

# Linux Command Line and Shell Scripting

# BIBLE

4th Edition

Richard Blum  
Christine Bresnahan

WILEY

# Table of Contents

[Cover](#)

[Title Page](#)

[Copyright](#)

[Dedication](#)

[About the Authors](#)

[About the Technical Editor](#)

[Acknowledgments](#)

[Introduction](#)

[Who Should Read This Book](#)

[How This Book Is Organized](#)

[Minimum Requirements](#)

[Where to Go from Here](#)

[Part I: The Linux Command Line](#)

[CHAPTER 1: Starting with Linux Shells](#)

[Investigating Linux](#)

[Examining Linux Distributions](#)

[Summary](#)

[CHAPTER 2: Getting to the Shell](#)

[Reaching the Command Line](#)

[Accessing CLI via a Linux Console Terminal](#)

[Accessing CLI via Graphical Terminal Emulation](#)

[Using the GNOME Terminal Emulator](#)

[Using the Konsole Terminal Emulator](#)

[Using the xterm Terminal Emulator](#)

[Summary](#)

## CHAPTER 3: Basic Bash Shell Commands

[Starting the Shell](#)

[Using the Shell Prompt](#)

[Interacting with the Bash Manual](#)

[Navigating the Filesystem](#)

[Listing Files and Directories](#)

[Handling Files](#)

[Managing Directories](#)

[Viewing File Contents](#)

[Summary](#)

## CHAPTER 4: More Bash Shell Commands

[Monitoring Programs](#)

[Monitoring Disk Space](#)

[Working with Data Files](#)

[Summary](#)

## CHAPTER 5: Understanding the Shell

[Investigating Shell Types](#)

[Exploring Parent and Child Shell Relationships](#)

[Understanding External and Built-In Commands](#)

[Summary](#)

## CHAPTER 6: Using Linux Environment Variables

[Exploring Environment Variables](#)

[Setting User-Defined Variables](#)

[Removing Environment Variables](#)

[Uncovering Default Shell Environment Variables](#)

[Setting the PATH Environment Variable](#)

[Locating System Environment Variables](#)

[Learning about Variable Arrays](#)

[Summary](#)

## [CHAPTER 7: Understanding Linux File Permissions](#)

[Exploring Linux Security](#)

[Using Linux Groups](#)

[Decoding File Permissions](#)

[Changing Security Settings](#)

[Sharing Files](#)

[Access Control Lists](#)

[Summary](#)

## [CHAPTER 8: Managing Filesystems](#)

[Exploring Linux Filesystems](#)

[Working with Filesystems](#)

[Managing Logical Volumes](#)

[Summary](#)

## [CHAPTER 9: Installing Software](#)

[Exploring Package Management](#)

[Inspecting the Debian-Based Systems](#)

[The Red Hat-Based Systems](#)

[Managing Software Using Containers](#)

[Installing from Source Code](#)

[Summary](#)

## [CHAPTER 10: Working with Editors](#)

[Visiting the vim Editor](#)

[Navigating the nano Editor](#)

[Exploring the Emacs Editor](#)

[Exploring the KDE Family of Editors](#)

[Exploring the GNOME Editor](#)

[Summary](#)

## [Part II: Shell Scripting Basics](#)

### [CHAPTER 11: Basic Script Building](#)

[Using Multiple Commands](#)

[Creating a Script File](#)

[Displaying Messages](#)

[Using Variables](#)

[Redirecting Input and Output](#)

[Employing Pipes](#)

[Performing Math](#)

[Exiting the Script](#)

[Working through a Practical Example](#)

[Summary](#)

### [CHAPTER 12: Using Structured Commands](#)

[Working with the \*if-then\* Statement](#)

[Exploring the if-then-else Statement](#)

[Nesting ifs](#)

[Trying the test Command](#)

[Considering Compound Testing](#)

[Working with Advanced if-then Features](#)

[Considering the case Command](#)

[Working through a Practical Example](#)

[Summary](#)

### [CHAPTER 13: More Structured Commands](#)

[Looking at the \*for\* Command](#)

[Trying the C-Style for Command](#)

