CHAPTER 1

Cisco Certifications, the Routing Exam, and This Book's Features

The Cisco Certified Network Professional (CCNP) and Cisco Certified Design Professional (CCDP) certifications on the Routing and Switching career track are becoming increasingly popular. These certifications have as their foundation the Cisco Certifed Network Associate (CCNA) certification and these profesional-level certifications form the second rung in the ladder to the coveted Cisco Certified Internetwork Expert (CCIE) certification. The Routing 2.0 exam (#640-503) is one of three exams that you must pass to become a CCNP or CCDP. This book will help you prepare for that exam. Professional-level certification opens doors to career opportunities and is a prerequisite for other Cisco certifications as well. Generally, passing the Routing 2.0 exam means that you have mastered the concepts and implementation skills necessary to build a complex IP network of Cisco routers.

NOTE You must pass the Routing 2.0 exam (among other exams) to acheive either the CCNP or the CCDP certification. The CCNP and CCDP certifications are often referred to as the *professional-level certifications* throughout this book wherever the information at hand applies to CCNP and CCDP. For more information on the differences between the two professional-level certifications and the latest on Cisco exams and certifications, begin at the Cisco Career Certification page (www.cisco.com/warp/public/10/wwtraining/certprog/index.html) at Cisco Connection Online (CCO).

The Routing exam is a computer-based exam, with multiple-choice, fill-in-the-blank, and list-in-order style questions. The exam can be taken at any Sylvan Prometric testing center (1-800-829-NETS, www.2test.com). The exam will take about 75 minutes and has approximately 60 questions. You should check with Sylvan Prometric for the exact length of the exam. (Be aware that when you register for the exam, you might be told to allow a certain amount of time to take the exam that is longer than the testing time indicated by the testing software when you begin. This is because Sylvan Prometrics wants you to allow for some time to get settled and take the tutorial on the testing engine.)

NOTE This book uses the terms *Routing exam* and *Routing 2.0 exam*. These terms are used synonomously and refer to the the exam #640-503.

The Routing 2.0 exam is not an easy exam. This is to say that you cannot simply read one book and expect to pass it. In fact, the exam is surprisingly difficult; this is so that Cisco can be sure that everyone who passes the test thoroughly understands the subject matter on a conceptual level and is not just good at exams. More importantly, Cisco is very interested in making sure that passing proves that you have the skills to actually implement the features, not just talk about them. The exam is difficult in subject matter and also in format. You can expect multiple-choice questions—some with multiple answers. You can also expect questions requiring you to pick the correct answer from output screens and configurations.

Another difficult aspect of the exam format is that, to ensure that you know your stuff, the exam does *not* allow you to go back and change an answer. Those CCNP/CCDP candidates who are unsure about the question will be forced to guess rather than have an extra 15 minutes to think about it at the end of the exam. Those who really know most of the answers will be rewarded by Cisco's attempts to preserve the integrety of the CCNP/CCDP certification. The professional-level certification will mean to all that you are highly qualified at the subject at hand.

Although this is a difficult exam, most networking professionals can expect to pass if they meet the prerequisites and spend the proper amount of time on training, on-the-job experience, and study. Like most certification exams, you might not pass the first time. Taking the exam a second time, however, might be easier because you have an idea of what to expect.

There are many questions on the Routing 2.0 exam that you might already know through your professional background and experiences, if you meet the prerequisites. This book offers you the opportunity to solidify and build on that knowledge as you make your final preparations to take the Routing exam. The concepts and commands covered on the exam are not secrets locked in some vault—the information is available in many places and forms, including this book. So, although the exam is difficult, passing is certainly attainable with study.

Goals of This Book

The goals for this book became somewhat obvious to me after considering the exam itself, as well as Cisco's exam philosophy. The first goal came straight from Cisco, who asked that I write a book that not only helps you pass the exam, but that also ensures that you really understand the concepts and implementation details. The second goal of this book is that the content should be the most comprehensive coverage of Routing 2.0 exam-related topics available, without too much coverage of topics not on the exam. The third and ultimate goal is to get you from where you are today to the point that you can confidently pass the Routing 2.0 exam. Therefore, all this book's features, which are outlined in this chapter, are geared toward helping you discover the IP routing topics that are on the Routing exam, where you have a knowledge deficiency in these topics, and what you need to know to master these topics.

This Book's Intended Audience

Although the only prerequisite for CCNP certificaion is CCNA status, and the only prerequisite for CCDP certification is CCNA and CCDA status, Cisco does not expect you to be able to pass the professional-level exams (such as the Routing exam) without training and experience. This is why Cisco's recommended training for CCNP/CCDP involves an official Cisco course. For the routing knowledge required of a CCNP/CCDP, Cisco recommends a course called Building Cisco Scalable Networks (BSCN).

