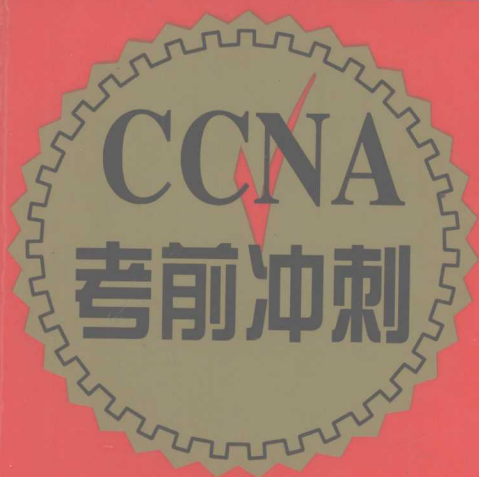


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Exam 640-507

Routing and Switching

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**Jason Waters, Matthew J. Rees,
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CCNATM

Routing and Switching

Second Edition

Jason Waters
Matthew J. Rees
Jeffrey T. Coe

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This book is dedicated to my friends and family.
—Jason Waters

This book is dedicated to my family, Christine, and Luke.
You are the most special people in the world.
—Matthew J. Rees

This book is dedicated to Brenda, Daniel, Jackee, Jessica, my family and friends.
I will always remember your love and support for me.
—Jeffrey T. Coe

About the Authors

Jason Waters is a network consultant based in the Chicago area. He has designed and administered networks for a wide range of companies, including ISPs, insurance companies, and banks. Certifications include CCNA, MCSE, MCP+I, and A+.

Jason is entirely self-taught and has been growing with the industry ever since learning to program on his Commodore 64 and running a BBS in the pre-Internet days. When he is not strapped to his PC, Jason enjoys adventure travel such as backpacking across Europe or trekking in Peru. He also frequents renaissance festivals and is a collector of replica medieval arms and armor. Jason lives in Palatine, IL and can be reached at jwaters@iname.com.

Matthew J. Rees is a consultant with Calence, Inc. in Tempe, Arizona. He has worked in a diverse set of technical environments ranging from software development and testing to Wide Area Network design and implementation. Matthew has expertise in network planning, international network design, internetworking technologies, year 2000 network requirements, voice and data network integration, network modeling, campus design, and local and wide area network installation and testing. He has worked with a diverse set of Fortune 100 clients; however, Matthew's primary clientele has been telecommunications companies. Matthew currently holds a Cisco Certified Network Professional (CCNP) certification. He is also pursuing other Cisco internetworking certifications.

Jeffrey T. Coe is a network security consultant with Calence, Inc. in Tempe, Arizona. He has over ten years of experience in various information technologies, including applications development and support, database and distributed systems architecture design, and enterprise-wide application and network security. His technical experience includes designing and implementing computer networks for Fortune 500 companies using network protocols such as Frame Relay, SMDS, IP, IPX, STUN and SNA. In addition, Jeffrey has designed and implemented fault tolerant LAN architectures for call centers, Web complexes and third-party connectivity. Jeffrey currently holds Cisco Certified Network Professional (CCNP), Cisco Security Specialist and Certified Information Systems Security Professional (CISSP) certifications.

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—Jason Waters

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—*Matthew J. Rees*

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—*Jeffrey T. Coe*

Introduction

Welcome to *CCNA Routing and Switching Exam Cram, 2nd Edition*. This book aims to help you get ready to take and pass Cisco Certification Exam 640-507, “Cisco Certified Network Associate 2.0.” This introduction explains Cisco’s certification programs in general and talks about how the *Exam Cram* series can help you to prepare for Cisco’s certification exams.

Exam Cram books help you to understand and appreciate the subjects and materials you need to pass Cisco certification exams. *Exam Cram* books are aimed strictly at test preparation and review. They do not teach you everything you need to know about a topic, such as the ins and outs of configuring Integrated Services Digital Network (ISDN) services or all of the nitty-gritty details involved in using routing protocols. Instead, we (the authors) present and dissect the questions and problems we’ve found that you’re likely to encounter on a test. We’ve worked from Cisco’s own training materials, preparation guides, tests, and from a battery of third-party test preparation tools. Our aim is to present as much information as possible about Cisco’s certification exams.

Nevertheless, to prepare yourself completely for any Cisco test, we recommend that you begin by taking the self-assessment that immediately follows this introduction. This tool will help you to evaluate your knowledge base against the requirements for a CCNA exam under both ideal and real circumstances.

Based on what you learn from that exercise, you might decide to begin your studies with classroom training or background reading. On the other hand, you might decide to pick up and read one of the many study guides available from Cisco or third-party vendors on certain topics.

