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组建 Cisco 多层交换网络
(英文版)

CCNP Self-Study

Building Cisco Multilayer Switched Networks

Cisco authorized self-study book for
CCNP Switching foundation learning

Karen Webb, CCIE No. 3662 著

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内容提要

本书不但指导读者如何利用第 2 层设备（如交换机）和第 3 层设备（如路由器）来组建企业园区网，还进一步教给读者在园区网组建好之后如何优化路由、如何确保网络的可用性以及如何为多点广播应用做准备。本书内容全面，读者通过学习书中深层的案例分析和配置示例，可以完成以下的工作：

- 选择并连接能够实现园区网连通性的 Cisco 产品；
- 通过冗余链路和虚拟缺省路由器来确保网络的可用性；
- 启用多层交换以帮助进行线速数据传输；
- 通过实施 Cisco 热备份路由器协议（HSRP）来确保路由的可靠性；
- 实施网络服务以获得在多点广播组中的成员身份；
- 通过实施网络访问规则来控制网络流量。

本书适用于要为企业实施多层交换网络的网络管理员。同时，本书也是对“组建 Cisco 多层交换网络（BCMSN）”课程的有益补充，可以帮助读者顺利通过 CCNP 或 CCDP 认证过程中的相应认证考试。

About the Author

Karen Webb, CCIE #3662, develops and delivers training solutions for Cisco products and technologies through The Meadow Network Training Corporation. She is also a Cisco Certified Systems Instructor and has taught many of the Cisco authorized courses. She is known for her dynamic classroom teaching style, her dedication to adult learning, and her in-depth knowledge of routing and switching protocols and concepts. Karen has been in the networking industry for over 13 years and has extensive network design and implementation experience in a wide variety of network technologies and protocols.

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"We find greatest joy, not in getting, but in expressing what we are. Men do not really live for honors or for pay; their gladness is not the taking and holding, but in doing, the striving, the building, the living. It is a higher joy to teach than to be taught. It is good to get justice, but better to do it; fun to have things but more to make them. The happy man is he who lives the life of love, not for the honors it may bring, but for the life itself."

—R.J. Baughan

In addition to the course developers (Libby Goga, Charles Newby, and Karen Webb), Cisco Press would like to acknowledge the following technical contributors whose input and assistance made the Cisco Systems BCMSN course a reality: Andre Wetsteyn, Stefan Sidl, Gilles Larivee, Peter Welcher, Ilona Serrao, Ken Crozier, Phillip Harris, and Faraz Aladin.

Foreword

In April 1998, Cisco Systems, Inc., announced a new professional development initiative called the Cisco Career Certifications. These certifications address the growing worldwide demand for more and better-trained computer networking experts. Building upon our highly successful Cisco Certified Internetwork Expert (CCIE) program—the industry's most respected networking certification vehicle—Cisco Career Certifications enable you to be certified at various technical proficiency levels.

Building Cisco Multilayer Switched Networks is a Cisco authorized, self-paced learning tool that helps you understand the foundation concepts covered on the CCNP Switching exam. This book was developed in cooperation with the Cisco Internet Learning Solutions Group, the team within Cisco responsible for the development of the CCNP exams. As an early-stage exam preparation product, this book teaches you how to build campus networks using multilayer switching technologies over high-speed Ethernet. Whether you are studying to become CCNP- or CCDP-certified or you are seeking to gain a better understanding of the products, services, and policies that enable you to build and manage effective multilayer switched networks, you will benefit from the information presented in this book.

Cisco and Cisco Press present this material in a text-based format to provide another learning vehicle for our customers and the broader user community in general. Although a publication does not duplicate the instructor-led or e-learning environments, we acknowledge that not everyone responds in the same way to the same delivery mechanism. It is our intent that presenting this material via a Cisco Press publication will enhance the transfer of knowledge to a broad audience of networking professionals.

Cisco Press will present other books in the Certification Self-Study Series on existing and future exams to help achieve Cisco Internet Learning Solutions Group's principal objectives: to educate the Cisco community of networking professionals and to enable that community to build and maintain reliable, scalable networks. The Cisco Career Certifications and classes that support these certifications are directed at meeting these objectives through a disciplined approach to progressive learning.

In order to succeed with Cisco Career Certifications and in your daily job as a Cisco certified professional, we recommend a blended learning solution that combines instructor-led training with hands-on experience, e-learning, and self-study training. Cisco Systems has authorized Cisco Learning Partners worldwide, which can provide you with the most highly qualified instruction and invaluable hands-on experience in lab and simulation environments. To learn more about Cisco Learning Partner programs available in your area, please go to http://www.cisco.com/go/authorizedtraining.

