



Troy McMillan

Cisco[®] Networking

ESSENTIALS

Second Edition

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CISCO[®] NETWORKING

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Troy McMillan



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Cover Image: ©TimotiSt/iStockphoto; Back Cover Images: Courtesy of Troy McMillan
Copyright © 2015 by John Wiley & Sons, Inc., Indianapolis, Indiana
Published simultaneously in Canada

ISBN: 978-1-119-09215-5
ISBN: 978-1-119-09212-4 (ebk.)
ISBN: 978-1-119-09213-1 (ebk.)

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Library of Congress Control Number: 2015943420

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10987654321

*To my dear wife, Heike, and to her father, Joseph
Polteraitis, whom we loved and lost this year.*

ACKNOWLEDGMENTS

I want to thank the entire editing and production staff who have helped to make this book as good as it can possibly be. That includes Kelly Talbot, my development editor, who gave me great advice beyond simply grammar and style. I took full advantage of all his years of experience as an editor. He was the conductor of this orchestra and ensured everything was where it was supposed to be when it as supposed to be.

I also would like to thank the technical editor, Paul Sutton, who saved me from myself a number of times. It is so comforting to know that someone with deep technical knowledge is looking over your shoulder.

A special thanks goes to Ken Brown for encouraging me to update this book and helping to select new topics to add.

ABOUT THE AUTHOR

Troy McMillan is a trainer and writer from Sugarloaf Key, Florida. He began his IT career with IBM in 1999, supporting point-of-sale systems. After achieving his MCSE, he became a network administrator in the Atlanta office of a global manufacturer of electric motors. In 2000 he took his first job as a trainer, teaching MCSE classes to career changers at a local IT school in Atlanta.

In 2001 Troy started delivering corporate training for New Horizons in Atlanta. His concentration was in Microsoft, CompTIA, and Cisco classes. In 2002, Troy started his own training company while continuing with New Horizons on a contract basis and also teaching at various colleges and technical schools in the Atlanta area.

In 2003 Troy began traveling the United States and Canada teaching Cisco, wireless (CWNA program), and Microsoft classes for training organizations such as Global Knowledge, New Horizons, and PPI.

In 2005 Troy accepted a position with Kaplan University of Professional and Continuing Education, creating practice tests and study guides for the Self-Test and Transcender brands. His work includes Microsoft, but he is the principal Cisco writer.

Troy's first book, *Change Your Career: Computer Network Security as Your New Profession* (Kaplan Publishing) was released in 2007. It is a guide that provides resources and helpful hints for career changers considering a career in this field.

Troy began contributing to and providing technical edits for a number of Sybex books in 2009. This included contributing to Todd Lammle's *CCNA Wireless Study Guide: IUWNE Exam 640-721* and *CompTIA Network+ Study Guide (Exam: N10-005)*, doing technical edits and contributing to Todd's *CCNA Cisco Certified Network Associate Review Guide*, and acting as technical editor for Darril Gibson's *Windows 7 Desktop Support and Administration: Real World Skills for MCITP Certification and Beyond (Exams 70-685 and 70-686)*. He is currently providing technical editing on Toby Skandier's *Network Administrator Street Smarts: A Real World Guide to CompTIA Network+ Skills*.

In 2010 Troy coauthored the *VCP VMware Certified Professional on vSphere 4 Review Guide* with Brian Perry, Chris Huss, and Jeantet Fields. In 2010 he also created and edited text books for Penn-Foster on Apple computers, basic troubleshooting, and mobile devices. Troy created classroom instruction materials for many of the Sybex titles already listed as well as for the *MCTS: Windows Server 2008 R2 Complete Study Guide (Exams 70-640, 70-642 and 70-643)* by William Panek.

Since 2010 Troy has worked on the following print projects:

- ▶ Coauthor of *CISSP Cert Guide* (Pearson Education)
- ▶ Prep test question writer for *CCNA Wireless 640-722 Official Cert Guide* (Cisco Press)
- ▶ Coauthor of *CompTIA A+ Complete Review Guide: Exams 220-801 and 220-802* (Sybex)
- ▶ Author of *CompTIA A+ Complete Review Guide: Exams 220-901 and 220-902* (Sybex)
- ▶ Assisted Todd Lammle with the update to *CompTIA Network+ Study Guide: Exam N10-006* (Sybex)
- ▶ Coauthor of *CompTIA Advanced Security Practitioner (CASP) CAS-002 Cert Guide* (Pearson Education)

He also has written and appeared in the following training videos for Oncourse learning:

- ▶ Security +
- ▶ Network +
- ▶ Microsoft 70-410, 411,412 exam prep
- ▶ ICND 1
- ▶ ICND 2
- ▶ Cloud +
- ▶ CASP
- ▶ CISSP

Prior to his career in IT, Troy was a professional musician. From 1968 to 1986, he recorded and performed with many of his own bands and as a backup musician for acts including Vassar Clements and Delbert McClinton. He worked for a number of years as a session musician and songwriter in Nashville as well. In 1983 he returned to school, earning a BBA in Management from Georgia State University in 1986. He operated his own businesses after graduation, as well as working several years in retail management. He began a self-study in IT in the 1990s, leading to his first IT job at IBM.