As stated on the Cisco web site, the BSCN course is targeted toward enterprise network engineers (including systems engineers [SEs], customers, and resellers) who are responsible for network administration and implementation. The targeted audience performs one or more of the following tasks:

- Install and configure network devices
- Design and implement large enterprise networks
- Add services/applications to an existing network, and determine what router configurations are required to support the new services/applications
- Improve traffic flow, reliability, redundancy, and performance through the network

NOTE BSCN replaces the old Advanced Cisco Router Configuration (ACRC) course, much as the new Routing 2.0 exam (#640-503) replaces the old ACRC exam (#640-403).

This book is a final stage preparation tool. Therefore, this book will be most effective as a study resource after you have taken the BSCN course or have acquired an equivalent level of on-the-job experience and training. The following are the prerequisites for the BSCN course, and, for all practical purposes, should be considered prerequsites for using this book effectively:

- Working knowledge of the OSI reference model and the hierarchical model
- Understanding of internetworking fundamentals
- Ability to operate and configure a Cisco IOS device
- Working knowledge of the TCP/IP stack and how to configure a routed protocol such as IP
- Understanding of distance vector routing protocol operation and configuring Routing Information Protocol (RIP) and Interior Gateway Routing Protocol (IGRP)
- Ability to determine when to use static and default routes, and how to enable them on a Cisco router
- Ability to display and interpret a Cisco router routing table

- Ability to enable a WAN serial connection
- Ability to configure Frame Relay permanent virtual circuits (PVCs) on interfaces and subinterfaces
- Ability to configure an IP standard and extended access list
- Ability to verify router configurations with available tools such as **show** and **debug** commands

The ideal audience for this book is someone who has attended the Interconnecting Cisco Networking Devices (ICND) course (or the retired Introduction to Cisco Router Configuration [ICRC] course), has acheived CCNA status, and has attended the BSCN course, or who has an equivalent level of on-the-job training and experience with Cisco switches and routers.

Cisco highly recommends that you take courses to support each certification level, but it also recognizes that attending courses might not be an option for everyone. Therefore, if you find yourself struggling with CCNA-level knowledge as you work through this book, you might want to review a copy of the *Interconnecting Cisco Networking Devices* coursebook (ISBN 1-57870-111-2) from Cisco Press. Similarly, if you want course details at the CCNP/CCDP level about routing, review the *Building Scalable Cisco Networks* coursebook (ISBN 1-57870-228-3), also from Cisco Press.

Overview of Cisco Certifications

Cisco's main motivation behind the current certification program is to provide a means of measuring the skills of people working for Cisco resellers and certified partners. Cisco fulfills only a small portion of its orders via direct sale from Cisco; normally, a Cisco reseller is involved. Also, Cisco has not attempted to become the primary source for consulting and implementation services for network deployment using Cisco products, preferring instead to use partners as much as possible. With that business model, there is a great need to distinguish, ensure, and certify the skill levels of the partner company's employees.

The CCIE program was Cisco's first foray into certifications. Introduced in 1994, the CCIE was designed to be one of the most respected, difficult-to-achieve certifications. To certify, a written test (also given at Sylvan Prometric) must be passed, and then a two-day hands-on lab test is administered by Cisco. Cisco does not publish numbers on pass/fail rates for CCIE or the other certifications, but rumors have the failure rate on all lab test takers at over 50 percent, with failure rate for first-time lab takers at over 80 percent.

Certifying resellers and services partners, by using the number of employed CCIEs as the gauge, worked well originally, partly because Cisco had far fewer partners than today. Cisco uses the number of CCIEs on staff as part of the criteria in determining the level of partner status for the company, which in turn dictates the discount received by the reseller when buying from Cisco. (For more insight into reseller certification, go to CCO, at www.cisco.com.) This practice continues to be a good way for Cisco to judge the commitment to having people with

proven Cisco skills on staff, which in turn improves customer satisfaction—and customer satisfaction is tied to every Cisco executive's goals.

The CCIE certification became inadequate for helping certify resellers and other partners because, among other factors, the number of partners increased disproportionately to the difficulty of the CCIE exam. For instance, there are around 4500 CCIEs worldwide and 2500 resellers (and not all the CCIEs work for resellers, of course). Furthermore, many resellers that do not perform services do not require the extreme expertise of a CCIE on staff, other than to get a better discount. What Cisco needed were certifications that were less rigorous than CCIE and that would allow Cisco more granularity in judging the skills on staff at a partner company. So, Cisco started an entire Cisco Career Certification program, of which CCNP and CCDP are a part.

Cisco developed Routing and Switching career tracks, WAN Switching career tracks, and several specialization career tracks. Thus far, the Routing and Switching career tracks, which begin with CCNA/CCDA certification, have proven to be the most popular and make up the heart of Cisco certification. The Routing exam required for CCNP/CCDP certification is part of the Routing and Switching career tracks.

Two categories of certifications exist—one to certify implementation skills and the other to certify design skills. Resellers working in a presale environment need more design skills, whereas services companies need more implementation skills. So, the CCNA and CCNP are implementation-oriented certifications, whereas CCDA and CCDP are design-oriented certifications.

