

Red Hat[®] Linux[®] Administration A Beginner's Guide

Michael Turner
Steve Shah

McGraw-Hill/Osborne

New York Chicago San Francisco
Lisbon London Madrid Mexico City
Milan New Delhi San Juan
Seoul Singapore Sydney Toronto

Contents

ACKNOWLEDGMENTS	xxi
INTRODUCTION	xxiii

PART I

Installing Linux as a Server

1 Technical Summary of Linux Distributions and Windows	3
Critical Skill 1.1 Describing Linux and Linux Distributions	4
Project 1-1 Investigating Distributions	5
Critical Skill 1.2 Defining Free Software and the GNU License	5
What Is the GNU Public License?	6
The Advantages of Free Software	7
Ask the Expert	8
Critical Skill 1.3 Determining Technical Differences Between Windows and Linux ..	9
Single Users vs. Multiusers vs. Network Users	9
Separation of the GUI and the Kernel	10
The Network Neighborhood	11
The Registry vs. Text Files	12
Domains	13
Active Directory	14

Critical Skill 1.4 Exploring Other Linux Resources	14
Module Summary	15
Module 1 Mastery Check	15
2 Installing Linux in a Server Configuration	17
Critical Skill 2.1 Performing Preinstallation Evaluation	18
Hardware	18
Server Design	19
Dual-Booting Issues	20
Methods of Installation	21
If It Just Won't Work Right	22
Project 2-1 Determining a Server's Functions	23
Critical Skill 2.2 Installing Red Hat Linux	24
Creating a Boot Disk	25
Starting the Installation	25
Installation Type	29
Project 2-2 Installing a Server	54
Finding Additional Help	55
Module Summary	55
Module 2 Mastery Check	56
3 GNOME and KDE	59
Critical Skill 3.1 Understanding the X Window System's Origins	60
The Downside	61
Enter KDE and GNOME	62
What This Means for You	63
Critical Skill 3.2 Using and Customizing GNOME	63
Starting the X Window System and GNOME	64
GNOME Basics	66
The GNOME Start Here Icon	67
Project 3-1 Customizing a GNOME Desktop	71
Critical Skill 3.3 Using and Customizing KDE	73
Starting the X Window System and KDE	74
KDE Basics	76
The KDE Control Center	76
Project 3-2 Customizing a KDE Desktop	84
Module Summary	85
Module 3 Mastery Check	86
4 Installing Software	87
Critical Skill 4.1 Using the Red Hat Package Manager	88
Installing a New Package	89
Querying a Package	91
Uninstalling a Package	92

Project 4-1 Installing Webmin	93
redhat-config-packages	93
Project 4-2 Getting Apt	94
Critical Skill 4.2 Compiling Software Yourself	97
Getting and Unpacking the Package	97
Looking for Documentation	99
Configuring the Package	100
Compiling Your Package	100
Installing the Package	101
Running the Package	102
Cleaning Up	104
Project 4-3 Building and Installing Kgraphspace	105
Module Summary	106
Module 4 Mastery Check	106

PART II

Single-Host Administration

5 Managing Users	111
Critical Skill 5.1 Understanding Linux Users	112
Home Directories	113
Passwords	113
Shells	115
Startup Scripts	115
Mail	116
Critical Skill 5.2 Managing User Databases	116
The /etc/passwd File	117
The /etc/shadow File	119
The /etc/group File	120
Critical Skill 5.3 Employing User Management Tools	121
Command-Line User Management	121
Project 5-1 Creating a User Directory	126
Using redhat-config-users to Manipulate Users and Groups	127
Project 5-2 Handling Reorganization	130
Critical Skill 5.4 Running Programs as Other Users	131
SetUID and SetGID Programs	131
Using sudo	132
Critical Skill 5.5 Handling Orphaned Files	133
Critical Skill 5.6 Using Pluggable Authentication Modules (PAM)	133
How PAM Works	134
PAM's Files and Their Locations	134
Configuring PAM	135
Debugging PAM	139

