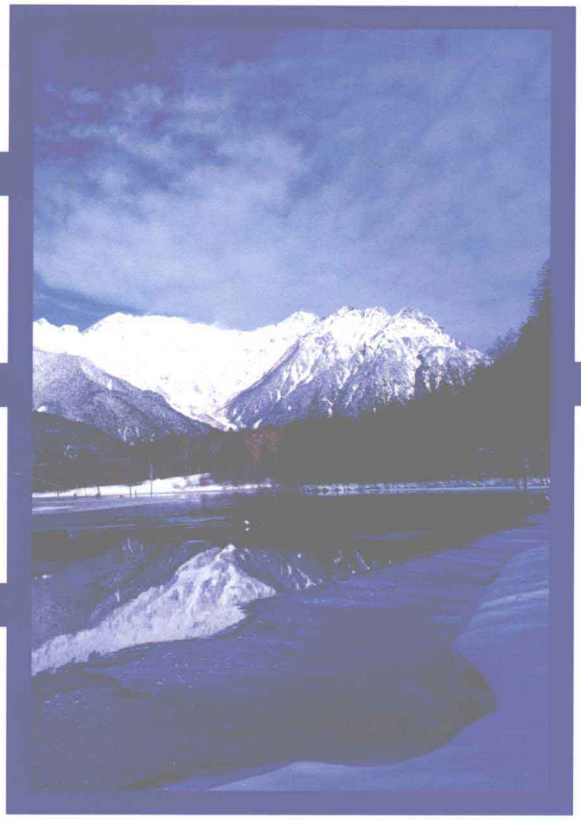
CCNP Building Cisco Remote Access Network Study Guide

CCNP: BCRAN

学习指南

（英文版）（642-821）



〔美〕 Robert Padjen 著

针对最新的CCNP考试全面更新

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内容提要

作为路由和交换领域真正的无冕之王，Cisco公司设立了一系列认证考试，保证使用、管理或提供Cisco产品服务的技术人员能够具备相应的技术水平，其考试目标和内容随其产品不断地发生变化。为覆盖其最新的考试目标，我们采用“原版引进，重新排版印刷”的方式以最快的速度出版Cisco认证考试系列相应科目的辅导丛书来满足读者的需求。本书作为系列中的一本，针对CCNP：642-821考试而推出。书中的内容从远程访问和异步连接开始，介绍了点对点协议、Window和其他操作系统联网、ISDN和DSL，接着介绍了电缆调制解调器、VPN和帧中继，最后介绍了排队和压缩、地址翻译服务和安全。全书每一章后均有大量复习题和答案，其篇幅得当，内容新颖实用，不仅适用于网络管理人员、网络设计和开发人员，更是CCNP应试人员的必备材料。

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To Our Valued Readers:

Thank you for looking to Sybex for your CCNP certification exam prep needs. We at Sybex are proud of the reputation we've established for providing certification candidates with the practical knowledge and skills needed to succeed in the highly competitive IT marketplace. Sybex is proud to have helped thousands of Cisco certification candidates prepare for their exams over the years, and we are excited about the opportunity to continue to provide computer and networking professionals with the skills they'll need to succeed in the highly competitive IT industry.

We at Sybex are proud of the reputation we've established for providing certification candidates with the practical knowledge and skills needed to succeed in the highly competitive IT marketplace. It has always been Sybex's mission to teach individuals how to utilize technologies in the real world, not to simply feed them answers to test questions. Just as Cisco is committed to establishing measurable standards for certifying those professionals who work in the cutting-edge field of internetworking, Sybex is committed to providing those professionals with the means of acquiring the skills and knowledge they need to meet those standards.

The author and editors have worked hard to ensure that the Study Guide you hold in your hand is comprehensive, in-depth, and pedagogically sound. We're confident that this book will exceed the demanding standards of the certification marketplace and help you, the Cisco certification candidate, succeed in your endeavors.

As always, your feedback is important to us. Please send comments, questions, or suggestions to support@sybex.com. At Sybex we're continually striving to meet the needs of individuals preparing for IT certification exams.

Good luck in pursuit of your CCNP certification!

Neil Edde
Associate Publisher—Certification
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Dedicated to the memory of Marcia Goldberg.

Acknowledgments

Most readers have little knowledge of the work involved in publishing a book like this, and, perhaps, that is good and it means that we are doing our jobs. In a technical text like this there are literally thousands of processes that have to come together in scant months.