Rather than requiring just one level of certification besides CCIE, Cisco created two additional levels—an associate level and a professional level. The associate level (CCNA/CCDA) is the most basic, and the professional level (CCNP/CCDP) is the intermediate level between CCNA and CCIE.

Several of the certifications require other certifications as a prerequisite. For instance, CCNP certification requires that you have CCNA certification. Also, CCDP requires both CCDA and CCNA certification. CCIE, however, does not require any other certification prior to the written and lab tests. CCIE certification is extremely difficult, however, and it is unlikely that someone could acheive that level of certification without a level of experience and training equalled in attaining and practicing associate- and professional-level certification.

Cisco certifications have taken on a much larger role and importance in the networking industry in recent years. From a career standpoint, Cisco certification can certainly be used to help you get a new job or a promotion. Or, you can have certification added to your performance evaluation plan and then justify a raise based on passing an exam. If you are looking for a new job, not only might passing an exam help you land the job, but it may actually help you make more money.

Exams Required for Certification

In 2000, Cisco initiated a major revamping of the career certification exams. Several new exams were unveiled, and the Routing exam was one of those. The Routing 2.0 exam replaced the old ACRC exam; this is why the exam is called Routing 2.0 sometimes, even though there was never a Routing 1.0 exam.

To certify for CCNP, you must pass multiple exams. This book deals with the Routing 2.0 exam—Sylvan Promteric exam #640-503. The qualifying exams, the CCNA and the CCDA, require only a single exam. The exams generally match the same topics that are covered in one of the official Cisco courses, but in most cases—and certainly on the Routing 2.0 exam—more topics are covered on the exam than are in the course. Table 1-1 outlines the exams and the courses with which they are most closely matched.

Table 1-1 *Exams and Courses by Certification Level*

Certification	Exam Number	Name	Course Most Closely Matching Exam Requirements
CCNA	#640-507	CCNA exam	Interconnecting Cisco Network Devices (ICND)
CCDA	#640-441	DCN (or CCDA) exam	Designing Cisco Networks (DCN)
CCNP	#640-503	Routing exam	Building Scalable Cisco Networks (BSCN)
	#640-504	Switching exam	Building Cisco Multilayer Switched Networks (BCMSN)
	#640-505	Remote Access exam	Building Cisco Remote Access Networks (BCRAN)
	#640-509*	Foundation exam	BSCN, BCMSN, and BCRAN
	#640-506	Support exam	Cisco Internetwork Troubleshooting (CIT)
CCDP	#640-503	Routing exam	BSCN
	#640-504	Switching exam	BCMSN
	#640-505	Remote Access exam	BCRAN
	#640-509*	Foundation exam	BSCN, BCMSN, and BCRAN
	#640-025	CID exam	Cisco Internetwork Design (CID)

* Exam #640-509 meets the same requirements as passing these three exams: #640-503, #640-504, and #640-505. Therefore, you can substitute exam #640-509 for those three exams, but you can expect a longer exam that covers the material in the other three exams.

Be cautioned that, although the exam coverage and course coverage are similar, there are no guarantees that if you know absolutely everything in the course, you will pass the test. Cisco is moving more toward the certifications being tied to technology, not to specific courses; note that the exam names do not match the course names as they previously did. As you can see, a Cisco Press Exam Certification Guide will help prepare you for the certification exam beyond how the courses can, with the added guidance of stressing the most important exam items and coverage of other topics not taught in the prerequisite courses. Cisco also maintains the right to change the exam content at will to ensure that the exam is current and fair.

What's on the Routing 2.0 Exam

Every one of us would like to know exactly what is on the Routing 2.0 exam, as well as the other Cisco certification exams. Well, to be honest, exactly what is on the exam is a very closely guarded secret. Only those who write the questions for Cisco and who have access to the entire question database truly know what is entirely on the exam.

The Routing 2.0 exam content that is made known by Cisco to the public is general. You can find a list of Cisco exams and the general outline that accompanies each exam at www.cisco.com/warp/public/10/wwtraining/certprog/testing/exam_list.htm.

You will have to download the outline for each exam. The following section contains excerpts from the Routing exam outline downloaded file.

Cisco Routing Exam Outline File Excerpts From CCO

Given your experience, this outline and guide will help you with the best methods of preparation for the Cisco Career Certifications exam.

The BSCN course is the recommended method of preparation for the Routing exam.

The topic areas listed in this outline are general guidelines for the type of content that is likely to appear on the exam. However, please be advised that other relevant or related topic areas may also appear.

The Routing (640-503) exam will contain a combination of the following topics:

1. Routing principles:
   - List the key information routers need to route data.
   - Describe classful and classless routing protocols.
   - Compare distance vector and link-state routing protocol operation.
   - Describe the use of the fields in a routing table.
   - Given a preconfigured laboratory network, discover the topology, analyze the routing table, and test connectivity using accepted troubleshooting techniques.

2 Extending IP addresses:

- Given an IP address range, use variable-length subnet masks (VLSMs) to extend the use of the IP addresses.
- Given a network plan that includes IP addressing, explain whether route summarization is possible.
- Configure an IP helper address to manage broadcasts.

