

Contents at a Glance

<i>Introduction</i>	xxvii
Part 1 • Installing Red Hat Linux	1
Chapter 1 • Introducing Red Hat Linux	3
Chapter 2 • Preparing Your Hardware	21
Chapter 3 • Installing Linux Locally	41
Chapter 4 • Installing Linux Over a Network	119
Chapter 5 • Kickstarting Linux	175
Part 2 • Linux Fundamentals	213
Chapter 6 • Starting at the Command Line	215
Chapter 7 • A Filesystem Primer	235
Chapter 8 • Making the Shell Work for You	255
Part 3 • Basic Linux Administration	271
Chapter 9 • Administering Users and Groups Securely	273
Chapter 10 • Managing Packages with RPM	291
Chapter 11 • Configuring and Troubleshooting the Boot Process	307
Chapter 12 • Upgrading and Recompiling Kernels	325
Chapter 13 • The Administrative Nitty-Gritty	369
Chapter 14 • Backing Up Your System	387
Part 4 • X Window Management	407
Chapter 15 • Managing X Servers and X Clients	409
Chapter 16 • GNOME	439

Chapter 17 • KDE	487
Chapter 18 • GUI Applications	535
Chapter 19 • Red Hat Graphical Front Ends	567
Part 5 • Basic Linux Networking	605
Chapter 20 • A TCP/IP Primer	607
Chapter 21 • Managing Linux on Your LAN	621
Chapter 22 • Securing Your Linux Network	643
Part 6 • Linux Network Services	663
Chapter 23 • Remote Access and xinetd Services	665
Chapter 24 • DNS and DHCP	677
Chapter 25 • Printing with CUPS and LPD	697
Chapter 26 • Mail Services	735
Part 7 • Linux File-Sharing Services	755
Chapter 27 • FTP Clients and Servers	757
Chapter 28 • Linux Sharing Services: NFS and NIS	777
Chapter 29 • Making Samba Work for You	799
Chapter 30 • Web Services	837
Appendix • Linux Command Reference	883
<i>Index</i>	273

Contents

Introduction xxvii

Part 1 • Installing Red Hat Linux **1**

Chapter 1 • Introducing Red Hat Linux **3**

Introducing Red Hat Linux 9	4
New Features	6
Basic Components	6
A Short History of Unix and Linux	8
Unix and the Coming Internet	8
Unix Alternatives	10
The Free Software Foundation	11
Linus Develops a Kernel	11
Exploring the Kernel	12
Configuring the Kernel	12
The /proc Filesystem	12
Modular or Monolithic	12
Why Choose Linux?	13
Cost	13
Reliability	14
Flexibility	14
Support	15
The Role of a Linux Computer	15
Linux as a Server	15
Linux on the Desktop	16
Red Hat Linux for Desktops	17
Red Hat Linux for Small Businesses	17
Red Hat Linux for the Enterprise	18
Summary	18

Chapter 2 • Preparing Your Hardware **21**

Creating Hard Disk Partitions	22
Partition Styles	22
Partition Names	22
Configuring Microsoft and Linux on the Same Computer	23
The Easy Way: A New Hard Drive	24
The Cheaper Way: An Existing Hard Drive	25
Step-by-Step Procedure	26
Why Worry about Hardware?	28
Hardware Problems Can Be Expensive	28
Not All Hardware Is Built for Linux	29

