The Smartest Way To Get Certified™

Exam 640-507

Routing and Switching

Cisco Certified Network Associate™

Mark A. Poplar, Jason Waters, Shawn D. McNutt, David Stabenaw

中国水利水电出版社
www.waterpub.com.cn
印刷工业出版社

CCNA™ Routing and Switching

江苏工业学院图书馆
藏书章

Mark A. Poplar, Jason Waters,
Shawn D. McNutt, David Stabenaw

中国水利水电出版社

Reprint Copyright

Original English language edition published by The Coriolis Group LLC, 14455N. Hayden Drive, Suite 220, Scottsdale, Arizona 85260 USA, telephone (602)483-0192, fax (602) 483-0193. Copyright © 1999 by The Coriolis Group. English language reprinted copyright © 2001 by China WaterPower Press. All rights reserved.

Original Copyright

©2000 The Coriolis Group. All Rights Reserved.

This book may not be duplicated in any way without the express written consent of the publisher, except in the form of brief excerpts or quotations for the purposes of review. The information contained herein is for the personal use of the reader and may not be incorporated in any commercial programs, other books, databases, or any kind of software without written consent of the publisher. Making copies of this book or any portion for any purpose other than your own is a violation of United States copyright laws.

Limits Of Liability And Disclaimer Of Warranty

The author and publisher of this book have used their best efforts in preparing the book and the programs contained in it .These efforts include the development, research, and testing of the theories and programs to determine their effectiveness. The author and publisher make no warranty of any kind, expressed or implied, with regard to these programs or the documentation contained in this book.

The author and publisher shall not be liable in the event of incidental or consequential damages in connection with, or arising out of, the furnishing, performance, or use of the programs, associated instructions, and/or claims of productivity gains.

Trademarks

Trademarked names appear throughout this book. Rather than list the names and entities that own the trademarks or insert a trademark symbol with each mention of the trademarked name, the publisher states that it is using the names for editorial purposes only and to the benefit of the trademark owner, with no intention of infringing upon that trademark.

书　　名	CCNA Routing and Switching 考前辅导
作　　者	[美]Mark A. Poplar, Jason Waters, Shawn D.McNutt, David Stabenaw
出版、发行	中国水利水电出版社（北京市三里河路6号 100044） 网址：www.waterpub.com.cn E-mail：sale@waterpub.com.cn 电话：(010) 63202266（总机）、68331835（发行部）
销　　售	全国各地新华书店
排　　版	北京万水电子信息有限公司
印　　刷	北京蓝空印刷厂
规　　格	787×1092毫米　16开本　47.75印张　1102千字
版　　次	2001年1月第一版　2001年1月北京第一次印刷
印　　数	0001—2000册
定　　价	75.80元（1CD，含配套书）

凡购买我社图书，如有缺页、倒页、脱页的，本社发行部负责调换

版权所有·侵权必究

This book is dedicated to my parents, Ben and Jean Poplar,
who have always had faith in me and words of encouragement.
Thank you for helping me strive to be the best I can be.
You are truly the best parents I could have asked for.
—Mark A. Poplar

❧

This book is dedicated to my family.
You are an inspiration to me, and you always give me
the support and encouragement I need to do my best.
—Jason Waters

❧

This book is dedicated to my wife, Dawn, and son, Nathaniel.
Being a father is the best thing I have ever done.
—Shawn D. McNutt

❧

This book is dedicated to my wife, Tonya,
and our 2 sons, Justin and Michael.
—David Stabenaw

❧

ABOUT THE AUTHORS

Mark A. Poplar (Riverside, California) has been involved with installation and troubleshooting networks for more than 10 years. He holds numerous professional certifications, including CCNA, CCDA, MCT, and MCSE. Other published works include *Network + Exam Prep* and *The Insiders Series Exam Prep for the Cisco Certified Design Associate Exam*. He currently works as a Senior Support Engineer for a major software development company in Irvine, California. You can reach Mark at **mpoplar@earthlink.net**.

Jason Waters (Palatine, Illinois) is a network consultant based in the Chicago area. He has designed and administered networks for a wide range of companies, including ISPs, insurance companies, and banks. His certifications include CCNA, MCSE, MCP+I, and A+. Jason, who is entirely self-taught when it comes to knowledge of computers and networking, has been growing with the industry ever since learning to program on his Commodore 64 and running a BBS in the pre-Internet days. When he is not strapped to his PC, Jason enjoys adventure travel, such as backpacking across Europe or trekking in Peru. He also frequents Renaissance festivals and is a collector of replica medieval arms and armor. Jason can be reached at **jwaters@iname.com**.

