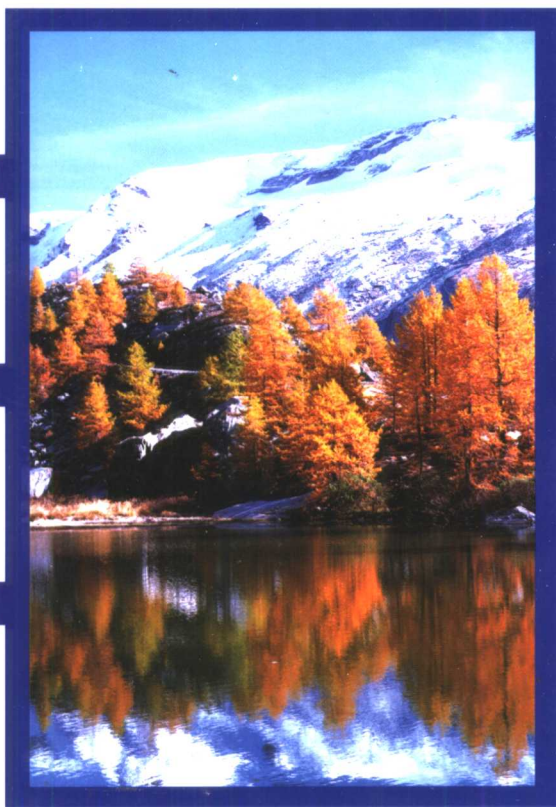


CCNP Cisco Internetwork Troubleshooting Study Guide

CCNP: CIT

学习指南

(英文版) (642-831)



[美] Arthur Pfund 著
Todd Lammle

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, 以保证使用、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, 而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: 642-831考试而推出。书中的内容从故障诊断方法论开始, 首先介绍了配置表和拓扑图、OSI参考模型及面向连接和无连接的协议, 接着介绍了Cisco内置诊断工具的使用、串行连接和帧中继连接, 之后是ISDN和相关协议以及Catalyst系列交换机, 最后以一个综合全书知识的现实世界的例子作为结尾。全书每一章后均有大量复习题和答案, 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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CCNP: Cisco Internetwork Troubleshooting

Study Guide

Exam number (642-831)

OBJECTIVE	CHAPTER
TECHNOLOGY	
Identify troubleshooting methods.	1, 3
Explain documentation standards and the requirements for document control.	2, 3
IMPLEMENTATION AND OPERATION	
Establish an optimal system baseline.	2, 3
Diagram and document system topology.	2
Document end system configuration.	3
Verify connectivity at all layers.	3, 4, 5, 6, 7, 8, 10
Select an optimal troubleshooting approach.	3, 4, 5, 6
PLANNING AND DESIGN	
Plan a network documentation system.	3
Plan a baseline monitoring scheme.	3
Plan an approach to troubleshooting that minimizes system downtime.	4, 5, 6, 7
TROUBLESHOOTING	
Use Cisco IOS commands and applications to identify system problems at all layers.	4, 5, 7, 8, 9, 10
Isolate system problems to one or more specific layers.	4, 8
Resolve sub-optimal system performance problems at layers 2 through 7.	5, 8, 9, 10
Resolve local connectivity problems at layer 1.	9, 10
Restore optimal baseline service.	9, 10
Work with external providers to resolve service provision problems.	7, 8
Work with system users to resolve network related end-use problems.	3



NOTE

Exam objectives are subject to change at any time without prior notice and at Cisco's sole discretion. Please visit Cisco's website (<http://www.cisco.com>) for the most current exam objectives listing.

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
Sybex, Inc.

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To my parents for helping me become the person I am today.

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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 Cisco Internet Troubleshooting Support (CIT) exam are built on the CCNA material. However, we have done everything possible to make sure that you can pass the CIT exam by reading this book and practicing with Cisco routers.

Cisco Systems's 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's 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 are used to form information networks using the Cisco Internetworking 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 an extraordinary 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 those products. 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 continually monitors the program, making the changes needed to make sure that the program 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 existed, you took only one test and were then faced with the lab, which made it difficult to succeed. With the 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 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; the Communications and Services track will help you prepare for the CCIE Communication and Services certification. It is important to note that you do not have to attempt any of these tracks to reach the CCIE, but choosing a track is recommended for the best success.

Cisco Certified Network Professional (CCNP)

The Cisco Certified Network Professional (CCNP) certification has opened 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 don't see an obvious way to advance.

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. One 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 on in this introduction.



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.

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 metamorphosis, vastly increasing your knowledge and skills through the process of obtaining these certifications.

What Are the CCNP Certification Skills?

