

英文原版

CCNP Advanced Cisco Router Configuration 复习重点及模拟试题



*CCNP Exam Notes:
Advanced Cisco
Router Configuration*

〔美〕 Todd Lammle 著



電子工業出版社

Publishing House of Electronics Industry

URL: <http://www.phei.com.cn>

**CCNP Exam Notes: Advanced Cisco
Router Configuration**

CCNP: Advanced Cisco Router Configuration

复习重点及模拟试题（英文原版）

〔美〕 Todd Lammle 著

電子工業出版社

Publishing House of Electronics Industry

北京 • BEIJING

版 权 声 明



Copyright©1999 SYBEX Inc., 1151 Marina Village Parkway, Alameda, CA 94501. World rights reserved. No part of this publication may be stored in a retrieval system, transmitted, or reproduced in any way, including but not limited to photocopy, photograph, magnetic or other record, without the prior agreement and written permission of the publisher. This book can only be sold and distributed into the People's Republic of China excluding Hong Kong district, Macau district, Taiwan district and the place in the world outside of People's Republic of China.

本书英文版由美国SYBEX公司出版, SYBEX公司已将英文版独家版权授予中国电子工业出版社及北京美迪亚电子信息有限公司。本书仅限于在中国境内(但除去香港、澳门和台湾地区)销售。未经许可,不得以任何形式和手段复制或抄袭本书内容。

图书在版编目(CIP)数据

CCNP: Advanced Cisco Router Configuration复习重点及模拟试题: 英文/(美)拉姆尔(Lammle, T.)著; —北京: 电子工业出版社, 2000. 2
ISBN 7-5053-5791-3

I. C… II. 拉… III. 计算机通信网—路由选择—配置—自学参考资料—英文 IV. TP915.05

中国版本图书馆CIP数据核字(2000)第03140号

书 名: CCNP: Advanced Cisco Router Configuration复习重点及模拟试题(英文原版)

著 作 者: [美] Todd Lammle

印 刷 者: 北京天竺颖华印刷厂

装 订 者: 三河金马印装有限公司

出版发行: 电子工业出版社 URL: <http://www.phei.com.cn>

北京市海淀区万寿路173信箱 邮编: 100036

北京市海淀区翠微东里甲2号 邮编: 100036

经 销: 各地新华书店

开 本: 787×1092 1/16 印张: 20.375 字数: 520 千字

版 次: 2000年2月第1版 2000年2月第1次印刷

书 号: ISBN 7-5053-5791-3

TP·3011

定 价: 34.00元

版权贸易合同登记号 图字: 01-2000-0101

凡购买电子工业出版社的图书, 如有缺页、倒页、脱页、所附磁(光)盘有问题者, 请向购买书店调换。

若书店售缺, 请与本社发行部联系调换。电话: 68279077

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20世纪80年代，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。

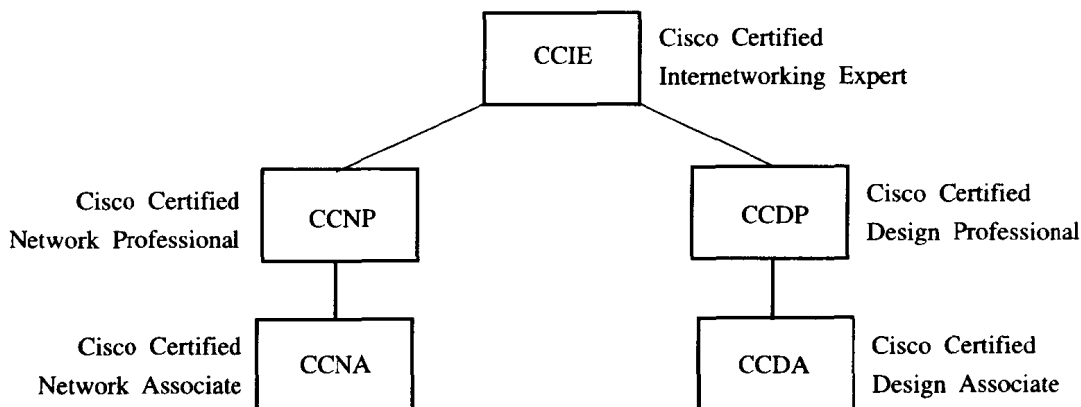


图0.1 Cisco认证考试由高及低的层次结构

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 见CCNP
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一个“热点”，同时也是出版界的一个“时髦话题”。从1998年开始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年我们推出Cisco认证考试的学习指南系列（见表0.2），在2000年我们再推出Cisco认证考试的复习重点及模拟试题系列（见表0.3）。

