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TCP/IP 路由技术

(第二卷)(英文版)

Routing TCP/IP

Volume II

A detailed examination of exterior routing protocols and advanced IP routing issues

[美] Jeff Doyle, CCIE #1919
Jennifer DeHaven Carroll, CCIE #1402 著

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内容提要

本书深入系统地阐述了 TCP/IP 路由技术，内容包括几种重要的网络协议，如外部网关协议（EGP）、边界网关协议（BGP4），以及相应的高级 IP 路由技术与应用——网络地址转换、IP 组播路由技术、IPv6 技术、路由器管理等。本书共分 9 章，首先介绍并讨论了有关主题的基本原理，接着是设计用来展示实际网络环境中相关概念的一系列配置范例，最后提供给读者经实践验证过的故障排除方法以解决网络可能会出现的问题。重点介绍了自治系统之间的路由选择策略以及诸如组播和 IPv6 等更具挑战性的路由选择和实施技术。

本书内容全面，可读性强，含有协议配置、网络实施、故障排除等方面的大量实例，是备战 CCIE 认证考试的经典之作，适合准备参加 CCIE 考试的人员、网络与通信系统工程技术人员阅读。

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Jeff Doyle, CCIE #1919, is a Professional Services Consultant with Juniper Networks, Inc. in Denver, Colorado. Specializing in IP routing protocols and MPLS Traffic Engineering, Jeff has helped design and implement large-scale Internet service provider networks throughout North America, Europe, and Asia. Jeff has also lectured on advanced networking technologies at service provider forums such as the North American Network Operators' Group (NANOG) and the Asia Pacific Regional Internet Conference on Operational Technologies (APRICOT). Prior to joining Juniper Networks, Jeff was a Senior Network Systems Consultant with International Network Services. Jeff can be contacted at jeff@juniper.net.

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Dedications

Jeff Doyle: This book is dedicated to my wife, Sara, and my children, Anna, Carol, James, and Katherine. They are my refuge, and they keep me sane, humble, and happy.

Jennifer DeHaven Carroll: To my husband, Mike, and son, Mitchell, who continue to encourage me.

Acknowledgments

Jeff Doyle: An author of a technical book is just a front man for a small army of brilliant, dedicated people. This book is certainly no exception. At the risk of sounding like I'm making an Academy Award acceptance speech, I would like to thank a number of those people.

First and foremost, I would like to thank Jenny Carroll, whose efforts as a technical editor on *Volume I* were amazing. Not only has Jenny again contributed her technical expertise to this second volume as a technical editor, but when I became hopelessly behind schedule, she stepped in as a coauthor, at my request, and wrote the last two chapters. Neither volume would be what they are without her invaluable advice and attention to detail.

I would also like to thank Pete Moyer, my friend and associate, who came aboard as a technical editor for this second volume. Pete has had a profound influence on my life beyond this project, and I will always be indebted to him.

My gratitude goes to Laurie McGuire and Chris Cleveland for their expert guidance as development editors. They have made the book a better book and me a better writer.

Thanks to Brett Bartow and all the folks at Cisco Press for their enormous patience with me as I struggled to finish the book and let deadline after deadline slip. They continued to show me great kindness throughout the project when I'm sure they would have preferred to bash me on the head with a copy of my first book.

Finally, I would like to thank you, good reader, for making the first book such a success and for waiting so patiently for me to finish this second volume. I hope the book proves to be worth the wait.

Jennifer DeHaven Carroll: I'd like to thank Jeff Doyle for giving me the opportunity to contribute to his books. It has been fun and challenging.

Introduction

Since the publication of *Volume I* of *Routing TCP/IP*, many volumes have been added to the Cisco Press CCIE Professional Development series. And the CCIE program itself has expanded to include various areas of specialization. Yet the IP routing protocols remain the essential foundation on which the CCIE candidate must build his or her expertise. If the foundation is weak, the house will tumble.

I stated in the introduction to *Volume I* that "...as internetworks grow in size and complexity, routing issues can become at once both large and subtle." Scalability and management of growth continues to be a central theme in this second volume, as we move beyond the interior gateway protocols to examine both interautonomous system routing and more exotic routing issues such as multicasting and IPv6.