3 Configuring Open Shortest Path First (OSPF) in a single area:

- Explain why OSPF is better than RIP in a large internetwork.
- Explain how OSPF discovers, chooses, and maintains routes.
- Explain how OSPF operates in a single-area nonbroadcast multiaccess (NBMA) environment.
- Configure OSPF for proper operation in a single area.
- Verify OSPF operation in a single area.
- Given an addressing scheme and other laboratory parameters, configure a single-area OSPF environment, and verify proper operation (within described guidelines) of your routers.
- Given an addressing scheme and other laboratory parameters, configure single-area OSPF in an NBMA environment, and verify proper operation (within described guidelines) of your routers.

4 Interconnecting multiple OSPF areas:

- Describe the issues with interconnecting multiple areas, and tell how OSPF addresses each.
- Explain the differences between the possible types of areas, routers, and LSAs.
- Explain how OSPF supports the use of VLSM.
- Explain how OSPF supports the use of route summarization in multiple areas.
- Explain how OSPF operates in a multiple-area NBMA environment.
- Configure a multiarea OSPF network.
- Verify OSPF operation in multiple areas.
- Given an addressing scheme and other laboratory parameters, configure a multiple-area OSPF environment, and verify proper operation (within described guidelines) of your routers.

5 Configuring Enhanced IGRP (EIGRP):

- Describe EIGRP features and operation.
- Explain how EIGRP discovers, chooses, and maintains routes.
- Explain how EIGRP supports the use of VLSM.
- Explain how EIGRP operates in an NBMA environment.
- Explain how EIGRP supports the use of route summarization.
- Describe how EIGRP supports large networks.
- Configure EIGRP.
- Verify EIGRP operation.
- Given a set of network requirements, configure an EIGRP environment, and verify proper operation (within described guidelines) of your routers.
- Given a set of network requirements, configure EIGRP in an NBMA environment, and verify proper operation (within described guidelines) of your routers.

6 Configuring Basic Border Gateway Protocol (BGP):

- Describe BGP features and operation.
- Describe how to connect to another autonomous system using an alternative to BGP, static routes.
- Explain how BGP policy-based routing functions within an autonomous system.
- Explain how BGP peering functions.
- Describe BGP communities and peer groups.
- Describe and configure external and internal BGP.
- Describe BGP synchronization.
- Given a set of network requirements, configure a BGP environment, and verify proper operation (within described guidelines) of your routers.

7 Implementing BGP in scalable networks:

- Describe the scalability problems associated with internal BGP.
- Explain and configure BGP route reflectors.
- Describe and configure policy control in BGP using prefix lists.
- Describe methods to connect to multiple ISPs using BGP.
- Explain the use of redistribution between BGP and Interior Gateway Protocols (IGPs).

- Given a set of network requirements, configure a multihomed BGP environment, and verify proper operation (within described guidelines) of your routers.

8 Optimizing routing update operation:

- Select and configure the different ways to control routing update traffic.
- Configure route redistribution in a network that does not have redundant paths between dissimilar routing processes.
- Configure route redistribution in a network that has redundant paths between dissimilar routing processes.
- Resolve path selection problems that result in a redistributed network.
- Verify route redistribution.
- Configure policy-based routing using route maps.
- Given a set of network requirements, configure redistribution between different routing domains, and verify proper operation (within described guidelines) of your routers.
- Given a set of network requirements, configure policy-based routing within your pod, and verify proper operation (within described guidelines) of your routers.

9 Implementing scalability features in your internetwork:

- Given a set of network requirements, configure many of the features discussed in the course, and verify proper operation (within described guidelines) of your routers.

Author's Note About Exam Content

As Cisco's authorized external publishing company, Cisco Press is the only publisher that is partnered with Cisco. Cisco has shared other information with Cisco Press, part of which includes some details that are expected to be posted on Cisco's web site at a later date. At press time, Cisco had not finalized what other details about the exam will be posted on its web site, so I cannot list any of those details here. Fortunately, what does get posted by Cisco will be easily available to you! I encourage you to check Cisco's web site for the latest information on the exam.

Some points I would like to make about the exam as it relates to this book are as follows:

- If we at Cisco Press believe that a topic is definitely on the exam, it is covered in Chapters 2 through 10.
- For topics that we at Cisco Press believe have only a remote (but still possible) chance of being in Cisco's Routing 2.0 exam question database, the topic is covered briefly in the body of the book, but it is clearly stated that it is not part of the exam study. These marginal topics are placed in the body of the book so that the topics are in context.

- If we at Cisco Press believe that a topic is simply not in the Cisco Routing 2.0 exam question database, then it is not covered in this book. The only exception would be topics that must be explained to make a topic that is on the exam more understandable. Again, this is indicated within the book.

Topics in This Book

The list that follows outlines the topics that will be the focus of the exam. The topics are listed corresponding to the chapters in which they are covered.

