

Introduction **1**

1.1 Linux Versus Unix 2

1.2 Kernel Architecture 3

1.3 Guide 5

1.4 Typographical Conventions 8

Development of Unix **9**

2.1 Academic Versions 9

2.2 Commercial Breakthrough 11

2.3 PC Unix Variants 14

2.4 Free Unix Distributions 15

Operating Linux **17**

3.1 Login, Logout, Shutdown 18

3.1.1 Virtual Consoles 20

3.2 Quick Lead-in 21

3.3 Command Interpreter 26

3.3.1 Command Syntax 27

3.3.2 Environment Variables 28

3.3.3 Editing the Command Line 29

3.3.4 Wildcards 30

3.3.5 Redirecting the Input and Output 31

3.3.6 Command Sequences and Background Processes 32

3.3.7 Pipelines 34

3.4 User Profiles 34

3.5 Online Help 35

Programs and Processes 39

4.1	Process Monitoring	40
4.1.1	ps	41
4.1.2	top	42
4.1.3	time	43
4.2	Creating Processes	45
4.3	Process Signals	45
4.4	Independent Processes	47
4.5	Process Priority	48
4.6	Daemons	49
4.6.1	Interval Controlled Daemons	50
4.6.2	Signal Controlled Daemons	51

Files and File Systems 55

5.1	File Systems	55
5.2	The Directory Tree	57
5.3	File Types	61
5.4	File Attributes	62
5.5	Device Files	65
5.6	Device Administration	68
5.6.1	Keyboard Adaption	68
5.6.2	Graphics Mode	69
5.6.3	Hard Disk Administration	70
5.6.4	CD-ROM Operation	72
5.6.5	Diskette (Floppy) Operation	72
5.6.6	Magnetic Tape Drives	74
5.6.7	Serial Connections	75
5.6.8	Printer Administration	77
5.6.9	Ethernet Configuration	78
5.6.10	Audio Configuration	81

File Oriented Commands 83

6.1	Changing the Working Directory: cd	83
6.1.1	Displaying the Working Directory: pwd	84
6.2	Creating and Removing	85
6.2.1	Creating Directories: mkdir	86

6.2.2	Removing Directories: rmdir	86
6.2.3	Creating Files	87
6.2.4	Removing Files: rm	89
6.3	Displaying Contents	90
6.3.1	Information on File Systems: mount and df . .	90
6.3.2	Directory Information: ls and du	91
6.3.3	File Type Identification: file	93
6.3.4	Displaying Files: cat , head and tail	94
6.3.5	Displaying Text Files: more	97
6.3.6	Displaying Binary Files: od , nm and strings .	98
6.4	Renaming Entries	102
6.5	Changing Attributes	104
6.5.1	Changing Access Permissions: chmod	105
6.5.2	Changing File Owners: chown	106
6.5.3	Changing the Group Identification: chgrp . . .	107
6.5.4	Modifying Time Stamps: touch	108
6.6	Copying, Saving, Reloading	109
6.6.1	Copying Files: cp	110
6.6.2	Archive Programs: cpio and tar	111
6.6.3	Copying and Converting: dd	116
6.6.4	Saving Files and File Systems: dump	117
6.6.5	Restoring Files and File Systems: restore . .	118
6.7	Searching, Comparing, Sorting	119
6.7.1	Searching for File Names: find	120
6.7.2	Searching for File Contents: grep	122
6.7.3	Comparing File Contents: cmp and diff	123
6.7.4	Sorting Text Files: sort	125
6.8	Formatting Files	127
6.8.1	Preparing Printer Output: pr	128
6.8.2	Tab Conversion: expand and unexpand	129
6.8.3	Breaking Text Lines: fold	130
6.8.4	Merging Text Files: paste	131
6.8.5	Cutting Columns: cut	131
6.8.6	List Processing: awk	132
6.8.7	Character Translation: tr	136
6.9	Data Compression	137
6.9.1	LZC Compression: compress and uncompress	138
6.9.2	LZ77 Compression: gzip and gunzip	140

6.10	Regular Expressions	142
6.10.1	Basic Regular Expressions	142
6.10.2	Range Information	142
6.10.3	Word and Line Limits	143
6.10.4	Repetitions	144
6.10.5	Chaining Regular Expressions	144