[Exploring the while Command](#)

[Using the until Command](#)

[Nesting Loops](#)

[Looping on File Data](#)

[Controlling the Loop](#)

[Processing the Output of a Loop](#)

[Working through a Few Practical Examples](#)

[Summary](#)

## [CHAPTER 14: Handling User Input](#)

[Passing Parameters](#)

[Using Special Parameter Variables](#)

[Being Shifty](#)

[Working with Options](#)

[Standardizing Options](#)

[Getting User Input](#)

[Working through a Practical Example](#)

[Summary](#)

## [CHAPTER 15: Presenting Data](#)

[Understanding Input and Output](#)

[Redirecting Output in Scripts](#)

[Redirecting Input in Scripts](#)

[Creating Your Own Redirection](#)

[Listing Open File Descriptors](#)

[Suppressing Command Output](#)

[Using Temporary Files](#)

[Logging Messages](#)

[Working through a Practical Example](#)

[Summary](#)

## [CHAPTER 16: Script Control](#)

[Handling Signals](#)

[Running Scripts in Background Mode](#)

[Running Scripts without a Hang-up](#)

[Controlling the Job](#)

[Being Nice](#)

[Running like Clockwork](#)

[Working through a Practical Example](#)

[Summary](#)

### [Part III: Advanced Shell Scripting](#)

#### [CHAPTER 17: Creating Functions](#)

[Exploring Basic Script Functions](#)

[Returning a Value from a Function](#)

[Using Variables in Functions](#)

[Investigating Array Variables and Functions](#)

[Considering Function Recursion](#)

[Creating a Library](#)

[Using Functions on the Command Line](#)

[Working Through a Practical Example](#)

[Summary](#)

#### [CHAPTER 18: Writing Scripts for Graphical Desktops](#)

[Creating Text Menus](#)

[Doing Windows](#)

[Getting Graphic](#)

[Working Through a Practical Example](#)

[Summary](#)

#### [CHAPTER 19: Introducing \*sed\* and \*gawk\*](#)

[Manipulating Text](#)

[Looking at the sed Editor Basic Commands](#)

[Working Through a Practical Example](#)  
[Summary](#)

## [CHAPTER 20: Regular Expressions](#)

[Exploring Regular Expressions](#)

[Defining BRE Patterns](#)

[Trying Out Extended Regular Expressions](#)

[Working Through Some Practical Examples](#)

[Summary](#)

## [CHAPTER 21: Advanced \*sed\*](#)

[Looking at Multiline Commands](#)

[Holding Space](#)

[Negating a Command](#)

[Changing the Flow](#)

[Replacing via a Pattern](#)

[Placing \*sed\* Commands in Scripts](#)

[Creating \*sed\* Utilities](#)

[Working Through a Practical Example](#)

[Summary](#)

## [CHAPTER 22: Advanced \*gawk\*](#)

[Using Variables](#)

[Working with Arrays](#)

[Considering Patterns](#)

[Structured Commands](#)

[Printing with Formats](#)

[Using Built-in Functions](#)

[Trying Out User-Defined Functions](#)

[Working Through a Practical Example](#)

[Summary](#)



## [CHAPTER 23: Working with Alternative Shells](#)

[Considering the Dash Shell](#)

[Looking at the Dash Shell Features](#)

[Scripting in Dash](#)

[Exploring the zsh Shell](#)

[Viewing Parts of the zsh Shell](#)

[Scripting with zsh](#)

[Working Through a Practical Example](#)

[Summary](#)

## [Part IV: Creating and Managing Practical Scripts](#)

### [CHAPTER 24: Writing Simple Script Utilities](#)

[Performing Backups](#)

[Managing Account Deletion](#)

[Monitoring Your System](#)

[Summary](#)

### [CHAPTER 25: Getting Organized](#)

[Understanding Version Control](#)

[Setting Up Your Git Environment](#)

[Committing with Git](#)

[Summary](#)

## [APPENDIX A: Quick Guide to Bash Commands](#)

[Reviewing Built-In Commands](#)

[Looking at Common Bash Commands](#)

[Assessing Environment Variables](#)