We also strongly recommend that you install, configure, and fool around with the software and hardware on which you’ll be tested, because nothing beats hands-on experience and familiarity when it comes to understanding the questions you’re likely to encounter on a certification test. Book-learning is essential, but hands-on experience is the best teacher of all.

The Cisco Certification Program

It is important that when you start the Cisco Career Certification process, first determine the technological career path you wish to master. Cisco offers wide variety of certifications; however, they are designed to follow two distinct career paths with multiple tracks along each path. In an effort to summarize the material, this book presents each career path and the tests required for proceeding along each path. Cisco Systems Inc. offers a wide variety of training courses that are designed to facilitate the certification process. Of course you have to pay for these training courses. You can find the recommended training courses and a more in-depth analysis of each test on Cisco's Web page at www.cisco.com/warp/public/10/wwtraining/certprog/index.html.

Career Path 1: Routing and Switching

The routing and switching career path is shown in Table 1.

Track 1: Network Support

The routing and switching network support certification career path is for professionals who support networks with Cisco local area network (LAN) and wide area network (WAN) routers and switches. This path has three core certifications.

Table 1 Cisco Routing and Switching CCNA, CCNP, and CCIE Requirements

CCNA

Only 1 exam required

➤ **Exam 640-507** Cisco Certified Network Associate 2.0 (CCNA)

CCNP*

4 exams required

Exam 640-503 Routing 2.0 (RTING)

Exam 640-504 Switching 2.0 (SWTCH)

Exam 640-505 Remote Access 2.0 (RMTAC)

Exam 640-506 Support 2.0 (SUPRT)

* You need to have your CCNA before you become a CCNP.

CCIE

1 written exam and 1 lab exam required

Exam 350-001 CCIE Routing and Switching Qualification

Lab Exam CCIE Routing and Switching Laboratory

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Cisco Certified Network Associate (CCNA) 2.0 (CCNA Exam 640-507)

The skills expected of a CCNA are the ability to install, configure, and operate simple-routed LAN, routed WAN, and switched LAN networks.

Cisco Certified Network Professional (CCNP) 2.0

The skills expected of a CCNP are the ability to install, configure, operate, and troubleshoot complex routed LAN, routed WAN, switched LAN networks, and dial access services. Two different test options are available for achieving the CCNP.

Test option 1:

- CCNA Certification (CCNA Exam 640-507)
- Foundation 2.0 (Exam 640-509)
- Support 2.0 (SUPRT Exam 640-506)

Test option 2:

- CCNA Certification (CCNA Exam 640-507)
- Routing 2.0 (RTING Exam 640-503)
- Switching 2.0 (SWTCH Exam 640-504)
- Remote Access 2.0 (RMTAC Exam 640-505)
- Support 2.0 (SUPRT Exam 640-506)

The only difference between test option 1 and 2 is the second set of tests required for test option 2. These tests are designed to cover the same material as the Foundation 2.0 Exam in test option 1, but they are broken up to reduce the test time and make the certification process more manageable.

In addition, Cisco offers specialization exams for people who have achieved the CCNP certification. These tests are designed for professionals to demonstrate superior knowledge in specific technical disciplines. These tests include the following specialization:

Security specialization:

- Managing Cisco Network Security (MCNS Exam 640-442)
- Cisco Enterprise Management Solutions (CEMS Exam 640-601)
- Managing Cisco Routed Internetworks (MCRI Exam 640-443)
- Managing Cisco Switched Internetworks (MCSI Exam 640-444)

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LAN ATM:

- Cisco Campus ATM Solutions (CATM 640-446)

Voice access:

- Cisco Voiceover Fram Relay (CVOICE Exam 640-447)

SNA solutions:

- SNA Foundation (SNAIPF Exam 640-456)
- SNA Configuration for Multiprotocol Administrators (SNAM Exam 640-445)

CCIE—Routing and Switching

The CCIE is the pinnacle of career certifications in the Cisco certification process. The skills expected of a CCIE are the ability to install, configure, operate, and troubleshoot complex routed LAN, routed WAN, switched LAN, and ATM LANE network, and dial access services. Also, a CCIE is expected to diagnose and resolve network faults, use packet/frame analysis and Cisco debugging tools, and document and report the problem-solving processes used. The CCIE exam is split into a written test and a grueling laboratory test:

- Routing and Switching CCIE Written Exam
- Routing and Switching CCIE Lab Test

For more information about the CCIE Routing and Switching certification, please visit Cisco's CCIE Routing and Switching Web page at www.cisco.com/warp/public/625/ccie/certifications/routing.html.

