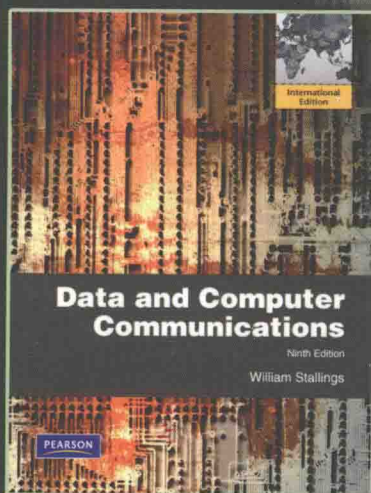


国外计算机科 学教材系列

PEARSON

# 数据与计算机通信 (第九版)

Data and Computer Communications  
Ninth Edition



英文版

[美] William Stallings 著



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## 内 容 简 介

本书是著名计算机专业作家William Stallings的经典著作之一,内容涉及基本的数据通信原理、各种类型的计算机网络以及多种网络协议和应用,覆盖面广,信息量大。这一版对上一版内容做了许多改进,使新版对通信领域各专题的阐述更清晰、更紧凑。同时,新版补充了双绞线传输标准、宽带因特网接入、第四代移动无线网络、虚拟局域网、移动IP等内容,修订了高速以太网、无线局域网、MPLS的相关内容,彻底重写了安全相关章节。此外,本书还包括术语表、参考文献、缩写词对照表。每章都附有习题和推荐读物,以便读者进一步阅读。

本书可供通信或计算机、信息技术专业的本科生和研究生作为双语教学教材,同时也适合作为广大通信和计算机领域相关人员的参考用书。

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# PREFACE

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*Begin at the beginning and go on till you come to the end; then stop*

—*Alice in Wonderland*, Lewis Carroll

## OBJECTIVES

This book attempts to provide a unified overview of the broad field of data and computer communications. The organization of the book reflects an attempt to break this massive subject into comprehensible parts and to build, piece by piece, a survey of the state of the art. The book emphasizes basic principles and topics of fundamental importance concerning the technology and architecture of this field and provides a detailed discussion of leading-edge topics.

The following basic themes serve to unify the discussion:

- **Principles:** Although the scope of this book is broad, there are a number of basic principles that appear repeatedly as themes and that unify this field. Examples are multiplexing, flow control, and error control. The book highlights these principles and contrasts their application in specific areas of technology.
- **Design approaches:** The book examines alternative approaches to meeting specific communication requirements.
- **Standards:** Standards have come to assume an increasingly important, indeed dominant, role in this field. An understanding of the current status and future direction of technology requires a comprehensive discussion of the related standards.

## INTENDED AUDIENCE

The book is intended for both an academic and a professional audience. For the professional interested in this field, the book serves as a basic reference volume and is suitable for self-study. As a textbook, it can be used for a one-semester or two-semester course. It covers the material in Networking (NET), a core area in the Information Technology body of knowledge, which is part of the Draft ACM/IEEE/AIS Computing Curricula 2005. The book also covers the material in Computer Networks (CE-NWK), a core area in Computer Engineering 2004 Curriculum Guidelines from the ACM/IEEE Joint Task Force on Computing Curricula.

## PLAN OF THE TEXT

The book is divided into seven parts, which are described in Chapter 0:

- Overview
- Data Communications
- Wide Area Networks

- Local Area Networks
- Internet and Transport Protocols
- Network Security
- Internet Applications

The book includes a number of pedagogic features, including the use of animations and numerous figures and tables to clarify the discussions. Each chapter includes a list of key words, review questions, homework problems, suggestions for further reading, and recommended Web sites. The book also includes an extensive online glossary, a list of frequently used acronyms, and a reference list. In addition, a test bank is available to instructors.

The chapters and parts of the book are sufficiently modular to provide a great deal of flexibility in the design of courses. See Chapter 0 for a number of detailed suggestions for both top-down and bottom-up course strategies.

