

## Introduction

Cisco Networking Academy is a comprehensive e-learning program that delivers information technology skills to students around the world. The Cisco CCNA Discovery curriculum consists of four courses that provide a comprehensive overview of networking, from fundamentals to advanced applications and services. The curriculum emphasizes real-world practical application, while providing opportunities for you to gain the skills and hands-on experience needed to design, install, operate, and maintain networks in small to medium-sized businesses, as well as enterprise and service provider environments. The Networking for Home and Small Businesses course is the first course in the curriculum.

*Networking for Home and Small Businesses, CCNA Discovery Learning Guide* is the official supplemental textbook for the first course in v4.x of the CCNA Discovery online curriculum of the Networking Academy. As a textbook, this book provides a ready reference to explain the same networking concepts, technologies, protocols, and devices as the online curriculum. In addition, it contains all the interactive activities, Packet Tracer activities, and hands-on labs from the online curriculum as well as bonus labs.

This book emphasizes key topics, terms, and activities and provides many alternative explanations and examples as compared with the course. You can use the online curriculum as directed by your instructor and then also use this *Learning Guide's* study tools to help solidify your understanding of all the topics. In addition, the book includes

- Expanded coverage of CCENT/CCNA exam material
- Additional key glossary terms
- Bonus labs
- Additional Check Your Understanding and Challenge questions
- Interactive activities and Packet Tracer activities on the CD-ROM

## Goal of This Book

First and foremost, by providing a fresh, complementary perspective of the online content, this book helps you learn all the required materials of the first course in the Networking Academy CCNA Discovery curriculum. As a secondary goal, individuals who do not always have Internet access can use this text as a mobile replacement for the online curriculum. In those cases, you can read the appropriate sections of this book, as directed by your instructor, and learn the topics that appear in the online curriculum. Another secondary goal of this book is to serve as your offline study material to help prepare you for the CCENT and CCNA exams.

## Audience for This Book

This book's main audience is anyone taking the first CCNA Discovery course of the Networking Academy curriculum. Many Networking Academies use this textbook as a required tool in the course, while other Networking Academies recommend the *Learning Guides* as an additional source of study and practice materials.

## Book Features

The educational features of this book focus on supporting topic coverage, readability, and practice of the course material to facilitate your full understanding of the course material.

### Topic Coverage

The following features give you a thorough overview of the topics covered in each chapter so that you can make constructive use of your study time:

- **Objectives:** Listed at the beginning of each chapter, the objectives reference the core concepts covered in the chapter. The objectives match the objectives stated in the corresponding chapters of the online curriculum; however, the question format in the *Learning Guide* encourages you to think about finding the answers as you read the chapter.
- **“How-to” feature:** When this book covers a set of steps that you need to perform for certain tasks, the text lists the steps as a how-to list. When you are studying, the icon helps you easily refer to this feature as you skim through the book.
- **Notes, tips, cautions, and warnings:** These are short sidebars that point out interesting facts, timesaving methods, and important safety issues.
- **Chapter summaries:** At the end of each chapter is a summary of the chapter’s key concepts. It provides a synopsis of the chapter and serves as a study aid.



### Readability

The authors have compiled, edited, and in some cases rewritten the material so that it has a more conversational tone that follows a consistent and accessible reading level. In addition, the following features have been updated to assist your understanding of the networking vocabulary:

- **Key terms:** Each chapter begins with a list of key terms, along with a page-number reference from inside the chapter. The terms are listed in the order in which they are explained in the chapter. This handy reference allows you to find a term, flip to the page where the term appears, and see the term used in context. The Glossary defines all the key terms.
- **Glossary:** This book contains an all-new Glossary with more than 350 computer and networking terms.

### Practice

Practice makes perfect. This new *Learning Guide* offers you ample opportunities to put what you learn to practice. You will find the following features valuable and effective in reinforcing the instruction that you receive:

- **Check Your Understanding questions and answer key:** Updated review questions are presented at the end of each chapter as a self-assessment tool. These questions match the style of questions that you see in the online course. Appendix A, “Check Your Understanding and Challenge Questions Answer Key,” provides an answer key to all the questions and includes an explanation of each answer.
- **(NEW) Challenge questions and activities:** Additional, and more challenging, review questions and activities are presented at the end of chapters. These questions are purposefully designed to be similar to the more complex styles of questions you might see on the CCNA exam. This section might also include activities to help prepare you for the exams. Appendix A provides the answers.