The Cisco Career Certifications and classes that support these certifications are directed toward meeting these objectives through a disciplined approach to progressive learning. The books Cisco creates in partnership with Cisco Press meet the same standards for content quality demanded of our courses and certifications. It is our intent that you will find this and subsequent Cisco Press certification self-study publications of value as you build your networking knowledge base.

Thomas M. Kelly
Vice-President, Internet Learning Solutions Group
Cisco Systems, Inc.
February 2000

Introduction

Building Cisco Multilayer Switched Networks teaches you how to build an enterprise campus network utilizing Layer 2 devices such as switches and Layer 3 devices such as routers. As soon as your campus network is built, this coursebook further teaches you how to optimize routing, ensure network availability, and provide for multicast applications. From this book's extensive text, configuration examples, and in-depth case studies, you will learn to do the following:

- Select and cable the Cisco products that enable connectivity within the campus network
- Ensure network availability through redundant links and virtual default routers
- Enable multilayer switching to facilitate wire-speed data transmission
- Ensure routing reliability through the implementation of the Cisco Hot Standby Router Protocol
- Implement network services to obtain membership in multicast groups
- Control network traffic by implementing a network admission policy

Who Should Read This Book

This book is intended for network administrators who will be implementing a multilayer switched network in an enterprise. It is recommended for anyone who is interested in learning switching concepts at both Layer 2 and Layer 3. Of course, it is also intended to supplement the Building Cisco Multilayer Switched Networks (BCMSN) course and to prepare you for the corresponding certification exam on the Cisco Certified Network Professional (CCNP) or Cisco Certified Design Professional (CCDP) certification track.

The technologies taught in this book and the network diagrams used in the case studies are taken from Cisco recommended designs and from typical customer implementations. The majority of current customer implementations use Ethernet in the campus network and TCP/IP as the Layer 3 protocol. For this reason, the transmission media that are covered in this course are Ethernet, Fast Ethernet, and Gigabit Ethernet. The Layer 3 protocol discussed is TCP/IP.

The book first discusses design criteria for multilayer switched networks, including the current Cisco recommendation for designing a campus network. The network is built in the subsequent chapters, from cabling connections to implementing VLANs, Spanning Tree, and routing. After the network has been built, this book examines ways to optimize the network and to ensure its availability.

This book follows the typical progression of a new campus network installation, making it a useful tool for network administrators who are installing a campus network for the first time.

Prerequisites

This book is one in a series of books designed to prepare you for CCNP and CCDP certification. In order to be properly prepared for the material in this book, you should have a CCNA-level understanding of the following:

- Internetworking fundamentals
- Basic router configuration

- Basic switch configuration
- Basic VLAN configuration
- Spanning Tree protocol
- Inter-Switch Link configuration
- Standard access list configuration
- Routing protocol concepts

At the end of each chapter, you have a chance to review the concepts you learned by answering review questions and examining a case study. Each case study shows you how to implement a new portion of the network shown in Figure I-1.