表0.2 Cisco认证考试系列丛书

书 名	适用考试科目
CCNA: Cisco Certified Network Associate (CCNA) 学习指南	CCNA Exam 640-407
CCNP: Advanced Cisco Router Configuration (ACRC) 学习指南	CCNP Exam 640-403
CCNP: Cisco LAN Switch Configuration (CLSC) 学习指南	CCNP Exam 640-404
CCNP: Cisco Internetwork Troubleshooting (CIT) 学习指南	CCNP Exam 640-440
CCDA: Cisco Certified Design Associate (CCDA) 学习指南	CCDA Exam 640-441

表0.3 Cisco认证考试复习重点及模拟试题系列

书 名	适 用 考试科目
CCNP: Advanced Cisco Router Configuration (ACRC) 复习重点及模拟试题	640-403
CCNP: Cisco LAN Switch Configuration (CLSC) 复习重点及模拟试题	640-404
CCNP: Cisco Internetwork Troubleshooting (CIT) 复习重点及模拟试题	640-440

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，并恳请读者对书中存在的问题提出批评和指正。

Acknowledgments

I'd like to acknowledge Brian Horakh of www.networkstudyguides.com. He helped me develop many of the questions in this book that will help the reader get a firm grasp of the real exam.

I happily acknowledge Neil Edde and thank him for supplying motivation, patience, and insight whenever I needed them.

Much thanks also goes out to Jeff Gammon, who edited this book. I appreciate his care in editing and all of the late nights and extra hours that he devoted to making this a better book for its readers.

I appreciate Shawn Zudal's attention and care in helping me to keep this book technically in tune.

Last, but certainly not least, I appreciate the production crew at Sybex. Thanks to Project Team Leader Teresa Trego and Electronic Publishing Specialist Bill Gibson for corralling my manuscript and turning it into this good-looking book!

Introduction

The *CCNP Exam Notes* is intended to start you out on an exciting new path toward obtaining your CCNP certification. It reaches beyond popular certifications like the MCSE and CNE to provide you with an indispensable factor in understanding today's network: insight into the Cisco world of internetworking.

If you've purchased this book, you are probably chasing one of the Cisco professional certifications: CCNA/CCNP, CCDA/CCDP, or CCIE. All of these are great goals, and they are also great career builders. Glance through any newspaper and you'll find employment opportunities for people with these certifications. These ads are there because finding qualified network administrators is a challenge in today's market. The certification means you know something about the product, but, more importantly, it also means you have the ability, determination, and focus to learn—the greatest skills any employee can have!

You've probably also have heard all the rumors about how hard the Cisco tests are. Believe it or not, the rumors are true! Cisco has designed a series of exams that truly challenge your knowledge of their products. Each test not only covers the materials presented in a particular class but it also covers the prerequisite knowledge for that course.

Is This Book for You?

The *CCNP Exam Notes* covers everything you need to know to pass Cisco's Advanced Cisco Router Configuration (ACRC) exam (640-403). The ACRC exam is a required exam in the CCNP certification process. Each chapter begins with a list of the ACRC test objectives that are detailed in it (so make sure to read over them before working through the chapter). This book teaches you how to perform advanced configurations on Cisco routers using multiple protocols. And it covers all of the advanced topics you'll need to understand, including the Cisco three-layer hierarchical model, distance-vector and link-state routing protocols, bridging, queuing, and more!

The Sybex Exam Notes books are designed to be succinct, portable exam review guides. They can be used either in conjunction with a more complete study program—supplemented by books, CBT courseware, or practice in a classroom/lab environment—or as an exam review for those who don't feel the need for more extensive test preparation. It isn't our goal to "give the answers away" but rather to identify the topics on which you can expect to be tested and to provide sufficient coverage of those topics.