## [APPENDIX B: Quick Guide to \*sed\* and \*gawk\*](#)

[The \*sed\* Editor](#)

[The \*gawk\* Program](#)

[Index](#)

## [End User License Agreement](#)

# List of Tables

### Chapter 1

[TABLE 1-1 The SysVinit Runlevels](#)

[TABLE 1-2 Linux Filesystems](#)

[TABLE 1-3 Linux Shells](#)

[TABLE 1-4 Other Linux Graphical Desktops](#)

[TABLE 1-5 Core Linux Distributions](#)

[TABLE 1-6 Specialized Linux Distributions](#)

### Chapter 2

[TABLE 2-1 Graphical Interface Elements](#)

[TABLE 2-2 `setterm` Options for Foreground and Background Appearance](#)

[TABLE 2-3 Popular Graphical Terminal Emulator Packages](#)

[TABLE 2-4 The File Menu](#)

[TABLE 2-5 The Edit Menu](#)

[TABLE 2-6 The View Menu](#)

[TABLE 2-7 The Search Menu](#)

[TABLE 2-8 The Terminal Menu](#)

[TABLE 2-9 The Tabs Menu](#)

[TABLE 2-10 The File Menu](#)

[TABLE 2-11 The Edit Menu](#)

[TABLE 2-12 The View Menu](#)

[TABLE 2-13 The Bookmarks Menu](#)

[TABLE 2-14 The Settings Menu](#)

[TABLE 2-15 The Help Menu](#)

[TABLE 2-16 xterm Command-Line Parameters](#)

[TABLE 2-17 xterm +/- Command-Line Parameters](#)

## Chapter 3

[TABLE 3-1 The Linux Man Page Conventional Section Names](#)

[TABLE 3-2 The Linux Man Page Section Areas](#)

[TABLE 3-3 Common Linux Directory Names](#)

## Chapter 4

[TABLE 4-1 The ps Command Unix Parameters](#)

[TABLE 4-2 The ps Command BSD Parameters](#)

[TABLE 4-3 The ps Command GNU Parameters](#)

[TABLE 4-4 Linux Process Signals](#)

[TABLE 4-5 The mount Command Parameters](#)

[TABLE 4-6 The sort Command Parameters](#)

[TABLE 4-7 Linux File Compression Utilities](#)

[TABLE 4-8 The tar Command Functions](#)

[TABLE 4-9 The tar Command Options](#)

## Chapter 5

[TABLE 5-1 The bash Command-Line Options](#)

## Chapter 6

[TABLE 6-1 The Bash Shell Bourne Variables](#)

[TABLE 6-2 The Bash Shell Environment Variables](#)

## Chapter 7

[TABLE 7-1 The useradd Command-Line Parameters](#)

[TABLE 7-2 The `useradd` Change Default Values Parameters](#)

[TABLE 7-3 User Account Modification Utilities](#)

[TABLE 7-4 The `chage` Command Parameters](#)

[TABLE 7-5 Linux File Permission Codes](#)

[TABLE 7-6 The `chmod` SUID, SGID, and Sticky Bit Octal Values](#)

## Chapter 8

[TABLE 8-1 Journaling Filesystem Methods](#)

[TABLE 8-2 Common `fdisk` Commands](#)

[TABLE 8-3 Common `gdisk` Commands](#)

[TABLE 8-4 Command-Line Programs to Create Filesystems](#)

[TABLE 8-5 The `fsck` Commonly Used Command-Line Options](#)

[TABLE 8-6 The Growing and Shrinking LVM Commands](#)

## Chapter 10

[TABLE 10-1 vim Editing Commands](#)

[TABLE 10-2 nano Control Commands](#)

[TABLE 10-3 The KWrite Edit Menu Items](#)

[TABLE 10-4 The KWrite Tools](#)

[TABLE 10-5 The GNOME Desktop `gedit` Plugins](#)

## Chapter 11

[TABLE 11-1 The `expr` Command Operators](#)

[TABLE 11-2 Linux Exit Status Codes](#)

## Chapter 12

[TABLE 12-1 The `test` Numeric Comparisons](#)

