

CCNP: Cisco Internetwork Troubleshooting Study Guide

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# CCNP Cisco Internetwork Troubleshooting 学习指南

(英文原版)

Cisco认证考试  
系列丛书之五



[美] Kevin Hales  
Robert Padjen 著  
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URL: <http://www.phei.com.cn>

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## **学习指南 (英文原版)**

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**电子工业出版社**  
**Publishing House of Electronics Industry**  
北京 • BEIJING

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# Cisco认证考试系列丛书说明

## Cisco认证考试及其背景

当前，计算机系统及其网络系统的开发、管理、使用和维护需要大量不同层次的专业技术人员。真实地评价各种技术人员的技术水平是一件既复杂而又必不可少的工作。为此，许多世界著名的大公司和厂家纷纷推出了各自的认证考试方案。如Microsoft公司的MCSE、MCSD，Novell公司推出的CNE/CNA等，世界著名的网络系统公司——Cisco公司，则推出了其CCNA、CCDA、CCNP、CCDP、CCIE认证考试方案。那么，Cisco公司认证考试的意义、考试内容及其做法是怎样的呢？

Cisco公司建立于80年代初期，主要致力与开发、生产、销售高档网关、路由器和网络互联设备，其产品广泛应用于局域网、广域网和Internet等领域。基于Cisco产品领先的技术、优异的性能和良好的服务，Cisco公司的产品遍及世界各地，其业务量每年以非常高的速度递增，该公司的股票也以极高的速度逐年攀升。可以说，Cisco公司是计算机、特别是网络时代所创造的又一个奇迹。

Cisco公司的产品不同于普通的计算机软、硬件产品，它的技术含量高，原理复杂，因此学习和掌握其工作原理及使用方法需要许多相关知识和实践经验，需要高层次、高技术水平的人员。为保证使用、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，Cisco公司设立了一整套认证考试方案（见图0.1）。可以坦言，Cisco考试的难度高于其它公司的考试方案，自然通过其考试后也更容易得到一些高薪的职位。也许是高难度的挑战所带来的诱惑，也许是高薪职位的吸引，目前参加或准备参加Cisco认证考试的人员正在逐年增加。

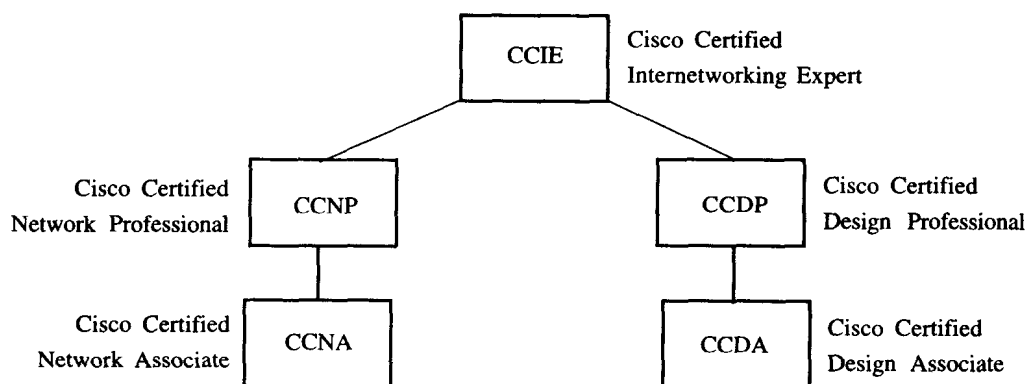


图0.1 Cisco认证考试由高及低的层次结构

要通过各项认证考试，具体的要求见表0.1中所示。

表0.1 CISCO认证证书及考试要求

证书名称	考试要求和考试科目	考试代码	注释
CCNA (Cisco Certified Network Associate)	Cisco Certified Network Associate	Exam 640-407	
CCNP (Cisco Certified Network Professional)	CCNA证书 ACRC (Advanced Cisco Router Configuration) CLSC (Cisco Lan Switch Configuration) CMTD (Configuring, Monitoring and Troubleshooting Dial-up Services) CIT (Cisco Internetwork Troubleshooting)	Exam 640-403 Exam 640-404 Exam 640-405 Exam 640-406	①
	CCNA证书 CIT (Cisco Internetwork Troubleshooting) F R/S (Foundation Routing and Switching)	Exam 640-406 Exam 640-409	②
CCDA (Cisco Certified Design Associate)	CDS (Cisco Design Specialist)	Exam 9E0-004	
CCDP (Cisco Certified Design Professional)	CCDA证书 CCNP证书 CID (Cisco Internetwork Design)	Exam 640-025	③
	CCDA证书 ACRC, CLSC, CIT, CMTD四门考试		④
CCIE (Cisco Certified Internetworking Expert)	CCNP证书 CID (Cisco Internetwork Design) IMCR (Installing and Maintaining Cisco Router)课程 Cisco实际上机考核 CCIE-R/S (Exam Qualification)	Exam 640-025 Exam 350-001	⑤