Perhaps you've been working with Cisco internetworking technologies for years now. The thought of paying lots of money for a specialized Cisco exam preparation course probably doesn't sound too appealing. What can they teach you that you don't already know, right? Be careful, though. Many experienced network administrators, even CCIEs, have walked confidently into testing centers only to walk sheepishly out of them after failing a Cisco exam. As they discovered, there's the Cisco of the real world but also the Cisco of the Cisco certification exams. It's the goal of the Exam Notes books to show you where the two both converge and diverge. After you've finished reading through this book, you should have a clear idea of how your understanding of the technologies involved matches up with the expectations of the Cisco test makers.

Or perhaps you're relatively new to the world of Cisco internetworking, being drawn to it by the promise of challenging work and higher salaries. You've just waded through an 800-page Cisco ACRC study guide or taken a class at a local training center. Lots of information to keep track of, isn't it? Well, by organizing the Exam Notes books according to the Cisco exam objectives, and by breaking up the information into concise, manageable pieces, we've created what we think is the handiest exam review guide available. Throw it in your briefcase and carry it to work with you. As you read through the book, you'll be able to quickly identify those areas that you know best and those that require more in-depth review.

The goal of the Exam Notes series is to help Cisco certification candidates familiarize themselves with the subjects on which they can expect to be tested in the certification exams. For complete, in-depth coverage of the technologies and topics involved in Cisco networking, we recommend the Cisco Certification Study Guide series from Sybex.

How is This Book Organized?

As previously mentioned, this book is organized according to the official exam objectives list prepared by Cisco for the ACRC exam (640-403). Within each chapter, the individual exam objectives are addressed in turn. Each objective section is further divided according to the type of information presented, as explained in the following paragraph.

Critical Information

This section presents the greatest level of detail on information that is relevant to the objective. This is the place to start if you're unfamiliar with or uncertain about the technical issues related to the objective.

Necessary Procedures

Here you'll find instructions for procedures that usually require a lab computer to be completed. From logging into a router to configuring EIGRP and OSPF routing, the information in these sections addresses the hands-on requirements for the ACRC exams.

NOTE Not every objective has a hands-on procedure associated with it. For such objectives, the Necessary Procedures section is omitted.

Exam Essentials

This section consists of a concise list of the most crucial subject areas that you'll need to fully comprehend prior to taking the Cisco exam. This section can help you to identify those topics that might require extra study.

Key Terms and Concepts

This section is a mini-glossary of the most important terms and concepts related to the specific objective being presented. Since some objectives are inter-related, certain terms are sometimes repeated from objective to objective. You'll understand what all of those technical words mean within the context of the related subject matter.

Sample Questions

For each exam objective, we've included a selection of questions similar to those you'll encounter on the actual Cisco exam. Answers and explanations are provided so you can gain some insight into the test-taking process.

How Do You Become a CCNP?

The CCNP certification is a new certification in the new line of Cisco certifications. With the new certification programs, Cisco has created a stepping-stone approach to Cisco Certified Internetwork Associate (CCIE) certification. You can become a CCNP by passing the CCNA exam and four other exams, one of which is the ACRC exam (640-403). Once you are a CCNP, you have completed all the coursework and acquired all the knowledge you need to attempt the CCIE lab.

Why Become a CCNP?

Cisco has created a certification process—not unlike Microsoft's or Novell's—to give administrators a set of skills and prospective employers an authenticated way to measure those skills. Becoming a CCNP can be the initial step of

a successful journey toward a new or refreshed, highly rewarding and sustainable career.

As you study for the ACRC exam, this point can't stress 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 dozens of configuration examples throughout this book to help network administrators (or people who want to become network administrators) learn what they need to know to pass the ACRC exam.

SEE ALSO 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. (<http://www.lammle.com>), produced by the author of this book. And check out the router simulator available at www.routersim.com. It can help you get the hands-on experience you need at a fraction of the cost of real routers.

It can also be helpful to take an Introduction to Cisco Router Configuration (ICRC) course at an Authorized Cisco Education Center, but be aware that this class doesn't cover all of the test objectives. If you decide to take the class, reading this book in conjunction with the hands-on course will give you the knowledge you need for certification. There are hundreds of Cisco Authorized Training Centers around the world; see the Cisco Web page (<http://www.cisco.com>) for the location nearest you.