Within Sybex I need to thank Liz Burke, Neil Edde, and Maureen Adams. Their tireless work behind the scenes is the sole reason this book is in your hands. Todd Lammle, sometimes called the Barry Bonds of Sybex, is a good friend who I must also thank, and I can think of no one better deserving of snow in September!

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I should also thank my parents. Dad, thank you for reminding me that sometimes life isn't fair and that we all view it through our own eyes. Mom, thank you for everything, including the too rarely shared flights.

Lastly, I need to thank the readers who invest their time in not only reading this material, but, often, provide feedback on how to constantly improve it.

Introduction

This book is intended to help you continue on your exciting new path toward obtaining your CCNP certification. Before reading this book, it is important to have at least read the Sybex *CCNA: Cisco Certified Network Associate Study Guide*, Fourth Edition. You can take the CCNP tests in any order, but you should have passed the CCNA exam before pursuing your CCNP. Many questions in the Building Cisco Remote Access Networks (BCRAN) exam are built on the CCNA material. However, we have done everything possible to make sure that you can pass the BCRAN exam by reading this book and practicing with Cisco routers.

Cisco Systems' Place in Networking

Cisco Systems has become an unrivaled worldwide leader in networking for the Internet. Its networking solutions can easily connect users who work from diverse devices on disparate networks. Cisco products make it simple for people to access and transfer information without regard to differences in time, place, or platform.

Cisco Systems' big picture is that it provides end-to-end networking solutions that customers can use to build an efficient, unified information infrastructure of their own or to connect to someone else's. This is an important piece in the Internet/networking-industry puzzle because a common architecture that delivers consistent network services to all users is now a functional imperative. Because Cisco Systems offers such a broad range of networking and Internet services and capabilities, users needing regular access to their local network or the Internet can do so unhindered, making Cisco's wares indispensable.

Cisco answers this need with a wide range of hardware products that form information networks using the Cisco Internetwork Operating System (IOS) software. This software provides network services, paving the way for networked technical support and professional services to maintain and optimize all network operations.

Along with the Cisco IOS, one of the services Cisco created to help support the vast amount of hardware it has engineered is the Cisco Certified Internetworking Expert (CCIE) program, which was designed specifically to equip people to effectively manage the vast quantity of installed Cisco networks. The business plan is simple: If you want to sell more Cisco equipment and have more Cisco networks installed, ensure that the networks you installed run properly.

However, having a fabulous product line isn't all it takes to guarantee the huge success that Cisco enjoys—lots of companies with great products are now defunct. If you have complicated products designed to solve complicated problems, you need knowledgeable people who are fully capable of installing, managing, and troubleshooting them. That part isn't easy, so Cisco began the CCIE program to equip people to support these complicated networks. This program, known colloquially as the Doctorate of Networking, has also been very successful, primarily due to its extreme difficulty. Cisco continuously monitors the program, changing it as it sees fit, to make sure that it remains pertinent and accurately reflects the demands of today's internetworking business environments.

Building on the highly successful CCIE program, Cisco Career Certifications permit you to become certified at various levels of technical proficiency, spanning the disciplines of network design and support. So, whether you're beginning a career, changing careers, securing your present position, or seeking to refine and promote your position, this is the book for you!

Cisco's Certifications

Cisco has created several certification tracks that will help you become a CCIE, as well as aid prospective employers in measuring skill levels. Before these new certifications, you took only one test and were then faced with the lab, which made it difficult to succeed. With these new certifications that add a better approach to preparing for that almighty lab, Cisco has opened doors that few were allowed through before. So, what are these new certifications, and how do they help you get your CCIE?

Cisco Certified Network Associate (CCNA)

The CCNA certification is the first certification in the new line of Cisco certifications and it is a precursor to all current Cisco certifications. With the new certification programs, Cisco has created a type of stepping-stone approach to CCIE certification. Now, you can become a Cisco Certified Network Associate for the meager cost of the Sybex *CCNA: Cisco Certified Network Associate Study Guide*, Fourth Edition, plus $125 for the test. And you don't have to stop there—you can choose to continue with your studies and select a specific track to follow. The Installation and Support track will help you prepare for the CCIE Routing and Switching certification, whereas the Communications and Services track will help you prepare for the CCIE Service Provider certification. It is important to note that you do not have to attempt any of these tracks to reach the CCIE, but it is recommended.