注释: ① 要获取CCNP证书, 需先具有CCNA证书, 并通过四门考试。

② 获取CCNP证书, 也可采取第二种方法, 即先获取CCNA证书, 再通过CIT考试和FR/S考试、后者是一个相当长的测试过程, 内容涵盖了ACRC, CLSC, CMTD三项, 选择此方式比前者节省约100美元。

③ 要获取CCDP证书, 需先具有CCDA和CCNP证书, 再经过CID考试。

④ 如果尚不具备CCNP证书, 可在具有CCDA证书的前提下, 分别通过CCNP的四门考试。

⑤ 获得CCIE证书是一项非常艰难的过程, 因此CCIE几乎成为了一种“出类拔萃”的标志。在进行严格的CISCO上机实验操作之前, CISCO推荐考生先完成CID并学习IMCR课程(本书写作时尚没有IMCR考试)。CISCO建议要有最少两年相关的工作经历, 并通过上述考试后进行CCIE-R/S资格考试, 再完成实际上机考核, 并获得CCIE证书。

## 关于Cisco认证考试系列丛书

计算机认证考试是计算机业界人士和高等院校学生的的一个“热点”，同时也是出版界的一个“时髦话题”。1998年我们在国内领先推出了“微软MCSE系列丛书”，合计20余册（见本书封底的书目），结果非常成功。利用与国外出版公司的密切合作关系，加之我们认真负责的翻译、编辑和出版印刷方面努力，MCSE系列丛书以其快速的出版速度、较高的质量和适中的价格得到了广大读者的欢迎，取得了很好的社会效益和经济效益。借助过去的成功经验，我们再次引进Sybex公司的版权，采用“原版引进，重新排版印刷”的方式，出版Cisco认证考试系列丛书（英文版），在1999年将首先推出如下6本书籍（见表0.2）。

表0.2 Cisco认证考试系列丛书

中文书名	丛书编号	适用考试科目
CCNA: Cisco CCNA学习指南	Cisco认证考试系列丛书之一	CCNA
CCNP: Cisco ACRC学习指南	Cisco认证考试系列丛书之二	CCNP Exam 640-403
CCNP: Cisco CLSC学习指南	Cisco认证考试系列丛书之三	CCNP Exam 640-404
CCNP: Cisco CMTD学习指南	Cisco认证考试系列丛书之四	CCNP Exam 640-405
CCNP: Cisco CIT学习指南	Cisco认证考试系列丛书之五	CCNP Exam 640-440
CCDA: Cisco CCDA学习指南	Cisco认证考试系列丛书之六	CCDA

以后，我们将推出其余认证考试科目的书籍。请读者留意书店内的销售广告或本系列书中的最新说明（恕不另行通知）。

最后，向支持和喜爱我们图书的广大读者表示感谢，并肯请读者对书中存在的问题提出批评和指正。

1999年 春

*In memory of my mother-in-law, Aura Recinos. Thank you for your inspiration, love, and counsel.*

*For my parents, to whom I am eternally grateful. Thank you for all of your guidance, discipline, teachings, and love in the past and present.*

*Kevin Hales*

*To my wife, Kristie, and the boys, Tyler and Eddie. Thank you for all your patience, understanding, and support. For my grandfather, for guidance and teachings of years past.*

*Robert Padjen*

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Kevin Hales

I would like to thank Todd Lammle and Neil Edde, along with the rest of the book team, for all of their assistance and the opportunity to work on this project. Special thanks to Mike "Na, keep the egg" Velasco, Ann LaCosse, Deloris Washington, and my friends, family, and coworkers. And, of course, thanks to my mom for her professional advice and loving support, and my dad (no, this is not your book) for words of wisdom and guidance.

Robert Padjen

We can't forget all the fantastic editors who contributed countless hours of work to this project: Nancy Sixsmith, the copy editor; Raquel Baker, the project editor; and Shawn Zudal, the technical editor. And John Swartz for his final editorial review to check for technical errors to ensure that this book meets the highest standards so that you, the reader, can pass the exam the first time.

