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Enterprise Certification

STUDY GUIDE

EXAM 350-401

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Enterprise Certification Study Guide

Ben Piper

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I dedicate this book to the Lord Jesus Christ through Whom all things were created and in Whom all things hold together

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About the Author

Ben Piper is a networking and cloud consultant who has authored multiple books including the *AWS Certified Solutions Architect Study Guide: Associate SAA-C01 Exam, Second Edition* (Sybex, 2019), *AWS Certified Cloud Practitioner Study Guide: Foundational CLF-C01 Exam* (Sybex, 2019), and *Learn Cisco Network Administration in a Month of Lunches* (Manning, 2017). You can contact Ben by visiting his website `https://benpiper.com`.

Contents at a Glance

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Introduction

Networking is uniquely challenging in that it's not a single technology, but a collection of interdependent technologies that every other aspect of IT depends on. Without networking, there are no connected applications and that means there are no IT employees. Even if you're not sure that you want networking to become your permanent career, becoming an expert at networking will open the doors for other in-demand areas of IT, including security, software development, and cloud computing.

Cisco's Professional Network Certifications

In 2019, Cisco announced updates to its Cisco Certified Network Professional (CCNP) certification program. There are six professional level certifications to choose from:

- CCNP Enterprise
- CCNP Data Center
- CCNP Security
- CCNP Service Provider
- CCNP Collaboration
- Cisco Certified DevNet Professional

Each certification requires passing one core exam and one concentration exam. The core exam for the CCNP Enterprise certification is 350-401 ENCOR, "Implementing Cisco Enterprise Network Core Technologies." The concentration exams let you focus on a specific specialty, such as routing, wireless, network design, automation, or software-defined networking (SDN). Regardless of the concentration exam you choose, you must pass the ENCOR exam to attain your CCNP Enterprise certification.

Is CCNP Certification Right for You?

Many who attain the Cisco Certified Network Associate (CCNA) don't go on to pursue more advanced Cisco certifications. So why should you consider the CCNP Enterprise certification, and is it right for you? It may be right for you if

- You have a passion for networking.
- You want to set yourself apart as someone who has a passion for technology and isn't just in it for the money (although there is plenty of that!).
- You want to specialize in security, wireless, network automation, cloud, or software-defined networking.
- You enjoy tweaking the "nerd knobs" on individual technologies just to see what will happen.
- You love facing and overcoming the challenges of troubleshooting.

Study Tips

Before taking the CCNP ENCOR exam, there are a few things to keep in mind. There's no reason that you can't pass the exam the first time. To help you do that, I want to share with you some study tips that have helped me pass several Cisco certification exams on the first try. One of the neglected skills required on any Cisco exam is speed. Being able to troubleshoot a 10-router Open Shortest Path First (OSPF) topology is good. Taking 15 minutes to do it is not so good. I can't stress enough the importance of spending quality time with the command-line interface (CLI). You should spend at least 50 percent of your study time on configuring and troubleshooting a variety of topologies and technologies.

There's an old Latin proverb that repetition is the mother of learning. Repetition—in terms of both study and practice—is going to be your best friend. Understanding networking requires making connections that aren't always obvious, and the more you practice and study, the more opportunities your mind has to make those connections. For years I've used SuperMemo (`https://super-memory.com`), a flashcard-like program that lets you create your own question-and-answer pairs, quizzes you, and shows you how well you're retaining the information. What makes SuperMemo superior to flashcards is that it identifies the information you've already retained, and it doesn't waste time continuing to quiz you on it. That means you can safely load your collection with hundreds of items while still using your time efficiently.

One last tip: As you read this study guide cover to cover, keep a running list of questions and things you're not sure about. Chances are if you find something confusing, a lot of other people did too, and that makes it good fodder for the exam. Be sure to visit `https://benpiper.com/encor` for book resources, updates, and errata.

Prerequisites and Lab Requirements

The CCNA certification isn't required to attain the CCNP Enterprise certification. Nevertheless, I strongly recommend that you obtain your CCNA certification or the equivalent experience before embarking on your CCNP Enterprise journey. Refer to the CCNA exam blueprint (`www.cisco.com/c/en/us/training-events/training-certifications/certifications/associate/ccna.html`) for a full list of topics you should already be familiar with. Because the CCNP Enterprise is a professional-level certification, I don't review some of the basics covered by the CCNA such as subnetting, IPv4, and IPv6 addressing.

You'll need a virtual or physical lab, which you should already have from your previous networking studies. Your lab should be able to support at least eight routers and two layer 3 switches running IOS version 15.2 or later. You should be able to configure your lab on your own by looking at layer 2 and layer 3 diagrams. Topology diagrams will be included in each chapter.