Where Do You Take the Exams?

You may take the exams at any one of the more than 800 Sylvan Prometric authorized testing centers around the world. For the location of a testing center near you, call 800-204-3926. For testing centers outside 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 ACRC exam number is 640-403.)
2. Register with the Sylvan Prometric testing center nearest you, either via phone at 1-800-204-3926 or at www.sylvanprometric.com. You will need to pay in advance for the exam. At this writing, registration costs \$100 per exam, and the test must be taken within one year of payment. You can sign up for an exam as early as six weeks in advance or as late as one working day prior to your exam date. Same-day registration isn't available for the Cisco tests. (If something comes up and you need to cancel or reschedule your exam appointment, contact Sylvan Prometric at least 24 hours in advance.)

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

What the Cisco ACRC Exam Measures

The CCNP program was not only created to provide a solid introduction to the Cisco internetwork operating system (IOS) and to Cisco hardware but to internetworking in general, making it helpful to you in areas not exclusively Cisco's. It's hard to say at this point in the certification process, but it's not unrealistic to imagine that future network managers—even those without Cisco equipment—could easily require Cisco certifications of their job applicants.

To meet the ACRC certification skill level, you must be able to understand or do 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.

Tips for Taking Your Cisco ACRC Exam

The ACRC test contains around 70 questions, which are to be answered in 90 minutes. You must schedule the test at least 24 hours, or one business day, in advance (unlike the Novell or Microsoft exams), and you aren't allowed to take more than one Cisco exam per day.

Many questions on the exam will have answer choices that, at first glance, look identical—especially the syntax questions! Remember to read through the choices carefully, because a “close” answer won't cut it. If you choose an answer in which the commands are in the wrong order or there is even one measly character missing, you'll get the question wrong. Some of the exam questions are multiple-choice and some are fill-in-the-blank. Unlike Microsoft or

Novell tests, the exam has answer choices that are really similar in syntax; some syntax will be dead wrong, but, more than likely, it will just be very *subtly* wrong. Some other syntax choices may be almost right except that the variables are shown in the wrong order.

Also, never forget that the right answer is the Cisco answer. In many cases, they'll present more than one correct answer, but the correct answer is the one 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—particularly IP tables and lists of exam-related information.
- Read the questions *carefully*. Don't jump to conclusions. Make sure you're clear on *exactly* what the question is asking.
- Don't leave any unanswered questions. These will be counted against you.
- When answering multiple-choice questions that you're not sure about, use a process of elimination to get rid of the obviously incorrect answers first. Doing this will greatly improve your odds should you need to make an "educated guess."
- Because the hard questions will eat up the most time, save them for last. You can move forward and backward through the exam.
- If you are unsure of the answer to a question, choose one of the answers anyway. Mark the question so that if you have time, you can go back to it and double-check your answer. Remember, an unanswered question is as bad as a wrong one, so answer questions even if you're not certain of the correct choice; if you don't and you run out of time or forget to go back to the question, you'll get it wrong for sure.

Once you have completed an exam, you'll be given immediate online notification of your pass or fail status, plus a printed Examination Score Report indicating whether you passed or failed, along with your exam results by section. (The test administrator will give you the printed score report.) Test scores are automatically forwarded to Cisco within five working days after you take the test, so you don't need to send your score to them. If you pass the exam, you'll receive confirmation from Cisco, typically within two to four weeks.

There's one more thing you can do to prepare. Visit Brian Horakh's Web site (<http://www.networkstudyguides.com>) and go through the exercises and practice test questions he provides. This will really help you keep abreast of any changes made to the test.