Troy lives with his wife, Heike, and a house full of dogs, cats, and birds in Sugarloaf Key, Florida. He enjoys running, music, and sports of all kind, especially NASCAR.

INTRODUCTION

The first edition of this book was designed to fill a gap that has existed for some time in technical books and instructional materials covering networking in general and Cisco technology in particular. As a trainer, I struggled to find materials that struck a middle ground between basic networking texts and books that jump immediately into certification-level topics for which many readers and students were not prepared to digest. The reaction to the first edition confirmed my belief that a book of this type is needed and drove the creation of this second edition.

There will always be a market for books designed to present and review certification-level topics to those who are already familiar with the knowledge required to understand those topics. In today's economic times, however, there is a whole new breed of students who are either taking classes or operating in a self-study capacity who do not have this prerequisite knowledge and may not even realize this as they attempt to tackle certification-level classes and books.

I have seen these students in my classes over the years. They are no less intelligent or motivated than the students who have more background and experience. But at the pace at which these books and classes must move to cover all the material, they soon find themselves struggling. Some even give up entirely.

This book is designed to cover all of the basics required to really understand routing and switching, providing the required amount of time to digest the fundamentals and then moving on to actually setting up and configuring the routers and switches and seeing them operate. It does not attempt to cover every bell and whistle that these devices offer, nor does it cover every topic that is on a Cisco CCENT exam. What it does do is provide all of the basic network information from a Cisco perspective.

The student who reads this book and works through these exercises or the student who takes a class using this book as its text will come away ready in every way to tackle books and classes targeted for exam prep for the CCNA. That is the goal of this book and was our guiding principle throughout its creation.

Who Should Read This Book

This book is designed for anyone wishing to gain a basic understanding of how networks operate and how Cisco devices in particular fulfill their roles in the process. This includes:

- ▶ Those who have been away from the IT industry for some time and are reentering the field
- ▶ Career changers with no previous experience
- ▶ Students who have struggled with certification-level prep materials
- ▶ Students who have had success with certification-level prep materials but came away from the experience with a shallow understanding of the core foundational knowledge

What's Inside

Here is a glance at what's in each chapter.

Chapter 1, "Networks," describes network components, classifies LANs and WANs by function, and compares and contrasts peer-to-peer and client-server networks.

Chapter 2, "The OSI Model," explains the purpose of reference models, introduces the layers of the OSI model, and describes how the layers relate to the encapsulation process.

Chapter 3, "TCP/IP," explains the TCP/IP reference model, compares it to the OSI model, and describes the function of the four layers of the model.

Chapter 4, "Protocols," describes the function of protocols in networking and surveys various protocols that operate at each layer of the TCP/IP model.

Chapter 5, "Physical and Logical Topologies," defines the meaning of a topology in networking and describes the main physical and logical topologies.

Chapter 6, "Numbering Systems," explains the main numbering systems of importance in networking, the binary and hexadecimal systems, and how they are converted to and from the decimal system.

Chapter 7, "Classful IP Addressing," explains the basics of IP addressing, identifies the types of IP addresses, introduces network troubleshooting tools, and describes the use of DHCP to automate the IP configuration process.

Chapter 8, "Classless IP Addressing," points out the shortcomings of classful IP addressing, explains the benefits of classless subnetting, and introduces the components of CIDR.

Chapter 9, "Media," begins with a brief description of media types, then explains cable behaviors and characteristics, and ends with a survey of the types of cables and their proper use.

Chapter 10, “Network Devices,” describes the function of the various devices found in a network and explains design principles guiding their placement.

Chapter 11, “LAN Operations,” explains both the routing and the switching process and describes how they fit together in end-to-end communication.

Chapter 12, “Managing the Cisco IOS,” introduces the components of the Cisco operating system, describes the boot process of a router or switch, and describes how to navigate the command-line interface.

Chapter 13, “Configuring Routers,” explains how to get a router operational, including cabling the router, logging into the IOS, securing the router, and configuring its interfaces.

Chapter 14, “Configuring Switches,” explains how to get a switch operational, including cabling the switch, logging into the IOS, securing the switch, configuring its switch ports, and creating and managing VLANs.

Chapter 15, “Configuring Static Routing,” explains how routes are configured and verified at the CLI and how to configure inter-VLAN routing.