If your existing lab doesn't meet the requirement, Cisco Virtual Internet Routing Lab (`http://virl.cisco.com`) includes virtual machine images for a variety of switches and routers. These images are virtual machines that run using QEMU and are light on CPU and

memory, so you don't need a beast of a server to run simulations, although more resources always help. Other options, although not blessed by Cisco, are GNS3 (`https://gns3.com`) and EVE-NG (`www.eve-ng.net`).

How to Use This Book

Hands-on experience is crucial for exam success. Each chapter in this study guide contains hands-on exercises that you should strive to complete during or immediately after your reading of the chapter. The exercises are there to test your understanding, and not to cover every possible permutation of configurations. The exercises are your foundation, and you should build on them by experimenting with them, breaking things, and then figuring out how to fix them.

Each chapter contains review questions to thoroughly test your understanding of the services and concepts covered in that chapter. They also test your ability to integrate the concepts with information from preceding chapters. I've designed the questions to help you realistically gauge your understanding and identify your blind spots. Once you complete the assessment in each chapter, referring to the answer key will give you not only the correct answers but a detailed explanation as to why they're correct. Even if you feel comfortable on a certain topic, resist the urge to skip over the pertinent chapter. I strongly encourage you to carefully read this book from cover to cover so that you can discover your strengths and weaknesses—particularly the ones you may not be aware of. Remember, even though you can't learn networking just by reading a book, it's equally true that you can't learn *without* reading a book.

The book also contains a self-assessment exam with 36 questions, two practice exams with 50 questions each to help you gauge your readiness to take the exam, and flashcards to help you learn and retain key facts needed to prepare for the exam.

What Does This Book Cover?

This book covers topics you need to know to prepare for the CCNP ENCOR exam:

Chapter 1: Networking Fundamentals This chapter overviews the fundamentals of networking theory and network design.

Chapter 2: Spanning Tree Protocols This chapter covers Spanning Tree protocols, including Rapid Spanning Tree and Multiple Instance Spanning Tree. We also cover VLANs, trunking, and pruning.

Chapter 3: Enterprise Network Design In this chapter, you'll learn the advantages and disadvantages of different physical and layer 2 network designs. We also dive into EtherChannels and first-hop redundancy protocols.

Chapter 4: Wireless LAN (WLAN) This chapter explains the fundamentals of radio frequency, WLAN 802.11 standards, wireless security, and WLAN controller (WLC) design and deployment considerations.

Chapter 5: Open Shortest Path First (OSPF) In this chapter, you'll learn how to configure and troubleshoot OSPF adjacencies, authentication, route filtering, summarization, and more.

Chapter 6: Enhanced Interior Gateway Routing Protocol (EIGRP) This chapter covers advanced EIGRP concepts, including redistribution, multipathing, and path control.

Chapter 7: The Border Gateway Protocol (BGP) In this chapter, you'll learn all about BGP, including path selection, redistribution, summarization, and filtering.

Chapter 8: Network Address Translation and Multicast This two-for-the-price-of-one chapter gives you complete coverage of network address translation and multicast.

Chapter 9: Quality of Service This chapter covers QoS concepts, including queuing, policing, shaping, and classification.

Chapter 10: Network Virtualization This chapter dives deep into virtualization concepts such as server virtualization, network virtualization, generic routing encapsulation, IPsec, LISP, and VXLAN.

Chapter 11: Software-Defined Networking and Network Programmability In this chapter, you'll learn about Cisco's software-defined networking (SDN) solutions, SD-Access, Cisco DNA Center, and SD-WAN. You'll also learn about network automation tools such as Python, RESTCONF, NETCONF, Ansible, Chef, Puppet, and SaltStack.

Chapter 12: Network Security and Monitoring This chapter will show you how to implement infrastructure security best practices and wireless security configurations. You'll also learn about Cisco security products and how to monitor your network using NetFlow, IPSLA, debugs, Syslog, SNMP, and more.

Interactive Online Learning Environment and Test Bank

The interactive online learning environment that accompanies this *CCNP Enterprise Certification Study Guide: Exam 350-401* provides a test bank with study tools to help you prepare for the certification exam—and increase your chances of passing it the first time! The test bank includes the following:

Sample Tests All the questions in this book are provided, including the assessment test at the end of this introduction and the chapter tests that include the review questions at the

end of each chapter. In addition, there are two practice exams with 50 questions each. Use these questions to test your knowledge of the study guide material. The online test bank runs on multiple devices.

Flashcards The online text banks include 100 flashcards specifically written to hit you hard, so don't get discouraged if you don't ace your way through them at first. They're there to ensure that you're really ready for the exam. And no worries—armed with the review questions, practice exams, and flashcards, you'll be more than prepared when exam day comes. Questions are provided in digital flashcard format (a question followed by a single correct answer). You can use the flashcards to reinforce your learning and provide last-minute test prep before the exam.

