

Contents at a Glance

Introduction	xxv
Part I: The Linux Command Line	1
Chapter 1: Starting with Linux Shells	3
Chapter 2: Getting to the Shell	25
Chapter 3: Basic bash Shell Commands	61
Chapter 4: More bash Shell Commands	95
Chapter 5: Using Linux Environment Variables	129
Chapter 6: Understanding Linux File Permissions	155
Chapter 7: Managing Filesystems	179
Chapter 8: Installing Software	201
Chapter 9: Working with Editors	223
Part II: Shell Scripting Basics	251
Chapter 10: Basic Script Building	253
Chapter 11: Using Structured Commands	281
Chapter 12: More Structured Commands	309
Chapter 13: Handling User Input	337
Chapter 14: Presenting Data	365
Chapter 15: Script Control	387
PART III: Advanced Shell Scripting	415
Chapter 16: Creating Functions	417
Chapter 17: Writing Scripts for Graphical Desktops	439
Chapter 18: Introducing sed and gawk	467
Chapter 19: Regular Expressions	495
Chapter 20: Advanced sed	521
Chapter 21: Advanced gawk	549
Chapter 22: Working with Alternative Shells	579
Part IV: Advanced Shell Scripting Topics	609
Chapter 23: Using a Database	611
Chapter 24: Using the Web	643

Contents at a Glance

Chapter 25: Using E-mail.....	665
Chapter 26: Writing Script Utilities.....	689
Chapter 27: Advanced Shell Scripts.....	717
Appendix A: Quick Guide to bash Commands.....	751
Appendix B: Quick Guide to sed and gawk.....	761
Index.....	773

Contents

Introduction	xxv
Part I: The Linux Command Line	1
Chapter 1: Starting with Linux Shells	3
What Is Linux?	3
Looking into the Linux Kernel	4
The GNU Utilities	12
The Linux Desktop Environment	14
Linux Distributions	20
Core Linux Distributions	21
Specialized Linux Distributions	22
The Linux LiveCD	23
Summary	24
Chapter 2: Getting to the Shell	25
Terminal Emulation	25
Graphics Capabilities	27
The Keyboard	30
The terminfo Database	31
The Linux Console	35
The xterm Terminal	37
Command Line Parameters	37
The xterm Main Menu	39
The VT Options Menu	42
The VT Fonts Menu	44
The Konsole Terminal	46
Command Line Parameters	46
Tabbed Window Sessions	47
Profiles	49
The Menu Bar	49
The GNOME Terminal	54
The Command Line Parameters	54
Tabs	55
The Menu Bar	57
Summary	60

Contents

Chapter 3: Basic bash Shell Commands	61
Starting the Shell	61
The Shell Prompt	62
The Bash Manual	65
Filesystem Navigation	66
The Linux Filesystem	67
Traversing Directories	69
File and Directory Listing	71
Basic Listing	71
Modifying the Information Presented	73
The Complete Parameter List	74
Filtering Listing Output	77
File Handling	78
Creating Files	78
Copying Files	79
Linking Files	81
Renaming Files	83
Deleting Files	83
Directory Handling	85
Creating Directories	85
Deleting Directories	85
Viewing File Contents	86
Viewing File Statistics	86
Viewing the File Type	87
Viewing the Whole File	87
Viewing Parts of a File	92
Summary	93
Chapter 4: More bash Shell Commands	95
Monitoring Programs	95
Peeking at the Processes	95
Real-Time Process Monitoring	104
Stopping Processes	107
Monitoring Disk Space	109
Mounting Media	109
Using the df Command	113
Using the du Command	114
Working with Data Files	115
Sorting Data	115
Searching for Data	120
Compressing Data	121
Archiving Data	125
Summary	127