Chapter 16, “Configuring Dynamic Routing,” introduces how dynamic routing functions, explains the types of routing protocols, and describes how to configure an example of each.

Chapter 17, “Device Security,” describes the security features available in Cisco devices and the issues those features address. It also covers the implementation of these features.

How to Contact the Author

I welcome feedback from you about this book or about books you'd like to see from me in the future. You can reach me by writing to mcmillantroy@hotmail.com.

Sybex strives to keep you supplied with the latest tools and information you need for your work. Please check their website at www.sybex.com, where we'll post additional content and updates that supplement this book should the need arise. Enter **Cisco Networking Essentials** in the Search box (or type the book's ISBN—978-1-119-09215-5), and click Go to get to the book's update page.

CONTENTS AT A GLANCE

	<i>Introduction</i>	<i>xxiii</i>
CHAPTER 1	Networks	1
CHAPTER 2	The OSI Model	19
CHAPTER 3	TCP/IP	39
CHAPTER 4	Protocols	63
CHAPTER 5	Physical and Logical Topologies	91
CHAPTER 6	Numbering Systems	109
CHAPTER 7	Classful IP Addressing	129
CHAPTER 8	Classless IP Addressing	153
CHAPTER 9	Media	175
CHAPTER 10	Network Devices	201
CHAPTER 11	LAN Operations	225
CHAPTER 12	Managing the Cisco IOS	253
CHAPTER 13	Configuring Routers	281
CHAPTER 14	Configuring Switches	315
CHAPTER 15	Configuring Static Routing	337
CHAPTER 16	Configuring Dynamic Routing	353
CHAPTER 17	Device Security	371
	<i>Appendix A Answers to Review Questions</i>	<i>393</i>
	<i>Appendix B CCNA Essentials: Ancillary Exercises</i>	<i>407</i>
	<i>Index</i>	<i>437</i>

CONTENTS

Introduction

xxiii

CHAPTER 1	Networks	1
	Describing Network Components	1
	Defining the Benefits of Networks	2
	Identifying the Requirements for a Network	5
	Classifying Networks by Function	8
	Understanding LANs	9
	Understanding WANs	10
	Defining Network Architectures	10
	Understanding Peer-to-Peer Networks	11
	Understanding Client-Server Networks	14
	The Essentials and Beyond	17
CHAPTER 2	The OSI Model	19
	Using Reference Models	19
	Understanding the Benefits of Reference	21
	Exploring Reference Model Examples	21
	Introducing the Layers of the OSI Model	22
	Understanding the Application Layer	23
	Understanding the Presentation Layer	24
	Understanding the Session Layer	26
	Understanding the Transport Layer	26
	Understanding the Network Layer	30
	Understanding the Data-Link Layer	31
	Understanding the Physical Layer	33
	Describing the OSI Encapsulation Process	33
	Identifying the Process on the Source Device	34
	Identifying the Process on the Destination Device	35
	The Essentials and Beyond	36
CHAPTER 3	TCP/IP	39
	Understanding the TCP/IP Model	40
	Exploring the Four Layers	41

Comparing the OSI and TCP/IP Models	44
Describing the TCP/IP Encapsulation Process	46
Understanding Data and PDUs	46
Describing the Contents of Data	47
Describing the Contents of Segments	47
Describing the Contents of Packets	47
Describing the Contents of Frames	47
Understanding the Conversion to Bits	48
Describing the Functions at the Transport Layer	50
Understanding TCP	50
Understanding UDP	51
Describing the Functions at the Internet Layer	52
Defining Logical Addressing	53
Performing Routing	54
Accomplishing Packet Forwarding	54
Describing the Functions of ARP	55
Illustrating the ARP Broadcast	55
Describing the Logic of MAC-to-IP-Address Conversion	57
The Essentials and Beyond	59

CHAPTER 4	Protocols	63
Understanding the Function of Protocols	64	
Defining Routed Protocols	64	
Defining Routing Protocols	64	
Exploring Application Layer Protocols	65	
Describing FTP	65	
Describing TFTP	67	
Describing SMTP	67	
Describing DNS	69	
Describing SNMP	70	
Exploring Transport Layer Protocols	72	
Reviewing TCP	72	
Reviewing UDP	76	
Exploring Internet Layer Protocols	77	
Describing IP	77	
Describing ARP	79	

Describing ICMP	80
Describing IGMP	82
Exploring Network Access Layer Protocols	83
Defining Network Access Layer Protocols on the LAN	84
Defining Network Access Layer Protocols on the WAN	85
The Essentials and Beyond	86

