

**CCIE Professional Development:**

**Routing TCP/IP, Volume I**

**TCP/IP 路由技术, 卷 I**

**Jeff Doyle**



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**CCIE Professional Development: Routing TCP/IP, Volume I**

Jeff Doyle

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## 出版前言

21 世纪将会是一个信息高速公路四通八达的时代,信息产业发展的水平亦将是评估一个国家综合国力的重要依据。世界各国将会在信息技术的研究开发和信息产业的发展方面展开激烈的竞争。这既是一种挑战也是一种机遇。有鉴于此,我国已经开始全面快速地发展网络技术和因特网。

Cisco Systems 公司是世界领先的全球 Internet, Intranet 以及电信网络设备及解决方案的供应商,1996 年名列世界十大电信公司之一。Cisco Systems 的联网操作系统(IOS)是支持网络服务和网络应用的坚实基础。该公司与麦克米伦计算机出版公司合作创立了 Cisco Press,出版了一系列关于最新的网络技术的权威著作。这些著作不仅兼顾建网与网际互联的基础理论和实际应用,为网络专业人员和用户提供必要的技术支持,还有一部分是为 Cisco CCIE 考试和 CCNA,CCNP,CCDA 及 CCDP 职业考试认证准备的自学和培训教材。Cisco 公司早于 1994 年就进入中国,已为国内信息产业界所熟悉。我们引进其中部分著作组成“CISCO 系列丛书(影印版)”影印出版,以祈对我国信息产业的发展稍尽绵薄之力,并衷心希望这套丛书对从事建网,网际互联的专业人员;有志于我国信息产业发展的读者,以及参加 Cisco 培训和准备 Cisco 考试认证的人员有所裨益。

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## Dedications

This book would not have been possible without the concerted efforts of many dedicated people. I would like to thank the following people for their contributions:

First, thanks to Laurie McGuire, development editor, who not only improved the book but improved me as a writer.

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## **About the Author**

Jeff Doyle is a Senior Network Systems Consultant with International Network Services (INS) in Denver, Colorado. He is a Cisco Certified Internetwork Expert (CCIE # 1919) and a Certified Cisco Systems Instructor. He has developed and taught a variety of networking and internetworking courses.

## **About the Reviewers**

Jennifer DeHaven Carroll is a principal consultant for International Network Services. She is CCIE number 1402. Jennifer has planned, designed and implemented many IP networks over the past 10 years, utilizing RIP version 2, IGRP, E-IGRP, OSPF and BGP. She has also developed and taught theory and Cisco implementation classes on all IP routing protocols.

Michael Tibodeau is a Systems Engineer for Cisco Systems. Over the past two years, Michael has specialized in security technologies for both his own customers and Networkers audiences. He also focuses on the Electronic Commerce and Quality of Service arenas. Michael holds a Bachelor's degree in Systems Engineering from the University of Virginia and holds a Master's degree in Systems Engineering and Management, concentrating on telecommunications.





# Introduction

Routing is an essential element of all but the smallest data communications networks. At one level, routing and the configuration of routers are quite simple. But as internetworks grow in size and complexity, routing issues can become at once both large and subtle. Perversely, perhaps, I am grateful for the difficult problems large-scale routing can present—as a network systems consultant, these problems are my bread and butter. Without them, the phrase “You want fries with that?” could be an unfortunate part of my daily vocabulary.

Cisco Certified Internetwork Experts are widely recognized for their ability to design, troubleshoot, and manage large internetworks. This recognition comes from the fact that you cannot become a CCIE by attending a few classes and then regurgitating some memorized facts onto a written test. A CCIE has proven his or her expertise in an intense, famously difficult hands-on lab exam.

## **OBJECTIVES**

This book is the first in a series designed to aid you in becoming a Cisco Certified Internetwork Expert and the first of two volumes that focuses on TCP/IP routing issues. Early in the project, Kim Lew, Cisco Systems program manager, said, “Our objective is to make CCIEs, not to make people who can pass the CCIE lab.” I entirely

agree with that statement and have used it as a guiding principle throughout the writing of this book. Although the book includes many case studies and exercises to help you prepare for the CCIE lab, my primary objective is to increase your understanding of IP routing—both on a generic level and as it is implemented on Cisco routers.

