
Contents

Acknowledgments	xxxi
Introduction	xxxiii

Part I Basics

1 Background	3
What Is UNIX?	4
Why Is UNIX Important?	4
Open Source Code	4
Cooperative Tools and Utilities	4
Multiuser and Multitasking Abilities	5
Excellent Networking Environment	5
Portability	5
The Structure of the UNIX Operating System	5
The Kernel	6
Utilities	6
The File System	7
The Shell	7
Applications	7
The UNIX Philosophy	8
The Birth of the UNIX System	9
UNIX System V	10
The Berkeley Software Distribution (BSD)	11
XENIX	12
GNU and Linux	13
UNIX Standards	14
The Open Software Foundation (OSF)	15
The X/OPEN Consortium	15
The X/OPEN API	16
The Common Open Software Environment (COSE)	16
The Open Group and the Single UNIX Specification	16
Widely Used UNIX Variants	18
Linux	18
BSD Variants: FreeBSD, NetBSD, and OpenBSD	20
Solaris	21
MAC OS X	22
AIX	23

HP-UX	24
UNIXWARE	24
Tru64 UNIX	25
IRIX	26
A UNIX System Timeline	26
UNIX Contributors	29
The UNIX System and Microsoft Windows NT Versions	30
Windows NT	31
Differences Between Windows NT and UNIX	31
The Future of UNIX	33
Choosing a UNIX Variant	34
Summary	34
How to Find Out More	35
2 Getting Started	37
Starting Out	37
Connecting Locally	37
Connecting Remotely	40
Logging In	40
Selecting a Login Name	41
Choosing a Password	41
A Successful Login	42
The UNIX System Prompt	43
Entering Commands	44
Command Options and Arguments	44
Stopping a Command	45
The passwd Command	45
The cal Command	45
The who Command	46
The finger Command	46
The write Command	47
The talk Command	47
The mesg Command	48
Getting Command Details	48
Getting Started with Electronic Mail	49
Notification of New Mail	49
Reading Mail	49
Disposing of Messages	50
Sending Messages	51
Quitting mailx	51
Logging Out	52
Summary	52
How to Find Out More	53

3 Working with Files and Directories	55
Files	55
Filenames	55
Filename Extensions	56
Directories	57
Subdirectories	57
Choosing Directory Names	58
The Hierarchical File Structure	58
Pathnames	59
UNIX and Windows File Structure	60
UNIX System File Types	60
Ordinary Files	60
Symbolic Links	61
Directories	62
Special Files	62
Common Commands for Files and Directories	62
Listing the Contents of a Directory	62
Viewing Files	63
Moving Around in Directories	66
Moving and Renaming Files and Directories	68
Copying Files	69
Linking Files	70
Removing Files	72
Creating a Directory	73
Removing a Directory	73
Getting Information About File Types	74
Searching for Files	75
Using find	75
Running find in the Background	76
Other Search Criteria	77
More About Listing Files	77
Listing Hidden Files	77
Controlling the Way ls Displays Filenames	78
Showing Nonprinting Characters	78
Sorting Listings	79
Combining Options to ls	79
The Long Form of ls	79
Permissions	80
Permissions for Files	80
Permissions for Directories	81
The chmod Command	81
Setting Absolute Permissions	82
Setting Permissions for Groups of Files	83
Using umask to Set Permissions	83

Changing the Owner of a File	84
Changing the Group of a File	85
Viewing Long Files	85
Using pg	85
Using more	87
Using less	87
Viewing the Beginning or End of a File	88
Printing Files	88
Sending Output to the Printer	89
Specifying a Printer	89
Print Spooling	89
Printing Command Output	90
Using lpstat to Monitor the Print System	90
Canceling Print Jobs	91
Formatting	91
Summary	91
How to Find Out More	92
4 The Command Shell	93
The Common Shells	93
Running the Shell	94
Changing Your Login Shell	94
Logging Out	95
What the Shell Does	95
Entering Commands	96
Argument Expansion	96
Grouping Commands	97
Using Wildcards	97
Wildcards and Hidden Files	98
How Wildcards Work	98
Standard Input and Output	99
Using Pipes	100
Output Redirection to a File	101
Input Redirection from a File	101
Standard Input from the Keyboard	102
Standard Error	103
Running Commands in the Background	105
Running Windowed Commands	105
Standard I/O and Background Jobs	106
Logging Off with Active Jobs	107
Job Control	107
Configuring the Shell	109
Interactive Shells	110
Sample Configuration Files	110