We gratefully acknowledge the skillful work of the Sybex production team: Bill Gibson, Adrian Woolhouse, Kate Kaminski, and Cyndy Johnsen, electronic publishing specialist; Shannon Murphy, project team leader; and Camera Obscura, Davina Baum, and Bonnie Hart, proofreaders.

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There are more CCNA/CCNP practice test questions available. Check [www.lammle.com](http://www.lammle.com) for updates on Cisco testing questions regarding the Cisco certifications.

We are grateful to Janice Spampinato from AGGroup. Thanks to AGGroup, we were able to include network traces throughout this book with one of the best network analyzers on the market: Etherpeek.

Christy Delger from Visio Corporation provided an awesome product for the CD that can easily help you document your network, plus more. Most of the figures in this book were produced in full or in part from Visio.

The Authors



## Introduction

**T**his book is intended to help you continue on your exciting new path toward obtaining your CCNP and CCIE certification. Before reading this book, it is important to have at least read the Sybex *CCNA Study Guide*. You can take the tests in any order, but the CCNA exam should probably be your first test. It would also be beneficial to have read the Sybex *ACRC Study Guide*. Many questions in the CIT exam are built upon the CCNA and ACRC 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.

The new Cisco certifications reach beyond the popular certifications, such as the MCSE and CNE, to provide you with an indispensable factor in understanding today's network—insight into the Cisco world of internetworking.

### Cisco—A Brief History

A lot of readers may already be familiar with Cisco and what they do. However, those of you who are new to the field, just coming in fresh from your MCSE, or maybe even have 10 or more years in the field, but wish to brush up on the new technology may appreciate a little background on Cisco.

In the early 1980s, a married couple who worked in different computer departments at Stanford University started up cisco Systems (notice the small c). Their names are Len and Sandy Bosack. They were having trouble getting their individual systems to communicate (like many married people), so in their living room they created a gateway server to make it easier for their disparate computers in two different departments to communicate using the IP protocol.

In 1984, Cisco Systems was founded with a small commercial gateway server product that changed networking forever. Some people think the name was intended to be San Francisco Systems, but the paper got ripped on the way to the incorporation lawyers—who knows? But in 1992, the company name was changed to Cisco Systems, Inc.

The first product it marketed was called the Advanced Gateway Server (AGS). Then came the Mid-Range Gateway Server (MGS), the Compact Gateway Server (CGS), the Integrated Gateway Server (IGS), and the AGS+. Cisco calls these “the old alphabet soup products.”

In 1993, Cisco came out with the amazing 4000 router, and then created the even more amazing 7000, 2000, and 3000 series routers. These are still around and evolving (almost daily, it seems).

Cisco Systems has since 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 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 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 upon 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 Network Support Certifications

Cisco has created new certifications that will help you get the coveted 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 Study Guide* book, plus \$100 for the test. And you don't have to stop there—you can choose to continue with your studies and achieve a higher certification called the Cisco Certified Network Professional (CCNP). Someone with a CCNP has all the skills and knowledge they need to attempt the CCIE lab. However, because no textbook can take the place of practical experience, we'll discuss what else you need to be ready for the CCIE lab shortly.

**Why Become a CCNA?** Cisco has created the certification process, not unlike Microsoft or Novell, to give administrators a set of skills and to equip prospective employers with a way to measure skills or match certain criteria. Becoming a CCNA can be the initial step of a successful journey toward a new, highly rewarding, and sustainable career.

The CCNA program was not only created to provide a solid introduction to the Cisco Internetworking Operating System (IOS) and Cisco hardware, but to internetworking in general, making it helpful to you in areas that are not exclusively Cisco's. At this point in the certification process, it's not unrealistic to imagine that future network managers—even those without Cisco equipment—could easily require Cisco certifications for their job applicants.

If you make it through the CCNA and are still interested in Cisco and internetworking, you're headed down a path to certain success.

To meet the CCNA certification skill level, you must be able to understand or do the following:

- Install, configure, and operate simple-routed LAN, routed WAN, and switched LAN and LANE networks.
- Understand and be able to configure IP, IGRP, IPX, Serial, AppleTalk, Frame Relay, IP RIP, VLANs, IPX RIP, Ethernet, and access-lists.

- Install and/or configure a network.
- Optimize WAN through Internet-access solutions that reduce bandwidth and WAN costs, using features such as filtering with access-lists, bandwidth on demand (BOD), and dial-on-demand routing (DDR).
- Provide remote access by integrating dial-up connectivity with traditional, remote LAN-to-LAN access, as well as supporting the higher levels of performance required for new applications such as Internet commerce, multimedia, etc.