**Packet Tracer**  
**Activity**

- **Packet Tracer activities:** Interspersed throughout the chapters you'll find many activities to work with the Cisco Packet Tracer tool. Packet Tracer allows you to create networks, visualize how packets flow in the network, and use basic testing tools to determine whether the network would work. When you see this icon, you can use Packet Tracer with the listed file to perform a task suggested in this book. The activity files are available on this book's CD-ROM; Packet Tracer software, however, is available through the Academy Connection website. Ask your instructor for access to Packet Tracer.
- **Interactive activities:** These activities provide an interactive learning experience to reinforce the material presented in the chapter.
- **Labs:** This book contains all the hands-on labs from the curriculum plus additional challenge labs for further practice. Part I includes references to the hands-on labs, as denoted by the lab icon, and Part II of the book contains each lab in full. You may perform each lab as you see each lab referenced in the chapter or wait until you have completed the chapter.

## A Word About Packet Tracer Software and Activities

Packet Tracer is a self-paced, visual, interactive teaching and learning tool developed by Cisco. Lab activities are an important part of networking education. However, lab equipment can be a scarce resource. Packet Tracer provides a visual simulation of equipment and network processes to offset the challenge of limited equipment. Students can spend as much time as they like completing standard lab exercises through Packet Tracer, and have the option to work from home. Although Packet Tracer is not a substitute for real equipment, it allows students to practice using a command-line interface. This “e-doing” capability is a fundamental component of learning how to configure routers and switches from the command line.

Packet Tracer v4.x is available only to Cisco Networking Academies through the Academy Connection website. Ask your instructor for access to Packet Tracer.

## A Word About the Discovery Server CD

The CCNA Discovery series of courses is designed to provide a hands-on learning approach to networking. Many of the CCNA Discovery labs are based on Internet services. Because it is not always possible to allow students access to these services on a live network, the Discovery Server has been developed to provide them.

The Discovery Server CD is a bootable CD developed by Cisco that transforms a regular PC into a Linux server running several preconfigured services for use with the CCNA Discovery labs. The Discovery Server is available from the Academy Connection website *only*. Your instructor can download the CD files from the Instructor Tools section of the Academy Connection website, burn a CD, and show you how to make use of the Server. Hands-on labs that make use of the Discovery Server are identified within the labs themselves.

Once booted, the server provides many services to clients including

- Domain Name Services
- Web Services
- FTP

- TFTP
- Telnet
- SSH
- DHCP
- Streaming Video
- VPN Termination

## How This Book Is Organized

This book covers the major topics in the same sequence as the online curriculum for the CCNA Discovery Networking for Home and Small Businesses course. The online curriculum has 10 chapters for this course, so this book has 10 chapters with the same names and numbers as the online course chapters.

To make it easier to use this book as a companion to the course, the major topic headings in each chapter match, with just a few exceptions, the major sections of the online course chapters. However, the *Learning Guide* presents many topics in slightly different order inside each major heading. Additionally, the book occasionally uses different examples than the course. As a result, students get more detailed explanations, a second set of examples, and different sequences of individual topics, all to aid the learning process. This new design, based on research into the needs of the Networking Academies, helps typical students lock in their understanding of all the course topics.

## Chapters and Topics

Part I of this book has 10 chapters, as follows:

- **Chapter 1, “Personal Computer Hardware,”** discusses different types of personal computers, how they are used, and the difference between local and network applications. This chapter describes how data is represented and manipulated in a computer system. Also covered is the role of the various computer components and peripherals and the proper way to install and test them.
- **Chapter 2, “Operating Systems,”** introduces the OS, its key components, and user interfaces as well as some of the more common operating systems. It provides an overview of the commercial and GPL software licensing schemes. This chapter presents different options for OS installation and describes the process for upgrading and maintaining the OS. It covers the common types of file systems used with PCs and hard disk partitioning. You will also learn the IP parameters that must be configured to prepare a computer to participate on the network.
- **Chapter 3, “Connecting to the Network,”** introduces communications protocols and describes how communication occurs on an Ethernet network. The main components of an information network are explored as are the roles clients and servers play. In this chapter you will build a peer-to-peer computer network and verify it is functioning. Logical and physical topologies are compared and the layered networking model is introduced. You will learn how hubs, switches, and routers function. Also covered are broadcast and collision domains, ARP, default gateways, and prototyping.
- **Chapter 4, “Connecting to the Internet Through an ISP,”** introduces ISP services, options for connecting to the Internet, and components of an ISP Network Operations Center (NOC). This chapter discusses the Internet Protocol (IP) and how information is sent across the Internet

through an ISP. Other major areas covered by this chapter are the cabling and connectors used for connecting network devices, with focus on Ethernet UTP cables and how they are constructed. You will build Ethernet cables and test them.