How to Contact the Author

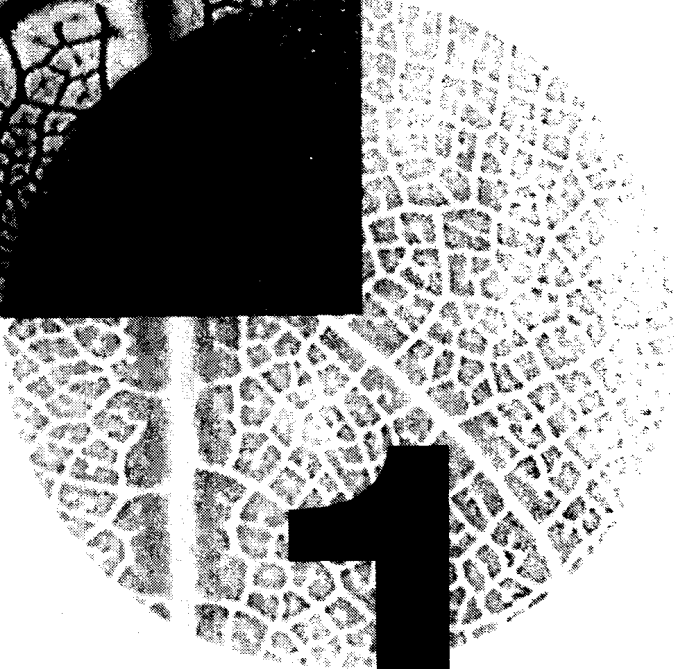
Todd Lammle can be reached at his integration and consulting company, located in Colorado, at todd@lammle.com.

How to Contact the Publisher

Sybex welcomes reader feedback on all of their titles. Visit the Sybex Web site at <http://www.sybex.com> for book updates and additional certification information. You'll also find online forms for submitting comments or suggestions regarding this or any other Sybex book.



CHAPTER



1

Overview of Scalable Networks

Cisco ACRC Exam Objectives Covered in This Chapter:

- ▶ **Describe the key requirements of a scalable internetwork.**
- ▶ **Select a Cisco IOS feature as a solution for a given internetwork requirement.**

For an internetwork to realize its full potential, it must be able to efficiently connect many different networks together to serve the organizations depending on it. The key requirements of a scalable internetwork are based on an ideal design using the Cisco hierarchical model to simplify management, which permits well-planned growth that honors the network's requirements. The essential areas focused on in this chapter are important not only to know for the test but also for everyday network administration, troubleshooting, and design. All good network designers must focus on answering the question of whether or not their design meets the criteria listed in this chapter before proceeding with purchasing or implementation. Finding a vendor who can provide these benefits and then properly implement the equipment so as to achieve the desired result is mandatory, especially if you want peace of mind and to get a good night's sleep.

The Cisco internetwork operating system (IOS) has many features that can help administrators create a dependable and growth-oriented network. This chapter covers the features of the Cisco IOS. These objectives are the foundation for the rest of the objectives, so you should learn as much of this chapter as possible.

Describe the key requirements of a scalable internetwork.

Today's internetworks are experiencing extraordinary growth due to increasing demands for connectivity both in businesses and homes. Therefore, it is very important for internetworks to be scalable. Scalable networks should be able to grow without changing the entire network. If a network is built correctly, growth can happen without any noticeable change to the core network.

It is now vital for administrators to understand what a scalable network is, as well as what is required to effectively manage its incessant growth. This section will focus on the following five specific keys to a scalable internetwork. The internetwork must be:

- Reliable and available
- Responsive
- Efficient
- Adaptable
- Easily accessible while being secure

Memorizing these areas will help you on the exam in two basic ways. You'll benefit if there is a test question directly relating to these areas and also if there is a question about a subject for which one of these areas is the underlying foundation.

Critical Information

Since a scalable internetwork undergoes continual growth, it must be both flexible and easily appended. An ideal design is based on the hierarchical model to both simplify management and permit well-planned growth that honors the network's requirements. The following sections present a more detailed account of the mandatory requirements of a scalable internetwork.

Reliability and Availability

The Cisco internetwork operating system provides features for implementing redundancy, load balancing, and reachability with protocols, such as the Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF). Strategies like tunneling and dial backups, which are also included in the Cisco IOS, can also help keep an internetwork up and running.

Responsiveness

Because network growth often occurs on a daily basis, the administrator's duty to maintain the network's responsiveness can become overwhelming. The Cisco IOS provides solutions to this issue, such as queuing that is configured by an administrator to keep latency to a minimum.

Efficiency

Efficiency, in a nutshell, boils down to keeping the bandwidth from becoming saturated. A central goal of this book is to arm you with information on fine-tuning your router in order to optimize the existing bandwidth on your internetwork. You'll learn how to achieve that objective through innovative techniques such as snapshot routing, access lists, and dial-up routing.