**How Do You Become a CCNA?** The first step is to pass one “little” test and poof—you’re a CCNA! (Don’t you wish it were that easy?) True, it’s just one test, but you still have to possess enough knowledge to understand (and read between the lines—trust us) what the test writers are saying.

We can’t say this enough—it’s critical that you have some hands-on experience with Cisco routers. If you can get your hands on some 2500 routers, you’re set. But if you can’t, we’ve worked hard to provide hundreds of configuration examples throughout the Sybex *CCNA Study Guide* book to help network administrators (or people who want to become network administrators) learn what they need to know to pass the CCNA exam.

One way to get the hands-on router experience you’ll need in the real world is to attend one of the seminars offered by Globalnet System Solutions, Inc. ([www.lammle.com](http://www.lammle.com)). Cyberstate University also is providing hands-on Cisco router courses over the Internet using the Sybex Cisco Certification series books. Go to [www.cyberstateu.com](http://www.cyberstateu.com) for more information.



Keystone Learning Systems ([www.klscorp.com](http://www.klscorp.com)) also offers the popular Cisco video certification series, featuring Todd Lammle. Also, check out [www.virtualrack.com](http://www.virtualrack.com) for online access to Cisco equipment 24 hours a day!

It can also be helpful to take an Introduction to Cisco Router Configuration (ICRC) course at an authorized Cisco Education Center, but you should understand that this class doesn’t meet all of the test objectives. If you decide to take the course, reading the Sybex *CCNA Study Guide* book, in conjunction with the hands-on course, will give you the knowledge that you need for certification.



In addition to the Sybex *CCNA: Cisco Certified Network Associate Study Guide*, there are other useful ways to supplement your studies for the CCNA exam. CiscoTests (<http://www.networkstudyguides.com>) offers an online study guide with sample questions and information about the most current release of the CCNA, CCNP, and CCIE exams. CiscoTests also provides a discount for owners of Sybex Study Guides. To get instant access and the discount, you should visit the following URL: <http://www.networkstudyguides.com/sybex.html>.

**Cisco Certified Network Professional (CCNP)**

This new Cisco certification has opened up many opportunities for the individual wishing to become Cisco-certified; but who is lacking the training, 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 that much-coveted CCIE certification. The first way is to continue studying and become a Cisco Certified Network Professional (CCNP). That means four more tests, and the CCNA certification, to you.

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 is demanding 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, AppleTalk, extended access-lists, IP RIP, route redistribution, IPX RIP, 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 640-403: Advanced Cisco Router Configuration (ACRC) continues to build on the fundamentals learned in the ICRC course. It focuses on large multiprotocol internetworks and how to manage them with access-lists, queuing, tunneling, route distribution, route summarization, and dial-on-demand.
- Exam 640-404: Cisco LAN Switch Configuration (CLSC) tests your understanding of configuring, monitoring, and troubleshooting Cisco switching products.
- Exam 640-440: Cisco Internetwork Troubleshooting (CIT) tests you on the troubleshooting information you learned in the other Cisco courses.
- Exam 640-405: Configuring, Monitoring, and Troubleshooting Dial-up Services (CMTD) tests your knowledge of installing, configuring, monitoring, and troubleshooting Cisco ISDN and dial-up access products. It is important to remember that the CMTD course is no longer available, but you can still take the exam. The course has been replaced by BCRAN. However, as of this writing, the test is not yet available.

**NOTE**

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 (640-409). 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 \$100 (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.

**TIP**

Remember that test objectives and tests can change at any time without notice. Always check the Cisco Web site for the most up-to-date information ([www.cisco.com](http://www.cisco.com)).

### Cisco Certified Internetworking Expert (CCIE)

You've become a CCNP, and now you fix your sights on getting your CCIE in Routing and Switching—what do you do next? Cisco recommends that before you take the lab, you take test 640-025: Cisco Internetwork Design (CID), and the Cisco authorized course called Installing and Maintaining Cisco Routers (IMCR). By the way, no Prometric test for IMCR exists at the time of this writing, and 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 CCIE-R/S Exam Qualification (exam 350-001) before taking the actual lab.

To become a CCIE, Cisco recommends the following:

1. Attend all the recommended courses at an authorized Cisco training center and pony up around \$15,000–\$20,000, depending on your corporate discount.
2. Pass the Drake/Prometric exam (\$200 per exam—so hopefully, you'll pass it the first time).
3. Pass the two-day, hands-on lab at Cisco. This costs \$1,000 per lab, which many people fail two or more times. (Some never make it through!) Also, because you can take the exam only in San Jose, California; Research Triangle Park, North Carolina; Sydney, Australia; Halifax, Nova Scotia; Tokyo, Japan; or Brussels, Belgium, you might just need to add travel costs to that \$1,000.