## WHAT'S NEW IN THIS EDITION

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This ninth edition is seeing the light of day less than four years after the publication of the eighth edition. During that time, the pace of change in this field continues unabated. In this new edition, I try to capture these changes while maintaining a broad and comprehensive coverage of the entire field. To begin the process of revision, the eighth edition of this book was extensively reviewed by a number of professors who teach the subject. The result is that, in many places, the narrative has been clarified and tightened, and illustrations have been improved.

Beyond these refinements to improve pedagogy and user-friendliness, there have been major substantive changes throughout the book. Highlights include:

- **Examples:** The number of examples incorporated in the book has been significantly expanded.
- **Twisted-pair transmission standards:** This new edition covers the 2009 ANSI/TIA 568-C standards and the recent ISO/IEC 11801 twisted-pair transmissions, which are important for gigabit-range Ethernet and other high-speed twisted-pair applications.
- **Expanded coverage of broadband Internet access:** The sections on cable modem and DSL broadband access have been expanded.
- **New coverage of fourth-generation (4G) mobile wireless networks:** Includes the key 4G technology of orthogonal frequency division multiple access (OFDMA).
- **New coverage of virtual LANs:** VLAN technology is covered, as well is the IEEE 802.1Q standard.
- **Updated coverage of high-speed Ethernet:** The new 100-Gbps standard is covered, including the multilane distribution (MLD) transmission technique, plus expanded coverage of 64B/66B encoding.

- **Updated coverage of Wi-Fi/IEEE 802.11 wireless LANs:** IEEE 802.11 and the related Wi-Fi specifications have continued to evolve. New coverage includes 802.11n.
- **Mobile IP:** New to this edition is coverage of Mobile IP, which standardizes techniques for IP addressing and routing for mobile end systems.
- **MPLS:** New to this edition is full chapter devoted to Multiprotocol Label Switching, which is becoming increasingly important on the Internet and other IP-based networks, as well as in telecommunications networks.

In addition, throughout the book, virtually every topic has been updated to reflect the developments in standards and technology that have occurred since the publication of the eighth edition.

## ONLINE DOCUMENTS FOR STUDENTS

For this new edition, a tremendous amount of original supporting material has been made available online, in the following categories:

- **Online chapters:** To limit the size and cost of the book, Four chapters of the book are provided in PDF format. The chapters are listed in this book's table of contents.
- **Online appendices:** There are numerous interesting topics that support material found in the text but whose inclusion is not warranted in the printed text. A total of 23 appendices cover these topics for the interested student. The appendices are listed in this book's table of contents.
- **Homework problems and solutions:** To aid the student in understanding the material, a separate set of homework problems with solutions are available. These enable the students to test their understanding of the text.
- **Key papers:** Several dozen papers from the professional literature, many hard to find, are provided for further reading.
- **Supporting documents:** A variety of other useful documents are referenced in the text and provided online.

Purchasing this textbook new grants the reader six months of access to this online material. See the access card in the front of this book for details.<sup>①</sup>

## INSTRUCTIONAL SUPPORT MATERIALS

To support instructors, the following materials are provided:<sup>②</sup>

- **Solutions Manual:** Solutions to all end-of-chapter Review Questions and Problems.

① 此段内容针对英文原版教材。相关资料可登录华信教育资源网(www.hxedu.com.cn)注册下载(其中包括第23章和第24章的文件)。——编者注

② 教师题解手册和其他资源(PPT等)只提供给授课教师,申请方式请参见书末的“教学支持说明”。——编者注

- **Projects Manual:** Suggested project assignments for all of the project categories listed below.
- **PowerPoint Slides:** A set of slides covering all chapters, suitable for use in lecturing.
- **PDF files:** Reproductions of all figures and tables from the book.
- **Test Bank:** A chapter-by-chapter set of questions.