Module Summary	139
Module 5 Mastery Check	140
6 The Command Line	143
Critical Skill 6.1 Switching Users: su	144
Critical Skill 6.2 Using the BASH Shell	145
Job Control	146
Environment Variables	147
Pipes	149
Redirection	149
Command-Line Shortcuts	150
Critical Skill 6.3 Reviewing Command-Line Documentation	152
The man Command	152
The texinfo System	154
Critical Skill 6.4 Understanding File Listings, Ownerships, and Permissions	154
Listing Files: ls	155
File and Directory Types	155
Changing Ownership: chown	157
Changing Groups: chgrp	158
Changing Mode: chmod	158
Critical Skill 6.5 Managing and Manipulating Files	160
Copying Files: cp	160
Moving Files: mv	160
Linking Files: ln	161
Project 6-1 Creating an Export Area	161
Converting and Copying a File: dd	164
File Compression: gzip	164
Making Special Files: mknod	166
Creating a Directory: mkdir	166
Removing Directory: rmdir	167
Showing Present Working Directory: pwd	167
Tape Archive: tar	167
Concatenating Files: cat	169
Displaying a File One Screen at a Time: more or less	170
Disk Utilization: du	170
Showing the Directory Location of a File: which	171
Locating a Command: whereis	171
Disk Free: df	171
Synchronizing Disks: sync	172
Critical Skill 6.6 Tracking and Terminating Processes	172
Listing Processes: ps	172
Showing an Interactive List of Processes: top	175
Sending a Signal to a Process: kill	176

Project 6-2 Checking Your Processes	178
Critical Skill 6.7 Using Miscellaneous Command-Line Tools	179
Showing the System Name: <code>uname</code>	179
Learning Who Is Logged In: <code>who</code>	180
Networking Tools	180
Critical Skill 6.8 Editing Text Files	184
<code>vi</code>	184
<code>emacs</code>	184
<code>joe</code>	185
<code>pico</code>	185
Critical Skill 6.9 Reviewing Linux File System Standards	185
Module Summary	186
Module 6 Mastery Check	187
7 File Systems	189
Critical Skill 7.1 Understanding File Systems	190
i-Nodes	190
Superblocks	191
<code>ext3</code>	191
Ask the Expert	192
Critical Skill 7.2 Managing File Systems	193
Mounting and Unmounting Local Disks	193
Using <code>fsck</code>	199
Critical Skill 7.3 Adding and Partitioning a Disk	201
Overview of Partitions	202
Where Disks Exist	202
Creating Partitions	203
Making File Systems	209
Project 7-1 To Journal, or Not to Journal?	210
Critical Skill 7.4 Using Network File Systems	211
Mounting NFS Partitions	211
Using the <code>autofs</code> Service	212
Critical Skill 7.5 Managing Quotas	215
Preparing a Disk for Quotas	216
Configuring Quota Settings	217
Managing Quotas	219
Project 7-2 Setting Up <code>autofs</code>	220
Module Summary	221
Module 7 Mastery Check	221
8 Core System Services	223
Critical Skill 8.1 Configuring the Boot Manager	224
Configuring GRUB	225

Running LILO	227
Adding a New Kernel to Boot	228
Project 8-1 Modifying Your GRUB Configuration	229
Step by Step	229
Critical Skill 8.2 Knowing the Boot Process	230
Kernel Execution	230
The init Process	230
Critical Skill 8.3 Learning about the init Service	232
The /etc/inittab File	232
The telinit Command	234
Critical Skill 8.4 Configuring and Using the xinetd Process	234
The /etc/xinetd.conf File	235
Critical Skill 8.5 Managing the syslogd Daemon	240
Invoking syslogd	240
The /etc/syslog.conf File	241
Critical Skill 8.6 Using the cron Program	246
The crontab File	246
Using the kron GUI	247
The /etc/cron.* Directories	248
Critical Skill 8.7 Enabling and Disabling Services	250
Graphical Service Managers	250
rc Scripts	252
Project 8-2 Creating an rc Script	256
Module Summary	258
Module 8 Mastery Check	258
9 Securing an Individual Server	261
Critical Skill 9.1 Keeping Your System up2date	262
Using the Red Hat Network	262
Manually Performing Security Updates	270
Project 9-1 Getting Your System up2date	270
Critical Skill 9.2 Understanding TCP/IP and Network Security	271
The Importance of Port Numbers	271
Port Dangers	272
Critical Skill 9.3 Using Tracking Services	273
Using the netstat Command	274
Security Implications of netstat's Output	275
Shutting Down Services	276
Critical Skill 9.4 Monitoring Your System	278
Making the Best Use of syslog	278
Monitoring Bandwidth with MRTG	279
COPS	280