**The CCIE Skills** The CCIE Router and Switching exam includes the advanced technical skills that are required to maintain optimum network performance and reliability, as well as advanced skills in supporting diverse networks that use disparate technologies. CCIEs just don't have problems getting a job. These experts are basically inundated with offers to work for six-figure salaries! But that's because it isn't easy to attain the level of capability that is mandatory for Cisco's CCIE. For example, a CCIE will have the following skills down pat:

- Installing, configuring, operating, and troubleshooting complex routed LAN, routed WAN, switched LAN, and ATM LANE networks, and Dial-Access Services
- Diagnosing and resolving network faults
- Using packet/frame analysis and Cisco debugging tools
- Documenting and reporting the problem-solving processes used
- Having general LAN/WAN knowledge, including data encapsulation and layering; windowing and flow control, and their relation to delay; error detection and recovery; link-state, distance vector, and switching algorithms; management, monitoring, and fault isolation
- Having knowledge of a variety of corporate technologies—including major services provided by Desktop, WAN, and Internet groups—as well as the functions, addressing structures, and routing, switching, and bridging implications of each of their protocols
- Having knowledge of Cisco-specific technologies, including router/ switch platforms, architectures, and applications; communication servers; protocol translation and applications; configuration commands and system/network impact; and LAN/WAN interfaces, capabilities, and applications

## Cisco's Network Design Certifications

In addition to the Network Support certifications, Cisco has created another certification track for network designers. The two certifications within this track are the Cisco Certified Design Associate and Cisco Certified Design Professional certifications. If you're reaching for the CCIE stars, we highly recommend the CCNP and CCDP certifications before attempting the lab (or attempting to advance your career).

This certification will give you the knowledge to design routed LAN, routed WAN, and switched LAN and ATM LANE networks.

### Cisco Certified Design Associate (CCDA)

To become a CCDA, you must pass the DCN (Designing Cisco Networks) test (640-441). 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.



The Sybex *CCDA Study Guide* is the most cost-effective way to study for and pass your CCDA exam.

### Cisco Certified Design Professional (CCDP)

If you're already a CCNP and want to get your CCDP, you can simply take the CID 640-025 test. If you're not yet a CCNP, however, you must take the ACRC, CLSC, CIT, and CMTD exams.

CCDP certification skills include the following:

- Designing complex routed LAN, routed WAN, and switched LAN and ATM LANE networks
- Building upon the base level of the CCDA technical knowledge

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



## What Does This Book Cover?

This book covers everything you need to pass the CCNP: Cisco Internetworking Troubleshooting exam. It teaches you how to troubleshoot processes on Cisco Routers and Catalyst Switches. Each chapter begins with a list of the CCNP: CIT test objectives covered, so make sure to read them over before working through the chapter.

Chapter 1 starts with learning about the troubleshooting methodology that should be followed to successfully resolve network problems. Different troubleshooting approaches will be discussed.

These different troubleshooting approaches are the foundation of the application of knowledge that will be gained throughout the book. Chapter 2 discusses Layer 2 and Layer 3 technologies and protocols. An overview is provided for all major LAN and WAN protocols.

Chapter 3 gives you an introduction to generic troubleshooting tools. This chapter is dedicated to making you familiar with all of the different troubleshooting tools that are available to effectively troubleshoot network problems. You move on from there to Chapter 4, in which you learn about Cisco's diagnostic commands. The infrastructure of high- and low-end routers is discussed in detail, as well as the switching paths used by each. Some global Cisco commands are also covered. Chapter 5 teaches you how to apply the commands and tools that are learned in previous chapters.

Chapter 6 is dedicated exclusively to TCP/IP troubleshooting. Commands and techniques are discussed in detail. A summary sheet is provided at the end of the chapter that is a great quick reference guide.

Chapter 7 covers serial line and Frame Relay troubleshooting. show and debug commands that are specific to these technologies are introduced.

Chapter 8 is dedicated to ISDN connectivity issues. Chapters 9 and 10 deal with LAN protocols, such as Novell and AppleTalk. debug and show commands relating to these protocols are discussed thoroughly.

Chapter 11 covers the Cisco Catalyst 5000 switch and switched Ethernet networks. SPAN and other troubleshooting targets are also addressed. Chapter 12 provides information about Cisco Systems and the information that it provides.

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, if possible, work through the hands-on labs at the end of most chapters.

The CIT (640-440) exam consists of a combination of the following objectives: