

Introduction

Modern networks are both extremely complex and critical to business success. As organizational processes continue to increase the requirements for bandwidth, reliability, and functionality from their networks, network designers are challenged to rapidly develop and evolve networks that use new protocols and technologies. Network designers are also challenged to stay current with the internetworking industry's constant and rapid changes. Designing robust, reliable, scalable networks is a necessary skill for network operators and designers in the modern organizational environment.

This book teaches you how to design enterprise networks. You will learn about network design in the context of the Cisco Service Oriented Network Architecture (SONA) architectural framework and Enterprise Architecture. Specific topics include campus and data center infrastructure, remote connectivity, IP addressing design, routing protocol selection, designing voice networks, wireless network design, and including security in your designs.

An ongoing case study and chapter-ending review questions illustrate and help solidify the concepts presented in this book.

This book provides you with the knowledge and skills you need to achieve associate-level competency in network design. It starts you down the path to attaining your CCDA certification, because it provides in-depth information to help you prepare for the DESGN exam.

DESGN is the first step in the design curriculum that supports the Cisco network design certification track. This book focuses on the technology and methods currently available.

Objectives of This Book

The goal of this book is to provide you with the knowledge you need to gather internetworking requirements, identify solutions, and design the network infrastructure and services to ensure basic functionality, using the principles of hierarchical network design to structure and modularize a converged enterprise network design. Design tasks might include understanding the design methodology; structuring and modularizing the network design using the Cisco Enterprise Architecture; designing the Enterprise Campus, Enterprise Data Center, Enterprise Edge, and remote modules as needed; designing an addressing plan and selecting suitable routing protocols; designing basic voice transport across the network; designing a basic wireless solution; and evaluating security solutions.

Who Should Read This Book

This book is intended for network and sales engineers who are involved in network design, planning, and implementation, and for those who plan to take the 640-863 DESGN exam toward the CCDA certification. This book provides in-depth study material for that exam. To fully benefit from this book, you should have the following prerequisite skills:

- CCNA-level knowledge (or CCNA certification), which can best be achieved by completing the related CCNA courses and using CCNA books from Cisco Press. You can find more information on the CCNA certification at <http://www.cisco.com/go/ccna/>.
- Knowledge of wireless networking, quality of service (QoS), and multilayer switching is highly recommended. The level equivalent to that covered in the Building Cisco Multilayer Switched Networks (BCMSN) course or the book *Building Cisco Multilayer Switched Networks (BCMSN)*, Fourth Edition (Richard Froom, Balaji Sivasubramanian, Erum Frahim, Cisco Press, 2007) is appropriate.

NOTE We assume that you understand the wireless networking material in the Cisco Press book just mentioned. In Chapter 9, we include some material from that book as an introduction to wireless technology. Refer to the Cisco Press BCMSN book for more detailed information.

- Practical experience deploying and operating networks based on Cisco network devices and the Cisco IOS.

Summary of the Contents

The chapters and appendixes of this book are as follows:

- Chapter 1, “Network Fundamentals Review,” introduces some fundamental concepts and terminology that are the foundation for the material in the rest of the book.
- Chapter 2, “Applying a Methodology to Network Design,” introduces the Cisco vision of intelligent networks and the Service Oriented Network Architecture (SONA) architectural framework. The lifecycle of a network and a network design methodology based on the lifecycle are presented, and each phase of the network design process is explored in detail.
- Chapter 3, “Structuring and Modularizing the Network,” introduces a modular hierarchical approach to network design, the Cisco Enterprise Architecture. The chapter includes a detailed description of services within modular networks. Network management protocols and features are also discussed.
- Chapter 4, “Designing Basic Campus and Data Center Networks,” examines the design of the Enterprise Campus and Enterprise Data Center network infrastructure.
- Chapter 5, “Designing Remote Connectivity,” discusses WAN technologies and design considerations. This chapter describes the Enterprise WAN and metropolitan-area network (MAN) architectures and the Enterprise Branch and Teleworker architectures and discusses the selection of WAN hardware and software components.
- Chapter 6, “Designing IP Addressing in the Network,” discusses the design of an IP version 4 (IPv4) addressing scheme. The chapter also introduces IP version 6 (IPv6) and discusses IPv4-to-IPv6 migration strategies.
- Chapter 7, “Selecting Routing Protocols for the Network,” describes considerations for selecting the most appropriate network routing protocol. The chapter discusses why certain protocols are suitable for specific modules in the Enterprise Architecture. It concludes with a description of some advanced routing protocol deployment features, including redistribution, filtering, and summarization.
- Chapter 8, “Voice Network Design Considerations,” introduces voice design principles and provides guidelines for a successful integrated network deployment. It begins with an overview of traditional voice architectures and features and continues with a discussion of integrated voice architectures, including VoIP and IP telephony.
- Chapter 9, “Wireless Network Design Considerations,” introduces the Cisco Unified Wireless Network (UWN) architecture and discusses wireless design principles. The chapter introduces wireless technologies and explores considerations when designing Cisco UWNs in enterprise environments.
- Chapter 10, “Evaluating Security Solutions for the Network,” describes network security, including threats and risks, and network security policies. The Cisco Self-Defending Network strategy for designing network security is explored, and Cisco network security solutions for enterprise networks are discussed.