Cisco Certified Network Professional (CCNP)

The Cisco Certified Network Professional (CCNP) certification has opened up many opportunities for the individual wishing to become Cisco-certified but who is lacking the training, the expertise, or the bucks to pass the notorious and often failed two-day Cisco torture lab. The new Cisco certifications will truly provide exciting new opportunities for the CNE and MCSE who just don't know how to advance to a higher level.

So, you're thinking, Great, what do I do after I pass the CCNA exam? Well, if you want to become a CCIE in Routing and Switching (the most popular certification), understand that there's more than one path to the CCIE certification. The first way is to continue studying and become a Cisco Certified Network Professional (CCNP). That means taking four more tests in addition to obtaining the CCNA certification.

We'll discuss requirements for the CCIE exams later in this introduction.

The CCNP program will prepare you to understand and comprehensively tackle the internetworking issues of today and beyond—not limited to the Cisco world. You will undergo an immense metamorphosis, vastly increasing your knowledge and skills through the process of obtaining these certifications.

Remember that you don't need to be a CCNP or even a CCNA to take the CCIE lab, but to accomplish that, it's extremely helpful if you already have these certifications.

What Are the CCNP Certification Skills?

Cisco demands a certain level of proficiency for its CCNP certification. In addition to those required for the CCNA, these skills include the following:

- Installing, configuring, operating, and troubleshooting complex routed LAN, routed WAN, and switched LAN networks, and Dial Access Services.
- Understanding complex networks, such as IP, IGRP, IPX, Async Routing, extended access lists, IP RIP, route redistribution, route summarization, OSPF, VLSM, BGP, Serial, IGRP, Frame Relay, ISDN, ISL, DDR, PSTN, PPP, VLANs, Ethernet, access lists, and transparent and translational bridging.

To meet the Cisco Certified Network Professional requirements, you must be able to perform the following:

- Install and/or configure a network to increase bandwidth, quicken network response times, and improve reliability and quality of service.
- Maximize performance through campus LANs, routed WANs, and remote

access.

- Improve network security.
- Create a global intranet.
- Provide access security to campus switches and routers.
- Provide increased switching and routing bandwidth—end-to-end resiliency services.
- Provide custom queuing and routed priority services.

How Do You Become a CCNP?

After becoming a CCNA, the four exams you must take to get your CCNP are as follows:

Exam 642-801: Building Scalable Cisco Internetworks (BSCI) A while back, Cisco retired the Routing (640-603) exam and now uses this exam to build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them. Among other topics, you'll be tested on IS-IS, OSFP, and BGP. This book covers all the objectives you need to understand for passing the BSCI exam. The BSCI exam is also a required exam for the CCIP and CCDP certifications, which will be discussed later in this introduction.

Exam 642-811: Building Cisco Multilayer Switched Networks (BCMSN) The Building Cisco Multilayer Switched Networks exam tests your knowledge of the 1900 and 5000 series of Catalyst switches.

Exam 642-821: Building Cisco Remote Access Networks (BCRAN) The Building Cisco Remote Access Networks (BCRAN) exam tests your knowledge of installing, configuring, monitoring, and troubleshooting Cisco ISDN and dial-up access products. You must understand PPP, ISDN, Frame Relay, and authentication.

Exam 642-831: Cisco Internetwork Troubleshooting Support (CIT) The Cisco Internetwork Troubleshooting Support (CIT) exam tests you on troubleshooting information. You must be able to troubleshoot Ethernet and Token Ring LANS, IP, IPX, and AppleTalk networks, as well as ISDN, PPP, and Frame Relay networks.

If you hate tests, you can take fewer of them by signing up for the CCNA exam and the CIT exam, and then take just one more long exam called the Foundation R/S exam (640-841). Doing this also gives you your CCNP—but beware, it's a really long test that fuses all the material listed previously into one exam. Good luck! However, by taking this exam, you get three tests for the price of two, which saves you $125 (if you pass). Some people think it's easier to take the Foundation R/S exam because you can leverage the areas that you would score higher in against the areas in which you wouldn't. There is also an option to take three tests: the BCRAN and CIT exams, and the Composite Exam (642-891), which fuses the BSCI and BCMSN exams.

Remember that test objectives and tests can change at any time without notice. Always check the Cisco website for the most up-to-date information (www.cisco.com).

Sybex has a solution for each one of the CCNP exams. Each study guide listed in the following table covers all the exam objectives for their respective exams.