Shawn D. McNutt (Standish, Maine) is an Information Systems Specialist for Saco River Telegraph and Telephone Company in Bar Mills, Maine. Shawn has a master's degree in education from Lesley College in Cambridge, Massachusetts, and holds several technical certifications, including CompTIA's A+, Network+, and i-Net+, Microsoft's MCSE+I, and Cisco's CCNA. He has worked on designing, installing, and troubleshooting LAN and WAN networks for school districts in Maine and Massachusetts. Some of his recent roles include being a system administrator, a Webmaster, a teacher, and most importantly, a father. Shawn can be reached at **smcnutt@ime.net**.

David Stabenaw (Twenty-Nine Palms, California) is a senior network engineer for the United States Marine Corps. He is currently serving as an Advanced Network Instructor for the Marine Corps Computer Sciences School. David has served as an Information Systems Security Specialist, Deputy Director of Information Systems, Technical Trainer, and Network Analyst. David also does contract training throughout southern California. His certifications include CCNA, MCSE, MCT, and Network +. He can be contacted at **stabenawdm@29palms.usmc.mil**.

此为试读，需要完整PDF请访问：www.ertongbook.com

ACKNOWLEDGMENTS

I'd like to thank Meredith Brittain and Jeff Kellum and the other members of the Coriolis team—Todd, Cynthia, Jesse, April, and Michelle—for all their hard work making this book come to life. My thanks, too, to my coauthors for their teamwork and determination in making this book the best it could be. Also, I want to express my appreciation to my wife and children, who once again watched Dad disappear into his computer room for many long months.

—Mark A. Poplar

I would like to express my thanks to Jeff Kellum, Meredith Brittain, and everyone else at Coriolis for getting me involved in this project and giving me a chance to expand my career into this whole new area of writing. Thanks for all your encouragement and for pulling this thing together through a few minor difficulties.

It is overwhelming to try to think of all the other people I would like to thank for their help in getting me to where I am in my life and career. First, I must thank my parents. Mom and Dad: Your love and continual encouragement have enabled me to accomplish things I never thought possible. Thanks also to the rest of my family—Jimmy, Heidi, my grandparents, and everyone else. Dawn: Thank you for all your help and patience throughout this process—I certainly could not have done this without you in my life. I love you all! I also want to thank several people—co-workers, friends, employers—who have been vital to my career development. Thanks to Tony Young, Joe Danrich, HH Communications, Gary Cortez, Ricardo Bravo, Bill Lang, and SRI. And finally, I want to thank God for making all this possible!

—Jason Waters

I would first like to thank Coriolis for offering me the opportunity to work on a project of this scope. I would especially like to thank Jeff and Meredith at Coriolis and my coauthors for their tireless efforts, countless email messages, and late-night chats. Working with other professionals who share my interest in self-improvement has been a great experience for me, and I believe we have produced a book we can all be proud of. Thanks must also go to all of those

people who offered me assistance during the research and editing stages—specifically, Mike, Chris, Becky, Joanne, Erich, and anyone I forgot to mention for their technical and grammatical expertise. Finally, I need to thank my wife, Dawn, and son, Nathaniel, for their patience and support when I needed it most.

—*Shawn D. McNutt*

First, I would like to thank my wife. Without her ongoing support, my life would not be as wonderful as it is. I would also like to thank my boys, Justin and Michael. They both had to endure many weekends without me while I was working on this project. Next are the many thanks I would like to give to the staff members from ANET. Little Mike, Big Mike, John, and especially Mark, you all gave me any help and support I needed throughout this entire project. Mark, you always came through for me when I needed it. I would also like to thank Mike Singer for all of the career advice. You'll never know how much you've assisted in my career development. Last, but certainly not least, I would like to thank my Mom and Dad, Jim and Mary Ann. You have been the rock that I could always depend on to see me through all of the tough times in my life. Without your constant support, I'm not sure where I would be in life.

—*David Stabenaw*

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION TO INTERNETWORKING 1

The Origins Of Internetworking 2
Network Standards 3
The Need For Industry Standards 3
The OSI Reference Model 5
Advantages Of A Layered Architecture 6
The Network Transportation System 6
Network Topology 7
Network Media 10
Media Access Methods 14
Network Transmission Methods 17
Network Transport Methods 18
Network Protocols 22
The Evolution Of Protocols 23
Common Transport Protocols 23
Network Hardware 25
Important Network Terminology 25
Common LAN Hardware 25
Common WAN Hardware 32
Chapter Summary 37
Review Questions 37
Hands-On Projects 42
Case Studies 47

CHAPTER 2
THE OSI REFERENCE MODEL 49

History Of The OSI Model 50
Layered Approach To Networking 50
De Jure And De Facto Standards 51

Seven-Layer Model 51
Data Encapsulation 52
Application Layer 53
Presentation Layer 54
Session Layer 55
Transport Layer 55
Network Layer 58
Data Link Layer 60
Physical Layer 64
Chapter Summary 64
Review Questions 66
Hands-On Projects 71
Case Studies 78