Tripwire	280
Nessus	280
SATAN	281
Ask the Expert	281
Project 9-2 Running a Nessus Scan	282
Critical Skill 9.5 Employing a Checklist	284
Critical Skill 9.6 Finding Helpful Resources Online	285
CERT	285
BugTraq	285
Linux Security	286
Security Focus	286
Critical Skill 9.7 Being Aware of Security Miscellany	286
Module Summary	287
Module 9 Mastery Check	287

PART III

Internet Services

10 The Domain Name Service (DNS)	291
Critical Skill 10.1 Understanding the History Behind DNS: The /etc/hosts File	293
Critical Skill 10.2 Exploring the Guts of DNS	295
Domains and Hosts	295
Ask the Expert	295
Subdomains	297
in-addr.arpa Domain	298
Types of Servers	300
Critical Skill 10.3 Installing a DNS Server	301
Critical Skill 10.4 Configuring Clients	304
Client-Side DNS (a.k.a. the Resolver)	304
Critical Skill 10.5 Getting Ready for DNS Servers: The named.conf File	308
The Specifics	309
Critical Skill 10.6 Configuring Servers	318
Updating the named.conf File for a Primary Zone	319
Updating the named.conf for a Secondary Zone	320
Updating the named.conf File for a Caching Zone	321
DNS Records Types	322
Critical Skill 10.7 Putting It All Together	327
A Complete Configuration	328
Project 10-1 Configuring a Domain Using the GUI Tool	331
Critical Skill 10.8 Using the DNS Toolbox	333
rndc	333
host	333

dig	334
whois	335
Other References	336
Module Summary	337
Module 10 Mastery Check	338
11 Transferring Files with FTP	339
Critical Skill 11.1 Defining the Mechanics of FTP	340
Client/Server Interactions	341
Critical Skill 11.2 Setting Up vsftpd	343
Read the READMEs	344
Fixing Your xinetd.conf File	344
Critical Skill 11.3 Configuring vsftpd	346
General Configuration Options	348
Controlling Access to FTP	350
Ask the Expert	350
Configuring Host Access	352
Critical Skill 11.4 Configuring a Virtual FTP Server	352
Project 11-1 Setting Up Your FTP Server	354
Ask the Expert	354
Module Summary	355
Module 11 Mastery Check	356
12 Setting Up Your Web Server Using Apache	357
Critical Skill 12.1 Explaining the Mechanics of HTTP	358
Headers	359
Nonstandard Ports	360
Process Ownership and Security	360
Critical Skill 12.2 Setting Up the Apache HTTP Server	362
Changes in Apache 2	362
Ask the Expert	362
Apache Modules	363
Starting Up and Shutting Down Apache	363
Testing Your Installation	364
Critical Skill 12.3 Configuring Apache	365
Project 12-1 Creating a Simple Root-Level Page	366
Apache Configuration Files	366
Common Configuration Changes	367
Ask the Expert	367
Configuring Virtual Domains	370
GUI Configuration	372
Critical Skill 12.4 Performing Basic Troubleshooting with Apache	373