Finding Compatible Hardware	29
Certified Hardware	30
Compatible Hardware	31
Questionable Hardware	32
Community Knowledge Hardware	33
Creating a Hardware Checklist	34
Collecting Information	34
Collecting Drivers	35
Hardware Checklist	35
BIOS Tips	37
IDE Hard Drives	37
SCSI Hard Drives	38
Boot Sequence	38
Non-Plug-and-Play Hardware	39
Summary	39
Chapter 3 • Installing Linux Locally	41
Starting with a Boot Disk	42
Creating a Boot or Driver Disk	42
Analyzing the Red Hat Boot Floppy	44
Analyzing the Storage Device Driver Disk	46
Analyzing the Network Device Driver Disk	46
Analyzing the PCMCIA Driver Disk	46
The Boot ISO	47
Checking the Installation CDs	47
Inspecting CDs with mediacheck	47
Checking CDs with md5sum	50
Installing Red Hat Linux, Step by Step	50
Selecting Installation Prompt Options	51
Configuring Basic Parameters	54
Selecting an Installation Type	58
Setting Up Hard Drives	60
Setting Up Partitions with Disk Druid	62
Configuring Installation Details	70
Selecting Package Groups	84
Selecting Individual Packages	90
Ready to Install	91
Anaconda Installs Red Hat Linux	92
Managing Post-Installation Steps	94
Running the Red Hat Setup Agent	98
Creating a Regular User	99
Specifying a Date and Time	101
Sound Card	101
Registering with the Red Hat Network	102
Additional Installation	106
Troubleshooting the Installation	109
Installation Virtual Consoles	109
Package Status	113

Logging In	113
Upgrading Red Hat Linux	115
Allowable Upgrades	115
Summary	118
Chapter 4 • Installing Linux Over a Network	119
Preparing an NFS Server	120
Copying Files	120
Sharing Directories	121
Installation Parameters	122
Preparing an Apache Web Server	122
Copying Files	123
Sharing Directories	123
Installation Parameters	125
Preparing an FTP Server	125
Copying Files	125
Sharing Directories	126
Installation Parameters	127
Installing Linux over a Network	127
Making Boot Disks	127
Text Mode: Booting	128
Text Mode: Step by Step	130
Text-Mode Upgrades	168
Troubleshooting a Network Installation	172
Checking the Messages	172
Checking the Network	173
The Firewall on the Server	173
Address Settings	174
A Laptop Installation over a Network	174
Summary	174
Chapter 5 • Kickstarting Linux	175
Grouping Packages: comps.xml	175
Basic comps.xml Stanzas	176
Mandatory Groups	177
Package Groups	179
Package Group Categories	185
Dependencies	186
Editing Examples	186
Analyzing Your Default Kickstart Configuration	187
Preinstallation Commands	187
Basic Configuration	188
Graphics	190
Network Settings	191
The Root Password	191
Firewalls	192
Authentication Options	192

Hard Drive Partition Setup	192
Packages and Groups	193
Postinstallation Commands	194
Other Commands	195
Working with the GUI Kickstart Configurator	196
The Basic Configuration Menu	197
The Installation Method Menu	197
The Boot Loader Options Menu	198
The Partition Information Menu	199
The Network Configuration Menu	202
The Authentication Configuration Menu	203
The Firewall Configuration Menu	205
The X Configuration Menu	205
The Package Selection Menu	206
The Pre-Installation Script Menu	207
The Post-Installation Script Menu	207
The Next Steps	209
Kickstarting from a Floppy	209
Files on a Boot Floppy	209
The Installation Procedure	210
Testing Kickstart	210
Summary	210

Part 2 • Linux Fundamentals 213

Chapter 6 • Starting at the Command Line	215
Exploring Navigational Commands	215
pwd	216
cd	216
ls	216
Path Management	218
Setting Up Files and Directories	218
touch	218
cp	219
mv	219
rm	220
ln	221
mkdir and rmdir	222
Managing Files	222
file	223
cat	223
head and tail	223
more and less	224
Permissions	225
umask	226
Manipulating Files	226
wc	226
find	227

locate and slocate	227
grep	228
Command Combinations.	228
Using the vi Editor.	228
Command Mode.	229
Insert Mode.	230
Execute Mode.	231
Understanding Other Text Editors.	232
emacs	232
pico	232
joe	233
Summary	234
Chapter 7 • A Filesystem Primer	235
Understanding the Filesystem Hierarchy Standard.	235
The Basic Linux Directory Structure	236
Partition Schemes	237
Managing Partitions	238
Adding Partitions with fdisk	238
Revising Partition Labels.	242
Using Formats and Journals	243
Basic Linux Formats	243
Formatting a Partition.	244
Tuning	244
Disk Management.	245
Extended Partition Data	246
Mounting Directories	246
Troubleshooting	247
Mastering /etc/fstab	250
Exploring Logical Volume Management	251
Fundamentals	251
Creating a Physical Volume	252
Creating a Volume Group	252
Creating a Logical Volume.	252
Summary	253
Chapter 8 • Making the Shell Work for You	255
Managing the Shell.	255
Interactivity	256
Command Completion	257
Configuring the Shell	258
Shell Variables.	258
Environment Variables.	261
The Secrets of the Shell	262
Data Streams	262
Running in the Background.	263
Special Shell Characters.	264