Career Path 2: Network Design

The routing and switching network design certification career path is for professionals who want to design Cisco-based networks that predominantly include routed LAN, routed WAN, and switched LAN networks. This career path has two core certifications.

Cisco Certified Design Associate (CCDA)

The skills expected of a CCDA are the ability to design simple routed LAN, routed WAN, and switched LAN networks. The test required to achieve the CCDA certification is as follows:

- Design Cisco Networks (DCN Exam 640-441)

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Cisco Certified Design Professional (CCDP) 2.0

The skills expected of a CCDP are to design complex routed LAN, routed WAN, and switched LAN networks. The test assumes prerequisite knowledge and skills to install, configure, and operate these networks. Two different test options are available for achieving the CCDP.

Test option 1:

- CCNA Certification (CCNA Exam 640-507)
- CCDA Certification (CCDA Exam 640-441)
- Foundation 2.0 (Exam 640-509)
- Cisco Internetworking Design 3.0 (CID 3.0 Exam 640-025)

Test option 2:

- CCNA Certification (CCNA Exam 640-507)
- CCDA Certification (CCDA Exam 640-441)
- Routing 2.0 (RTING Exam 640-503)
- Switching 2.0 (SWTCH Exam 640-504)
- Remote Access 2.0 (RMTAC Exam 640-505)
- Cisco Internetworking Design 3.0 (CID 3.0 Exam 640-025)

The only difference between test option 1 and 2 is the third set of tests required for test option 2. These tests are designed to cover the same material as the Foundation 2.0 Exam in test option 1, but they are broken up to reduce the test time and make the certification process more manageable.

Career Path 3: WAN Switching Network Design and Support

The WAN switching network design and support career path is designed for professionals who focus on WAN switching, such as Internet Service Providers (ISPs) and carriers. Two tracks are available in the WAN switching network design and support career path.

Track 1: Network Support

The routing and switching network support certification career path is for professionals who configure, operate, troubleshoot, and manage WAN switched networks. The exams are designed to test required skills in the following areas:

-
- Media and telephony transmission techniques, error detection, and time division multiplexing (TDM)
 - Knowledge of Frame Relay and ATM
 - Knowledge of Cisco-specific technologies, including WAN switch platforms, applications, architectures, and interfaces
 - Knowledge of service provider technology, including packet encapsulation and network-to-network interconnections

CCNA (WAN Switching)

The skills expected of a CCNA (WAN switching) are the ability to install WAN switches IPX, IGX, BPX, AXIS, Shelf, and modems. The test required to achieve the CCNA WAN switching certification is:

- CCNA WAN Exam 640-410

CCNP (WAN Switching)

The skills expected of a CCNP (WAN switching) are the ability to configure, operate, troubleshoot, and manage WAN switched networks. Three different test options are available for achieving the CCNP (WAN switching).

Test option 1:

- CCNA-WAN Switching Certification (CCNA Exam 640-410)
- BPX Switch and Service Configuration (BSSC Exam 640-425)
- MGX ATM Concentrator Configuration (MACC Exam 640-411)
- Multiband Switch and Service Configuration (MSSC Exam 640-419)
- Cisco StrataView Plus (CSVP Exam 640-422)

Test option 2:

- CCNA-WAN Switching Certification (CCNA Exam 640-410)
- Cisco WAN Switch Service Networking (CWSSN Exam 640-424)
- Cisco WAN Switch Configuration (CWSC Exam 640-423)
- Cisco StrataView Plus (CSVP Exam 640-422)

Test option 3:

- CCNA-WAN Switching Certification (CCNA Exam 640-410)
- Network Operations for BPX/AXIS Products (BNOC Exam 640-414)

-
- Network Operations for IGX Products (NNOC Exam 640-415)
 - Cisco StrataView Plus (CSVP Exam 640-422)

Track 2: Network Design

The skills expected of the network design track are the ability to design and implement ATM and frame networks, troubleshoot existing WAN switched networks, and manage traffic and voice technologies.

CCDP (WAN Switching)

The skills expected of a CCDP (WAN switching) are the ability to design and implement an ATM network with CBR, ABR, and VBR traffic and a frame relay network using Committed Information Rate (CIR) and MIR traffic parameters; troubleshoot an existing WAN switched network; and manage traffic and voice technologies. The test required to achieve the CCDP certification is as follows:

- Designing Switched WAN Voice Solutions (DSWVS Exam 640-413)

CCIE (WAN Switching)

The CCIE is the pinnacle of career certifications in the Cisco certification process. The skills expected of a CCIE are the ability to implement an ATM network (with CBR, ABR, and VBR traffic) and a frame relay network (using CIR and MIR traffic parameters), troubleshoot an existing WAN switched network, and manage traffic and voice technologies. The CCIE is split into a written test and a grueling laboratory test:

- WAN Switching CCIE Written Exam
- WAN Switching CCIE Lab Test

For more information about the CCIE WAN switching certification, visit Cisco's CCIE WAN switching Web page at www.cisco.com/warp/public/625/ccie/certifications/wan.html.

