BIND: TRACKING DOMAIN NAMES AND ADDRESSES

Introduction to DNS

Setting Up a DNS Server

Configuring a DNS Server

Setting Up Different Types of DNS Servers

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 25: firewalld AND iptables: SETTING UP A FIREWALL

The firewalld Service

JumpStart: Building a Firewall Using firewall-config

firewall-config: The Firewall Configuration Window

firewall-cmd: Controlling firewalld from the Command Line

Introduction to iptables

Building a Set of Rules Using iptables

Copying Rules to and from the Kernel

Table of Contents

system-config-firewall: Generates a Set of Rules

Sharing an Internet Connection Using NAT

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 26: APACHE (httpd): SETTING UP A WEB SERVER

Introduction

Running an Apache Web Server

Filesystem Layout

Configuration Directives

Advanced Configuration

Troubleshooting

Modules

webalizer: Analyzes Web Traffic

MRTG: Monitors Traffic Loads

Error Codes

Chapter Summary

Exercises

Advanced Exercises

PART V: PROGRAMMING TOOLS

CHAPTER 27: PROGRAMMING THE BOURNE AGAIN SHELL (bash)

Control Structures

File Descriptors

Parameters

Variables

Builtin Commands

Expressions

Implicit Command-Line Continuation

Shell Programs

Chapter Summary

Pearson

Table of Contents

Exercises

Advanced Exercises

CHAPTER 28: THE PYTHON PROGRAMMING LANGUAGE

Introduction

Scalar Variables, Lists, and Dictionaries

Control Structures

Reading from and Writing to Files

Regular Expressions

Defining a Function

Using Libraries

Lambda Functions

List Comprehensions

Chapter Summary

Exercises

Advanced Exercises

CHAPTER 29: THE MARIADB SQL DATABASE MANAGEMENT SYSTEM

History

Notes

Installing a MariaDB Server and Client

Setting Up MariaDB

Examples

Chapter Summary

Exercises

Advanced Exercises

PART VI: APPENDIXES

APPENDIX A: REGULAR EXPRESSIONS

Characters

Delimiters

Simple Strings

Special Characters

Table of Contents

Rules

Bracketing Expressions

The Replacement String

Extended Regular Expressions

Appendix Summary

APPENDIX B: HELP

Solving a Problem

Finding Linux-Related Information

Specifying a Terminal

APPENDIX C: SECURITY INCLUDING GPG

Encryption

File Security

Email Security

Network Security

Host Security

Tutorial: Using GPG to Secure a File

Security Resources

Appendix Summary

APPENDIX D: KEEPING THE SYSTEM UP-TO-DATE USING apt-get

Using apt-get to Install, Remove, and Update Packages

Using apt-get to Upgrade the System

Other apt-get Commands

Repositories

sources.list: Specifies Repositories for apt-get to Search

APPENDIX E: LPI AND COMPTIA CERTIFICATION

More Information

Linux Essentials

Certification Exam 1 Objectives: LX0-101

Certification Exam 2 Objectives: LX0-102

GLOSSARY

Table of Contents

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Z
JUMPSTART INDEX
A

Table of Contents

C
D
F
M
N
O
S
Y

FILE TREE INDEX

A
B
C
D
E
F
G
H
I
M
N
O
P
R
S
T
U
V

Table of Contents

UTILITY INDEX

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

Table of Contents

MAIN INDEX

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

Table of Contents