Table of Contents

Pre	eface	
1.	Beginning bash	
	1.1 Why bash?	2
	1.2 The bash Shell	3
	1.3 Decoding the Prompt	4
	1.4 Showing Where You Are	
	1.5 Finding and Running Commands	
	1.6 Getting Information About Files	
	1.7 Showing All Hidden (Dot) Files in the Current Directory	11
	1.8 Using Shell Quoting	13
	1.9 Using or Replacing Builtins and External Commands	15
	1.10 Determining if You Are Running Interactively	17
	1.11 Setting bash as Your Default Shell	18
	1.12 Keeping bash Updated	20
	1.13 Getting bash for Linux	21
	1.14 Getting bash for xBSD	22
	1.15 Getting bash for macOS	
	1.16 Getting bash for Unix	
	1.17 Getting bash for Windows	26
4	1.18 Getting bash Without Getting bash	29
	1.19 Learning More About bash Documentation	30
2.	Standard Output	33
	2.1 Writing Output to the Terminal/Window	34
	2.2 Writing Output but Preserving Spacing	
	2.3 Writing Output with More Formatting Control	36
	2.4 Writing Output Without the Newline	38

	2.5 Saving Output from a Command	39
	2.6 Saving Output to Other Files	40
	2.7 Saving Output from the ls Command	41
	2.8 Sending Output and Error Messages to Different Files	42
	2.9 Sending Output and Error Messages to the Same File	43
	2.10 Appending Rather than Clobbering Output	45
	2.11 Using Just the Beginning or End of a File	46
	2.12 Skipping a Header in a File	46
	2.13 Throwing Output Away	47
	2.14 Saving or Grouping Output from Several Commands	48
	2.15 Connecting Two Programs by Using Output as Input	50
	2.16 Saving a Copy of Output Even While Using It as Input	51
	2.17 Connecting Two Programs by Using Output as Arguments	53
	2.18 Using Multiple Redirects on One Line	55
	2.19 Saving Output When Redirect Doesn't Seem to Work	56
	2.20 Swapping STDERR and STDOUT	58
	2.21 Keeping Files Safe from Accidental Overwriting	59
	2.22 Clobbering a File on Purpose	61
	: The bash Shell	
3.	Standard Input	63
	3.1 Getting Input from a File	63
	3.2 Keeping Your Data with Your Script	64
	3.3 Preventing Weird Behavior in a Here-Document	66
	3.4 Indenting Here-Documents	67
	3.5 Getting User Input	68
	3.6 Getting Yes or No Input	70
	3.7 Selecting from a List of Options	73
	3.8 Prompting for a Password	74
4.	Executing Commands	77
	4.1 Running Any Executable GRAx tolt desd gaine DA	77
	4.2 Running Several Commands in Sequence	80
	4.3 Running Several Commands All at Once	81
	4.4 Telling Whether a Command Succeeded or Not	82
	4.5 Running a Command Only if Another Command Succeeded	84
	4.6 Using Fewer if Statements	85
	4.7 Running Long Jobs Unattended	87
	4.8 Displaying Error Messages When Failures Occur	88
	4.9 Running Commands from a Variable Washings Taylor Department	89
	4.10 Running All Scripts in a Directory and galvesses and and another galvess.	90