- Appendix A, “Answers to Review Questions and Case Studies,” contains answers to the review questions and case studies that appear at the end of the chapters.
- Appendix B, “IPv4 Supplement,” provides job aids and supplementary information intended for your use when working with IPv4 addresses. Topics include an IP addressing and subnetting job aid, a decimal-to-binary conversion chart, IPv4 addressing review, and IPv4 access lists.
- Appendix C, “Open Systems Interconnection (OSI) Reference Model,” is a brief overview of the OSI seven-layer model.
- Appendix D, “Network Address Translation,” contains information about Cisco’s implementation of Network Address Translation (NAT) and port address translation (PAT).
- “Acronyms and Abbreviations” spells out the abbreviations, acronyms, and initialisms used in this book.

Case Studies and Review Questions

Starting in Chapter 2, each chapter concludes with a case study on Acme County Medical Center (ACMC) Hospital, a fictitious small county hospital in the United States, to help you evaluate your understanding of the concepts presented. In each task of the case study, you act as a network design consultant and make creative proposals to accomplish the customer’s business needs. The final goal of each case study is a paper solution. Also starting in Chapter 2, each chapter also includes review questions on the subjects covered in that chapter so that you can test your knowledge.

To find out how you did and what material you might need to study further, you can compare your answers to those provided in Appendix A. Note that for each case study task, Appendix A provides a solution based on the assumptions made. There is no claim that the provided solution is the best or only solution. Your solution might be more appropriate for the assumptions you made. The provided solution allows you to understand the author’s reasoning and offers you a means of comparing and contrasting your solution.

What’s New in This Edition

This book is an update to *CCDA Self-Study: Designing for Cisco Internetwork Solutions (DESGN)*, ISBN 1-58705-141-9. This second edition reflects changes to the DESGN course. The following are the major changes between editions:

- Every chapter has been rewritten. Some material that was removed from the main portion of the previous edition because of course changes has been put in sidebars, as appropriate. The appendixes have been modified and updated to reflect the book’s content.
- The methodology used throughout the book is now based on Cisco’s SONA framework and Enterprise architectures.

- New topics include the design of the data center and the design of teleworker and branch offices.
- A new chapter on wireless network design, Chapter 9, has been included.
- Chapter 1 has been enhanced to include a more thorough review of networking fundamentals and to reflect new prerequisite material.
- Some information on IP addressing in the main body of the first edition has been moved to Appendix B.
- Chapter 10 includes details of Cisco network security solutions and the Cisco Self-Defending Network strategy.
- The information about network management has been condensed and moved to Chapter 3.
- The case study is new and includes a more thorough examination of network design issues. Simulation output is no longer included.

Author's Notes, Key Points, Sidebars, and Cautions

The notes, key points, and sidebars found in this book provide extra information on a subject.

KEY POINT | The key points highlight information that is important for understanding the topic at hand and specific points of interest.

Resources for Further Study

Within each chapter are references to other resources that provide you with further information on specific topics. For more information about Cisco exams, training, and certifications, refer to the Training and Events area on the Cisco website at <http://www.cisco.com/web/learning/index.html>.

NOTE The website references in this book were accurate at the time of writing; however, they might have since changed. If a URL is unavailable, you might try conducting a search using the title as keywords in your favorite search engine.