- Chapter 2, "Managing Scalable Network Growth"
  - The key requirements of a network
  - The problem of network congestion
  - The symptoms of network congestion
  - Methods of controlling network traffic
  - Access lists, how to restrict vty access, and uses of access lists
  - Alternatives to access lists
- Chapter 3, "IP Addressing"
  - Prefix routing
  - The use of VLSM and its application
  - The use, application, and configuration of summarization
  - Key points in the design of an IP network
  - How to connect to the outside world and use NAT and private addresses
- Chapter 4, "IP Routing Principles"
  - The requirements of the routing process
  - The routing table
  - The differences between a classful and classless routing protocol
  - The difference between distance vector and link-state routing protocol
  - How routing tables are maintained
  - Path selection
- Chapter 5, "Using OSPF in a Single Area"
  - How a link-state routing protocol (such as OSPF) discovers, chooses, and maintains links

  - How OSPF operates in a single NBMA area WAN
  - How to configure OSPF in a single area
  - How to verify the operation of and troubleshoot an OSPF network
- Chapter 6, "Using OSPF Across Multiple Areas"
  - The issues with interconnecting multiple OSPF areas
  - The differences between the possible types of areas, routers, and LSAs
  - How OSPF operates across multiple areas using NBMA
  - How OSPF supports the use of VLSM and summarization
  - The Cisco commands for implementing OSPF for multiple areas
- Chapter 7, "Using EIGRP in Enterprise Networks"
  - The features and operation of EIGRP
  - How EIGRP discovers, chooses, and maintains routes
  - How EIGRP supports the use of VLSM and summarization
  - How EIGRP functions in an NBMA environment
  - How EIGRP supports large networks
  - How to configure EIGRP, both in an enterprise network and in an NBMA network
  - How to verify an EIGRP configuration
- Chapter 8, "Connecting to Other Autonomous Systems—The Basics of BGP-4"
  - The features and operation of BGP
  - BGP terminology
  - Design issues with BGP
  - BGP communities, peer groups, and the peering function
  - The configuration of internal and external BGP
  - How to verify the BGP configuration
- Chapter 9, "Implementing and Tuning BGP for Use in Large Networks"
  - Scaling internal BGP
  - Configuring route reflectors
  - Determining policy control using prefix lists

  - Connecting to multiple ISPs
  - Redistributing between interior routing protocols and BGP
  - Configuring and verifying the BGP configuration
- Chapter 10, “Controlling Routing Updates Across the Network”
  - Selecting and configuring different ways to control routing updates
  - Configuring route redistribution in networks with and without redundant paths between dissimilar routing processes
  - Resolving problems occuring in a redistributed network
  - Configuring policy-based route maps
  - Verifying and troubleshooting redistribution and policy-based routing
- Chapter 11, “Scenarios for Final Preparation”
  - Chapter 11 contains two scenarios that test you on various topics covered throughout the book instead of concentrating on a particular technology. This challenges your understanding at a profound level and places the topics in context.

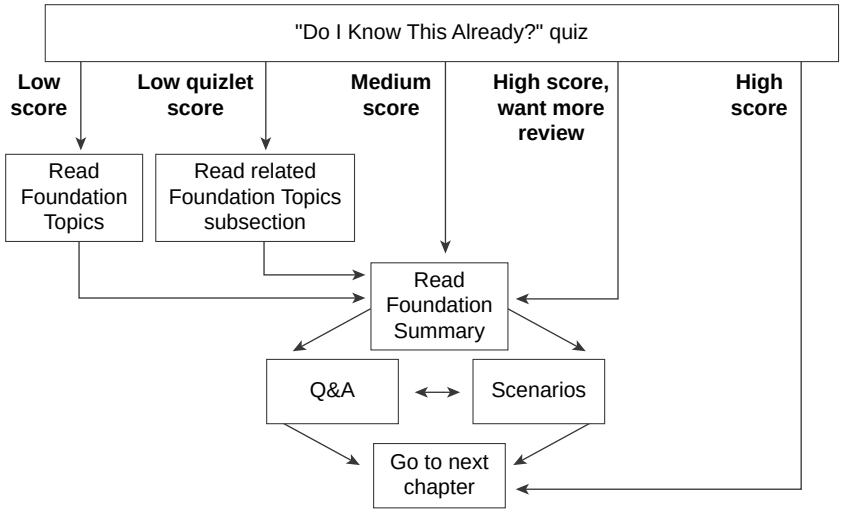
How to Use This Book to Pass the Exam

One way to use this book is to start at the beginning and read it cover to cover. While that would certainly help you prepare, most people do not have that much time to spare, particularly if they already have mastered some of the topics in the book. However, if you want to read the entire book and answer all the CD-ROM questions, then that is a great way to prepare!

For the rest of you, you might want to consider different strategies for how best to use this book, depending on what training and experience you already have. With its prechapter analysis quizzes and chapter-ending summary sections and questions, as well as its traditional foundation sections, this book is designed to help you get the most out of the time you take to study.