Exam Name	Exam #	Sybex Products
Building Scalable Cisco Internetworks	642-801	*CCNP: Building Scalable Cisco Internetworks Study Guide* (ISBN 0-7821-4293-1)
Building Cisco Multilayer Switched Networks	642-811	*CCNP: Building Cisco Multilayer Switched Networks Study Guide* (0-7821-4294-X)
Building Cisco Remote Access Networks	642-821	*CCNP: Building Cisco Remote Access Networks Study Guide* (0-7821-4296-6)
Cisco Internetwork	642-831	*CCNP: Cisco Internetwork Troubleshooting Study Guide* (0-7821-4295-8)

Also available is the *CCNP Study Guide Kit, 3rd Ed.* (0-7821-4297-4), which covers all four exams.

Cisco Certified Internetwork Professional (CCIP)

After passing the CCNA, the next step in the Communications and Services track would be the CCIP. The CCIP is a professional-level certification.

The CCIP will present you with the skills necessary to understand and tackle the complex internetworking world of the service provider. The skills you will obtain will prepare you to move forward toward the ever-elusive CCIE Communications and Services certification.

What Are the CCIP Certification Skills?

Cisco demands a certain level of proficiency for its CCIP certification. In addition to those required for the CCNA, these skills include the following:

- Perform complex planning, operations, installations, implementations, and troubleshooting of internetworks.
- Understand and manage complex communications networks—last mile, edge, or core.

How Do You Become a CCIP?

After becoming a CCNA, you must take two core exams and an elective. The core exams are listed here:

Exam 642-801: Building Scalable Cisco Internetworks (BSCI) A while back, Cisco retired the Routing (640-603) exam and now uses this exam to build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them. Among other topics, you'll be tested on IS-IS, OSFP, and BGP. This book covers all the objectives you need to understand for passing the BSCI exam.

Exam 642-641: Quality of Services (QoS) This exam tests your knowledge of quality of service for internetworks.

Exam 640-910: Implementing Cisco MPLS (MPLS) This exam tests your knowledge of multiprotocol label switching and its implementation. The Sybex *CCIP: MPLS Study Guide* covers all the exam objectives.

Exam 642-661: Border Gateway Protocol (BGP) This exam tests your knowledge of Border Gateway Protocol (BGP). When you complete this exam, you should be able to manage a large BGP network.

Cisco's Network Design and Installation Certifications

In addition to the Network Installation and Support track and the Communications and Services track, Cisco has created another certification track for network designers. The two certifications within this track are the Cisco Certified Design Associate (CCDA) and Cisco Certified Design Professional (CCDP) certifications. If you're reaching for the CCIE stars, we highly recommend the CCNP and CCDP certifications before attempting the CCIE R/S Qualification exam.

These certifications will give you the knowledge to design routed LAN, routed WAN, and switched LAN.

Cisco Certified Design Associate (CCDA)

To become a CCDA, you must pass the DESGN (Designing for Cisco Internetwork Solutions) test (640-861). To pass this test, you must understand how to do the following:

- Design simple routed LAN, routed WAN, and switched LAN and ATM LANE networks.
- Use network-layer addressing.
- Filter with access lists.
- Use and propagate VLAN.
- Size networks.

Cisco Certified Design Professional (CCDP)

If you're already a CCNP and want to get your CCDP, you can simply take the CCDA and the Designing Cisco Network Architectures (ARCH) 642-871 tests. If you're not yet a CCNP, however, you must take the CCDA, CCNA, BSCI, BCMSN, BCRAN, and ARCH exams.

CCDP certification skills include the following:

- Designing complex internetworks with hierarchical network designs
- Implementation of quality of service
- Understanding of advanced networking concepts, including VLSM, IP multicast, AVVID, VPN, and wireless

Cisco's Security Certifications

There are quite a few Cisco security certifications to obtain. All of the Cisco security certifications also require a valid CCNA.

Cisco Certified Security Professional (CCSP)

You have to pass five exams to get your CCSP. The pivotal one of those is the SECUR exam. After you pass the SECUR exam, you need to take only four more. Here they are—the exams you must pass to call the CCSP yours:

Exam 642-501: Securing Cisco IOS Networks (SECUR) This exam tests your understanding of such concepts as basic router security, AAA security for Cisco routers and networks, Cisco IOS firewall configuration and authentication, building basic and advanced IPSec VPNs, and managing Cisco enterprise VPN routers. Sybex can help you pass the SECUR exam with the *CCSP: Securing Cisco IOS Networks Study Guide* (ISBN 0-7821-4231-1).