- **Chapter 5, “Network Addressing,”** examines the IP address and subnet mask and how they are used on a network. Unicast, multicast, and broadcast IP addresses are introduced as well as the three classes of assignable IP addresses. This chapter covers how IP addresses are obtained, the differences between public and a private addresses, and how network address translation (NAT) functions.
- **Chapter 6, “Network Services,”** builds on the client/server model as it relates to common network services. This chapter describes the TCP and UDP transport protocols, the function of port numbers, and the protocols and applications that use them. Focus is on major Internet services, applications, and protocols including DNS, e-mail, WWW, FTP, and IM. The concept of a protocol stack and how protocols interact on a host when sending and receiving a message are introduced. The purpose of a layered networking model is discussed as are the two major models in use, the Open Systems Interconnect (OSI) and the TCP/IP model.
- **Chapter 7, “Wireless Technologies,”** explores the benefits and limitations of wireless technology and where it is used. This chapter compares the wireless personal-area network (WPAN), wireless local-area network (WLAN), and wireless wide-area network (WWAN). It describes components required to build a WLAN and their functions as well as the current standards for WLANs and how they compare. In this chapter, you will configure parameters on a wireless access point (AP) to allow a wireless client to access network resources. You will also explore techniques available to help secure the WLAN.
- **Chapter 8, “Basic Security,”** introduces networking threats, their characteristics, and different methods of attack. This chapter also describes security procedures and applications that can help prevent attacks and focuses on firewalls, their capabilities, and how a DMZ is structured. You will configure a DMZ and port forwarding with an integrated router device. You will also learn about vulnerability analysis software and how can it help to prevent attacks.
- **Chapter 9, “Troubleshooting Your Network,”** identifies the steps involved in the troubleshooting process and some of the common troubleshooting techniques. Utilities available for troubleshooting connectivity issues are explored. This chapter also covers some of the more common issues with wired and wireless LANs and suggests some possible sources of help when troubleshooting.
- **Chapter 10, “Putting It All Together.”** In this summary activity, you use what you have learned about computer hardware and software, wired and wireless networking components, protocols and applications, and techniques for securing a network to plan and implement a technical solution for a small business.

Part II of this book includes the labs that correspond to each chapter.

This book also includes the following:

- An appendix, **“Check Your Understanding and Challenge Questions Answer Key,”** provides the answers to the Check Your Understanding questions that you find at the end of each chapter. It also includes answers for the Challenge questions and activities that conclude most chapters.
- The **Glossary** provides a compiled list of all the key terms that appear throughout this book plus additional computer and networking terms.

## About the CD-ROM

The CD-ROM included with this book provides many useful tools and information to support your education:

Packet Tracer  
Activity



- **Packet Tracer Activity files:** These are files to work through the Packet Tracer activities that are referenced throughout the book, as indicated by the Packet Tracer activity icon.
- **Interactive Activities:** The CD-ROM contains the interactive activities referenced throughout the book.
- **OSI Model Overview:** The CD-ROM also contains a brief overview of the OSI model for your reference.
- **Taking Notes:** This section includes a .txt file of the chapter objectives to serve as a general outline of the key topics of which you need to take note. The practice of taking clear, consistent notes is an important skill for not only learning and studying the material but for on-the-job success as well. Also included in this section is “A Guide to Using a Networker’s Journal”; a PDF booklet providing important insight into the value of the practice of using a journal, how to organize a professional journal, and some best practices on what, and what not, to take note of in your journal.
- **IT Career Information:** This section includes a Student Guide to applying the toolkit approach to your career development. Learn more about entering the world of Information Technology as a career by reading two informational chapters excerpted from *The IT Career Builder’s Toolkit*: “Information Technology: A Great Career” and “Breaking into IT.”
- **Lifelong Learning in Networking:** As you embark on a technology career, you will notice that it is ever-changing and evolving. This career path provides new and exciting opportunities to learn new technologies and their applications. Cisco Press is one of the key resources to plug into on your quest for knowledge. This section of the CD-ROM provides an orientation to the information available to you and tips on how to tap into these resources for lifelong learning.