Shell Variables	113
Variables in sh, ksh, and bash	113
Variables in csh and tcsh	117
Command Aliases	120
Aliases in ksh and bash	121
Aliases in csh and tcsh	122
Command History	122
History Substitution in csh and tcsh	124
History Substitution in ksh and bash	125
Command-Line Editing	125
Setting the Line Editor in bash and ksh	127
Setting the Line Editor in tcsh	127
Command Substitution	127
Filename Completion	128
Removing Special Meanings in Command Lines	129
Summary	130
How to Find Out More	130
5 Text Editing	133
Editing with vi	134
Setting Your Terminal Display Type for vi	134
Starting vi	135
Entering Input Mode	136
Leaving Input Mode	137
Exiting vi	137
Moving Within a Window	137
Moving the Window in the Buffer	139
Modifying Text	139
Deleting Text	139
Undoing Changes and Deletions	140
The Ten-Minute vi Tutorial	141
Advanced Editing with vi	142
Writing vi Macros	147
Useful Text Processing Macros	148
Editing with emacs	150
Setting Your Terminal Display Type for emacs	151
Starting emacs	152
Creating Text with emacs	152
Exiting emacs	152
Moving Within a Window	153
Moving the Window in the Buffer	153
Deleting Text	153
emacs Help	154
The Ten-Minute emacs Tutorial	154
Advanced Editing with emacs	156

Modifying Text with emacs	156
Editing with Multiple Windows	157
emacs Environments	158
How to Get emacs	159
Editing with vim	160
Starting vim	160
Some Advanced Features of vim	160
Exiting vim	160
Other Variants of vim	160
Editing with pico	160
Starting pico	161
Exiting pico	161
How to Get pico	162
Summary	162
How to Find Out More	163
6 The GNOME Desktop	165
The Evolution of the GNOME Desktop	166
Installing GNOME	166
Booting GNOME	167
Working with the GNOME Desktop	167
Becoming Familiar with GNOME Desktop Concepts	169
The Nautilus File Manager	177
GNOME Built-in Applications and Utilities	179
Printing from GNOME	187
Logging Out of GNOME	188
Summary	189
How to Find Out More	189
Useful Books on GNOME	189
Useful Web Sites for GNOME	189
7 The CDE and KDE Desktops	191
The Evolution of the CDE and KDE Desktops	192
The CDE Desktop	193
Obtaining CDE	193
CDE Features	194
CDE End-User Components	194
CDE Developer Components	196
CDE Online Documentation	197
Internationalization Features	198
How to Find More about CDE	198
The KDE Desktop	198
Installing KDE	198
Booting KDE	199
Working with the KDE Desktop	199
Becoming Familiar with KDE Desktop Concepts	200

The Konqueror File Manager	206
KDE Built-in Applications and Utilities	208
Printing from KDE	221
Logging Out of KDE	221
Summary	222
How to Find Out More	222
Useful Books on CDE	222
Useful Web Sites for CDE	223
Useful Books on KDE	223
Useful Web Sites for KDE	223

Part II User Networking

8 Electronic Mail	227
E-Mail on the UNIX System	227
Local Mail, Remote Mail, and Webmail	227
Types of UNIX Mail Clients	228
Common UNIX Mail Clients	228
Command-Line Mail Programs	228
Screen-Oriented Mail Programs	229
pine	230
mutt	234
Graphical Interfaces for E-Mail	238
KMail	239
Evolution	241
Tools for Managing E-Mail	242
Forwarding Mail	242
The vacation Command	243
Notification of New Mail	243
Remote Access with fetchmail	244
Summary	245
How to Find Out More	245
9 Networking with TCP/IP	247
Basic Networking Concepts	248
The Internet Protocol Family	248
How TCP/IP Works	248
UNIX Commands for TCP/IP Networking	249
The Remote Commands	249
The DARPA Commands, Including ftp and telnet	257
Using ftp	257
Using tftp	262
Remote Login Using telnet	263
Obtaining Information About Users and Hosts	264