CHAPTER 3
EXPANDING THE LAN: NETWORK CONGESTION AND SEGMENTATION 79
Network Evolution 80
LAN Technologies 80
Ethernet 80
Fast Ethernet 84
Token Ring 85
Virtual Local Area Networks (VLANs) 87
WAN Technologies 90
Preventing Network Traffic Problems 91
Cable Plant 91
Location Of Network Resources 92
Type Of Network Resources 92
Network Operating Systems 92
Network Protocols 92
Network Hardware 93
Network Hardware Solutions 93
Repeaters/Hubs 93
Bridges 94
Routers 99
Switches 100
Chapter Summary 102
Review Questions 104
Hands-On Projects 108
Case Studies 113

CHAPTER 4
CISCO ROUTING AND SWITCHING SOLUTIONS 115
The Hierarchical Model For Network Design 116
The Core Layer 117
The Distribution Layer 118
The Access Layer 118
Fault Tolerance In Network Design 118
Cisco Router And Switch Products 120
Access Layer Devices 121
Cisco Fixed Configuration Access Routers 121
Cisco Modular Access Routers 126
Cisco Workgroup Switches 129
Distribution Layer Devices 130
Cisco Distribution Layer Switches 131
Core Layer Devices 136
Cisco High-End Routers 136
Cisco High-End Switches 139
Interface Cards 142
Chapter Summary 143
Review Questions 145
Hands-On Projects 150
Case Studies 154

CHAPTER 5
CISCO ROUTER BASICS 155
Router Anatomy 156
Console Port 157
Auxiliary Port 157
Ethernet Interface 158
Serial Port 159
Modular Interfaces 161
Router Memory Types 161
ROM 161
RAM 161
Flash Memory 162
NVRAM 162
Router Startup Process 162
Startup Sequence 163
Changing The Startup Behavior 165
boot system Commands 166

Accessing The Router 167
Access Methods 167
Access Modes 169
Passwords 171
Console Password 172
Auxiliary Password 172
Virtual Terminal Password 173
enable secret Password 173
enable Password 173
Using The IOS Interface 174
Command History Features 178
Editing Features 179
Router Identification 182
Changing The Hostname 182
Displaying Banners 182
Adding Descriptions 184
Chapter Summary 184
Review Questions 186
Hands-On Projects 190
Case Studies 196

CHAPTER 6
CONFIGURING THE ROUTER: THE CISCO IOS 197
Cisco IOS Software Versions 198
Cisco IOS Software Images 199
Cisco IOS Image Naming Convention 199
Image Locations 200
Loading The Boot Image 201
Transferring Images 202
Setup Commands 204
show Commands 208
Configuration Commands 230
Chapter Summary 234
Review Questions 236
Hands-On Projects 241
Case Studies 246

CHAPTER 7
TCP/IP 247
The DOD Model 248
Introduction To TCP/IP 249

此为试读,需要完整PDF请访问: www.ertongbook.com

How Standards Are Published (RFCs) 249
Comparing The OSI Model To TCP/IP 250
TCP/IP Layers 251
Application Layer 251
Transport Layer 253
Internet Layer 257
Network Interface Layer 261
Addressing 263
Numbering Systems 263
Layer 3 Addressing 267
Addressing Rules 270
IP Logic 271
Step 1: Network Identification 271
Step 2: Subnet Identification 271
Step 3: Physical Address Identification 272
Subnetting 272
When To Subnet 272
Subnet Masks 273
Subnet Calculations 273
IP Forwarding 279
Lost IP Addresses 280
IPv6 281
Chapter Summary 282
Review Questions 283
Hands-On Projects 288
Case Studies 291

CHAPTER 8
NOVELL IPX/SPX 293

Introduction To Novell's IPX/SPX 294
IPX Layers 294
Upper Layers 295
Network Transport 296
Addressing, Encapsulation, And Media Access 298
Addressing 299
IPX Network Addressing 299
IPX Node Addressing 300
Valid IPX/SPX Addresses 300
Socket Identifier 301
Encapsulation 301
Network Topologies 302

Encapsulation Frame Types 302
Troubleshooting Considerations 304
Enabling IPX On Cisco Routers 305
Enabling IPX Routing 305
Configuring Individual Interfaces 306
Configuring Secondary Addresses 308
Configuring A Parallel Interface 309
Monitoring IPX Operation 309
Displaying Interface Configuration 309
Displaying The RIP Routing Table 310
Displaying The SAP Table 311
Monitoring IPX Traffic 311
Troubleshooting 312
Chapter Summary 314
Review Questions 315
Hands-On Projects 319
Case Studies 329