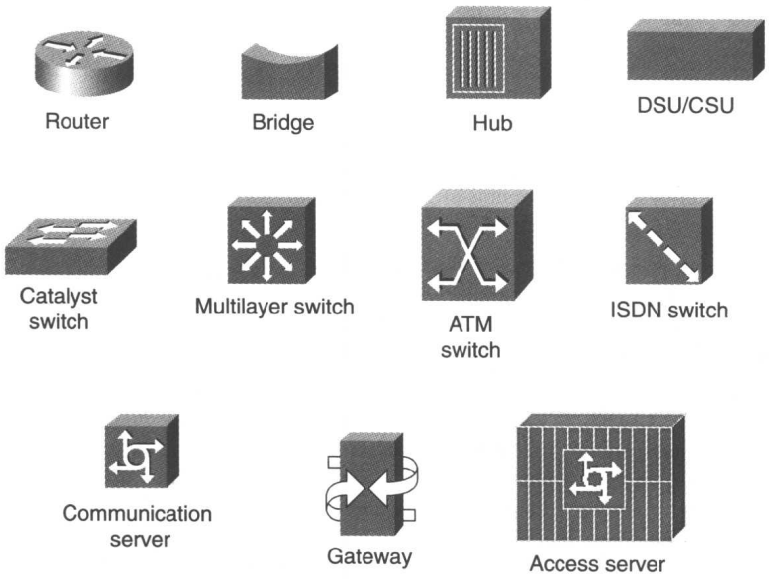
My objective in this book is not only to help you walk away from the CCIE lab exam with one of those valued and valuable numbers after your name, but also to help you develop the knowledge and skills to live up to the CCIE title. As with the first volume, I want to make CCIEs, not people who can pass the CCIE lab. In this vein, you will find in this book more information than you will need to pass the lab, but certainly all of the material is important in your career as a recognized internetworking expert.

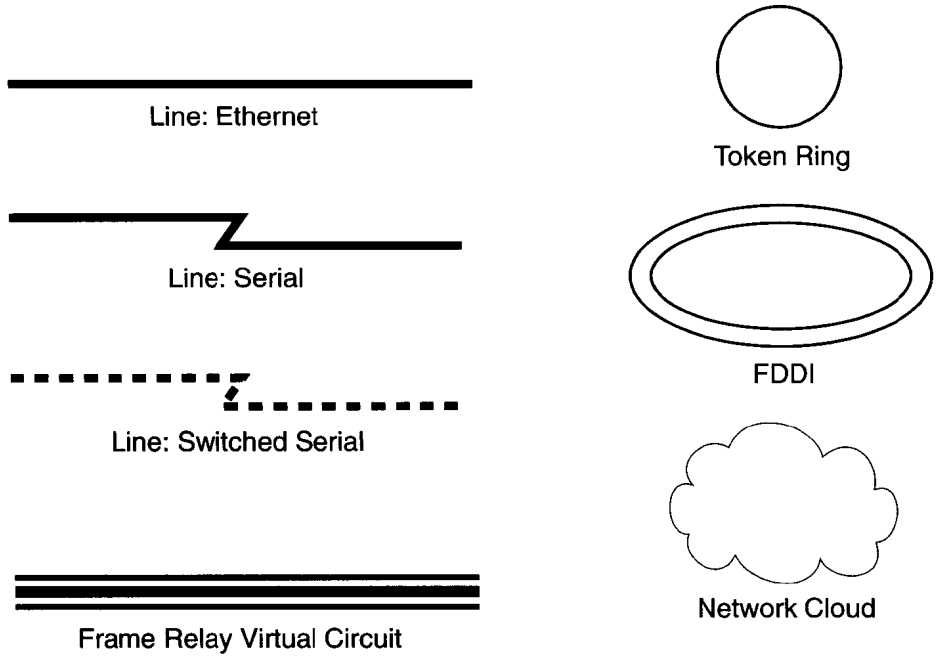
When I earned my CCIE, the lab still consisted mostly of AGS+ routers. Certainly the lab and the nature of the exam have changed substantially since that ancient time. If anything, the lab is more difficult now. Another addition to the CCIE program has been the recertification requirement. Even before I took the recertification exam for the first time, people were telling me how much *Volume I* had helped them prepare for the test—particularly for IS-IS, a protocol that few outside of service provider environments are exposed to. I have therefore written this second volume with not only CCIE candidates in mind, but also existing CCIEs who need to review for their recertification. The chapters on multicasting and IPv6 are directed to this audience.

I have endeavored to follow the same structure that I followed in *Volume I*, in which a protocol is introduced in generic terms, followed by examples of configuring the protocol using Cisco IOS Software, and finally by examples of Cisco IOS Software tools for troubleshooting the protocol. In the case of BGP and IP multicast, this structure is far too lengthy for a single chapter and therefore spans multiple chapters.

I hope you learn as much from reading this book as I have from writing it.

Icons Used in This Book





Command Syntax Conventions

The conventions used to present command syntax in this book 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 brackets [{ }] indicate a required choice within an optional element.

- **Boldface** indicates commands and keywords that are entered literally as shown. In actual configuration examples and output (not general command syntax), boldface indicates commands that are manually input by the user (such as a **show** command).
- *Italics* indicates arguments for which you supply actual values.

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