Other Study Tools A glossary of key terms from this book is available as a fully searchable PDF.

Go to `www.wiley.com/go/sybextestprep` to register and gain access to this interactive online learning environment and test bank with study tools.

Exam Objectives

The CCNP ENCOR exam is intended for people who have experience implementing enterprise network technologies including IPv4 and IPv6 architecture, virtualization, monitoring, security, and automation. In general, you should have the following before taking the exam:

- A minimum of two years of hands-on experience configuring and troubleshooting routers and switches
- Ability to design and configure a network based on customer requirements
- Ability to provide implementation guidance
- A mastery of IPv4 and IPv6

The exam covers six different domains, with each domain broken down into objectives.

Objective Map

The following table lists each domain and its weighting in the exam, along with the chapters in the book where that domain's objectives are covered.

Domain	Percentage of exam	Chapter
Domain 1: Architecture	**15%**	
1.1 Explain the different design principles used in an enterprise network		1, 3
1.2 Analyze design principles of a WLAN deployment		4
1.3 Differentiate between on-premises and cloud infrastructure deployments		11
1.4 Explain the working principles of the Cisco SD-WAN solution		11
1.5 Explain the working principles of the Cisco SD-Access solution		11
1.6 Describe concepts of wired and wireless QoS		9
1.7 Differentiate hardware and software switching mechanisms		1
Domain 2: Virtualization	**10%**	
2.1 Describe device virtualization technologies		10
2.2 Configure and verify data path virtualization technologies		10
2.3 Describe network virtualization concepts		10
Domain 3: Infrastructure	**30%**	
3.1 Layer 2		1, 2, 3
3.2 Layer 3		1, 5, 6, 7
3.3 Wireless		4
3.4 IP Services		3, 8, 12
Domain 4: Network Assurance	**10%**	
4.1 Diagnose network problems using tools such as debugs, conditional debugs, trace route, ping, SNMP, and syslog		12
4.2 Configure and verify device monitoring using syslog for remote logging		12

Domain	Percentage of exam	Chapter
4.3 Configure and verify NetFlow and Flexible NetFlow		12
4.4 Configure and verify SPAN/RSPAN/ERSPAN		12
4.5 Configure and verify IPSLA		12
4.6 Describe Cisco DNA Center workflows to apply network configuration, monitoring, and management		11
4.7 Configure and verify NETCONF and RESTCONF		11
Domain 5: Security	**20%**	
5.1 Configure and verify device access control		12
5.2 Configure and verify infrastructure security features		12
5.3 Describe REST API security		11
5.4 Configure and verify wireless security features		4, 12
5.5 Describe the components of network security design		4, 12
Domain 6: Automation	**15%**	
6.1 Interpret basic Python components and scripts		11
6.2 Construct valid JSON encoded file		11
6.3 Describe the high-level principles and benefits of a data modeling language, such as YANG		11
6.4 Describe APIs for Cisco DNA Center and vManage		11
6.5 Interpret REST API response codes and results in payload using Cisco DNA Center and RESTCONF		11
6.6 Construct EEM applet to automate configuration, troubleshooting, or data collection		11
6.7 Compare agent vs. agentless orchestration tools, such as Chef, Puppet, Ansible, and SaltStack		11

Assessment Test

1. IP depends on which of the following?
   - **A.** Address Resolution Protocol
   - **B.** Data link layer
   - **C.** Network layer
   - **D.** Transport layer

2. Which is *not* a function of a bridge?
   - **A.** Simulating some properties of a shared physical Ethernet cable
   - **B.** MAC-based routing
   - **C.** Reducing the size of a broadcast domain
   - **D.** Frame check sequence validation

3. What are the purposes of TCP sequence numbers? (Choose two.)
   - **A.** Error control
   - **B.** Ordering
   - **C.** Flow control
   - **D.** Reliable delivery

4. Three switches are connected via 802.1Q trunk links. You need to prevent VLAN 25 traffic from reaching two of the switches. Which of the following can accomplish this? (Choose two.)
   - **A.** Prune VLAN 25 on the trunk links.
   - **B.** Use routed interfaces instead of trunks.
   - **C.** Configure Spanning Tree to block the ports to the switches.
   - **D.** Delete VLAN 25 on the switches.

5. Switch SW1 is running RPVST+ and is connected via a routed interface to SW2, which is running Multiple Spanning Tree. If you add VLAN 2 to both switches and map VLAN 2 to `MST1` on SW2, which switch will necessarily be the root for VLAN 2?
   - **A.** SW1
   - **B.** SW2
   - **C.** The switch with the lowest bridge priority
   - **D.** Both SW1 and SW2

6. Which of the following can effectively prune a VLAN from a trunk?
   - **A.** BPDU Guard
   - **B.** BPDU Filter
   - **C.** Loop Guard
   - **D.** UDLD