The many different career tracks in the certification process are designed to meet the requirements of a variety of career fields. Most of you will want to proceed down the routing and switching network support or network design career tracks; these are the most mainstream certifications. Those of you who need to proceed down the WAN switching career path will be working in that type of environment. The ultimate goal of any one of these tracks is to achieve the CCIE certification. This is a noble achievement, and the marketplace recognizes the value of CCIEs.

Taking a Certification Exam

You can register for the CCNA 2.0 exam online through Sylvan Prometric's Web site at www.2test.com.

You can also call 1-800-829-NETS to register for the exam. We strongly recommend that you take the time to review Cisco's Exam Web sites mentioned previously. The cost of the exam is \$100 that can be paid by credit card, personal check, or money order.

You will be taking the test at a Sylvan Prometric Testing Center at the location you choose. When you arrive at the testing location, sign in with the test coordinator and have two forms of identification ready, one of which must be a photo ID. The test coordinator will give you a set of rules for you to read and abide by during the test. You will also receive some scratch paper and a pencil, or a dry-erase board and marker. The amount of scratch paper required to take the test will vary for each individual, but we recommend that you get as much as possible to be safe. If you are given a dry-erase board, ask for two of them so you don't have to erase previously written material to make extra room for notes or calculations during the test. The test coordinator will take you to a room with a number of computer stations divided by walls. You will have the option of taking a tutorial on the exam before the time starts for the test. If this is your first Cisco test, we recommend that you review this material.

A Cram Sheet has been provided at the beginning of the text with material that most often appears on the test. If it helps you, write down as much as you can remember on your scratch paper before taking the test. You can use the time provided to take the tutorial to make these notes. The test will consist of 65 questions, and you will be given 75 minutes to complete the exam. Strategies for time management are provided in the next section. Remember to take a deep breath and have confidence in yourself. If you have spent the time studying the material in this book, you will be well-equipped to tackle the test head on.

After you have completed the test, the results of your test will be available online immediately. After you have received your passing score, you will be prompted to print your results. *Do print your results.* Don't go any further until you have seen a printed copy of your results, because this is your only true verification that you have passed the exam. After you have seen this printout, conclude the exam, and see the test coordinator.

CCNA Exam Test Format

The CCNA exam uses the typical certification test format of asking multiple-choice questions with one or more answers per question. What makes some questions more difficult is that more than five answer choices are listed, reducing the

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power of eliminating answers and choosing from the remaining answers. The nice part is that the number of required answers is given for each question.

The test consists of 65 questions and requires a score of 822 on a scale of 300 to 1,000 to pass. The test questions can be grouped into eight topics, all of which are covered in this book. We have attempted to estimate the number of questions that are taken from each subject area to give you an idea of where to focus the majority of your time; however, the percentage of questions that will appear for any topic will most certainly vary. We have developed this list from taking the test and talking with other people who have passed the exam.

As you can see, the Open Systems Interconnect (OSI) model, router configuration basics, Transmission Control Protocol/Internet Protocol (TCP/IP), and WAN protocols make up 65 percent of the test. Make sure that you spend extra time learning these concepts. Concentrate especially on the OSI model; without a thorough understanding of it, you will have difficulty passing the test. Also, to develop a foundation for obtaining additional internetworking skills, you need to master these topics.

Tracking Cisco Certification Status

As soon as you pass any Cisco certification, you'll attain Cisco certification status. Cisco also generates transcripts that indicate which exams you have passed and your corresponding test scores. Cisco will send these transcripts to you. In addition, you will receive a login ID and password that will allow you to track your status on Cisco's Web page.

How to Prepare for an Exam

The CCNA exam requires test-taking skills that many of us learned in high school or college. This section will be a refresher for many and important for all.

The first thing to focus on during the test is time management. The CCNA exam allows 75 minutes to complete the test. This gives you just over 1 minute per question. Don't worry about how long it takes you to finish an individual question, but divide the test into checkpoints to monitor your progress during the test.

You must answer each question. In fact, the test engine will not let you proceed if you have not selected an answer or if you have not chosen the correct number of answers. You will not be allowed to go back to a question after you've answered it. If you get stuck on a question, check to see how much time you have left and if you are on schedule to finish in adequate time. If you don't have time to spare, make an educated guess and move on.