## **AUDIENCE**

The audience for this book is any network designer, administrator, or engineer who needs a full understanding of the interior routing protocols of TCP/IP. Although the practical aspects of the book focus on Cisco's IOS, the information is applicable to any routing platform.

The book is not only for readers who plan to become Cisco Certified Internetwork Experts, but for anyone who wishes to advance his or her knowledge of TCP/IP routing. These readers will fall into one of three categories:

- The “beginner” who has some basic networking knowledge and wishes to begin a deep study of internet-working
- The intermediate-level networking professional who has experience with routers, Cisco or otherwise, and plans to advance that experience to the expert level
- The highly experienced networking expert. This individual has extensive hands-on expertise with Cisco routers and is ready to take the CCIE lab; however, he or she wants a structured review and series of exercises for verification and validation.

*CCIE Professional Development: Routing TCP/IP, Volume I* focuses primarily on the intermediate-level networking professional while offering to the beginner a structured outline of fundamental information and to the expert the required challenges to hone his or her skills.

## **ORGANIZATION**

The fourteen chapters of the book are divided into three parts.

Part I examines the basics of networks and routing. Although more advanced readers may wish to skip the first two chapters, I recommend that they at least skim Chapter 3, “Static Routing,” and Chapter 4, “Dynamic Routing Protocols.”

Part II covers the TCP/IP Interior Gateway Protocols. Each protocol-specific chapter begins with a discussion of the mechanics and parameters of the protocol. This general overview is followed by case studies on configuring and troubleshooting the protocol on Cisco routers in various network topologies.

The Exterior Gateway Protocols, as well as such topics as multicast routing, Quality of Service routing, router security and management, and routing IPv6 will be covered in Volume II.

Part III examines the tools available for creating and managing interoperability with multiple IP routing protocols, as well as such tools as default routes and route filtering. These chapters, like the ones in Part II, begin with concepts and conclude with case studies.

## CONVENTIONS AND FEATURES

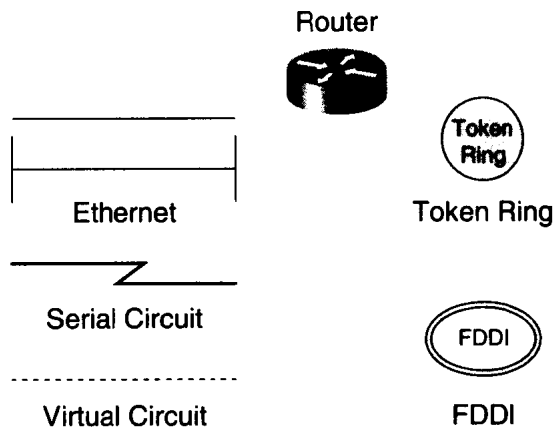
Most chapters conclude with a set of review questions, configuration exercises, and troubleshooting exercises. The review questions focus on the theoretical aspects of the chapter topic, whereas the configuration and troubleshooting exercises address Cisco-specific aspects of the chapter topic.

Also at the end of each chapter is a table with a brief description of all important Cisco IOS commands used in that chapter. The conventions used to present these commands are the same conventions used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- Vertical bars (|) separate alternative, mutually exclusive, elements.
- Square brackets [] indicate optional elements.
- Braces {} indicate a required choice.
- Braces within square brackets [{}] indicate a required choice within an optional element.
- **Boldface** indicates commands and keywords that are entered literally as shown.
- *Italics* indicate arguments for which you supply values.

Important concepts are called out in margin notes for quick reference.

Figure I.1 shows the conventions used in the illustrations throughout the book.



*Figure 0.1  
Illustration conventions used in this book.*

All protocol analyzer displays shown in the book are taken from a Wandel & Goltermann DA-320 DominoLAN Internetwork Analyzer.



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