TUTORIAL

LOCAL NETWORK TECHNOLOGY

Third Edition

William Stallings

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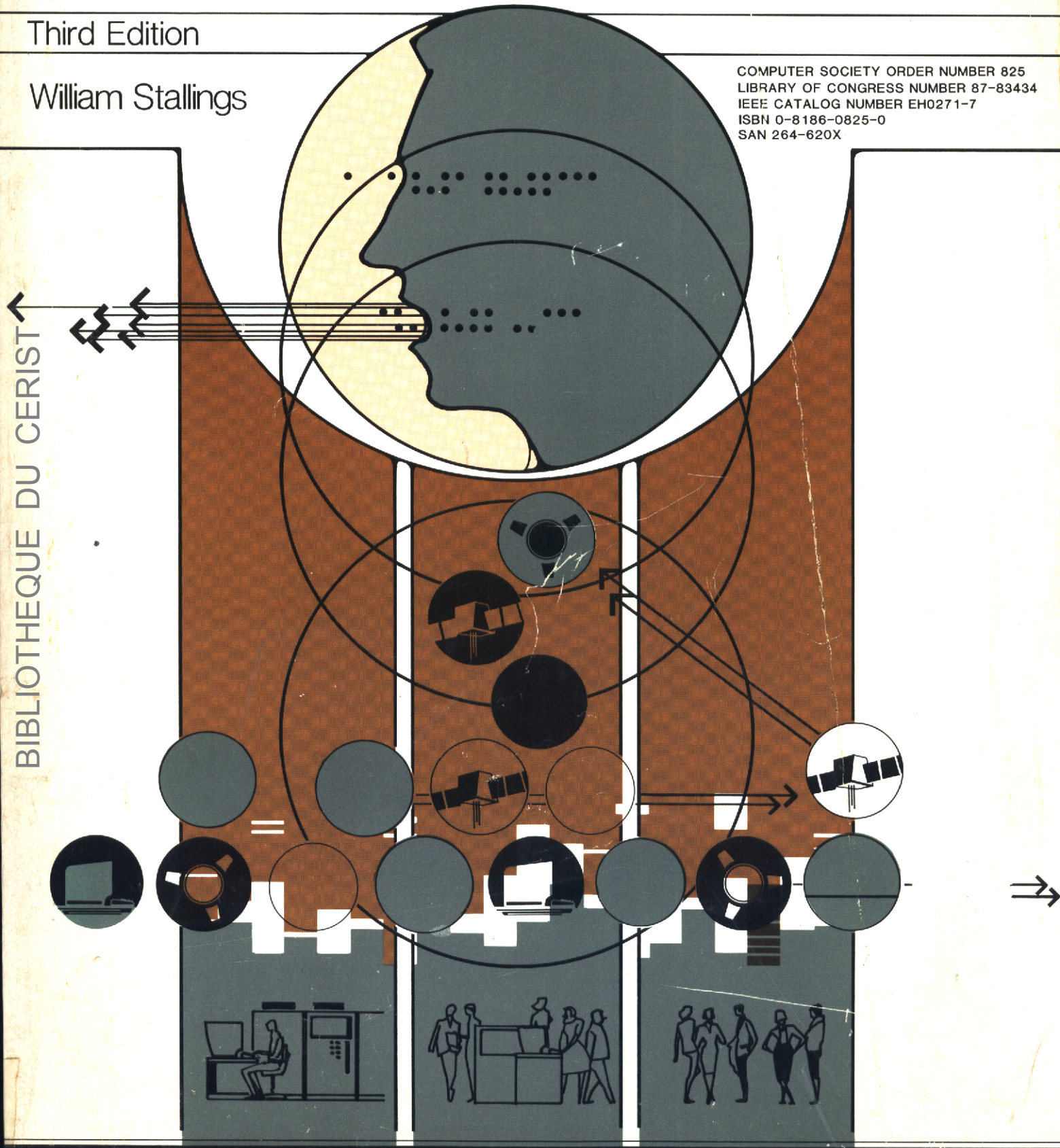