The Secure Shell (ssh)	267
PPP and PPPoE	268
Summary	268
How to Find Out More	268
10 The Internet	271
What Is the Internet?	271
Accessing the Internet	271
Using a Public-Access Provider	272
Internet Addresses	272
The Usenet	273
Usenet Background	273
How Usenet Articles Are Distributed	274
Reading Netnews	275
Posting News	283
Internet Mailing Lists	285
Subscribing and Unsubscribing to a Mailing List	285
Internet Relay Chat	286
Getting Started with the IRC	287
Summary of IRC Commands	288
Running an IRC Server	289
Finding Out More about the IRC	289
Instant Messaging (IM)	289
Gaim	289
The World Wide Web	290
Browsers	290
Web Browsers	290
Browser History	290
Using UNIX Browsers	291
Helper Applications and Plug-Ins	293
Web Documents	295
Links	295
Addressing	296
Summary	300
How to Find Out More	301

Part III System Administration

11 Processes and Scheduling	305
Processes	305
The ps Command	306
How to Kill a Process	307
Parent and Child Processes	309
Process Scheduling	309
The at Command	309
The cron Facility	311

The crontab Command	312
The batch Command	312
Daemons	312
Process Priorities	313
The nice Command	313
The sleep Command	314
The wait Command	314
ps Command Options	315
Signals and Semaphores	317
The nohup Command	319
Zombie Processes	320
Real-Time Processes	320
Priority Classes of Processes	320
Setting the Priority of a Process	321
Executing a Process with a Priority Class	322
Time Quanta for Real-Time Processes	322
Displaying the Priority Classes of Processes	322
Displaying Priority Classes and Limits	323
The /proc File System	324
Summary	324
How to Find Out More	325
12 System Security	327
Security Is Relative	328
User and Group IDs	328
Setting User ID Permission	328
Setting Group ID Permission	329
Access Control Lists	330
HP-UX ACLs	330
Role-Based Access Control	331
Password Files	332
The /etc/passwd File	332
HP-UX Password Security	335
File Encryption	336
Using crypt	336
Strong Replacements for crypt	338
Compressing and Encrypting Files	339
Pretty Good Privacy (PGP)	341
Obtaining and Installing PGP	342
Configuring PGP	343
Key Rings and Key Servers	343
Encrypting Files	345
Secure Signatures	345
Decrypting Files	345
Advanced PGP Features	346
GNU Privacy Guard (GPG)	346

Console Locking	348
Logging Off Safely	348
Trojan Horses	349
Viruses and Worms	350
Security Guidelines for Users	351
The Restricted Shell (rsh)	352
Levels of Operating System Security	353
Minimal Protection (Class D)	353
Discretionary Security Protection (Class C1)	353
Controlled Access Protection (Class C2)	353
Labeled Security Protection (Class B1)	354
Structured Protection (Class B2)	354
Security Domains (Class B3)	354
Verified Design (Class A1)	354
The Level of UNIX Security	354
Summary	354
How to Find Out More	355
13 Basic System Administration	357
Administrative Concepts	358
Multiuser Concepts	358
Multitasking Concepts	358
Administrative Interfaces	358
Commands	361
Directory Structure	366
Setup Procedures	367
Installing the Console Terminal	367
Installation	367
Powering Up	369
The Superuser	370
Maintaining the Superuser Login	371
Setting Date/Time	371
Setting the Time Zone	371
Setting System Names	372
Using Administrative Logins	372
Startup and Shutdown (Changing System States)	373
Managing User Logins	376
Display Default User Environment	376
Changing Default User Environment	376
Default profile Files	377
Adding a User	378
useradd Options	379
User Passwords	379
Blocking User Access	381
Hard Delete of a User	382
Soft Delete of a User	382

Adding a Group	383
Deleting a Group	383
Setting Up Terminals and Printers	383
Maintenance Tasks	386
Communicating with Users	386
Checking the System	388
Security Tips for System Administrators	395
Summary	397
How to Find Out More	397
Web Sites with Useful Information on System Administration	398
Newsgroups to Consult for Information on System Administration	399
Journals and Publications on System Administration	399
14 Advanced System Administration	401
Managing Information Storage	401
Storage Media and UNIX File Systems	401
UNIX File Systems	403
Managing Storage Media	406
UNIX System Directory Structure	410
Managing Disk Space	412
Backup and Restore	419
Backup Plan	423
Backing Up Data Using ufsdump	423
Restore Plan	425
Restoring Data Using ufsrestore	425
Restore Strategy	426
Managing System Services	427
Service Access Facility	427
Process Scheduling Parameters	431
Display Scheduler Parameters	433
Summary	433
How to Find Out More	434
Web Sites with Useful Information on System Administration	435
Newsgroups to Consult for Information on System Administration	435
Journals and Publications on System Administration	435