CHAPTER 9
BASIC ROUTING 331
What Is Routing? 332
The Routing Process 334
Path Determination 334
Packet Switching 339
Static IP Routing 342
Designing Your Internetwork 343
Router Configuration 345
Showing The Routing Tables 351
Testing Connectivity 352
ip route Command 353
Default Routing 356
Setting A Default Route For Atlanta 357
Setting A Default Route For Chicago 358
Chapter Summary 359
Review Questions 360
Hands-On Projects 363
Case Studies 370

CHAPTER 10
DYNAMIC ROUTING 373
What Is Dynamic Routing? 374
Routed And Routing Protocols 374

Routing Areas 375
Interior And Exterior Routers 375
Routing Scenarios 378
Families Of Routing Protocols 378
How Do Routing Protocols Work? 379
Routing Classification 381
Static Vs. Dynamic 381
Single-Path Vs. Multipath 382
Flat Vs. Hierarchical 382
Host-Intelligent Vs. Router-Intelligent 382
Intradomain Vs. Interdomain 383
Distance Vector Vs. Link State 383
Distance Vector Routing Protocols 383
The Metric 385
Distance Vector Problems And Solutions 386
What Are Distance Vector Routing Protocols Good For? 390
Link State Routing Protocols 390
Convergence With Link State Protocols 392
Link State Problems And Solutions 392
What Are Link State Routing Protocols Good For? 393
Multiprotocol Routing 394
Cisco's Routing Protocols 397
RIP 397
IGRP 398
EIGRP 399
OSPF 400
Chapter Summary 401
Review Questions 402
Hands-On Projects 408
Case Studies 410

CHAPTER 11
IMPLEMENTING RIP AND IGRP 413
Routing Information Protocol 414
Background 414
RIP Packet Format 415
RIP Operation 417
Configuring RIP Routing 418
Preparing Your Internetwork 419
RIP Commands 421
Additional RIP Options 424

Monitoring RIP 426
The **show ip route** Command 427
The **show ip protocol** Command 428
The **show ip interface** Command 428
The **debug ip rip** Command 430
The **ping** Command 430
The **trace** Command 431
Interior Gateway Routing Protocol 431
IGRP Metrics 432
IGRP Operations 434
Configuring IGRP Routing 435
Enabling IGRP 435
Additional IGRP Options 439
Monitoring IGRP 440
The **show ip protocol** Command 440
The **debug ip igrp** Command 440
Chapter Summary 442
Review Questions 443
Hands-On Projects 447
Case Studies 453

CHAPTER 12
DEDICATED WAN SERVICES 455

Basic WAN Connectivity 456
Useful WAN Terminology 456
Physical WAN Connectivity 459
WAN Encapsulation Protocols 464
Synchronous Data Link Control (SDLC) 464
High-Level Data Link Control (HDLC) 465
Link Access Procedure, Balanced (LAPB) 466
Link Access Protocol For An ISDN D Channel (LAPD) 467
Point-To-Point Protocol (PPP) 467
Cisco/IETF 468
X.25 469
X.25 Standards 469
X.25 Equipment 472
A Typical X.25 Session 474
X.25 Monitoring And Configuration 475
Frame Relay 477
Frame Relay Standards 478
Frame Relay Equipment 481

A Typical Frame Relay Session 482
Configuring Frame Relay 483
Monitoring Frame Relay 487
Chapter Summary 489
Review Questions 491
Hands-On Projects 495
Case Studies 508

CHAPTER 13
PSTN-BASED WAN SERVICES 511
PSTN Networking Options 512
Plain Old Telephone Service (POTS) 512
Integrated Services Digital Network (ISDN) 514
Asymmetric Digital Subscriber Line (ADSL) 521
Cisco Support For WAN Links Using The PSTN 522
Dial-On-Demand Routing 523
PPP Encapsulation 526
Configuring PPP Authentication With Passwords 529
Chapter Summary 530
Review Questions 532
Hands-On Projects 536
Case Studies 543

CHAPTER 14
NETWORK SECURITY 547
Firewalls 548
PIX Firewall 549
Cisco IOS Firewall Features Set 549
Protocol Isolation Firewall 549
Access Lists 550
Permit And Deny 551
Inbound And Outbound 552
Installing An Access List 553
IP Standard Access Lists 555
IP Extended Access Lists 559
IPX Standard Access Lists 563
IPX Extended Access Lists 564
IPX SAP Filters Access Lists 567
Applying The Access List To An Interface 569
Monitoring Access Lists 571
Troubleshooting Access Lists 574

Password Recovery 575
Chapter Summary 578
Review Questions 580
Hands-On Projects 586
Case Studies 588

CHAPTER 15
SAMPLE TEST 591

CHAPTER 16
ANSWER KEY 611

APPENDIX A
ANSWERS TO REVIEW QUESTIONS AND CASE STUDIES 627

APPENDIX B
STUDY RESOURCES 667

GLOSSARY 671

INDEX 699

此为试读,需要完整PDF请访问: www.ertongbook.com