Cisco demands a certain level of proficiency for its CCNP certification. In addition to what's required for the CCNA, you'll need to have the following skills:

- Installing, configuring, operating, and troubleshooting complex routed LAN, routed WAN, and switched LAN networks, and Dial Access Services.
- Understanding complex networking concepts, such as IP, IGRP, Async Routing, extended access lists, IP RIP, route redistribution, route summarization, OSPF, VLSM, BGP, Serial, IGRP, Frame Relay, ISDN, ISL, X.25, DDR, PSTN, PPP, VLANs, Ethernet, ATM LAN emulation, access lists, 802.10, FDDI, 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, 642-801, to build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them. 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. You'll also be challenged on your knowledge of switching technology, implementation and operation, planning and design.

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 document a network; troubleshoot Ethernet LANS and IP networks, as well as ISDN, PPP, and Frame Relay networks. This book covers all the topics you'll need to pass the CIT exam.

An Alternate Plan

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 in this introduction into one exam. Good luck! That said, 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 your higher-scoring areas against the areas in which you don't do as well. There is also an option to obtain your CCNP. This is to do three tests: the Composite Exam (642-891), which fuses the BSCI and BCMSN exams, plus the BCRAN and CIT 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	<i>CCNP: Building Scalable Cisco Internetworks Study Guide</i> (ISBN 0-7821-4293-1)
Switching	642-811	<i>CCNP: Building Cisco Multilayer Switched Networks Study Guide</i> (0-7821-4294-X)
Remote Access	642-821	<i>CCNP: Building Cisco Remote Access Networks Study Guide</i> (0-7821-4296-6)
Support	642-831	<i>CCNP: Cisco Internetwork Troubleshooting Study Guide</i> . (0-7821-4295-8)

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

Cisco Certified Internetwork Professional (CCIP)

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

The CCIP certification gives you the skills necessary to understand and tackle the complex internetworking world of the service provider. You will acquire the knowledge necessary to prepare you for moving forward toward the coveted 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 what's required for the CCNA, you will need to have the following skills:

- Performing complex planning, operations, installations, implementations, and troubleshooting of internetworks.

- Understanding and managing 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:

Exam 642-801: Building Scalable Cisco Internetworks (BSCI) A while back, Cisco retired the Routing (640-603) exam and now uses this exam, 642-801, to build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them.

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* (ISBN 0-7821-4096-3) 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). 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 two 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 ARCH 642-871 test. If you're not yet a CCNP, however, you must take the CCDA, CCNA, BSCI, Switching, Remote Access, and CID exams.

CCDP certification skills include:

- Designing complex routed LAN, routed WAN, and switched LAN and ATM LANE networks.
- Technical knowledge beyond the base level of CCDA.

CCDPs must also demonstrate proficiency in the following:

- Network-layer addressing in a hierarchical environment.
- Traffic management with access lists.
- Hierarchical network design.
- VLAN use and propagation.
- Performance considerations: required hardware and software; switching engines; memory, cost, and minimization.

Cisco's Security Certifications

Quite a few Cisco security certifications are available. 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 exam is the SECUR. Here 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, 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; configuring various Cisco VPNs for remote access, hardware client, backup server, and load balancing; plus 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 IDS 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 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. You can take advantage of Sybex's *CCSP: Secure PIX and Secure VPN Study Guide* (ISBN 0-7821-4287-7) for help with this exam.

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 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 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 four CCIE certifications, and you must pass a written section and a lab portion for each certification. As can be seen from below, most of the CCIE certifications require only a single test, but one requires multiple:

CCIE Communications and Services (Exams 350-020, 350-021, 350-022, 350-023) The four 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.

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 CIT exam number is 642-831.)
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 CIT Exam

The CCNP CIT test contains about 65 questions to be completed in about 90 minutes. However, understand that your test may vary somewhat from this estimate.

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, your answer will be wrong. So, to practice, do the hands-on exercises at the end of the chapters over and over again until the solutions feel natural to you.

Unlike Microsoft or Novell tests, the exam has answer choices that are highly similar in syntax—although some syntax is dead wrong, it is usually just *subtly* wrong. Some other syntax choices may be right, but they're shown in the wrong order. Cisco does split hairs, and it 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 statement looks correct to most people because they 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 can be filtered in this way). Another indicator that this command is wrong is the use of an extended access list number but with any or no destination address for the destination.



Cisco does have some simulation questions on the CIT exam. Make sure you've got hands-on skills to take this test. Practice with the hands-on labs in this book, and for further practice with routers and switches, check out the CCNP Virtual Lab from Sybex.



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.
- Read the questions *carefully*. Don't just jump to conclusions. Make sure that you're clear about *exactly* what each question asks.
- Don't leave any questions unanswered. They count against your score.