Editors 145

7.1	The Stream Editor sed	147
7.1.1	sed Addresses	148
7.1.2	sed Commands	149
7.2	The Screen Editor vi	153
7.2.1	Starting and Quitting vi	154
7.2.2	vi Operation Modes	156
7.2.3	Input and Replacement Modes	156
7.2.4	Moving the Cursor	157
7.2.5	Deleting, Replacing, Copying	159
7.2.6	Marks, Keyboard Sequences, Abbreviations	161
7.2.7	ex Commands	162
7.2.8	Searching and Replacing	163
7.2.9	vi Options	163
7.3	GNU Emacs	165
7.3.1	Starting and Quitting Emacs	166
7.3.2	Basic Commands	168
7.3.3	Moving the Cursor	168
7.3.4	Deleting	169
7.3.5	Marking	170
7.3.6	Searching	171
7.3.7	Replacing	171
7.3.8	Restoring	172
7.3.9	Loading and Saving Files	173
7.3.10	Switching Buffers	174
7.3.11	Window Commands	174
7.3.12	Command Sequences	175
7.3.13	Repeat Execution	175
7.3.14	Abbreviations	176
7.3.15	Online Help	177

7.3.16 Modes 178

7.3.17 Application Packages 179

7.3.18 Miscellaneous 181

7.3.19 The GNU Emacs as an X Application 183

Shell Programs 187

8.1 Linux Shells 188

8.2 **bash** and **ksh** 189

8.2.1 Variables 191

8.2.2 Input and Output 196

8.2.3 Branches 198

8.2.4 Loops 201

8.2.5 Functions 203

8.2.6 Starting Shell Programs 204

8.2.7 Signals 205

8.2.8 Shell Internal Functions 205

8.2.9 External Help Programs 208

8.3 **tcsh** Programs 210

8.3.1 **tcsh** Variables 211

8.3.2 Input and Output 214

8.3.3 Branches 215

8.3.4 Loops 216

8.3.5 Jump Command 217

8.3.6 Signals 217

Networked Systems 219

9.1 Network Topologies 220

9.2 Protocol Families 222

9.3 OSI 225

9.4 TCP/IP 227

9.5 System Addresses 229

9.5.1 Internet Addresses 230

9.5.2 Domain Addresses 232

9.6 Network Services 233

9.7 Network Configuration 234

9.7.1 Serial Login 235

9.7.2	SLIP Connections	235
9.7.3	PPP Connections	236

TCP/IP Applications 241

10.1	Network Analysis	241
10.2	telnet	243
10.3	Berkeley r Utilities	244
10.3.1	rlogin Remote Login	245
10.3.2	rsh Remote Shell	246
10.3.3	rcp Remote Copy	246
10.4	Terminal Emulators	247
10.5	File Transfer	250
10.5.1	ftp	251
10.5.2	Anonymous ftp	253
10.6	Electronic Mail	255
10.6.1	Mail Protocols	255
10.6.2	Linux MTAs	256
10.6.3	Linux MUAs	257
10.6.4	Graphic Linux MUAs	260
10.6.5	Mailbox Systems	262
10.7	News	262
10.7.1	Linux News Clients	264
10.7.2	Off-line News	265
10.8	Dialog Programs	266
10.8.1	talk and ytalk	266
10.8.2	Internet Relay Chat	267
10.9	Information Systems	268
10.9.1	FTP Search Help	269
10.9.2	Gopher	270
10.9.3	World Wide Web	271

X Window System 277

11.1	Window Systems	277
11.2	Architecture of X11	280
11.3	Widgets	281
11.4	Working with X11	283

11.4.1	Starting and Killing the X Server	283
11.4.2	X Server Addresses and Access Permissions . .	286
11.4.3	MIT X Clients	287
11.5	X Resources	289
11.6	X Fonts	293
11.7	X Colors	294

X Window Manager 299

12.1	Tab Window Manager twm and ctwm	301
12.1.1	twm Decorations and Functions	301
12.1.2	twm Configuration	302
12.1.3	Variable Section	303
12.1.4	Binding Section	303
12.1.5	Menu Section	304
12.2	OpenLook WMs olwm and olvwm	304
12.2.1	olwm Decorations and Functions	305
12.2.2	olwm Configuration	307
12.3	F(?) Virtual Window Manager fvwm	308
12.3.1	fvwm Decorations and Functions	309
12.3.2	fvwm Configuration	311
12.3.3	Color Information	312
12.3.4	General Parameters	312
12.3.5	Path Names	313
12.3.6	Style Options	313
12.3.7	Function Definitions	314
12.3.8	Menu Definitions	315
12.3.9	Keyboard and Mouse Bindings	317
12.3.10	Module Options	318

Bibliography 319

Index 321