[TABLE 12-2 The `test` String Comparisons](#)

[TABLE 12-3 The `test` File Comparisons](#)

[TABLE 12-4 The Double Parentheses Command Symbols](#)

Chapter 14

[TABLE 14-1 Common Linux Command-Line Options](#)

Chapter 15

[TABLE 15-1 Linux Standard File Descriptors](#)

[TABLE 15-2 Default `ls` Output](#)

Chapter 16

[TABLE 16-1 Linux Signals](#)

[TABLE 16-2 The `jobs` Command Parameters](#)

Chapter 17

[TABLE 17.1 The `shtool` Library Functions](#)

Chapter 18

[TABLE 18.1 The `dialog` Widgets](#)

[TABLE 18.2 The `dialog` Command Options](#)

[TABLE 18.3 `kdial` Window Options](#)

[TABLE 18.4 The `zenity` Window Widgets](#)

Chapter 19

[TABLE 19.1 The `sed` Command Options](#)

[TABLE 19.2 The `gawk` Options](#)

Chapter 20

[TABLE 20.1 BRE Special Character Classes](#)

Chapter 21

[TABLE 21.1 The `sed` Editor Hold Space Commands](#)

## Chapter 22

[TABLE 22.1 The `gawk` Data Field and Record Variables](#)

[TABLE 22.2 More `gawk` Built-in Variables](#)

[TABLE 22.3 Format Specifier Control Letters](#)

[TABLE 22.4 The `gawk` Mathematical Functions](#)

[TABLE 22.5 The `gawk` String Functions](#)

[TABLE 22.6 The `gawk` Time Functions](#)

## Chapter 23

[TABLE 23.1 The Dash Command-Line Parameters](#)

[TABLE 23.2 The Dash Shell Built-in Commands](#)

[TABLE 23.3 The zsh Shell Command-Line Parameters](#)

[TABLE 23.4 The zsh Core Built-in Commands](#)

[TABLE 23.5 The zsh Modules](#)

## Appendix A

[TABLE A.1 Bash Built-In Commands](#)

[TABLE A.2 The Bash Shell External Commands](#)

[TABLE A.3 Bash Shell Environment Variables](#)

## Appendix B

[TABLE B.1 The `sed` Command Options](#)

[TABLE B.2 The `gawk` Options](#)

[TABLE B.3 The `gawk` Data Field and Record Variables](#)

[TABLE B.4 More `gawk` Built-In Variables](#)

# List of Illustrations

## Chapter 1

[FIGURE 1-1 The Linux system](#)

[FIGURE 1-2 The Linux system memory map](#)

[FIGURE 1-3 The KDE Plasma desktop on an openSUSE Linux system](#)

[FIGURE 1-4 A GNOME 3 desktop on an Ubuntu Linux system](#)

[FIGURE 1-5 The Cinnamon desktop from Linux Mint](#)

[FIGURE 1-6 The Xfce desktop as seen in the MX Linux distribution](#)

## Chapter 2

[FIGURE 2-1 A simple terminal emulator running on a Linux desktop](#)

[FIGURE 2-2 Linux virtual console login screen](#)

[FIGURE 2-3 Linux virtual console with `inversescreen` being turned on](#)

[FIGURE 2-4 Finding GNOME Terminal in GNOME Shell](#)

[FIGURE 2-5 GNOME Terminal on CentOS](#)

[FIGURE 2-6 GNOME Terminal on Ubuntu](#)

[FIGURE 2-7 GNOME Terminal icon in the Favorites bar](#)

[FIGURE 2-8 Reaching the Keyboard Shortcuts window](#)

[FIGURE 2-9 Creating a keyboard shortcut](#)

[FIGURE 2-10 The Konsole terminal emulator](#)

[FIGURE 2-11 The xterm terminal](#)

### Chapter 3

[FIGURE 3-1 Manual pages for the hostname command](#)

[FIGURE 3-2 A Linux virtual directory file path](#)

[FIGURE 3-3 The Linux file structure](#)

[FIGURE 3-4 Using the more command to display a text file](#)

### Chapter 4

[FIGURE 4-1 The output of the top command while it is running](#)