The core material for the Routing 2.0 exam is covered in Chapters 2 through 10. At the beginning of each chapter, you are instructed on how to make best use of your time reading that chapter, assuming that you are not going to read every detail. The instructions on how to use each chapter is outlined in a figure in each chapter. That figure is repeated here as Figure 1-1.

Figure 1-1 *How to Use Chapters 2 Through 10*



If you skip to the Foundation Summary, Q&A, and scenarios sections and have trouble with the material there, you should go back to the Foundation Topics section.

Each of these chapters begins with a quiz, which is broken into subdivisions called quizlets. If you get a high score, you might simply review the "Foundation Summary" section at the end of the chapter. If you score well on one quizlet but low on another, you are directed to the section of the chapter corresponding to the quizlet on which your score was low. If you score less than 50 percent on the overall quiz, it is recommended that you read the whole chapter. Of course, these are simply guidelines—if you score well but want more review on that topic, read away!

After completing the core chapters (2 through 10), several options for your next study activity exist. Because Chapter 11 is the next chapter in succession, the detailed directions on what you can do are in the beginning of Chapter 11. However, here is a brief list of the study options provided by this book, beyond the core chapters:

- Chapter 11 includes scenarios and questions to test your overall comprehension of several exam topics.
- All prechapter quiz and chapter-ending questions, with answers, are in Appendix A, "Answers to Quiz Questions." These conveniently located questions can be read and reviewed quickly, with explanations.
- The CD-ROM contains practice exam questions that you can use to take an overall sample exam or to test yourself on specific topics.

- Each core chapter has a "Foundation Summary" section near the end that contains concise tables and information for final review.
- Where appropriate, each chapter has a glossary for the terms introduced in that chapter. The chapter glossaries and Appendix C, "Glossary," are also good study aids.

When you are preparing for the Routing 2.0 exam, the guidelines at the beginning of each chapter should be adequate no matter what your level of knowledge is. However, if you would like some additional guidance, the remainder of this section gives a few additional strategies for study, based on how you have prepared before buying this book. So, find the section that most closely matches your background in the next few pages, and read about some additional ideas to help you prepare.

There are basically five different categories of students:

- Those who have taken the BSCN course
- Those who have taken the ACRC course
- Those who have attended the Cisco Networking Academies
- Those who will not be taking any classes and have not had much experience
- Those who will not be taking any classes but have some experience

I've Taken BSCN—Now What?

Well, first let me say that you've taken the best path to prepare yourself! However, let me temper that with the fact that if you retain more than 50 percent of what you heard in class, then you are an extraordinary person! That said, in my opinion, you need to follow these strategies:

- **Strategy 1**—Use this book exactly as described in the opening pages of Chapters 2 through 10. Each of the core chapters begins with a quiz that helps you assess what you need to study. It then directs you to the appropriate sections in the chapter rather than requiring you to read the entirety of each chapter.
- **Strategy 2**—Use the directions at the beginning of Chapter 11 to direct your final study before the exam. Chapter 11 is designed to review many concepts; in addition, it outlines a good process for study in the days leading up to your exam.

By using these strategies, you will fill in your gaps in knowledge and will be confident taking your Routing 2.0 exam.

I've Taken the Old ACRC Course—Now What?

It is true that the current version of the exam is a closer match to the BSCN class. However, if you were to compare the BSCN and ACRC courses, you would find there is much more in common than is different. In fact, more than half of the ACRC topics are retained in the BSCN

course. Of course, if you retain more than 50 percent of what you heard in class, then you are an extraordinary person, so you probably still need to fill in some holes in your knowledge base. For you, the following strategies will be most helpful:

- **Strategy 1**—Begin with a review of Chapters 8 through 10. These chapters consist of almost completely new material of the Routing exam and should be studied in depth. Do not skip the configuration sections—they are very important.
- **Strategy 2**—Use this book exactly as described in the opening pages of Chapters 2 through 10. Each of the core chapters begins with a quiz that helps you assess what you need to study. It then directs you to the appropriate sections in the chapter rather than requiring you to read the entirety of each chapter. In fact, you probably should even use Chapters 8 through 10 this way, in spite of having read them already, because that will validate what you have learned.
- **Strategy 3**—Make it a point to read the sections of the book that cover topics not found in the ACRC course. Other than almost the entirety of Chapters 8 through 10 of this book, the subjects that you will want to make sure to read are as follows:
  - Chapter 3—Routing table analysis
  - Chapter 4—Hierarchical routing
  - Chapter 5—OSPF in an NBMA network, and OSPF operation
  - Chapter 6—OSPF across multiple areas
  - Chapter 7—Details of the EIGRP operation, particularly across an NBMA network, and design considerations in building a scalable network
- **Strategy 4**—Use the directions at the beginning of Chapter 11 to direct your final study before the exam. Chapter 11 is designed to review many concepts; in addition, it outlines a good process for study in the days leading up to your exam.