All of these support materials are available at the Instructor Resource Center (IRC) for this textbook, which can be reached through the Publisher's Web site [www.pearsonhighered.com/stallingsinternational](http://www.pearsonhighered.com/stallingsinternational) or by clicking on the button labeled "Book Info and More Instructor Resources" at this book's Web site [WilliamStallings.com/DCC/DCC9e.html](http://WilliamStallings.com/DCC/DCC9e.html).

In addition, the book's Web site supports instructors with:

- Links to Web sites for other courses being taught using this book
- Sign-up information for an Internet mailing list for instructors

## INTERNET SERVICES FOR INSTRUCTORS AND STUDENTS

There is a Web site for this book that provides support for students and instructors. The site includes links to other relevant sites, transparency masters of figures in the book, and sign-up information for the book's Internet mailing list. The Web page is at [WilliamStallings.com/DCC/DCC9e.html](http://WilliamStallings.com/DCC/DCC9e.html). For more information, see Chapter 0. The Publisher's Web site [www.pearsonhighered.com/stallings](http://www.pearsonhighered.com/stallings) provides instructors and students with direct links to the Companion Web site, Instructor Resources, Premium Content, and Web chapters.

New to this edition is a set of homework problems with solutions. Students can enhance their understanding of the material by working out the solutions to these problems and then checking their answers.

An Internet mailing list has been set up so that instructors using this book can exchange information, suggestions, and questions with each other and with the author. As soon as typos or other errors are discovered, an errata list for this book will be available at [WilliamStallings.com](http://WilliamStallings.com). In addition, the Computer Science Student Resource site at [WilliamStallings.com/StudentSupport.html](http://WilliamStallings.com/StudentSupport.html) provides documents, information, and useful links for computer science students and professionals.

## PROJECTS AND OTHER STUDENT EXERCISES

For many instructors, an important component of a data communications or networking course is a project or set of projects by which the student gets hands-on experience to reinforce concepts from the text. This book provides an unparalleled degree of support for including a projects component in the course. The IRC not only includes guidance on how to assign and structure the projects but also includes a set of User's Manuals for various project types plus specific assignments, all written especially for this book. Instructors can assign work in the following areas:

- **Animation assignments:** Described in the following section.
- **Practical exercises:** Using network commands, the student gains experience in network connectivity.



- **Sockets programming projects:** The book is supported by a detailed description of Sockets (Appendix T). The IRC includes a set of programming projects. Sockets programming is an “easy” topic and one that can result in very satisfying hands-on projects for students.
- **Wireshark projects:** Wireshark is a protocol analyzer that enables students to study the behavior of protocols. A video tutorial is provided to get students started.
- **Simulation projects:** The student can use the simulation package *cnet* to analyze network behavior.
- **Performance modeling projects:** Two performance modeling techniques are provided: a *tools* package and OPNET.
- **Research projects:** The IRC includes a list of suggested research projects that would involve Web and literature searches.
- **Reading/report assignments:** The IRC includes a list of papers that can be assigned for reading and writing a report, plus suggested assignment wording.
- **Writing assignments:** The IRC includes a list of writing assignments to facilitate learning the material.
- **Discussion topics:** These topics can be used in a classroom, chat room, or message board environment to explore certain areas in greater depth and to foster student collaboration.

This diverse set of projects and other student exercises enables the instructor to use the book as one component in a rich and varied learning experience and to tailor a course plan to meet the specific needs of the instructor and students. See Appendix B for details.



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Finally, I would like to thank the many people responsible for the publication of the book, all of whom did their usual excellent job. This includes the staff at Prentice Hall, particularly my editor Tracy Dunkelberger, her assistants Melinda Haggerty and Allison Michael. Also, Jake Warde of Warde Publishers managed the reviews.

With all this assistance, little remains for which I can take full credit. However, I am proud to say that, with no help whatsoever, I selected all of the quotations.

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## Glossary