Module Summary	374
Module 12 Mastery Check	375
13 Sending Mail with SMTP	377
Critical Skill 13.1 Discovering the Mechanics of SMTP	378
Rudimentary SMTP Details	378
Project 13-1 Using telnet to Examine SMTP	380
SMTP vs. POP and IMAP	382
Critical Skill 13.2 Exploring Sendmail	382
Security Implications	383
Recommended Texts	384
Ask the Expert	384
Installing Sendmail	385
Configuring Sendmail with .mc Files	386
Enough M4 for Sendmail	387
The Sendmail Macros	389
A Complete Sample Configuration	398
Compiling Macros into a Configuration File	399
Beyond the Primary Configuration File	399
Critical Skill 13.3 Choosing Postfix	403
Installing Postfix	404
Switching MTAs	404
The Structure of Postfix	405
Configuration	407
Aliases, Virtual Domains, and Fancy Addresses	412
Additional Reading	414
Critical Skill 13.4 Solving Real-Life MTA Issues	415
mailq	415
Is the MTA Running?	416
Where Are Queues and Spools Kept?	416
How to Remove Entries from the Queue	417
Flushing the Queue	418
Mail Logging	418
Module Summary	419
Module 13 Mastery Check	420
14 Using POP and IMAP for E-Mail Retrieval	421
Critical Skill 14.1 Comparing the POP and IMAP Protocols	422
Advantages of IMAP over POP	423
Ask the Expert	424
Critical Skill 14.2 Installing POP and IMAP on Red Hat	425
Configuring the POP and IMAP Servers	425
Starting the POP and IMAP Servers	425

- Critical Skill 14.3** Reading Mail with Telnet 427
 - Reading POP Mail with Telnet 427
 - Reading IMAP Mail with Telnet 429
- Project 14-1** Testing IMAP Using Telnet 432
- Critical Skill 14.4** Noticing IMAP Quirks 433
 - Don't Delete This Message 433
- Critical Skill 14.5** Performing Special Authentication 434
 - Setting Up APOP/CRAM-MD5 Users 435
- Module Summary 435
- Module 14 Mastery Check 436

- 15 The Secure Shell (SSH)** 437
 - Ask the Expert 438
 - Critical Skill 15.1** Discussing Public Key Cryptography 439
 - Key Characteristics 441
 - Cryptography References 442
 - Critical Skill 15.2** Exploring SSH Versions and Distributions 442
 - OpenSSH and OpenBSD 443
 - Alternative Vendors for SSH Clients 444
 - The Weakest Link 445
 - Critical Skill 15.3** Performing Server Setup 445
 - Ask the Expert 445
 - Server Startup and Shutdown 446
 - Configuration 446
 - Critical Skill 15.4** Using Secure Shell (SSH) 451
 - Public Key Logins 452
 - Applications Related to SSH 454
 - Module Summary 454
 - Module 15 Mastery Check 455

PART IV

Intranet Services

- 16 Network File System (NFS)** 459
 - Critical Skill 16.1** Examining the Mechanics of NFS 460
 - Mounting and Accessing a Partition 460
 - Security Considerations for NFS 461
 - Versions of NFS 461
 - Critical Skill 16.2** Enabling NFS 462
 - The Components of NFS 463
 - Critical Skill 16.3** Configuring NFS Servers 464
 - Ask the Expert 464

The /etc/exports Configuration File	465
Graphically configuring exports	467
Telling the NFS Server Process About /etc/exports	468
Common Problems	469
Critical Skill 16.4 Configuring NFS Clients	470
The mount Command	470
Critical Skill 16.5 Learning Common Uses for NFS Partitions	473
Critical Skill 16.6 Troubleshooting NFS	474
Stale File Handles	474
Permission Denied	474
Hard vs. Soft Mounts	474
Module Summary	475
Module 16 Mastery Check	475
17 Network Information Service (NIS)	477
Critical Skill 17.1 Looking Inside NIS	478
The NIS Servers	479
Domains	480
Critical Skill 17.2 Installing and Configuring the NIS Servers	480
Ask the Expert	480
Establishing the Domain Name	481
Starting NIS	481
Editing the Makefile	482
Using ypinit	485
Critical Skill 17.3 Configuring an NIS Client	487
Editing the /etc/yp.conf File	487
Setting Up the Startup Script	489
Editing the /etc/nsswitch.conf File	489
Testing Your NIS Client Configuration	490
Project 17-1 Setting Up a NIS Server	490
Critical Skill 17.4 Configuring a Secondary NIS Server	491
Setting the Domain Name	491
Setting Up the NIS Master to Push to Slaves	492
Running ypinit	492
Critical Skill 17.5 Discovering the NIS Tools	493
Using Netgroups	494
Using NIS in Configuration Files	495
Critical Skill 17.6 Implementing NIS in a Real Network	496
A Small Network	496
A Segmented Network	497
Networks Bigger than Buildings	497