Chapter 5: Using Linux Environment Variables	129
What Are Environment Variables?.....	129
Global Environment Variables	130
Local Environment Variables.....	131
Setting Environment Variables	134
Setting Local Environment Variables.....	134
Setting Global Environment Variables	136
Removing Environment Variables	136
Default Shell Environment Variables.....	137
Setting the PATH Environment Variable.....	142
Locating System Environment Variables	143
Login Shell.....	144
Interactive Shell	147
Non-Interactive Shell	150
Variable Arrays	150
Using Command Aliases	152
Summary.....	153
Chapter 6: Understanding Linux File Permissions	155
Linux Security.....	155
The /etc/passwd File	156
The /etc/shadow File	158
Adding a New User.....	158
Removing a User.....	161
Modifying a User	162
Using Linux Groups	165
The /etc/group File.....	166
Creating New Groups	167
Modifying Groups	168
Decoding File Permissions	168
Using File Permission Symbols.....	168
Default File Permissions	170
Changing Security Settings	172
Changing Permissions	172
Changing Ownership	173
Sharing Files.....	175
Summary.....	176
Chapter 7: Managing Filesystems	179
Exploring Linux Filesystems	179
The Basic Linux Filesystems.....	179
Journaling Filesystems.....	181
The Extended Linux Journaling Filesystems	182

Contents

Working with Filesystems	184
Creating Partitions.....	184
Creating a Filesystem.....	187
If Things Go Wrong.....	189
Logical Volume Managers.....	190
The Logical Volume Management Layout	191
The LVM in Linux.....	192
Using the Linux LVM.....	193
Summary.....	199
Chapter 8: Installing Software	201
Package Management Primer.....	201
The Debian-Based Systems	202
Managing Packages with aptitude.....	203
Installing Software Packages with aptitude	205
Updating Software with aptitude	207
Uninstalling Software with aptitude	208
The aptitude Repositories	209
The Red Hat-Based Systems.....	210
Listing Installed Packages.....	211
Installing Software with yum	213
Updating Software with yum.....	214
Uninstalling Software with yum.....	215
Dealing with Broken Dependencies.....	215
Yum Repositories	217
Installing from Source Code.....	218
Summary.....	221
Chapter 9: Working with Editors	223
The vim Editor	223
The Basics of vim.....	224
Editing Data.....	226
Copy and Paste	227
Search and Substitute	227
The emacs Editor.....	228
Using emacs on the Console.....	229
Using emacs in X Windows	234
The KDE Family of Editors.....	235
The KWrite Editor	236
The Kate Editor.....	240
The GNOME Editor.....	244
Starting gedit	244
Basic gedit Features	245
Setting Preferences.....	245
Summary.....	249

Part II: Shell Scripting Basics **251**

Chapter 10: Basic Script Building **253**

Using Multiple Commands.....	253
Creating a Script File.....	254
Displaying Messages.....	256
Using Variables.....	257
Environment Variables	258
User Variables.....	259
The Backtick.....	261
Redirecting Input and Output	262
Output Redirection.....	262
Input Redirection.....	263
Pipes.....	264
Performing Math	268
The expr Command.....	268
Using Brackets	270
A Floating-Point Solution.....	271
Exiting the Script	275
Checking the exit Status.....	275
The exit Command.....	277
Summary.....	278

Chapter 11: Using Structured Commands **281**

Working with the if-then Statement.....	281
The if-then-else Statement.....	284
Nesting ifs	284
The test Command.....	285
Numeric Comparisons.....	286
String Comparisons.....	288
File Comparisons.....	293
Compound Condition Testing.....	301
Advanced if-then Features.....	302
Using Double Parentheses	302
Using Double Brackets.....	304
The case Command.....	305
Summary.....	306

Chapter 12: More Structured Commands **309**

The for Command	309
Reading Values in a List.....	310
Reading Complex Values in a List.....	311
Reading a List from a Variable	313
Reading Values from a Command.....	314

Contents

Changing the Field Separator	315
Reading a Directory Using Wildcards	316
The C-Style for Command	318
The C Language for Command	318
Using Multiple Variables	320
The while Command	320
Basic while Format	321
Using Multiple Test Commands	322
The until Command	323
Nesting Loops	325
Looping on File Data	327
Controlling the Loop	328
The break Command	329
The continue Command	332
Processing the Output of a Loop	334
Summary	336
Chapter 13: Handling User Input	337
Command Line Parameters	337
Reading Parameters	337
Reading the Program Name	340
Testing Parameters	341
Special Parameter Variables	342
Counting Parameters	342
Grabbing All the Data	344
Being Shifty	346
Working with Options	347
Finding Your Options	347
Using the getopt Command	351
The More Advanced getopts	354
Standardizing Options	357
Getting User Input	358
Basic Reading	358
Timing Out	360
Silent Reading	361
Reading from a File	362
Summary	362
Chapter 14: Presenting Data.	365
Understanding Input and Output	365
Standard File Descriptors	365
Redirecting Errors	368
Redirecting Output in Scripts	370

