

(第4版·影印版)

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TCP/IP协议族

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Internet 入门 ①



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TCP/IP 协议族

(第4版·影印版)

[美] Behrouz A. Forouzan 著

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出版说明

近年来,我国的高等教育特别是计算机学科教育,进行了一系列大的调整 and 改革,亟需一批门类齐全、具有国际先进水平的计算机经典教材,以适应我国当前计算机科学的教學需要。通过使用国外优秀的计算机科学经典教材,可以了解并吸收国际先进的教學思想和教學方法,使我国的计算机科学教育能够跟上国际计算机教育发展的步伐,从而培养出更多具有国际水准的计算机专业人才,增强我国计算机产业的核心竞争力。为此,我们从国外多家知名的出版机构 Pearson、McGraw-Hill、John Wiley & Sons、Springer、Cengage Learning 等精选、引进了这套“国外计算机科学经典教材”。

作为世界级的图书出版机构, Pearson、McGraw-Hill、John Wiley & Sons、Springer、Cengage Learning 通过与世界级的计算机教育大师携手,每年都為全球的计算机高等教育奉獻大量的优秀教材。清华大学出版社和这些世界知名的出版机构长期保持着紧密友好的合作关系,这次引进的“国外计算机科学经典教材”便全是出自上述这些出版机构。同时,为了组织该套教材的出版,我们在国内聘请了一批知名的专家和教授,成立了专门的教材编审委员会。

教材编审委员会的运作从教材的选题阶段即开始启动,各位委员根据国内外高等院校计算机科学及相关专业的现有课程体系,并结合各个专业的培养方向,从上述这些出版机构出版的计算机系列教材中精心挑选针对性强的题材,以保证该套教材的优秀性和领先性,避免出现“低质重复引进”或“高质消化不良”的现象。

为了保证出版质量,我们为这套教材配备了一批经验丰富的编辑、排版、校对人员,制定了更加严格的出版流程。本套教材的译者,全部由对应专业的高校教师或拥有相关经验的 IT 专家担任。每本教材的责编在翻译伊始,就定期不间断地与该书的译者进行交流与反馈。为了尽可能地保留与发扬教材原著的精华,在经过翻译、排版和传统的三审三校之后,我们还请编审委员或相关的专家教授对文稿进行审读,以最大程度地弥补和修正在前面一系列加工过程中对教材造成的误差和瑕疵。

由于时间紧迫和受全体制作人员自身能力所限,该套教材在出版过程中很可能还存在一些遗憾,欢迎广大师生来电来信批评指正。同时,也欢迎读者朋友积极向我们推荐各类优秀的国外计算机教材,共同为我国高等院校计算机教育事业贡献力量。

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Behrouz A. Forouzan 目前任职于 DeAnza 学院的计算机信息系统系, 他参与了该系计算机信息系统学科的课程设计工作, 同时还兼任许多公司的系统开发顾问。Behrouz 是一位非常高产的作家, 出版了 10 余部涵盖计算机科学、组网、编程、数据库、安全等领域的热门书籍, 其中多部著作反复再版, 本书就是他的经典著作之一。

Behrouz 教授十分勤奋, 本版与第 3 版相比, 不少章节几乎全部重写, 并且新增了很多内容, 比如增加了对 MPLS 的介绍, 将 IPv6 扩展为 3 章(第 26、27 和 28 章), 将安全内容扩展为两章(第 29 和 30 章)等。在本书结构方面, 他按照 TCP/IP 协议层次关系对章节进行了重组, 从中可以看出他对如何更合理地安排这些章节内容所进行的不断探索; 同时他还在各章中适时补充了很多新的技术和内容, 删除了一些过时的协议, 增加了一些新的习题和研究项目等。

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Preface

Technologies related to networks and internetworking may be the fastest growing in our culture today. Many professors and students who have used, read, or reviewed the third edition of the book suggested the publication of a new edition that include these changes. In the fourth edition, I have reorganized the book incorporating many changes and added several new chapters and appendices.

The fourth edition of the book assumes the reader has no prior knowledge of the TCP/IP protocol suite, although a previous course in data communications is desirable.

Organization

This book is divided into seven parts.

- ❑ Part I (Introduction and Underlying Technologies), comprising Chapters 1 to 3, reviews the basic concepts and underlying technologies that, although independent from the TCP/IP protocols, are needed to support them.
- ❑ Part II (Network Layer), comprising Chapters 4 to 12, discusses IPv4 addressing, the IPv4 protocol, all auxiliary protocols helping IPv4 protocol, and unicast and multicast routing protocols.
- ❑ Part III (Transport Layer), comprising Chapters 13 to 16, introduces the general concepts in the transport layer (Chapter 13) and then fully discusses three transport layer protocols: UDP, TCP, and SCTP (Chapters 14, 15, and 16).
- ❑ Part IV (Application Layer), comprising Chapters 17 to 25, introduces the general concepts in the application layer including client-server programming (Chapter 17) and then fully discusses seven application layer protocols (Chapters 18 to 24). Chapter 25 is devoted to multimedia in the Internet.
- ❑ Part V (New Generation), comprising Chapters 26 to 28, introduces the new generation of IP protocol, IPv6 addressing (Chapter 26), IPv6 protocol (Chapter 27), and ICMPv6 (Chapter 28).
- ❑ Part VI (Security), comprising Chapters 29 to 30, discusses the inevitable topics such as cryptography and network security (Chapter 29) and Internet security (Chapter 30).
- ❑ Part VII (Appendices) inclosed seven appendices that may be needed when reading the book.