5.	Basic Scripting: Shell Variables	93
	5.1 Documenting Your Script	95
	5.2 Embedding Documentation in Shell Scripts	96
	5.3 Promoting Script Readability	98
	5.4 Separating Variable Names from Surrounding Text	100
	5.5 Exporting Variables	101
	5.6 Seeing All Variable Values	103
	5.7 Using Parameters in a Shell Script	104
	5.8 Looping Over Arguments Passed to a Script	106
	5.9 Handling Parameters with Spaces	107
	5.10 Handling Lists of Parameters with Spaces	109
	5.11 Counting Arguments	111
	5.12 Consuming Arguments	113
	5.13 Getting Default Values	115
	5.14 Setting Default Values	116
	5.15 Using null as a Valid Default Value	117
	5.16 Using More than Just a Constant String for Default	118
	5.17 Giving an Error Message for Unset Parameters	120
	5.18 Changing Pieces of a String	122
	5.19 Getting the Absolute Value of a Number	144
	5.20 Using bash for basename	125
	5.21 Using bash for dirname	126
	5.22 Using Alternate Values for Comma Separated Values	127
	5.23 Using Array Variables	128
	5.24 Converting Between Upper- and Lowercase	129
	5.25 Converting to Camel Case	130
6.	Shell Logic and Arithmetic	. 133
	6.1 Doing Arithmetic in Your Shell Script	133
	6.2 Branching on Conditions	136
	6.3 Testing for File Characteristics	140
	6.4 Testing for More than One Thing	143
	6.5 Testing for String Characteristics	144
	6.6 Testing for Equality	145
	6.7 Testing with Pattern Matches	147
	6.8 Testing with Regular Expressions	149
	6.9 Changing Behavior with Redirections	152
	6.10 Looping for a While	153
	6.11 Looping with a read	155
	6.12 Looping with a Count	157
	6.13 Looping with Floating-Point Values	159
	6.14 Branching Many Ways	160

	6.15 Parsing Command-Line Arguments	162
	6.16 Creating Simple Menus	165
	6.17 Changing the Prompt on Simple Menus	167
	6.18 Creating a Simple RPN Calculator	168
	6.19 Creating a Command-Line Calculator	171
7.	Intermediate Shell Tools I	175
	7.1 CiGing Thomash Files Cons Chains	176
	7.2 Catting Loot the Filmons from a Same	178
	7.2 C. Winner Circula Trans (F. L. Comma Count)	179
	7.4.C	100
	TED: 0 1: D: 1:	181
	7 (Daving Day With at the County Finds	182
	776 1: 11 M C 1 D 1	184
	TO 0 1: C CONT	185
	7.8 Searching for an SSN 7.9 Grepping Compressed Files	186
	7.10 Keeping Some Output, Discarding the Rest	187
	7.11 Varian Onland Destinant Outrast	188
	7.10 Described and Taylor Frank Line	189
	7.12 Commission of List of Novemberry	191
	714C .: C: XII ::1 1	100
	7.15 Counting Chair a William Mile hash	194
	7.16 Charles Data as Original Francisco	196
	717 A. F. III.	198
	7.17 An Easy Histogram with bash 7.18 Showing a Paragraph of Text After a Found Phrase	199
	The showing a range april of reactifies a round range of some second and	12 7
8.	Intermediate Shell Tools II	. 201
	8.1 Sorting Your Output	201
	8.2 Sorting Numbers	202
	8.3 Sorting IP Addresses	204
	8.4 Cutting Out Parts of Your Output	206
	8.5 Removing Duplicate Lines	208
	8.6 Compressing Files	209
	8.7 Uncompressing Files	211
	8.8 Checking a tar Archive for Unique Directories	213
	8.9 Translating Characters	214
	8.10 Converting Uppercase to Lowercase	215
	8.11 Converting DOS Files to Linux Format	216
	8.12 Removing Smart Quotes	217
	8.13 Counting Lines, Words, or Characters in a File	210
	8.14 Rewrapping Paragraphs	219
	8.15 Doing More with less	220