Temporary Redirections.....	370
Permanent Redirections.....	371
Redirecting Input in Scripts	372
Creating Your Own Redirection	373
Creating Output File Descriptors.....	373
Redirecting File Descriptors	374
Creating Input File Descriptors	375
Creating a Read/Write File Descriptor.....	375
Closing File Descriptors.....	376
Listing Open File Descriptors.....	378
Suppressing Command Output.....	380
Using Temporary Files.....	380
Creating a Local Temporary File.....	381
Creating a Temporary File in /tmp.....	382
Creating a Temporary Directory	383
Logging Messages.....	384
Summary.....	385
Chapter 15: Script Control	387
Handling Signals.....	387
Linux Signals Revisited.....	387
Generating Signals.....	388
Trapping Signals.....	390
Trapping a Script Exit.....	391
Removing a Trap.....	392
Running Scripts in Background Mode.....	393
Running in the Background.....	393
Running Multiple Background Jobs	394
Exiting the Terminal.....	395
Running Scripts Without a Console	395
Job Control.....	396
Viewing Jobs.....	397
Restarting Stopped Jobs.....	399
Being Nice	400
The nice Command	400
The renice Command	401
Running Like Clockwork	402
Scheduling a Job Using the at Command	402
Scheduling Regular Scripts.....	405
Start at the Beginning.....	409
Starting Your Scripts at Boot Time.....	409
Starting with a New Shell	412
Summary.....	412

PART III: Advanced Shell Scripting **415**

Chapter 16: Creating Functions **417**

- Basic Script Functions 417
 - Creating a Function 418
 - Using Functions 418
- Returning a Value 420
 - The Default Exit Status 421
 - Using the return Command 422
 - Using Function Output 423
- Using Variables in Functions 424
 - Passing Parameters to a Function 424
 - Handling Variables in a Function 426
- Array Variables and Functions 429
 - Passing Arrays to Functions 429
 - Returning Arrays from Functions 431
- Function Recursion 432
- Creating a Library 433
- Using Functions on the Command Line 435
 - Creating Functions on the Command Line 435
 - Defining Functions in the .bashrc File 436
- Summary 438

Chapter 17: Writing Scripts for Graphical Desktops **439**

- Creating Text Menus 439
 - Create the Menu Layout 439
 - Create the Menu Functions 441
 - Add the Menu Logic 442
 - Putting It All Together 442
 - Using the select Command 444
- Doing Windows 445
 - The dialog Package 446
 - The dialog Options 453
 - Using the dialog Command in a Script 455
- Getting Graphic 457
 - The KDE Environment 457
 - The GNOME Environment 461
- Summary 466

Chapter 18: Introducing sed and gawk **467**

- Text Manipulation 467
 - The sed Editor 468
 - The gawk Program 471
- The sed Editor Basics 477
 - More Substitution Options 478

Using Addresses	480
Deleting Lines.....	482
Inserting and Appending Text.....	484
Changing Lines.....	486
The transform Command	487
Printing Revisited	488
Using Files with sed.....	490
Summary.....	493
Chapter 19: Regular Expressions	495
What Are Regular Expressions?.....	495
A Definition	495
Types of Regular Expressions	496
Defining BRE Patterns	497
Plain Text.....	497
Special Characters	499
Anchor Characters.....	500
The Dot Character	502
Character Classes	503
Negating Character Classes	505
Using Ranges	505
Special Character Classes	507
The Asterisk.....	508
Extended Regular Expressions	509
The Question Mark.....	510
The Plus Sign.....	510
Using Braces	511
The Pipe Symbol.....	512
Grouping Expressions	513
Regular Expressions in Action.....	514
Counting Directory Files	514
Validating a Phone Number	515
Parsing an E-mail Address.....	517
Summary.....	519
Chapter 20: Advanced sed	521
Multiline Commands	521
The next Command.....	522
The Multiline delete Command	525
The Multiline print Command	526
The Hold Space.....	527
Negating a Command.....	529
Changing the Flow	531
Branching	532
Testing.....	533
Pattern Replacement.....	535