Part IV Network Administration

15 Clients and Servers	439
Mid-Range Power: The Evolution of Client/Server Computing	439
Principles of Client/Server Architecture	440
Clients and Client Functions	441
Servers and Server Functions	442
Client/Server Security	443

File Sharing	444
Distributed File System Basics	445
Benefits of Distributed File Systems	446
NFS Features	446
Sharing NFS Resources	447
Unsharing NFS Resources	449
Mounting Remote NFS Resources	450
Unmounting a Remote Resource	452
Displaying Information About Shared Resources	452
Browsing Shared Resources	453
Monitoring the Use of Local NFS Resources	454
Summary	454
How to Find Out More	454
16 The Apache Web Server	457
An Overview of Web Servers	457
The History and Popularity of Apache	459
Apache Installation	459
Binary Package Installation	460
Binary Package Installation on UNIX	463
Source Installation of Apache on UNIX	464
Apache Modules	467
Apache Configuration	468
Elements and Syntax of httpd.conf	469
User Directories	470
Virtual Hosts	471
CGI Support in Apache	471
CGI Security and Suexec	473
Password-Protected Web Pages with Basic Authentication	474
Apache and LAMP	475
Apache Configuration Front Ends	479
Apache Log Files	480
Summary	481
How to Find Out More	481
17 Network Administration	483
Network Administration Concepts	483
TCP/IP Administration	484
Internet Addresses	484
The Format of Internet Addresses	485
Obtaining IP Addresses	485
Installing and Setting Up TCP/IP	487
Network Provider Setup	487
Listener Administration	488
Starting TCP/IP	489
TCP/IP Security	490

Administering Anonymous FTP	492
Troubleshooting TCP/IP Problems	493
Netcat, the “TCP/IP Swiss Army Knife”	496
Advanced Features	498
PPP ADMINISTRATION	499
DNS (Domain Name Service) Administration	500
A Brief History of DNS	500
The Structure of DNS	501
Top-Level Domains	501
Subdomains	501
Fully Qualified Domain Names	502
Resolvers	502
DNS Resource Records	503
The Structure of DNS Database Files	504
Using NSLOOKUP to Find a Machine on the Network	504
Using host and dig	505
sendmail Mail Administration	506
Monitoring sendmail Performance	507
Networked Mail Directories	507
NIS+ (Network Information Service Plus) Administration	509
NFS (Network File System) Administration	509
Checking RPC	509
Setting Up NFS	510
NFS Security	512
Secure NFS	513
Troubleshooting NFS Problems	514
Firewalls, Proxy Servers, and Web Security	514
Firewalls for UNIX	514
Keeping Your Network Safe	516
Intrusion Detection	517
Proxy Servers	517
Summary	518
How to Find Out More	518
18 Using UNIX and Windows Together	521
Moving to UNIX If You Are a Windows User	522
Differences Between Windows and the UNIX System	522
Similarities Between UNIX and Windows	528
Networking UNIX and Windows Machines	528
Terminal Emulation	529
Logging In to Your UNIX System from Your PC	529
Microsoft Windows Terminal Emulators	529
Running Windows Applications and Tools on UNIX Machines	531
Running DOS and Windows Emulators Under UNIX	532

Sharing Files and Applications Across UNIX and Windows Machines	533
Accessing Your UNIX Files from a Windows Machine	533
Using UNIX Servers in Windows Networks	535
Virtual Network Computing (VNC)	536
Running UNIX Applications on DOS/Windows Machines	536
Running an X Window System Server on Your Windows PC	536
Using Tools to Emulate a UNIX Environment	537
UNIX Kernel Built-in Capabilities	540
Running UNIX and Windows Together on the Same Machine	540
Partitioning a Hard Disk for Use by both UNIX and Windows	540
VMware	541
A Simple Solution for Sharing UNIX and Windows Environments	542
Summary	542
How to Find Out More	543
Books on Using Windows and UNIX Together	543
Journals That Cover Using Windows and UNIX Together	544
Online Information About Using Windows and UNIX Together . . .	544