Therefore, compared to those who have taken BSCN, you should not require a lot of additional study time. The ACRC course did a great job of explaining the basics, and this book will help you fill in the gaps to confidently prepare to pass the exam!

I've Taken the Cisco Networking Academy Courses—Now What?

First, I'll start by congratulating you on having the foresight to get into the Cisco Networking Academy program—we need more people that can make this stuff work! For those of you who are did not take the Cisco Networking Academy track and are wondering what it is, visit www.cisco.com/warp/public/779/edu/academy/ for more information. Thankfully, the Networking Academy curriculum does a great job of preparing you with the skills and knowledge that you need to pass the Routing exam. Unfortunately, your study was probably spread over several semesters, and possibly over a couple years. So, the details that you do not

use frequently may have been forgotten! On to the strategies for success on CCNP/CCDP—and, in particular, the Routing exam:

- **Strategy 1**—Pull out your Networking Academy curriculum and notes, and reread them. Exciting, huh? Nevertheless, most people's memory is exercised better by seeing familiar material, and even more so when that person wrote it down himself. If you have ever taken a test and pictured in your mind where the answer was on your page of notes, then you can recall the information easily.
- **Strategy 2**—Use this book exactly as described in the opening pages of Chapters 2 through 10. Each of the core chapters begins with a quiz that helps you assess what you need to study. It then directs you to the appropriate sections in the chapter rather than requiring you to read the entirety of each chapter.
- **Strategy 3**—Make it a point to read the sections that cover some of the theory and conceptual sections, and some of the standards. The biggest reason for that is that the Networking Academy is more oriented toward building skills, not theoretical knowledge. The subjects that I suggest are as follows:
  - Chapter 2—From the beginning of the "Foundation Topics" section up to the beginning of the routing table analysis section
  - Chapter 3—The section on VLSM and router summarization
  - The sections on operations in all the other chapters
- **Strategy 4**—Use the directions at the beginning of Chapter 11 to direct your final study before the exam. Chapter 11 is designed to review many concepts; in addition, it outlines a good process for study in the days leading up to your exam.

This book is designed to help you sift through the topics and choose the areas for study that you need to focus on in a timely fashion. Congratulations on your Networking Academy work and CCNA/CCDA certification—now add the CCNP or CCDP certification to take away any doubt in the minds of prospective employers that you know Cisco products and technology.

I'm New to Internetworking with Cisco, and I Will Not Be Taking the BSCN Course—Now What?

You can take and pass the Routing 2.0 exam without taking any courses. Cisco wants you to take the recommended courses for all the exams, though. Cisco's motivation is not to make more money, because the company does not actually deliver the training. Instead, Cisco's motivation is that it truly believes that the more people understand Cisco products, ultimately the happier the customers will be, and the more products Cisco will sell. In addition, Cisco believes that its official training is the best way to teach people about its products, so Cisco wants you to take the classes.

If you are not taking the course, there is no reason to worry! However, truthfully, you will need more than just this book to prepare. Cisco Press publishes the *Building Scalable Cisco Networks* coursebook (ISBN 1-57870-228-3), which is a book version of the BSCN course. The figures are exactly like those in the course, and the text comes from the course material and is even expanded and reorganized to work well in book format. Therefore, if you can't take the course, your best substitute is the *Building Scalable Cisco Networks* coursebook. This book will build on the BSCN material and help you assess what further study you need to pass the Routing exam. Here are my strategy suggestions for your case:

- **Strategy 1**—Read the *Building Scalable Cisco Networks* coursebook. Although Routing 2.0 is not entirely a course-based test, the BSCN course is listed as the recommended course for the Routing exam.
- **Strategy 2**—After reading BSCN, use this book exactly as described in the opening pages of Chapters 2 through 10. Each of the core chapters begins with a quiz that helps you assess what you need to study. It then directs you to the appropriate sections in the chapter rather than requiring you to read the entirety of each chapter.
- **Strategy 3**—Use the directions at the beginning of Chapter 11 to direct your final study before the exam. Chapter 11 is designed to review many concepts; in addition, it outlines a good process for study in the days leading up to your exam.

I've Learned a Lot About CCNP Topics Through Experience, But I Will Not Be Taking the BSCN Course—Now What?

If you feel like you know a fair amount about professional-level routing topics already (at a level that makes taking the BSCN course not very worthwhile), but you are worried about the few topics that you simply just have not worked with, then this strategy is for you. This book is designed to help you figure out what IP routing topics you need some help with, and then help you learn about them. Here is the simple strategy for you:

- **Strategy 1**—Use this book exactly as described in the opening pages of Chapters 2 through 10. Each of the core chapters begins with a quiz that helps you assess what you need to study. It then directs you to the appropriate sections in the chapter rather than requiring you to read the entirety of each chapter.
- **Strategy 2**—Use the directions at the beginning of Chapter 11 to direct your final study before the exam. Chapter 11 is designed to review many concepts; in addition, it outlines a good process for study in the days leading up to your exam.

You will be able to fill in the gaps in your knowledge this way, and not risk being bored in the BSCN class when it covers the topics that you already know!