Contents

The Ampersand	535
Replacing Individual Words	535
Using sed in Scripts.....	537
Using Wrappers.....	537
Redirecting sed Output.....	538
Creating sed Utilities	538
Double Spacing Lines	539
Double Spacing Files That May Have Blanks	539
Numbering Lines in a File	540
Printing Last Lines	541
Deleting Lines.....	542
Removing HTML Tags.....	545
Summary.....	547
Chapter 21: Advanced gawk	549
Using Variables.....	549
Built-in Variables	549
User-Defined Variables	556
Working with Arrays.....	558
Defining Array Variables.....	558
Iterating Through Array Variables	559
Deleting Array Variables	560
Using Patterns	560
Regular Expressions	560
The Matching Operator	561
Mathematical Expressions	562
Structured Commands	563
The if Statement.....	563
The while Statement	565
The do-while Statement.....	566
The for Statement.....	567
Formatted Printing.....	567
Built-in Functions.....	570
Mathematical Functions	571
String Functions	572
Time Functions.....	574
User-Defined Functions.....	575
Defining a Function.....	575
Using Your Functions	576
Creating a Function Library	576
Summary.....	577
Chapter 22: Working with Alternative Shells	579
What Is the dash Shell?	579
The dash Shell Features.....	580

The dash Command Line Parameters	581
The dash Environment Variables	582
The dash Built-in Commands	585
Scripting in dash	586
Creating dash Scripts.....	586
Things That Won't Work	586
The zsh Shell	592
Parts of the zsh Shell	592
Shell Options	592
Built-in Commands	596
Scripting with zsh	602
Mathematical Operations	602
Structured Commands	604
Functions.....	604
Summary.....	607

Part IV: Advanced Shell Scripting Topics 609

Chapter 23: Using a Database 611

The MySQL Database	611
Installing MySQL.....	612
The MySQL Client Interface	614
Creating MySQL Database Objects	619
The PostgreSQL Database.....	622
Installing PostgreSQL.....	622
The PostgreSQL Command Interface.....	623
Creating PostgreSQL Database Objects.....	626
Working with Tables	627
Creating a Table.....	628
Inserting and Deleting Data.....	630
Querying Data	631
Using the Database in Your Scripts.....	633
Connecting to the Databases	633
Sending Commands to the Server	635
Formatting Data.....	639
Summary.....	640

Chapter 24: Using the Web 643

The Lynx Program.....	643
Installing Lynx	644
The lynx Command Line.....	645
The Lynx Configuration File.....	652
The Lynx Environment Variables.....	653
Capturing Data from Lynx.....	654

Contents

The cURL Program	657
Installing cURL	657
Exploring with cURL	657
Networking with zsh	658
The TCP Module	658
The Client/Server Paradigm	659
Client/Server Programming with zsh	660
Summary	664
Chapter 25: Using E-mail	665
The Basics of Linux E-Mail	665
E-Mail in Linux	665
The Mail Transfer Agent	667
The Mail Delivery Agent	668
The Mail User Agent	669
Setting Up Your Server	673
sendmail	674
Postfix	676
Sending a Message with Mailx	681
The Mutt Program	684
Installing Mutt	684
The Mutt Command Line	685
Using Mutt	686
Summary	687
Chapter 26: Writing Script Utilities	689
Monitoring Disk Space	689
The Required Functions	689
Creating the Script	692
Running the Script	693
Performing Backups	694
Archiving Data Files	695
Managing User Accounts	702
The Required Functions	702
Creating the Script	709
Summary	716
Chapter 27: Advanced Shell Scripts	717
Monitoring System Statistics	717
System Snapshot Report	717
System Statistics Report	725
Problem-Tracking Database	733
Creating the Database	733
Recording a Problem	736
Updating a Problem	739
Finding a Problem	745
Summary	749

Appendix A: Quick Guide to bash Commands 751
Built-in Commands 751
Bash Commands..... 754
Environment Variables 756

Appendix B: Quick Guide to sed and gawk 761
The sed Editor 761
 Starting the sed Editor 761
 sed Commands 762
The gawk Program 766
 The gawk Command Format 766
 Using gawk 767
 The gawk Variables 768
 The gawk Program Features 771

Index 773

Who Should Read This Book

How This Book Is Organized