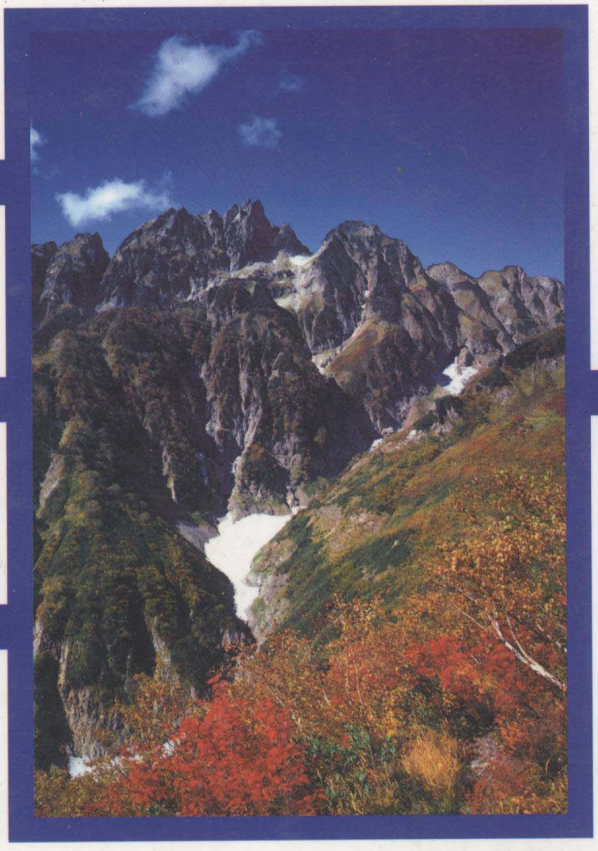
CCNP Building Scalable Cisco Internetworks Study Guide

CCNP: BSCI

学习指南

（英文版）（642-801）



〔美〕 Carl Timm, CCIE #7149
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针对最新的CCNP考试全面更新

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考试号
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内 容 提 要

本书主要介绍CCNP认证考试（642-801）涉及的全面内容，并提供了大量的实验题和复习题。

本书首先介绍了园区网络，然后依次介绍了路由原理、IP寻址、IGRP与EIGRP、单区域中的OSPF操作、互联OSPF区域、集成IS-IS、边界网关协议、高级边界网关协议和路由优化等方面的内容。另外，因为本书是一本学习指南，所以本书中还提供了大量的模拟试题，通过这些试题，读者可以进一步加深与巩固所学的知识。

本书主要针对那些准备参加CCNP认证考试的人员。不过，任何对网络感兴趣的读者都可以从本书中获取大量的网络知识。

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CCNP: Building Scalable Cisco Internetworks Study Guide

Exam 642-801

OBJECTIVE	CHAPTER
Technologies	
List the key information routers needs to route data.	1
Describe classful and classless routing protocols.	1, 2
Describe link-state router protocol operation.	1
Compare classful and classless routing protocols.	1
Compare distance vector and link state routing protocols.	1
Describe concepts relating to extending IP addresses and the use of VLSMs to extend IP addresses.	2
Describe the features and operation of EIGRP.	4
Describe the features and operation of single area OSPF.	5
Describe the features and operation of multi-area OSPF.	6
Explain basic OSI terminology and network layer protocols used in OSI.	7
Identify similarities and differences between Integrated IS-IS and OSPF.	7
List the types of IS-IS routers and their role in IS-IS area design.	7
Describe the hierarchical structure of IS-IS areas.	7
Describe the concept of establishing adjacencies.	7
Describe the features and operation of BGP.	8
Explain how BGP policy-based routing functions within an autonomous system.	9
Explain the use of redistribution between BGP and Interior Gateway Protocols (IGPs).	9
Implementation and Configuration	
Given a set of network requirements, identify the steps to configure an Enhanced IGRP environment and verify proper operation (within described guidelines) of your routers.	4
Given an addressing scheme and other laboratory parameters, identify the steps to configure a single-area OSPF environment and verify proper operation (within described guidelines) of your routers.	5
Given an addressing scheme and other laboratory parameters, identify the steps to configure a multiple area OSPF environment and verify proper operation (within described guidelines) of your routers.	6