9.	Finding Files: find, locate, slocate	223
	9.1 Finding All Your MP3 Files	224
	9.2 Handling Filenames Containing Odd Characters	225
	9.3 Speeding Up Operations on Found Files	227
	9.4 Finding Files Across Symbolic Links	227
	9.5 Finding Files Irrespective of Case MIMITH 60002 600000 E.S.	228
	9.6 Finding Files by Date	229
	9.7 Finding Files by Type	230
	9.8 Finding Files by Size Management Speed of the Transport of the State of the Sta	231
	9.9 Finding Files by Content Yam Any of the base of the general V.8	232
	9.10 Finding Existing Files and Content Fast	233
	9.11 Finding a File Using a List of Possible Locations	234
10.	Additional Features for Scripting	239
38	10.1 "Daemon-izing" Your Script	239
	10.2 Reusing Code with Includes and Sourcing	240
	10.3 Using Configuration Files in a Script and additional additional and additional additio	242
	10.4 Defining Functions	243
	10.5 Using Functions: Parameters and Return Values	245
	10.6 Trapping Interrupts	248
	10.7 Redefining Commands with alias	252
	10.8 Avoiding Aliases and Functions	254
	10.9 Counting Elapsed Time	256
	10.10 Writing Wrappers	257
11.	Working with Dates and Times	263
2.5	11.1 Formatting Dates for Display	264
	11.2 Supplying a Default Date HTASE supply a point of E.P.	265
	11.3 Automating Date Ranges	267
	11.4 Converting Dates and Times to Epoch Seconds	
	11.5 Converting Epoch Seconds to Dates and Times (1990) (1990)	
	11.6 Getting Yesterday or Tomorrow with Perl	
	11.7 Figuring Out Date and Time Arithmetic	
	11.8 Handling Time Zones, Daylight Saving Time, and Leap Years	
	11.9 Using date and cron to Run a Script on the Nth Day	
	11.10 Logging with Dates	278
12.	End-User Tasks as Shell Scripts	
Ka	12.1 Starting Simple by Printing Dashes	
	12.2 Viewing Photos in an Album	
	12.3 Loading Your MP3 Player	
	12.4 Burning a CD	295

	1 0	298
12	Finding All Your MP3 Files	202
15.	Parsing and Similar Tasks	
		303
		307
		309
		310
	13.5 Parsing Output with a Function Call	312
	13.6 Parsing Text with a read Statement	314
	13.7 Parsing with read into an Array	315
	13.8 Reading an Entire File	315
	13.9 Getting Your Plurals Right and aldress to talk a gast U slift a gailbail 119	317
	13.10 Taking It One Character at a Time	319
		320
		321
	13.13 Isolating Specific Fields in Data of how as bullet drive show a filter of the	323
		326
		327
	13.16 Compressing Whitespace	331
		333
	13.18 Processing Files with No Line Breaks	335
	13.19 Converting a Datafile to CSV	337
	13.20 Parsing a CSV Datafile	338
	13.20 Tarsing a Co v Datame	330
14	Writing Secure Shell Scripts	341
52		343
		344
	14.3 Setting a Secure \$PATH	345
	14.4 Clearing All Aliases	347
		348
	14.6 Preventing Core Dumps	349
		350
		350
	14.9 Finding World-Writable Directories in Your \$PATH	352
		354
	14.11 Using Secure Temporary Files	355
	14.12 Validating Input	360
		362
	14.14 Leaking Passwords into the Process List	364
	14.15 Writing setuid or setgid Scripts MadiA as all actoring galwait CA	365
	14.16 Restricting Guest Users	366
	14.17 Using chroot Jails	368

	14.18 Running as a Non-root User	370
	14.19 Using sudo More Securely	371
	14.20 Using Passwords in Scripts	
	14.21 Using SSH Without a Password	374
	14.22 Restricting SSH Commands	383
	14.23 Disconnecting Inactive Sessions	
	20 Using Initialization Files Correctly resylved to along nominal requirements	
15.	Advanced Scripting	387
	15.1 Finding bash Portably for #!	388
	15.2 Setting a POSIX \$PATH	390
	15.3 Developing Portable Shell Scripts	391
	15.4 Testing Scripts Using Virtual Machines	393
	15.5 Using for Loops Portably	396
	15.6 Using echo Portably	397
	15.7 Splitting Output Only When Necessary	400
	15.8 Viewing Output in Hex	
	15.9 Using bash Net-Redirection	
	15.10 Finding My IP Address	405
	15.11 Getting Input from Another Machine	410
	15.12 Redirecting Output for the Life of a Script	411
	15.13 Working Around "Argument list too long" Errors	
	15.14 Logging to syslog from Your Script	
	15.15 Using logger Correctly	415
	15.16 Sending Email from Your Script	416
	15.17 Automating a Process Using Phases	
	15.18 Doing Two Things at Once	424
	15.19 Running an SSH command on multiple hosts	426
16.	Configuring and Customizing bash	429
	16.1 bash Startup Options	430
	16.2 Customizing Your Prompt	430
	16.3 A Prompt Before Your Program Runs	439
	16.4 Changing Your \$PATH Permanently	441
	16.5 Changing Your \$PATH Temporarily	442
	0	
	16.7 When Programs Are Not Found	
	16.8 Shortening or Changing Command Names and and Spanish and State of the State of	
	16.9 Adjusting Shell Behavior and Environment	452
	16.10 Adjusting readline Behavior Using .inputrc	
	16.11 Keeping a Private Stash of Utilities by Adding ~/bin	
	16.12 Using Secondary Prompts: \$PS2, \$PS3, \$PS4 1100 fand and guidasquid	456
	16.13 Synchronizing Shell History Between Sessions and Bounday and Bounday	458

	16.14 Setting Shell History Options	459
	16.15 Creating a Better cd Command	111
	16.16 Creating and Changing Into a New Directory in One Step	463
	16.17 Getting to the Bottom of Things	465
	16.18 Adding New Features to bash Using Loadable Builtins	466
	16.19 Improving Programmable Completion	471
	16.20 Using Initialization Files Correctly	477
	16.21 Creating Self-Contained, Portable rc Files	480
	16.22 Getting Started with a Custom Configuration	
17.	Housekeeping and Administrative Tasks	
	17.1 Renaming Many Files	499
	17.2 Using GNU Texinfo and info on Linux	
	17.3 Unzipping Many ZIP Files	
	17.4 Recovering Disconnected Sessions Using screen	
	17.5 Sharing a Single bash Session	506
	17.6 Logging an Entire Session or Batch Job	507
	17.7 Clearing the Screen When You Log Out	508
	17.8 Capturing File Metadata for Recovery	510
	17.9 Creating an Index of Many Files	
	17.10 Using diff and patch	
	17.11 Counting Differences in Files	516
	17.12 Removing or Renaming Files Named with Special Characters	518
	17.13 Prepending Data to a File	519
	17.14 Editing a File in Place	522
	17.15 Using sudo on a Group of Commands	
	17.16 Finding Lines That Appear in One File but Not in Another	526
	17.17 Keeping the Most Recent N Objects	529
	17.18 Writing to a Circular Log	533
	17.19 Circular Backups and Inch and Inc	535
	17.20 Grepping ps Output Without Also Getting the grep Process Itself	538
	17.21 Finding Out Whether a Process Is Running	
	17.22 Adding a Prefix or Suffix to Output	541
	17.23 Numbering Lines	542
	17.24 Writing Sequences	
	17.25 Emulating the DOS Pause Command	547
	17.26 Commifying Numbers	
18.	Working Faster by Typing Less	
	18.1 Moving Quickly Among Arbitrary Directories	
	18.2 Repeating the Last Command 298 2292 2290009 VISB 10002 2018 U.S.	
	18.3 Running Almost the Same Command Translet Hall and Manager 18.3	

	18.4 Quick Substitution	556
	18.5 Reusing Arguments	557
	18.6 Finishing Names for You	558
	18.7 Playing It Safe	559
	18.8 Big Changes, More Lines	561
19.	Tips and Traps: Common Goofs for Novices	563
	19.1 Forgetting to Set Execute Permissions	563
	19.2 Fixing "No such file or directory" Errors	564
	19.3 Forgetting That the Current Directory Is Not in the \$PATH	566
	19.4 Naming Your Script "test"	567
	19.5 Expecting to Change Exported Variables	568
	19.6 Forgetting Quotes Leads to "command not found" on Assignments	570
	19.7 Forgetting that Pattern Matching Alphabetizes	571
	19.8 Forgetting that Pipelines Make Subshells	572
	19.9 Making Your Terminal Sane Again	575
	19.10 Deleting Files Using an Empty Variable	576
	19.11 Seeing Odd Behavior from printf	577
	19.12 Testing bash Script Syntax	579
	19.13 Debugging Scripts	580
	19.14 Avoiding "command not found" When Using Functions	582
	19.15 Confusing Shell Wildcards and Regular Expressions	583
A.	Reference Lists	585
B.	Examples Included with bash	621
C.	Command-Line Processing	631
D.	Revision Control	637
E.	Building bash from Source	667
Inc	dex	673