Tildes and Home Directories	265
Connecting the Dots	266
Wildcards	266
Slashes in the Shell	266
Quotes	267
Aliases	268
Summary	269

Part 3 • Basic Linux Administration. 271

Chapter 9 • Administering Users and Groups Securely 273

Basic User and Group Management	273
/etc/passwd	274
/etc/shadow	274
/etc/group	275
/etc/gshadow	277
/etc/skel	278
/etc/login.defs	278
Administering User Accounts	279
Adding Users	280
Using newusers	281
Deleting Users	282
Managing User Access with chage	282
The Shadow Password Suite	283
Strong Passwords	283
Converting User Passwords	284
Converting Group Passwords	284
Quotas	284
Configuration	284
Quota Monitoring	288
User Private Groups	288
The Red Hat Scheme	288
Creating a Shared Directory	289
Summary	289

Chapter 10 • Managing Packages with RPM 291

Installing and Upgrading, Simplified	292
Queries	292
The Basic Installation	294
Upgrades	295
Dependencies	296
Deletions	296
A Database of RPMs	296
Making Source RPMs Work	297
Directories	297
The Spec File	297
Building Binaries from a Tarball	298

Building a Binary RPM	299
RPM and Pretty Good Privacy	299
Verifying a Package	300
Verifying a File	300
Updating RPMs	301
A Special Agent: up2date	302
Summary	305

Chapter 11 • Configuring and Troubleshooting the Boot Process 307

Exploring the Basic Boot Process	307
Initializing Hardware	308
Bootloaders	308
Runlevels	308
Understanding the Default Configuration Files	308
Hardware Detection	309
The /etc/modules.conf Settings	311
Listing Modules	311
The Bootloader	312
/etc/inittab	314
Starting a Runlevel	316
Troubleshooting and Using Rescue Disks	317
Rescue Mode	318
Single-User Mode	321
Summary	323

Chapter 12 • Upgrading and Recompiling Kernels 325

Why Bother?	326
“Upgrading” the Easy Way	327
Installing the Newest Red Hat Kernel	327
Bootloader Updates	329
Tarballs and Patches	330
Download Sources	331
Setup	331
The Patch Alternative	332
Customizing a Kernel	332
Preparing the Source	333
Customizing the Configuration	334
Creating Dependencies	335
Making a Kernel Image	335
After Compiling	336
Building Modules	336
Setting Up Configuration Menus	336
Kernel RPM Packages	337
Make Menus	337
Kernels, Section by Section	341
Basic Configuration Menus	342
Storage Devices	346

Networking	349
External Hardware	355
Other Hardware Support	358
Other Software Support	362
Bootloader Updates	365
Updating GRUB	365
Updating LILO	366
Summary	367

Chapter 13 • The Administrative Nitty-Gritty 369

Using the cron Daemon	369
Formatting cron	370
The Syntax of cron	371
Standard cron Jobs	371
User cron Jobs	371
cron Security	372
Using the at Daemon	373
Setting Up an at Job	373
Job Queue	373
Batch Jobs	374
Security	374
Service Management	374
/etc/rc.d/init.d Scripts	374
Activation at Different Runlevels	376
Troubleshooting with Logs	376
Log File Categories	377
System Logs	378
Daemon Logs	380
Other Logs	382
Process Management	382
Processes and ps	382
Processes and top	383
Logins and who	384
Process kill	384
nice and renice	384
Leaving a nohup	385
Summary	385

Chapter 14 • Backing Up Your System 387

What You Need to Know about Backing Up	387
Data Disaster Scenarios	388
Levels of Backup	388
Backup Type and Frequency	389
Selecting Your Media	390
Tape Drives	390
CD/DVD Backups	391