OBJECTIVE	CHAPTER
Given an addressing scheme and other laboratory parameters, identify the steps to configure Cisco routers for proper Integrated IS-IS operation.	7
Identify the steps to select and configure the different ways to control routing update traffic.	10
Identify the steps to configure router redistribution in a network.	10
Identify the steps to configure policy-based routing using route maps.	10
Given a set of network requirements, identify the steps to configure a BGP environment and verify proper operation (within described guidelines) of your routers.	9
Identify the steps to configure a router for Network Address Translation with overload, static translations, and route maps.	3
Design	
Describe the three-layer hierarchical design model and explain the function of each layer: Access, Distribution and Core.	11
Given specific requirements, choose the correct routing protocol to meet the requirements.	11
Identify the correct IP addressing scheme, including features of IPv6.	2
Describe the concepts relating to route summarization and apply them to hypothetical scenarios.	2, 11
Troubleshooting	
Identify the steps to verify OSPF operation in a single area.	5
Identify the steps to verify OSPF operation in multiple areas.	6
Identify verification methods which ensure proper operation of Integrated IS-IS on Cisco routers.	7
Identify the steps to verify route redistribution.	10
Describe the scalability problems associated with internal BGP.	9
Interpret the output of various show and debug commands to determine the cause of route selection errors and configuration problems.	4, 5, 6, 9
Identify the steps to verify Enhanced IGRP operation.	4

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
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I would like to dedicate this book to my wife Bobbie, who has once again endured the long hours of work and continued to provide support, to my son Trevor, for understanding why I couldn't always make it to his games, and to my baby girl Lexi, who continues to amaze me and brings so much joy to our lives.
—Carl Timm

I would like to dedicate this book to my wonderful wife Kat who still loves me in spite of my faults plus her sacrifice and dedication for our children. To my boys, Jacob and Jon, for their infectious enthusiasm for life and their inherent goodness. Finally, to my precious daughter Lindy who is as beautiful as her mother and reminds me what life is all about.
—Wade Edwards

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

Cisco Systems' Place in Networking

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

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

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

Cisco's Certifications

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

Cisco Certified Network Associate (CCNA)

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

Cisco Certified Network Professional (CCNP)

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

So, you're thinking, "Great, what do I do after I pass the CCNA exam?" Well, if you want to become a CCIE in Routing and Switching (the most popular certification), understand that there's more than one path to the CCIE certification. The first way is to continue studying and become a Cisco Certified Network Professional (CCNP). That means taking four more tests or if you decide to take the foundation test 2 more tests in addition to obtaining the CCNA certification.

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

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

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

What Are the CCNP Certification Skills?

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

- Installing, configuring, operating, and troubleshooting complex routed LAN, routed WAN, and switched LAN networks, and Dial Access Services.
- Understanding complex networks, such as IP, IGRP, IPX, Async Routing, 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 642-801: Building Scalable Cisco Internetworks (BSCI) A while back, Cisco retired the Routing (640-603) exam and now uses this exam to build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them. Among other topics, you'll be tested on IS-IS, OSFP, and BGP. This book covers all the objectives you need to understand for passing the BSCI exam. The BSCI exam is also a required exam for the CCIP and CCDP certifications, which will be discussed later in this introduction.

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

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

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

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

Table 1.1 Sybex has a solution for each one of the CCNP exams. Each study guide listed in the table below covers all of the exam objectives for their respective exams.

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

Also available: *CCNP Study Guide Kit, Third Edition* (ISBN 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 would be the CCIP. The CCIP is a professional-level certification.

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

What Are the CCIP Certification Skills?

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

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

How Do You Become a CCIP?

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

Exam 642-801: Building Scalable Cisco Internetworks (BSCI) A while back, Cisco retired the Routing (640-603) exam and now uses this exam to

build on the fundamentals of the CCNA exam. BSCI focuses on large multiprotocol internetworks and how to manage them. Among other topics, you'll be tested on IS-IS, OSFP, and BGP. This book covers all the objectives you need to understand for passing the BSCI exam.

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

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

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

Cisco's Network Design

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

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

Cisco Certified Design Associate (CCDA)

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

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

Cisco Certified Design Professional (CCDP)

If you're already a CCNP and want to get your CCDP, you can simply take the 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 the following:

- Designing complex routed LAN, routed WAN, and switched LAN and ATM LANE networks
- Building on 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

Cisco's Security Certifications

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

Cisco Certified Security Professional (CCSP)

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

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

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

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

Exam 642-531: Cisco Secure Intrusion Detection System (CSIDS) The CSIDS exam will challenge your knowledge of intrusion detection technologies and solutions and test your abilities to install and configure ISD components. You'll also be tested on managing large-scale deployments of Cisco

IDS sensors using Cisco IDS management software. Prepare for the CSIDS exam using Sybex's *CCSP: Secure Intrusion Detection and SAFE Implementation Study Guide* (ISBN 0-7821-4288-5).

Exam 642-541: 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. To prepare for this exam uses Sybex's *CCSP: Secure PIX and Secure VPN Study Guide* (ISBN 0-7821-4287-7).

Cisco Firewall Specialist

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

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

Cisco IDS Specialist

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

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

Cisco VPN Specialist

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

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

Cisco Certified Internetwork Expert (CCIE)

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

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