Exam 642-521: Cisco Secure PIX Firewall Advanced (CSPFA) This exam challenges your knowledge of the fundamentals of Cisco PIX Firewalls, as well as translations and connections, object grouping, advanced protocol handling and authentication, and authorization and accounting, among other topics. You can tackle the CSPFA exam with the help of Sybex's *CCSP: Secure PIX and Secure VPN Study Guide* (ISBN 0-7821-4287-7).

Exam 642-511: Cisco Secure Virtual Private Networks (CSVPN) The CSVPN exam covers the basics of Cisco VPNs as well as configuring various Cisco VPNs for remote access, hardware client, backup server and load balancing, and IPSec over UDP and IPSec over TCP. Again, using the Sybex *CCSP: Secure PIX and Secure VPN Study Guide* (ISBN 0-7821-4287-7), you'll approach the CSVPN exam with confidence.

Exam 642-531: Cisco Secure Intrusion Detection System (CSIDS) The CSIDS exam will challenge your knowledge of intrusion detection technologies and solutions, and test your abilities to install and configure ISD components.

You'll also be tested on managing large-scale deployments of Cisco IDS sensors using Cisco IDS management software. Prepare for the CSIDS exam by using Sybex's *CCSP: Secure Intrusion Detection and SAFE Implementation Study Guide* (ISBN 0-7821-4288-5).

Exam 9E0-131: Cisco SAFE Implementation (CSI) This exam tests such topics as security and architecture fundamentals, SAFE network design for small and medium corporate and campus situations, and SAFE remote-user network implementation. See Sybex's *CCSP: Secure PIX and Secure VPN Study Guide* (ISBN 0-7821-4287-7).

Cisco Firewall Specialist

Cisco Security certifications focus on the growing need for knowledgeable network professionals who can implement complete security solutions. Cisco Firewall Specialists focus on securing network access by using Cisco IOS Software and Cisco PIX Firewall technologies.

The two exams you must pass to achieve the Cisco Firewall Specialist certification are Securing Cisco IOS Networks (SECUR) and Cisco Secure PIX Firewall Advanced (CSPFA).

Cisco IDS Specialist

Cisco IDS Specialists can both operate and monitor Cisco IOS Software and IDS technologies to detect and respond to intrusion activities.

The two exams you must pass to achieve the Cisco IDS Specialist certification are Securing Cisco IOS Networks (SECUR) and Cisco Secure Intrusion Detection System (CSIDS).

Cisco VPN Specialist

Cisco VPN Specialists can configure VPNs across shared public networks using Cisco IOS Software and Cisco VPN 3000 Series Concentrator technologies.

The exams you must pass to achieve the Cisco VPN Specialist certification are Securing Cisco IOS Networks (SECUR) and Cisco Secure Virtual Networks (CSVPN).

Cisco Certified Internetwork Expert (CCIE)

Cool! You've become a CCNP, and now your sights are fixed on getting your Cisco Certified Internetwork Expert (CCIE) certification. What do you do next? Cisco recommends a *minimum* of two years of on-the-job experience before taking the CCIE lab. After jumping those hurdles, you then have to pass the written CCIE Exam Qualifications before taking the actual lab.

There are actually four CCIE certifications, and you must pass a written exam for each one of them before attempting the hands-on lab:

CCIE Communications and Services (Exams 350-020, 350-021, 350-022, 350-023) The CCIE Communications and Services written exams cover IP and IP routing, optical, DSL, dial, cable, wireless, WAN switching, content networking, and voice.

CCIE Routing and Switching (Exam 350-001) The CCIE Routing and Switching exam covers IP and IP routing, non-IP desktop protocols such as IPX, and bridge- and switch-related technologies.

Sybex can help you pass the CCIE Routing and Switching exam with the *CCIE: Cisco Certified Internetworking Expert Study Guide*, Second Edition (ISBN 0-7821-4207-9).

CCIE Security (Exam 350-018) The CCIE Security exam covers IP and IP routing as well as specific security components.

CCIE Voice (Exam 351-030) The CCIE Voice exam covers those technologies and applications that make up a Cisco Enterprise VoIP solution.

What Does This Book Cover?

This book covers everything you need to know for the Remote Access examination; in addition to addressing the real-world materials that you need to understand connectivity options in production networks. Each chapter starts with a list of the topics included as they relate to the exam, so please take a moment to review them before delving into the chapter.

Chapter 1 introduces Remote Access, including a high-level presentation of the different connectivity types and their usage. We also review some of the hardware choices available for remote connectivity.

Chapter 2 presents asynchronous connections, or modem services on telephone lines. While not as glamorous as DSL or Frame Relay, asynchronous connections are the most ubiquitous.