Part V Tools and Programming

19 Filters and Utilities	547
Finding Patterns in Files	548
grep	548
fgrep	551
egrep	552
Compressing and Packaging Files	553
pack	553
compress	554
gzip	554
tar	555
Counting Lines, Words, and File Size	555
wc	555
nl	556
Working with Columns and Fields	556
cut	556
colrm	559
paste	559
join	561
Sorting the Contents of Files	562
sort	562
uniq	564
Comparing Files	565
cmp	566
comm	566

diff	566
patch	567
dircmp	567
Examining File Contents	568
od	568
strings	568
tac	569
Editing and Formatting Files	569
pr	570
fmt	571
tr	571
spell	573
Saving Output	574
tee	574
script	575
mail	575
Working with Dates and Times	576
date	576
touch	577
Performing Mathematical Calculations	578
bc	578
dc	581
Summary	583
How to Find Out More	584
20 Shell Scripting	585
The Shell Language vs. Other Programming Languages	585
A Sample Shell Script	586
Executing Your Script	587
Other Ways to Execute Scripts	587
Specifying Which Shell to Use	587
Explicitly Invoking the Shell	587
Running Scripts in the Current Shell	588
Putting Comments in Shell Scripts	588
Working with Variables	589
Special Variable Expansions	590
Special Variables for Shell Programs	591
Arrays and Lists	592
Working with Strings	592
Using Command-Line Arguments	593
Shifting Positional Parameters	594
The set Command	595
Arithmetic Operations	595
Drawbacks of expr	596
Using let for Arithmetic	597

Conditional Execution	597
Testing Logical Conditions	598
Exiting from Scripts	601
if . . . elif . . . else Statements	601
case Statements	603
Writing Loops	604
for Loops	604
while and until Loops	605
break and continue	606
The true and false Commands	606
Printing Menus with select	606
Shell Input and Output	607
The echo Command	607
The read Command	608
Here Documents	609
Creating Functions	609
Further Scripting Techniques	610
Command-Line Options in Shell Scripts	610
Grouping Commands	611
The trap Command	613
The xargs Command	614
Debugging Shell Programs	615
Summary	616
How to Find Out More	616
21 awk and sed	617
Versions of awk	618
How awk Works	618
Default Patterns and Actions	619
Working with Fields	619
Using Standard Input and Output	620
Running an awk Program from a File	620
Multiline Programs	621
Specifying Patterns	622
Regular Expressions	622
Comparison Operators	624
Compound Patterns	625
Range Patterns	625
BEGIN and END	626
Specifying Actions	626
Variables	626
Working with Strings	628
Working with Numbers	629
Arrays	629
Control Statements	630
User-Defined Functions	632

Input and Output	633
Getting Input	634
Using Command-Line Arguments	634
Printing Output	635
Sending Output to Files	636
sed	636
How sed Works	636
Selecting Lines	637
Editing Commands	637
Replacing Strings	637
Using sed and awk Together	638
Troubleshooting Your awk Programs	640
Summary	641
How to Find Out More	641
22 Perl	643
Obtaining Perl	643
Running Perl Scripts	644
Perl Syntax	644
Scalar Variables	645
Working with Numbers	645
Working with Strings	646
Variable Scope	648
Reading in Variables from Standard Input	648
Arrays and Lists	649
Reading and Printing Arrays	650
Modifying Arrays	650
Array Slices	651
Sorting Arrays	651
Hashes	652
Working with Hashes	652
Control Structures	653
if Statements	653
while Loops	655
foreach Loops	656
for Loops	656
Defining Your Own Procedures	656
File I/O	657
Standard I/O	657
Using Filename Arguments	657
Opening Files	658
Opening Command Pipes	659
Working with Files	659
Regular Expressions	661
Pattern Matching	661
Constructing Patterns	661

Saving Matches	661
Substitutions	663
Translations	663
More Uses for Regular Expressions	664
A Sample Program	665
Perl Modules	667
Using Perl for CGI Scripting	667
Troubleshooting	669
Summary	671
How to Find Out More	672
23 Python	675
Installing Python	675
Running Python Commands	676
Python Syntax	676
Using Python Modules	677
Variables	677
Numbers	677
Strings	679
Lists	682
List Slices	682
Dictionaries	683
Control Structures	685
if Statements	685
for Loops	686
while Loops	686
Defining Your Own Functions	687
Variable Scope	687
Input and Output	688
Getting Input from the User	688
File I/O	689
Standard Input, Output, and Error	690
Using Filename Arguments	691
Interacting with the UNIX System	692
File Manipulation	692
Running UNIX Commands	692
Opening Pipelines	693
Regular Expressions	693
Pattern Matching	693
Constructing Patterns	694
Saving Matches	694
Finding a List of Matches	695
Splitting a String	696
Substitutions	696