Using Backup and Restore Commands	391
Generic Backup Commands	391
Tape dump and restore	394
Backup Commands for CDs/DVDs	397
Understanding RAID	399
RAID Options	400
RAID 0	400
RAID 1	400
RAID 5	401
Software and Hardware RAID	401
Creating RAID Partitions	401
Configuring /etc/raidtab	402
Creating the RAID Device	404
Mounting RAID	404
Summary	405

Part 4 • X Window Management 407

Chapter 15 • Managing X Servers and X Clients. 409

Using the Basic Configuration Tools	409
xf86config	410
redhat-config-xfree86	414
Auto X Configure	419
switchdesk	419
Changing the Display Manager	420
Understanding the Configuration Files	423
startx	424
/etc/X11	425
Local Configuration Files	426
XF86Config	429
Troubleshooting the X Window	434
Log Files	434
Summary	436

Chapter 16 • GNOME 439

The Basic GNOME Interface	439
An Overview of GNOME	440
The GNOME Main Menu	443
The GNOME Control Center	445
Learning about GNOME Extras	456
Accessories	456
Documentation	460
Games	461
Internet Utilities	461
Internet Applications	468
Preferences	475

Multimedia	476
System Tools	479
Summary	486

Chapter 17 • KDE 487

Working with the Basic KDE Interface	488
An Overview of KDE	488
The KDE Main Menu	491
The KDE Control Center	493
Appearance & Themes	494
Desktop	497
Information	500
Internet & Network	502
KDE Components	503
Peripherals	504
Power Control	506
Regional & Accessibility	506
Security & Privacy	507
Sound & Multimedia	508
System Administration	511
Web Browsing	512
Learning About KDE Utilities	513
Accessories	513
More Accessories	517
Internet	519
Other Utilities	524
Preferences	526
More Programming Tools	526
Multimedia	528
System Tools	529
Summary	533

Chapter 18 • GUI Applications 535

Learning About OpenOffice	535
OpenOffice Calc	536
OpenOffice Draw	538
OpenOffice Impress	541
OpenOffice Writer	542
Other OpenOffice Tools	544
Understanding GNOME Office	545
AbiWord	546
Balsa	547
Dia	548
GnuCash	549
Gnumeric	549
MrProject	550

Working with KOffice	550
Karbon14	551
KChart	552
Kivio	553
KPresenter	553
KSpread	554
KWord	555
Other KOffice Tools	557
Taking Advantage of Graphical Applications	557
Graphical Document Readers	558
Image Viewers	560
Screen-Capture Programs	563
Another Graphical Program: Color Chooser	564
Summary	565
Chapter 19 • Red Hat Graphical Front Ends	567
Configuring with Basic Configuration Utilities	568
Setting a Date and Time	568
Configuring Your Keyboard	571
Selecting a Language	571
Configuring a Mouse	574
Setting Up a Sound Card	575
Connecting with Network Configuration Utilities	575
Basic Network Configuration	576
Text-Mode Network Configuration	580
Apache	582
Domain Name Service (DNS)	583
Network File System (NFS)	584
Samba	584
Using System Administration Utilities	586
Package Group Management	586
Root Password	588
Configuring Users	589
GUI Configuration	592
Log Viewer	592
Fonts	594
Kickstart	594
Security Level	595
Tuning the Kernel	596
Authentication	596
Working with Service Configuration Utilities	599
Setting Service Levels	600
Configuring Printers	600
Switching Print Daemons	601
Switching Mail Agents	601
Switching Desktops	602
Summary	603

Part 5 • Basic Linux Networking	605
Chapter 20 • A TCP/IP Primer	607
Exploring Network Fundamentals	608
LANs and WANs	608
The Internet	608
Domains	609
Hostname	609
Hardware Address	609
Understanding Protocol Stacks	609
OSI Levels	610
NetBEUI	612
IPX/SPX	612
Learning the Basics of TCP/IP	612
The TCP/IP Model	613
Major Protocols	613
Important Service Definitions	616
Using IP Addressing	616
IP Version 4	617
Address Classes	618
IP Version 6	619
Summary	620
Chapter 21 • Managing Linux on Your LAN	621
Understanding Network Hardware	622
Transmission Media	622
Hubs	622
Switches	622
Routers	623
Gateways	623
Configuring Your Computer on a LAN	623
Configuring with ifconfig	624
Configuring with arp	625
The Hostname Commands	625
Network Configuration Files	626
Configuring Private and Public Networks	627
Private IP Networks	628
Configuring a Network	629
Classless Inter-Domain Routing (CIDR)	631
Creating Internet Connections	632
The Internet Configuration Wizard	633
Using minicom	636
Troubleshooting Your Network	638
Checking Network Status	638
Checking Connections with ping and traceroute	639
Summary	640