Figure I-1 *Case Study Network*

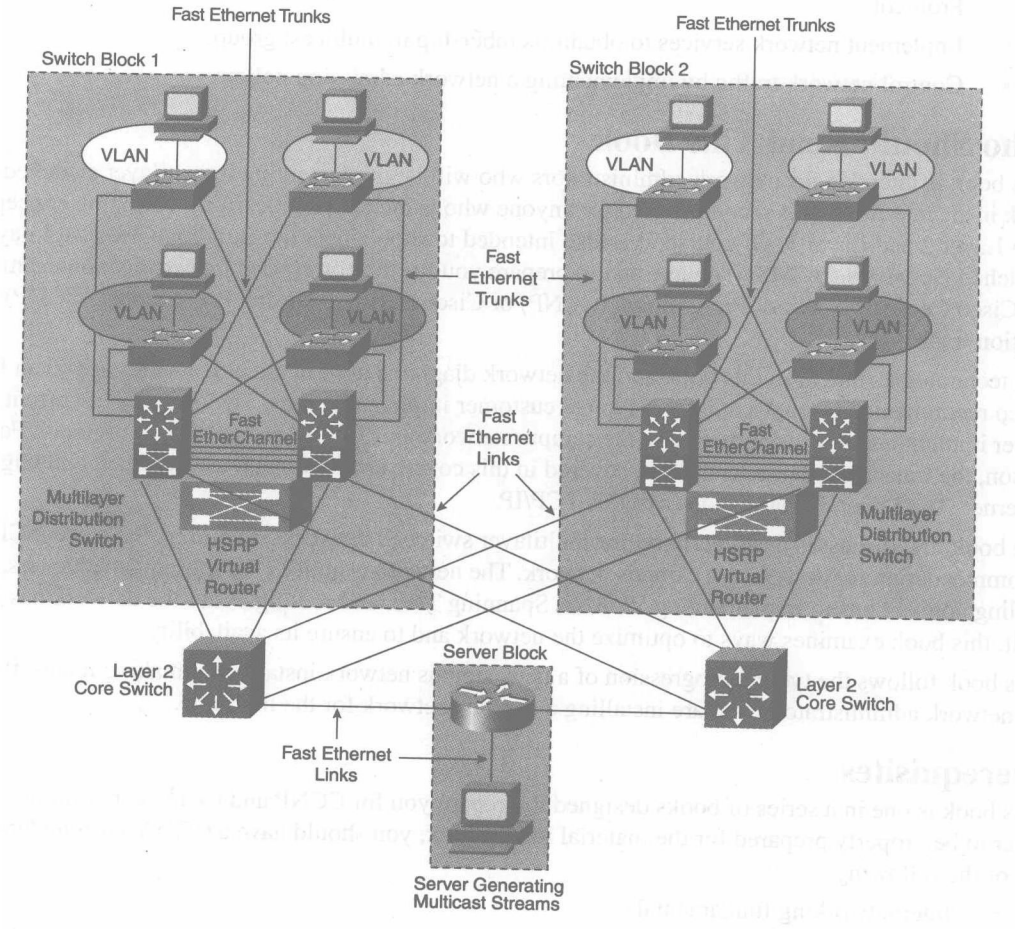


Figure I-1 represents the current most commonly recommended Cisco design for the enterprise campus network. Each chapter and its corresponding case study address building, optimizing, and securing a portion of this network.

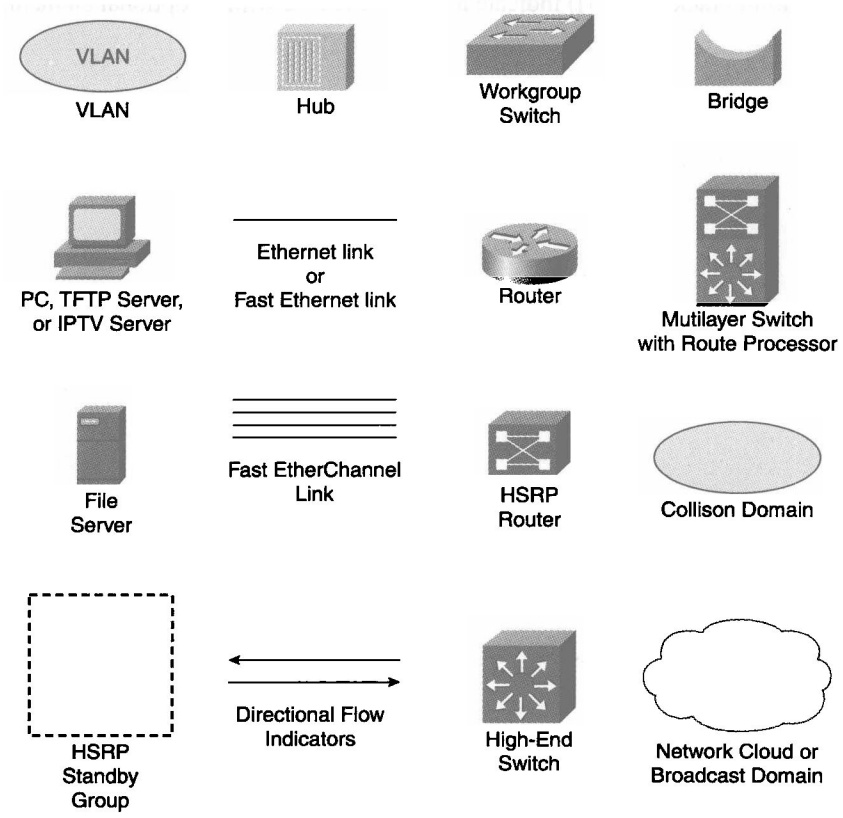
Conventions Used in This Book

This book contains illustrations and configuration examples to aid in your understanding of multilayer switched networks. This section covers the conventions of the images and syntax found in this book.

Illustration Iconography

The icons displayed in Figure I-2 are used in the figures presented throughout this book.

Figure I-2 *Network Icons Used in This Book*



Command Syntax Conventions

The conventions used in the command syntax in this book are the same as those used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- **Boldface** indicates commands or keywords that are typed in literally as shown. Note that in examples (not syntax), boldface indicates user input (such as a **show** command) or highlights portions of the example that pertain to the text.
- *Italics* indicates arguments for which you supply actual values.
- A vertical bar (|) separates alternative, mutually exclusive elements.
- Square brackets ([ ]) indicate an optional element.
- Braces ({ }) indicate a required choice.
- Braces within brackets ([{ }]) indicate a required choice with an optional element.

Table of Contents