CHAPTER 5 Physical and Logical Topologies 91

Designing the Physical Topology	91
Implementing a Bus Topology	92
Implementing a Ring Topology	93
Implementing a Star Topology	94
Implementing a Mesh Topology	96
Implementing a Hybrid Topology	97
Implementing a Point-to-Point Topology	98
Implementing a Point-to-Multipoint Topology	100
Designing the Logical Topology	101
Understanding the Token Ring Topology	101
Understanding the FDDI Ring Topology	102
Understanding the Star Topology	103
The Essentials and Beyond	105

CHAPTER 6 Numbering Systems 109

Exploring Binary Numbering	109
Understanding the Base-2 Numbering System	110
Understanding the Relationship between Binary and Computers	112
Exploring Hexadecimal Numbering	114
Understanding the Base-16 Numbering System	114
Identifying MAC Addresses	116
Applying Conversions	118
Decimal-to-Binary Conversion	118
Hex-to-Decimal Conversion	121
Binary-to-Hex Conversion	123
The Essentials and Beyond	124

CHAPTER 7	Classful IP Addressing	129
	Describing the Function of IP Addresses.	129
	Identification	130
	Segmentation	131
	Identifying IP Address Types	132
	Defining IP Address Classes.	133
	Identifying Network and Host Addresses	135
	Describing Private IP Addresses and NAT.	138
	Utilizing Diagnostic Tools.	139
	Executing the <i>ipconfig</i> Command	141
	Executing the <i>ping</i> Command.	141
	Executing the <i>arp</i> Command	142
	Executing the <i>tracert</i> Command.	143
	Understanding DHCP	143
	Operations	143
	Cisco DHCP	145
	Introducing IPv6.	146
	IPv6 Address Format	146
	IPv6 Address Types.	147
	Special IPv6 Addresses.	148
	The Essentials and Beyond	148
CHAPTER 8	Classless IP Addressing	153
	Understanding the Limitations of Classful Networking	153
	Exhaustion of the Class B Network Address Space.	154
	Unmanageable Routing Tables	154
	Exhaustion of the 32-Bit IPv4 Address Space.	155
	Understanding the Benefits of Subnetting	155
	Identifying Sources of Network Congestion.	156
	Deploying Subnetting as a Segmentation Tool.	157
	Describing the Components of CIDR.	158
	Introducing Classless Subnetting	158
	Designing and Implementing CIDR	160
	Understanding VLSM.	167
	Summarization	171
	The Essentials and Beyond	172

CHAPTER 9	Media	175
	Selecting the Proper Media Type	175
	Bandwidth	176
	Security	176
	Convenience	180
	Cost	180
	Understanding Cabling	181
	Describing Cable Behavior and Characteristics	181
	Describing Physical Implementations	183
	Choosing the Correct Wiring Standard	187
	Describing Wireless Standards	191
	Identifying Standards Bodies	191
	Understanding 802.11 Amendments	192
	Understanding Wireless LAN Components and Terminology	193
	Describing CSMA/CA Operation	196
	The Essentials and Beyond	198
CHAPTER 10	Network Devices	201
	Describing Device Functions	201
	Understanding Repeaters	202
	Understanding Hubs	202
	Understanding Bridges	203
	Understanding Switches	205
	Understanding Routers	209
	Understanding Wireless Access Points and Wireless Routers	214
	Understanding Device Placement Principles	216
	Defining Broadcast Domains	216
	Defining Collision Domains	217
	Understanding the Cisco Three-Layer Model	220
	The Essentials and Beyond	221
CHAPTER 11	LAN Operations	225
	Understanding the Routing Process	225
	Describing Routing Tables	226
	Understanding Population Methods	229

Understanding Administrative Distance	231
Using Routing Protocols	234
Describing the Switching Process	243
Reviewing MAC and IP Addresses	243
Reviewing Contention Methods	244
Describing MAC Address Tables	246
Understanding Frame Forwarding	246
Describing End-to-End Communications	247
Understanding the Local LAN Process	248
Understanding the Remote Communication Process	249
The Essentials and Beyond	250

CHAPTER 12 Managing the Cisco IOS 253

Describing Components	253
Defining the Contents of RAM	254
Defining the Contents of NVRAM	255
Defining the Contents of Flash	255
Defining the Contents of ROM	256
Describing IOS Navigation	258
Connecting to the Device	258
Accessing User, Privileged, and Global Configuration Modes	262
Understanding and Managing the Boot Process	266
Understanding the Boot Process	267
Managing the IOS	270
Understanding Configuration Files	271
Managing the Configuration Register	272
The Essentials and Beyond	276

CHAPTER 13 Configuring Routers 281

Cabling the Router	281
Cabling Router to Router	284
Cabling Router to Switch	287
Cabling PC to Router	288
Cabling Router to CSU/DSU	290
Creating a Console Session	292
Connecting with the Console Cable	292
Connecting Through the USB Port	293