

CCNP: Advanced Cisco Router Configuration Study Guide

# CCNP Advanced Cisco Router Configuration 学习指南

(英文原版)



Cisco 认证考试  
系列丛书之二

[美] Todd Lammle  
Kevin Hales 著  
Donald Porter



電子工業出版社

Publishing House of Electronics Industry

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STUDY GUIDE**

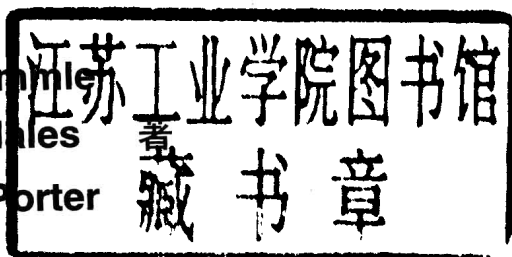
**CCNP**

**学习指南系列**

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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。

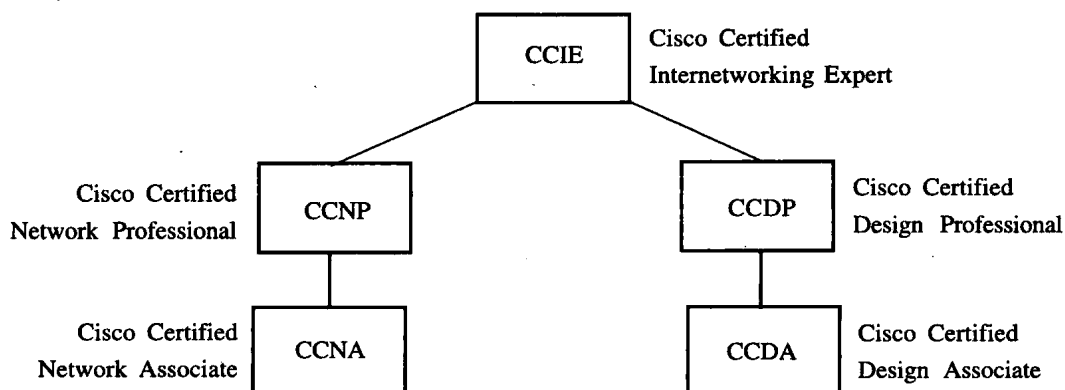


图0.1 Cisco认证考试由高及低的层次结构

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

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99年上半年将推出如下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 640-406 |
| CCDA: Cisco CCDA学习指南 | Cisco认证考试系列丛书之六 | CCDA              |

下半年，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

## Acknowledgments

I would personally like to acknowledge the great support I received from Neil Edde and James Chellis. Without their constant guidance and wisdom, these books would have never been written. I also would like to thank Don Porter for helping me put everything together, and for introducing me to Kevin Hales and Scott Richardson.

—Todd Lammle

First of all, I would like to thank Don Porter, the wearer of the “Blue Robe,” for recruiting me for this project.

I would also like to thank Todd and Monica Lammle for this opportunity and for working with me to make sure this book would be useful and effective for the reader.

Thanks should also go to my managers, Mike Cleary and Bill Kelleher. They were very supportive and accommodating in allowing me to work on this project. Thanks to Ross Nakamura for being my sounding board.

—Kevin Hales

Thanks to my coauthors, Todd and Kevin, for their help and patience. It always seemed that my work was the last finished. My thanks also to my coworkers at the university: Mike, Bill, and Ross. They truly set the standard in this field. Thanks to Travis, Scott, Jeff, Shawn, Steve, Andy, Rick, Ralph, and everyone else who has gone out of their way to put information into my head. Finally, thanks to Brian for introducing me to the Internet.

—Donald Porter

Let us not forget all the wonderful editors: Ronn Jost, the copy editor; Jeremy Crawford, the project editor; and John Chong, the technical editor, who went tirelessly over and over the material.

Last in the editorial chain, but certainly not the least, is Brian Horakh. He did a last editorial review not only to check for technical errors, but also to ensure that this book meets the CCNP test objectives so that you, the reader, can pass the exam the first time. Be sure to check out his Web site, [www.networkstudyguides.com](http://www.networkstudyguides.com), for the latest in Cisco certification news and updates.

We gratefully acknowledge the hard work of the Sybex production team: Nila Nichols and Robin Kibby, electronic publishing specialists, and Susan Berge, production coordinator.

We'd also like to thank the many terrific people who helped put the CD together:

Jerry Camel for writing and providing the best IP calculator program you can find. More information can be found at [www.progression-inc.com](http://www.progression-inc.com).

James Chellis and Matt for creating and letting us use the EdgeTest engine. There are more CCNA/CCNP testing questions available. Check [www.lammle.com](http://www.lammle.com) for updates on Cisco videos and testing questions regarding the Cisco certifications. You can also call 1-800-800-1NET (1638) for more information.

Janice Spampinato from AG Group. Thanks to AG Group, 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



*To my son, Joshua, who helps me remember what is really important in life:  
That you must take time out each day for playtime.*

*—Todd Lammle*

*For Claudia and Christopher:*

*My inspiration and sanctuary.*

*La fuerza del amor.*

*—Kevin Hales*

*For my grandfather, Max Willits, who taught me patience and perseverance in  
woodworking and everything else...*

*—Donald Porter*

## 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.

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 with 10 or more years in the field wishing to brush up on the new technology may appreciate a little background on Cisco.

In the early 1980s, a married couple that 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 they 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.”

Then, in 1993, Cisco came out with the amazing 4000 router, and then 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 working 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—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 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 for maintaining and optimizing all network operations.

Along with the Cisco IOS, one of the services Cisco has created to help support the vast amount of hardware they have engineered is the Cisco Certified Internetworking Expert (CCIE) program, designed specifically to equip people to effectively manage the vast quantity of installed Cisco networks. Their business plan is simple: If you want sell more Cisco equipment and have more Cisco networks installed, ensure that the networks you've 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 in supporting 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 they see fit to make sure 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 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, since 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 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 of their job applicants.

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

**NOTE**

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.

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 do that, reading the Sybex *CCNA Study Guide* book in conjunction with the hands-on course will give you the knowledge you need for certification. We’ve heard that Cisco Authorized Training Centers will offer the CCNA and other certification courses sometime in 1999, but check the Cisco Web page ([www.cisco.com](http://www.cisco.com)) for updated information. There are hundreds of Cisco Authorized Training Centers around the world—see the Cisco Web page for a location nearest you.

**NOTE**

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 the Sybex *CCNP: Advanced Cisco Router Configuration Study Guide*. To get instant access and the discount, you should visit the 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 didn'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 their CCNP certification. In addition to those required for the CCNA, these skills include:

- 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 640-406: 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.

**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 will also give you your CCNP—but beware, it's a really long test that fuses all the material listed above 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 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: <http://www.cisco.com>.

### Cisco Certified Internetworking Expert (CCIE)

You've become a CCNP, and now you've fixed 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 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 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; and Brussels, Belgium, you might just need to add travel costs to those 1,000 big dogs.

**The CCIE Skills** The CCIE Router and Switching exam will include advanced technical skills 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 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'd 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 CDS (Cisco Design Specialist) test (9EO-004). 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 CID 640-025 test. But if you're not yet a CCNP, you must take the ACRC, CLSC, CIT, and CMTD exams.

CCDP certification skills include:

- 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:

- 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