### Chapter 5

[FIGURE 5-1 Parent and child Bash shell processes](#)

[FIGURE 5-2 Subshell nesting](#)

[FIGURE 5-3 External command forking](#)

### Chapter 7

[FIGURE 7-1 The Linux file permissions](#)

### Chapter 10

[FIGURE 10-1 The vim main window](#)

[FIGURE 10-2 The nano editor window](#)

[FIGURE 10-3 Editing a file using the Emacs editor in console mode](#)

[FIGURE 10-4 The Emacs file browser](#)

[FIGURE 10-5 The Emacs graphical window](#)

[FIGURE 10-6 The default KWrite window editing a shell script program](#)



[FIGURE 10-7 The KWrite Find section](#)

[FIGURE 10-8 The KWrite Tool Mode Script submenu](#)

[FIGURE 10-9 The KWrite Configure Editor dialog box](#)

[FIGURE 10-10 The main Kate editing window](#)

[FIGURE 10-11 The Kate Documents List](#)

[FIGURE 10-12 The Kate Plugin Manager](#)

[FIGURE 10-13 The Kate built-in terminal window](#)

[FIGURE 10-14 The Kate configuration dialog box](#)

[FIGURE 10-15 The gedit main editor window](#)

[FIGURE 10-16 The gedit menu system](#)

[FIGURE 10-17 The gedit Side Panel](#)

[FIGURE 10-18 The gedit Side Panel's file manager](#)

[FIGURE 10-19 The gedit Plugins tab](#)

[FIGURE 10-20 The gedit Plugins tab after installation](#)

[FIGURE 10-21 The gedit Embedded Terminal plugin](#)

## Chapter 11

[FIGURE 11-1 Using piping to send data to the more command](#)

[FIGURE 11-2 Using the more command with the ls command](#)

## Chapter 18

[FIGURE 18-1 Displaying a menu from a shell script](#)

[FIGURE 18-2 Using the msgbox widget in the dialog command](#)

[FIGURE 18-3 Using the yesno widget in the dialog command](#)

[FIGURE 18-4 The inputbox widget](#)

[FIGURE 18-5 The textbox widget](#)

[FIGURE 18-6 The menu widget with menu items](#)

[FIGURE 18-7 The fselect widget](#)

[FIGURE 18-8 The meminfo command output displayed using the textbox dialog op...](#)

[FIGURE 18-9 A kdialog checklist dialog window](#)

[FIGURE 18-10 The sys admin menu script using kdialog](#)

[FIGURE 18-11 The zenity calendar dialog window](#)

[FIGURE 18-12 The zenity file selection dialog window](#)

[FIGURE 18-13 The system admin menu using zenity](#)

[FIGURE 18-14 The dialog form feature](#)

## Chapter 20

[FIGURE 20-1 Matching data against a regular expression pattern](#)

## Chapter 21

[FIGURE 21-1 Reversing the order of a text file using the hold space](#)

## Chapter 24

[FIGURE 24.1 Creating an archive directory hierarchy](#)

## Chapter 25

[FIGURE 25-1 Conceptual depiction of the Git environment](#)

[FIGURE 25-2 MWGuard remote repository](#)

# **Linux<sup>®</sup> Command Line and Shell Scripting BIBLE**

**Richard Blum**

**Christine Bresnahan**

**WILEY**

## **Linux<sup>®</sup> Command Line and Shell Scripting Bible**

Copyright © 2021 by John Wiley & Sons, Inc., Indianapolis, Indiana

Published simultaneously in Canada and the United Kingdom

ISBN: 978-1-119-70091-3

ISBN: 978-1-119-70094-4 (ebk)

ISBN: 978-1-119-70093-7 (ebk)

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at [www.wiley.com/go/permissions](http://www.wiley.com/go/permissions).

**LIMIT OF LIABILITY/DISCLAIMER OF WARRANTY: THE PUBLISHER AND THE AUTHOR MAKE NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS WORK AND SPECIFICALLY DISCLAIM ALL WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTY MAY BE CREATED OR EXTENDED BY SALES OR PROMOTIONAL MATERIALS. THE ADVICE AND STRATEGIES CONTAINED HEREIN MAY NOT BE SUITABLE FOR EVERY SITUATION. THIS WORK IS SOLD WITH THE UNDERSTANDING THAT THE PUBLISHER IS NOT ENGAGED IN RENDERING LEGAL, ACCOUNTING, OR OTHER PROFESSIONAL SERVICES. IF PROFESSIONAL ASSISTANCE IS REQUIRED, THE SERVICES OF A COMPETENT PROFESSIONAL PERSON SHOULD BE SOUGHT. NEITHER THE PUBLISHER NOR THE AUTHOR SHALL BE LIABLE FOR DAMAGES ARISING HEREFROM. THE FACT THAT AN ORGANIZATION OR WEB SITE IS REFERRED TO IN THIS WORK AS A CITATION AND/OR A POTENTIAL SOURCE OF FURTHER INFORMATION DOES NOT MEAN THAT THE AUTHOR OR THE PUBLISHER ENDORSES THE INFORMATION THE ORGANIZATION OR WEBSITE MAY PROVIDE OR RECOMMENDATIONS IT MAY MAKE. FURTHER, READERS SHOULD BE AWARE THAT INTERNET WEBSITES LISTED IN THIS WORK MAY HAVE CHANGED OR DISAPPEARED BETWEEN WHEN THIS WORK WAS WRITTEN AND WHEN IT IS READ.**

For general information on our other products and services please contact our Customer Care Department within the United States at (877) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may

not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at [booksupport.wiley.com](http://booksupport.wiley.com). For more information about Wiley products, visit [www.wiley.com](http://www.wiley.com).

**Library of Congress Control Number:** 2020949805

Trademarks: Wiley and the Wiley logo are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates, in the United States and other countries, and may not be used without written permission. Linux is a registered trademark of Linus Torvalds. All other trademarks are the property of their respective owners. John Wiley & Sons, Inc. is not associated with any product or vendor mentioned in this book.

***To the Lord God Almighty, “in whom are hidden all  
the treasures of wisdom and knowledge.”***

***— Colossians 2:3***

## About the Authors

**Richard Blum** has worked in the IT industry for more than 30 years as both a systems and a network administrator. During that time, he's had the opportunity to work with lots of different computer products, including Windows, NetWare, Cisco, Avaya, different flavors of UNIX, and of course, Linux. Over the years he's also volunteered for several nonprofit organizations to help support small networks that had little financial support. Rich is the author of many Linux-based books for total Linux geeks and teaches online courses in Linux and web programming. When he's not busy being a computer nerd, Rich enjoys playing piano and bass guitar and spending time with his wife, Barbara, and their two daughters, Katie Jane and Jessica.

**Christine Bresnahan** started working with computers more than 30 years ago in the IT industry as a systems administrator. Christine is an adjunct professor at Ivy Tech Community College, where she teaches Linux certification and Python programming classes. She also writes books and produces instructional resources for the classroom. During her downtime, Christine enjoys spending time with her husband and family, hiking, and gardening.



## About the Technical Editor

**Jason W. Eckert** is an experienced technical trainer, consultant, and best-selling author in the technology industry. With 45 industry certifications, 25 published textbooks, and over 30 years of technology and programming experience, Jason brings his expertise to every class that he teaches at triOS College. For more information about him, visit [jasoneckert.net](http://jasoneckert.net).

# Acknowledgments

First, all glory and praise go to God, who through His Son, Jesus Christ, makes all things possible and gives us the gift of eternal life.

Many thanks go to the fantastic team of people at John Wiley & Sons for their outstanding work on this project. Thanks to Kenyon Brown, the acquisitions editor, for offering us the opportunity to work on this book. Also thanks to Patrick Walsh, the project editor, for keeping things on track and making this book more presentable. Thanks, Pat, for all your hard work and diligence. The technical editor, Jason Eckert, did a wonderful job of double-checking all the work in the book, plus making suggestions to improve the content. Thanks to Saravanan Dakshinamurthy and his team for their endless patience and diligence to make our work readable. We would also like to thank Carole Jelen at Waterside Productions, Inc., for arranging this opportunity for us, and for helping us out in our writing careers.