<u>Module Summary</u>	498
Module 17 Mastery Check	498
18 Talking to Windows with Samba	501
Critical Skill 18.1 Understanding the Mechanics of SMB	502
Usernames and Passwords	503
Encrypted Passwords	503
The Differences Between smb and nmbd	504
Critical Skill 18.2 Installing Samba	504
Ask the Expert	504
Critical Skill 18.3 Performing Samba Administration	505
Starting and Stopping Samba	505
Critical Skill 18.4 Administering Samba with SWAT	506
Setting Up SWAT	507
The SWAT Menus	508
Project 18-1 Creating a Share with SWAT	510
Critical Skill 18.5 Sharing with redhat-config-samba	511
Project 18-2 Creating a Share with redhat-config-samba	511
Critical Skill 18.6 Using smbclient	512
Browsing a Server	512
Remote File Access	513
Remote Printer Access	514
Critical Skill 18.7 Mounting with smbmount	515
Critical Skill 18.8 Supporting Encrypted Passwords	515
Allowing NULL Passwords	516
Changing Passwords with smbpasswd	516
Critical Skill 18.9 Troubleshooting Samba	516
Module Summary	517
Module 18 Mastery Check	517
19 Printing	519
Critical Skill 19.1 Knowing the Basics of lpd	521
Critical Skill 19.2 Installing LPRng	521
Starting LPRng on Boot	522
Critical Skill 19.3 Configuring /etc/printcap	522
Sample /etc/printcap Files	524
Implementing Your Changes	525
Project 19-1 Graphical Printer Configuration	525

Critical Skill 19.4	Understanding the /etc/lpd.perms File	527
	The Format of /etc/lpd.perms	527
	Defaults	528
	Permission Keywords	528
	Example of /etc/lpd.perms	529
Critical Skill 19.5	Examining the Client Programs of lpd	529
	lpr	530
	lpq	530
	lprm	531
Critical Skill 19.6	Exploring CUPS	531
Critical Skill 19.7	Installing CUPS	532
	Ask the Expert	532
	Switching Print Systems	533
	CUPS Server Setup	533
Critical Skill 19.8	Configuring Clients for CUPS	538
	Module Summary	540
	Module 19 Mastery Check	540
20	Host Configuration with DHCP	543
Critical Skill 20.1	Discovering BOOTP and the Roots of DHCP	544
	Ask the Expert	544
Critical Skill 20.2	Viewing the Mechanics of DHCP	545
Critical Skill 20.3	Investigating the DHCP Server	546
	Installing the DHCP Server	546
	Configuring the DHCP Server	546
	Project 20-1 Setting Up a DHCP Server	553
	General Runtime Behavior	554
Critical Skill 20.4	Knowing the DHCP Client	554
	Client Configuration	555
	Advanced Client Configuration	556
	Module Summary	557
	Module 20 Mastery Check	557
21	Backups	559
Critical Skill 21.1	Evaluating Your Backup Needs	560
	Project 21-1 Creating a Backup Plan	562
Critical Skill 21.2	Managing the Backup Device and Files	563
	Manipulating the Tape Device with mt	564

Critical Skill 21.3 Exploring Command-Line Tools	566
dump and restore	566
tar	570
Critical Skill 21.4 Using Amanda	571
Installing Amanda	572
The Amanda Server	572
The Amanda Client	574
Starting the Amanda Service	575
Amanda Utilities	575
Module Summary	577
Module 21 Mastery Check	577
Appendix A	579
Index	597