The Features of This Book

After this brief introductory chapter, there are 10 chapters and three appendixes in this book. Each core chapter starts with a "Do I Know This Already?" quiz that allows you to decide how much time you need to devote to studying the subject at hand. Next, the "Foundation Topics" (the core material of the chapter) are presented. This section is the bulk of each chapter. At the end of each chapter, you will find a "Foundation Summary" section that is a collection of tables and quick-reference material that can be used as the last-minute review notes. Also contained in the "Foundation Summary" section of each chapter is a Chapter Glossary, which defines important terms used in the chapter. Reviewing the Chapter Glossary along with the rest of the "Foundation Summary" makes for excellent late-stage exam preparation. Each core chapter also has a "Q&A" section of review questions that test you on the chapter's contents. Finally, each core chapter contains a "Scenarios" section that tests you further on the material at hand.

The appendixes contain materials for your reference. Appendix A contains the answers to each chapter's "Do I Know This Already?" and "Q&A" quizzes. The answers to the "Scenarios" questions can be found at the end of each chapter.

This book is also accompanied by a CD-ROM that offers multiple-choice questions out of the entire book's content. Each question in the CD-ROM refers you to the chapter and section it is drawn from. The CD-ROM also contains a file called "Job Aids and Supplements." This material is taken from the BSCN course itself and provides further reference material on the following topics:

- IP addresses and subnetting
- Addressing review
- IP access lists
- Configuration and output examples of the following:
  - OSPF
  - EIGRP
  - BGP-4
  - Route optimization

Command Syntax Conventions

The conventions used to present command syntax in this book are the same conventions used in the *Cisco IOS Command Reference*, as follows:

- **Boldface** indicates commands and keywords that are entered literally as shown. In examples (not syntax), boldface indicates user input (for example, a **show** command).
- *Italics* indicates arguments for which you supply values.

- Square brackets ([and]) indicate optional elements.
- Braces ({ and }) contain a choice of required keywords.
- Vertical bars (|) separate alternative, mutually exclusive elements.
- Braces and vertical bars within square brackets—for example, [x {y | z}]—indicate a required choice within an optional element. You do not need to enter what is in the brackets, but if you do, you have some required choices in the braces.

References and Suggested Reading

The following is a list of suggested further reading, if you need additional information:

- *Routing in the Internet*, by Christian Huitema (Prentice Hall)
- *Internet Routing Architectures*, Second Edition, by Bassam Halabi (Cisco Press)
- RFC 1771, "BGP-4 Defined"
- RFC 1930, "Autonomous System Number Allocation"
- RFCs 1771–4, 1863, 1930, 1965, 1966, 1997, 1998, 2042, 2283, 2385, 2439

Strategies for The Exam Day

Here is a reminder of some simple things you can do to help you for the day of the exam.

On the day before the exam:

- Call Sylvan Prometrics to confirm your seat and the time and place of the exam center. Also check the confirmation number that was allocated for your exam.
- Ensure that you have directions for the center and the location of the nearest parking garage.
- Have a relaxing evening; do not be tempted to heavily review because this will simply emotionally exhaust you and prevent a good night's sleep. If you cannot resist some studying, simply read through the question and answer section at the end of the book.

On the exam day:

- Eat a nutritious meal before you leave. Rumbling stomachs are distracting, and it is proven that your brain functions better when fueled.
- Leave plenty of time to get to the testing center, park, and have a few moments to relax before the exam. Allow at least half an hour for traffic jams and the like.

- The testing center will provide pen and paper. You are not allowed any thing in the exam room, except a refreshment and the pen and paper provided. Leave all those heavy books at home.
- Wear loose, comfortable clothing.

During the exam:

- Work out the timing. If the exam still has 61 questions and you allowed 75 minutes to complete, that means you have approximately 1.25 minutes per question. This is very important. Because you cannot return to questions after you have passed them, you must try to allocate an equal amount of time to each question. It is counterproductive to miss questions or to guess unless you really have no idea of the answer. The exam tells you how many questions are left to answer and how much time is left.
- If you do not know the answer to a question, then try answering the question by a process of elimination. As Sherlock Holmes said, "When you have eliminated the impossible, whatever remains, however improbable, must be the truth."
- Use the paper provided to work out the logic of some questions.
- Try to stay calm. Remember that the exam can be taken multiple times, so even if you are struggling, you can use the exam to your advantage by remembering what topics are causing you trouble.

Conclusion

The CCNP certification has great value in the networking environment. It proves your competence and dedication. It is required for several certifications, and it is a further huge step in distinguishing yourself as someone who has proven knowledge of Cisco products and technology instead of just claiming that you know it.

The *CCNP Routing Exam Certification Guide* is designed to help you attain CCNP certification. It is a CCNP-certification book from the only Cisco-authorized publisher. We at Cisco Press believe that this book will help you achieve CCNP certification—but the real work is up to you! We hope you enjoy your time well spent with this book. Good luck.