Chapter 22 • Securing Your Linux Network	643
Understanding Best Practices	644
Physical Setup	644
Encryption	644
Password Security	645
Firewalls and DMZs	646
Using Pluggable Authentication Modules	646
Basic Configuration	647
Module Types	647
Control Flags	647
A PAM Example	648
Creating Firewalls	649
Data Directions and iptables	649
Firewalls as Chains	649
Format of iptables	650
Options for iptables	650
Patterns for iptables	652
Actions for iptables	653
Putting It All Together	654
Setting Up IP Masquerading	656
Functionality	656
IP Masquerading Commands	657
Detecting Break-ins	657
Sniffing with Ethereal	657
Checking Logins	658
Tripwire and Suspicious Activity	659
Troubleshooting Access Issues	661
Too Much Security	661
Denial or Rejection	661
Summary	662
Part 6 • Linux Network Services	663
Chapter 23 • Remote Access and xinetd Services	665
Using Typical Extended Services	666
The xinetd Configuration File	666
Activating xinetd Services	667
The Remote Shell	668
Telnet	668
FTP Servers	669
Other Super Server Services	670
Controlling Access with TCP Wrappers	670
Regulating Access	670
The xinetd Firewall	671
Understanding the Secure Shell (SSH)	673
SSH Installation	673
SSH Configuration	673
Sample Session	674

Troubleshooting Access Issues	675
Check That the Service Is Installed	675
Verify That the Service Is Active	675
Inspect the Service-Specific Security Files	675
Inspect the Extended xinetd Security Files	675
Check the Firewall iptables Chains	676
Summary	676
Chapter 24 • DNS and DHCP	677
Configuring a DNS Server	677
Packages	678
DNS Concepts	678
Initial DNS Configuration	679
A DNS Slave Server	683
DNS Configuration Files	683
Starting DNS	689
Using a DNS Client	689
Setting up a DHCP Server	690
Packages	690
Basic Configuration	690
The Configuration File: /etc/dhcpd.conf	691
Starting the DHCP Server	693
DHCP Servers and Remote Networks	693
A Lease Database	693
Working with DHCP and BOOTP Clients	694
Summary	695
Chapter 25 • Printing with CUPS and LPD	697
Using the Internet Print Protocol	698
Configuring the Common Unix Print System	699
Graphical Configuration	700
The lpadmin Command	712
The lpstat Command	712
Configuration Files	712
/etc/cups/cupsd.conf	713
Printer Management	723
Using the Line Print Daemon	725
The LPD Configuration Files	726
Printer Management	728
Red Hat's Printer Tool	730
Summary	734
Chapter 26 • Mail Services	735
Examining General Mail Services	736
Key Protocols	736
Alternate Mail Servers	736

Configuring sendmail	737
Packages	737
Basic Configuration Files	738
Understanding sendmail.mc	739
Revising sendmail.mc	744
Understanding submit.mc	745
Processing and Reactivating sendmail	746
Using Incoming E-mail Servers	746
The POP3 E-mail Server	746
The IMAP4 E-mail Server	747
Configuring Mail Clients	747
Text-Based Clients	747
Graphical Clients	750
Summary	754

Part 7 • Linux File-Sharing Services 755

Chapter 27 • FTP Clients and Servers 757

Using FTP as a Client	757
Basic Commands	758
Connecting to ftp.redhat.com	759
The GUI FTP Client	760
The Secure FTP Server	762
Basic Security Features	762
Configuration Files	762
Creating an Anonymous FTP Server	767
Configuring vsFTP	767
Configuring WU-FTP	767
Anonymous Directories	768
Configuring WU-FTP with Real Users	769
Configuration Files	769
Commands	774
Anonymous Uploads	774
Summary	774