Features

Several features of this text are designed to make it particularly easy for students to understand TCP/IP.

Visual Approach

The book presents highly technical subject matter without complex formulas by using a balance of text and figures. More than 650 figures accompanying the text provide a visual and intuitive opportunity for understanding the material. Figures are particularly important in explaining networking concepts, which are based on connections and transmission. Often, these are more easily grasped visually rather than verbally.

Highlighted Points

I have repeated important concepts in boxes for quick reference and immediate attention.

Examples and Applications

Whenever appropriate, I have included examples that illustrate the concepts introduced in the text. Also, I have added real-life applications throughout each chapter to motivate students.

Protocol Packages

Although I have not tried to give the detailed code for implementing each protocol, many chapters contain a section that discusses the general idea behind the implementation of each protocol. These sections provide an understanding of the ideas and issues involved in each protocol, but may be considered optional material.

Key Terms

The new terms used in each chapter are listed at the end of the chapter and their definitions are included in the glossary.

Summary

Each chapter ends with a summary of the material covered by that chapter. The summary is a bulleted overview of all the key points in the chapter.

Practice Set

Each chapter includes a practice set designed to reinforce salient concepts and encourage students to apply them. It consists of two parts: exercises and research activities. Exercises require understanding of the material. Research activities challenge those who want to delve more deeply into the material.

Appendices

The appendices are intended to provide a quick reference or review of materials needed to understand the concepts discussed in the book. The appendices in the previous edition have been revised, combined, and some new ones have been added.

Glossary and Acronyms

The book contains an extensive glossary and a list of acronyms.

Instructor Resources

Solutions, PowerPoint presentations, and Student Quizzes are available through the book's website at www.mhhe.com/forouzan.

Electronic Book Options

CourseSmart. This text is offered through CourseSmart for both instructors and students. CourseSmart is an online browser where students can purchase access to this and other McGraw-Hill textbooks in digital format. Through their browser, students can access a complete text online at almost half the cost of a traditional text. Purchasing the etextbook also allows students to take advantage of CourseSmart's Web tools for learning, which include full text search, notes and highlighting, and e-mail tools for sharing notes between classmates. To learn more about CourseSmart options, contact your sales representative or visit www.CourseSmart.com.

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New and Changes to the Fourth Edition

There are many changes and much new material in the fourth edition, including:

- ☐ Chapter objectives have been added to the beginning of each chapter.
- ☐ A brief references list and a list of corresponding RFCs have been added at the end of each chapter.
- ☐ Some new exercises and some research activities are added to some chapters.
- ☐ Figures are revised to reflect their relation to the actual technology used today.
- ☐ Chapter 3 (Underlying Technologies) has been totally revised to cover new technologies
- ☐ Chapter 4 (Introduction to Network Layer) is totally new.
- ☐ Chapter 13 (Introduction to the Transport Layer) is totally new.
- ☐ Chapter 17 (Introduction to the Application Layer) is totally new.
- ☐ Chapter 5 now discusses both classfull and classless addressing (a combination of Chapters 4 and 5 in the third edition).
- ☐ Chapter 6 has been revised to include MPLS.
- ☐ Materials on New Generation Internet Protocol (IPv6) has been augmented to three chapters (Chapters 26, 27, 28).
- ☐ Materials on security have been augmented to two chapters (Chapters 29, 30).
- ☐ Some deprecated protocols, such as RARP and BOOTP are removed to provide space for new material.
- ☐ Chapters are reorganized according to the layers in TCP/IP protocol suite.
- ☐ Appendix A (ASCII Code) has been replaced by Unicode.
- ☐ Appendix C (Error Detection) has been totally revised and augmented.
- ☐ Appendix D (Checksum) is totally revised.

- ☐ Appendix E (HTML, XHTML, XML, and XSL) is totally new.
- ☐ Appendix F (Client-Server Programming in Java) is totally new.
- ☐ Appendix G (Miscellaneous Information) is now a combination of the previous Appendices F, G, and H.

How to Use the Book

This book is written for both academic and professional audiences. The book can be used as a self-study guide for interested professionals. As a textbook, it can be used for a one-semester or one-quarter course. The chapters are organized to provide a great deal of flexibility. I suggest the following:

- ☐ Chapters 1 to 3 can be skipped if students have already taken a course in data communications and networking.
- ☐ Chapters 4 through 25 are essential for understanding the TCP/IP protocol suite.
- ☐ Chapters 26 to 28 can be used at the professor's discretion if there is a need for making the student familiar with the new generation.
- ☐ Chapters 29 and 30 can prepare the students for a security course, but they can be skipped if there is time restraint.

Acknowledgments for the Fourth Edition

It is obvious that the development of a book of this scope needs the support of many people. I acknowledged the contributions of many people in the preface of the first three editions. For the fourth edition, I would like to acknowledge the contributions from peer reviewers to the development of the book. These reviewers are:

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Behrouz A. Forouzan

January, 2009.

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