Creating Simple Classes	696
Exceptions	697
Troubleshooting	698
Summary	700
How to Find Out More	702
24 C and C++ Programming Tools	703
Obtaining C/C++ Development Tools	703
The gcc Compiler	704
Compiling C Programs Using gcc	704
Compiling C++ Programs Using gcc and g++	705
Useful gcc Options	706
Creating and Including Libraries	706
Inside gcc	708
Makefiles	709
A Short Makefile	709
Makefile Syntax	710
Makefiles with Multiple Dependencies	711
A Complex C++ Makefile	713
Non-Programming Makefiles	714
The gdb Debugger	714
Launching gdb	714
Common gdb Commands	716
Debugging with gdb	716
Source Control with cvs	720
Obtaining CVS	720
Configuring Your Environment and Repository	720
Adding a Project	721
Checking Out Source Files	721
Working with Files	722
Manual Pages	723
Other Development Tools	725
Summary	726
How to Find Out More	727
25 An Overview of Java	729
Object-Oriented Programming	729
Bytecode and the Java Virtual Machine (JVM)	730
Applications and Applets	730
The Java Development Kit (JDK)	730
A Simple Java Application	731
Create the Source File	731
Compile the Source File	731
Invoke the Java Interpreter	732

The Eclipse IDE	732
The Java Language	732
Comments	732
Simple Types	733
Arrays	734
Operators	734
Control Statements	735
Creating Classes and Objects	737
Class Inheritance	738
Method Overriding	739
Static Methods and Variables	741
Interfaces	741
Packages	742
Strings	743
Vectors	743
Exceptions	744
A Simple Java Applet	746
Create the HTML Source File	746
Create and Compile the Java Source File	746
Invoke the Applet Viewer	747
The Abstract Window Toolkit (AWT)	748
Event Handling	749
Multithreaded Programming	750
Summary	751
How to Find Out More	752

Part IV Enterprise Solutions

26 UNIX Applications and Databases	755
Commercially Available Software Packages	755
Open-Source Software	756
About Specific Packages Mentioned	757
Horizontal Applications	757
Office Automation Packages	758
Word Processing and Desktop Publishing Programs	761
Text Editors	761
Text Formatters	762
Spreadsheet Applications	765
Database Management Software	765
Drawing Applications	768
Graphing Applications	770
Image Manipulation and Viewing	771
Audio Applications	773
Movie Players	775
Other Multimedia Tools	777

Games	778
Internet Applications	780
Software for Mathematical Computations	788
UNIX Scientific and Engineering Applications	788
Software for Running Windows Applications on UNIX Machines	788
Summary	789
How to Find Out More	789
Commercial Software Lists	789
Books on UNIX Open-Source Software	789
Journals Regarding UNIX Software	789
Web Sites for Software Information and Downloads	790
27 Web Development under UNIX	791
History of the Web and Web Standards	792
The Early Web	792
The Dynamic Web	794
HTML Standards	794
HTML Syntax Basics	796
A Minimum Document	796
A Proper Minimum Document	796
Headings	798
Paragraphs	799
Hypertext Links	800
Inline Images	800
Image Maps	801
Named Anchors	801
Lists	802
Phrase Markup	804
Preformatted Text	806
Comments	807
Line Breaks	807
Horizontal Rules	807
Forms	808
JavaScript and the Document Object Model	808
Introduction to JavaScript Usage	810
The Document Object Model	812
Cascading Style Sheets	813
Server-Side Web Applications	817
The Common Gateway Interface	817
PHP: Hypertext Preprocessor	822
Web Authoring Software	827
Office Suites and Filters	828
Dedicated Web Page Editors	828
Summary	830
How to Find Out More	830

A How to Use the man (Manual) Pages	833
Using the Manual Pages	833
The man Command	834
The Structure of a Manual Page	838
Permuted Indexes	841
Online Manual Pages on the Web	843