Chapter 28 • Linux Sharing Services: NFS and NIS 777

Configuring Network File System Servers	778
NFS Packages	778
Basic Daemons	778
Setting Up Exports	779
Securing NFS	781
Starting NFS	783
Configuring with redhat-config-nfs	784
Working With NFS Clients	787
Listing Shared Directories	787
Mounting a Shared NFS Directory	788

Setting Up Network Information Service Servers	788
NIS Packages	789
Defining the NIS Domain	790
Defining Shared Files	790
Creating a Database Map	792
Updating the Database Map	793
NIS Slave Servers	793
Using NIS Clients	794
NIS Client Configuration in yp.conf	795
NIS Client Commands	795
Configuring /etc/nsswitch.conf	796
Summary	797
Chapter 29 • Making Samba Work for You	799
Bridging the Gap between Linux and Windows	800
Functioning on a Microsoft Network	800
Licensing	800
Definitions	800
Packages	801
Configuring Samba as a Client	802
Shared Samba Directory	802
Samba Terminal Mode	804
Connecting to a Printer	804
The Samba Configuration Files	806
Samba Daemons	806
Other Samba Configuration Files	807
The Main Samba File: smb.conf	808
A Samba Troubleshooting Checklist	822
The Samba Web Administration Tool (SWAT)	824
The Home Menu	824
Samba Configuration Wizard	825
The Globals Menu	826
The Shares Menu	828
The Printers Menu	829
The View Menu	830
The Password Menu	830
The Server Status Menu	832
The redhat-config-samba Alternative	832
Server Settings	833
User Management	834
Creating a New Share	835
Summary	835
Chapter 30 • Web Services	837
Exploring Web Server Options	838
Learning Apache Basics	839
Apache 2.0	839
Packages	839

Configuring Apache	840
Starting Apache	841
Customizing Apache	841
Customizing Apache Modules	866
Troubleshooting Apache	867
Configuring with the Red Hat GUI Apache Utility	868
Setting Main Apache Parameters	869
Configuring Virtual Hosts	870
Configuring the Server	877
Performance Tuning	878
Incorporating the Red Hat Content Accelerator	878
Installing and Starting TUX	879
Deciphering the Content Accelerator Configuration	880
Combining TUX and Apache	880
Summary	881
Appendix • Linux Command Reference	883
Installing Red Hat Linux	884
Preparing Your Hard Disk	884
Preparing a Boot Disk	886
Setting Up a Network Server	888
Setting Up a Kickstart Installation	888
Linux Fundamentals	888
Navigation	888
Managing Files and Directories	889
Reading through Different Files	889
Manipulating Files	890
Managing Partitions	890
The vi Editor	891
Basic Linux Administration	892
User and Group Commands	893
Modifying User and Group Access	893
Package Management	894
Boot Process Commands	894
Administrative Commands	895
Backup Commands	895
X Window Management	896
X Window Configuration	896
GUI Administration Tools	898
Basic Linux Networking	900
Network Card Commands	900
Network Domain Management	900
Network Troubleshooting Commands	901
Firewalls with iptables	902
Linux Network Services	903
Commands for xinetd Services	903
DNS and DHCP	904

Printer Commands	904
Mail Management Commands	905
Linux File-Sharing Services	905
FTP Servers	905
FTP Client	907
NFS Commands	908
NIS Commands	909
Samba Commands	910
Apache Commands	911
Other Commands	911
Summary	912
<i>Index</i>	913

Bonus Chapters on the Web

Web Chapter 1: Generic Linux Certifications

Web Chapter 2: Red Hat Certifications

Web Chapter 3: More Information Online

Web Chapter 4: GNU General Public License

Web Chapter 5: Red Hat Linux Packages By Group

NOTE The web chapters are bonus material provided on the Sybex website (www.sybex.com). They can be found and downloaded by navigating to the Sybex website and doing a search for *Mastering Red Hat Linux 9*, then clicking the Downloads link.