Christine would like to thank her husband, Timothy, for his encouragement, patience, and willingness to listen, even when he has no idea what she is talking about. Rich would like to thank his wife, Barbara, for the life-sustaining baked goods she readily prepared to help him keep up his energy while writing!

# Introduction

Welcome to the fourth edition of *Linux Command Line and Shell Scripting Bible*. Like all books in the *Bible* series, you can expect to find both hands-on tutorials and real-world information, as well as reference and background information that provides a context for what you are learning. This book is a fairly comprehensive resource on the Linux command line and shell commands. By the time you have completed *Linux Command Line and Shell Scripting Bible*, you will be well prepared to write your own shell scripts that can automate practically any task on your Linux system.

## Who Should Read This Book

If you're a systems administrator in a Linux environment, you'll benefit greatly by knowing how to write shell scripts. The book doesn't walk you through the process of setting up a Linux system, but after you have it running, you'll want to start automating some of the routine administrative tasks. That's where shell scripting comes in, and that's where this book helps you out. This book demonstrates how to automate any administrative task using shell scripts, from monitoring system statistics and data files to generating reports for your boss.

If you're a home Linux enthusiast, you'll also benefit from *Linux Command Line and Shell Scripting Bible*. Nowadays, it's easy to get lost in the graphical world of prebuilt widgets. Most desktop Linux distributions try their best to hide the Linux system from the typical user. However, sometimes you must know what's going on under the hood. This book shows you how to access the Linux command-line

prompt and what to do when you get there. Often, performing simple tasks, such as file management, can be done more quickly from the command line than from a fancy graphical interface. You can use a wealth of commands from the command line, and this book shows you how to use them.

# How This Book Is Organized

This book leads you through the basics of the Linux command line and into more complicated topics, such as creating your own shell scripts. The book is divided into four parts, each one building on the previous parts.

[Part I](#) assumes that you either have a Linux system running or are looking into getting a Linux system. [Chapter 1](#), “Starting with Linux Shells,” describes the parts of a total Linux system and shows how the shell fits in. After describing the basics of the Linux system, this part continues with the following:

- Using a terminal emulation package to access the shell ([Chapter 2](#))
- Introducing the basic shell commands ([Chapter 3](#))
- Using more advanced shell commands to peek at system information ([Chapter 4](#))
- Understanding what the shell is used for ([Chapter 5](#))
- Working with shell variables to manipulate data ([Chapter 6](#))
- Understanding the Linux filesystem and security ([Chapter 7](#))
- Working with Linux filesystems from the command line ([Chapter 8](#))
- Installing and updating software from the command line ([Chapter 9](#))
- Using the Linux editors to start writing shell scripts ([Chapter 10](#))

In [Part II](#), you begin writing shell scripts. As you go through the chapters, you'll do the following:

- Learn how to create and run shell scripts ([Chapter 11](#))
- Alter the program flow in a shell script ([Chapter 12](#))
- Iterate through code sections ([Chapter 13](#))
- Handle data from the user in your scripts ([Chapter 14](#))
- See different methods for storing and displaying data from your script ([Chapter 15](#))
- Control how and when your shell scripts run on the system ([Chapter 16](#))

[Part III](#) dives into more advanced areas of shell script programming, including these things:

- Creating your own functions to use in all your scripts ([Chapter 17](#))
- Utilizing the Linux graphical desktop for interacting with your script users ([Chapter 18](#))
- Using advanced Linux commands to filter and parse data files ([Chapter 19](#))
- Using regular expressions to define data ([Chapter 20](#))
- Learning advanced methods of manipulating data in your scripts ([Chapter 21](#))
- Working with advanced features of scripting to generate reports from raw data ([Chapter 22](#))
- Modifying your shell scripts to run in other Linux shells ([Chapter 23](#))

The last section of the book, [Part IV](#), demonstrates how to use shell scripts in real-world environments. In this part, you will learn these things:

- How to put all the scripting features together to write your own scripts ([Chapter 24](#))