Chapter 3 delves into the details of the Point-to-Point Protocol, which can be used to provide a common transport for users. The protocol also includes authentication options, which are further presented in the chapter.

Chapter 4 presents Microsoft Windows and networking with this popular operating system. There are few, if any, questions remaining on the examination regarding this product, but the coverage is good for real-world implementations and the possibility of a question or two remaining on the exam. The discussion on DHCP is relevant for most readers and should be reviewed.

Chapter 5 discusses Integrated Services Digital Network (ISDN) technologies, which are still common in many countries. Although cable modems and

DSL are quickly replacing ISDN, there are benefits in its use and it does provide some historical information applicable to the newer transports.

Chapter 6 addresses Digital Subscriber Line (DSL), one of the fastest growing consumer connectivity options. Businesses are finding economical, high-bandwidth benefits to the technology as well.

Chapter 7 deals with two key technologies. Cable modems are competing well with DSL and provide advantages and disadvantages for remote users. The second part of the chapter presents VPN technologies, including IPSec, and ties together cable modems with tunneling. Although they are independent technologies, they can be complementary and have been presented as such in this chapter.

Chapter 8 returns to what might be the most prevalent remote access technology for enterprise customers—Frame Relay. We examine the technology, its features, and future uses.

Chapter 9 leaves the transport technologies and presents two services that can be important on lower throughput links—queuing and compression. With the deployment of Voice over IP (VoIP) and other time-sensitive traffic on data networks, the ability to prioritize and control bandwidth is critical to success.

Chapter 10 continues with services that augment remote connections by delving into address translation services. These options can greatly help the administrator in remote access deployments.

Chapter 11 concludes with what some would argue is the most important aspect of networking—security. Specifically this chapter examines AAA (authentication, authorization, and accounting) and these functions' role in internetworking.

Each chapter ends with review questions that are specifically designed to help you retain the knowledge presented. To really nail down your skills, read each question carefully and take the time to work through the hands-on labs in some of the chapters.

Where Do You Take the Exam?

You can take the exams at any of the Sylvan Prometric or Virtual University Enterprises (VUE) testing centers around the world. For the location of a testing center near you, call Sylvan at (800) 755-3926 or VUE at (877) 404-3926. Outside of the United States and Canada, contact your local Sylvan Prometric Registration Center.

To register for a Cisco Certified Network Professional exam:

1. Determine the number of the exam you want to take. (The BCRAN exam number is 642-821.)
2. Register with the nearest Sylvan Prometric or VUE testing center. At this

point, you will be asked to pay in advance for the exam. At the time of this writing, the exams are $125 each and must be taken within one year of payment. You can schedule exams up to six weeks in advance or as soon as one working day prior to the day you wish to take it. If something comes up and you need to cancel or reschedule your exam appointment, contact the testing center at least 24 hours in advance. Same-day registration isn't available for the Cisco tests.

3. When you schedule the exam, you'll get instructions regarding all appointment and cancellation procedures, the ID requirements, and information about the testing-center location.

Tips for Taking Your CCNP Exam

The CCNP BCRAN test contains about 66 questions to be completed in about 90 minutes. However, understand that your test might vary.

Many questions on the exam have answer choices that at first glance look identical—especially the syntax questions! Remember to read through the choices carefully because "close" doesn't cut it. If you put commands in the wrong order or forget one measly character, you'll get the question wrong. So, to practice, do the hands-on exercises at the end of the chapters over and over again until they feel natural to you.

Unlike Microsoft or Novell tests, the exam has answer choices that are really similar in syntax—although some syntax is dead wrong, it is usually just *subtly* wrong. Some other syntax choices might be right, but they're shown in the wrong order. Cisco does split hairs, and is not at all averse to giving you classic trick questions. Here's an example:

access-list 101 deny ip any eq 23 denies Telnet access to all systems.

This item looks correct because most people refer to the port number (23) and think, "Yes, that's the port used for Telnet." The catch is that you can't filter IP on port numbers (only TCP and UDP). Another indicator is the use of an extended access list number but no destination address or any for the destination.

For further practice with routers and switches, check out the CCNP Virtual Lab from Sybex. For information on the current version of this product, please go to www.sybex.com.

Also, never forget that the right answer is the Cisco answer. In many cases, more than one appropriate answer is presented, but the *correct* answer is the one that Cisco recommends.

Here are some general tips for exam success:

- Arrive early at the exam center, so you can relax and review your study materials.