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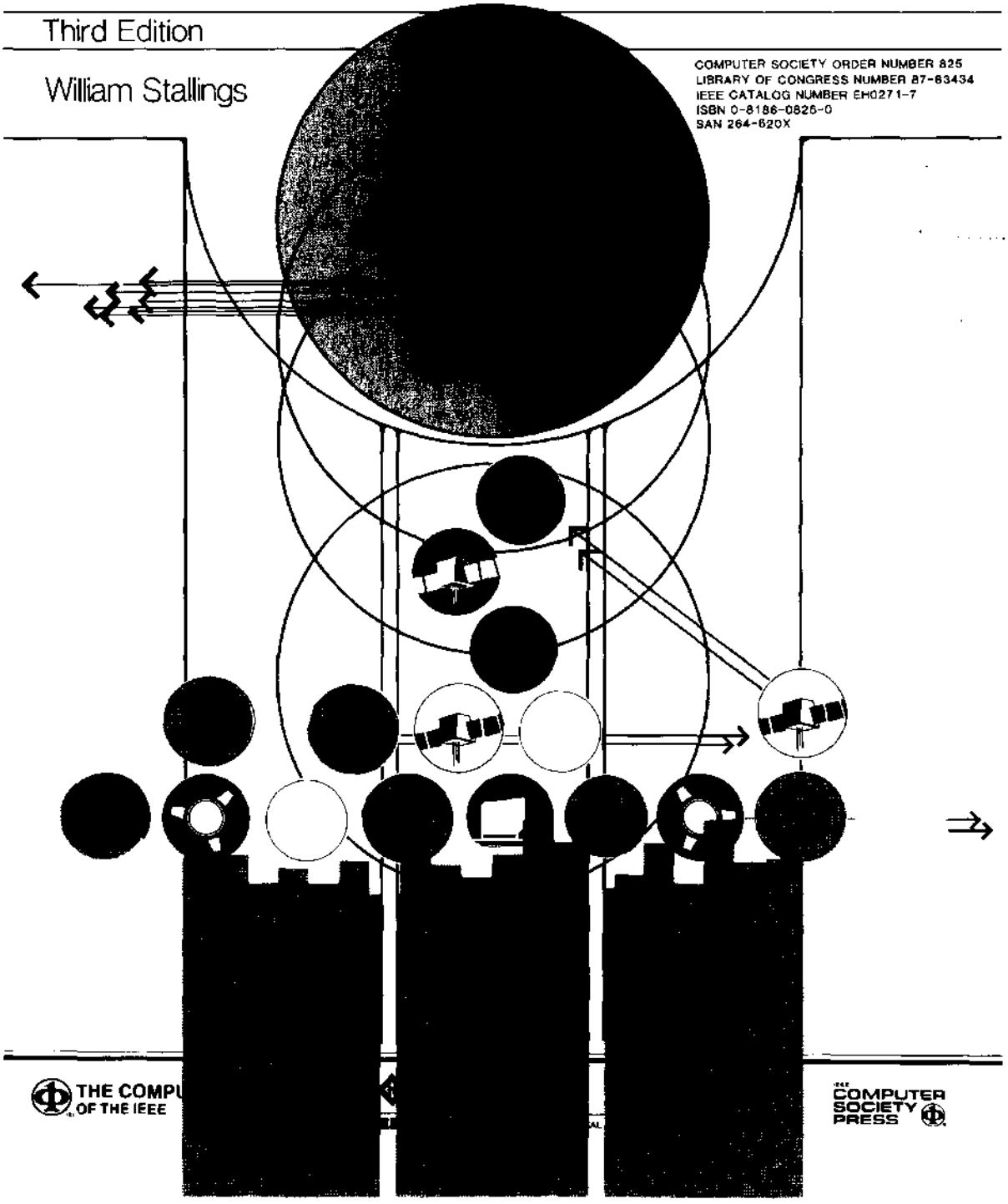

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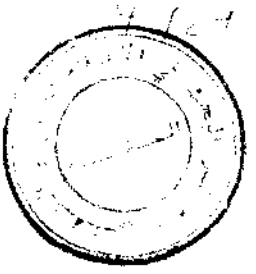

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Preface

Perhaps no other major innovation in data processing or data communications has been so widely discussed or so eagerly anticipated before its maturity as that of local networks. Local networks are attractive for such features as high availability and the ability to support multiple vendor equipment. Although the technology is still evolving, the principal architectural forms and design approaches have emerged.

P.1 Tutorial Focus

This tutorial focuses on the broad and rapidly evolving field of local networks. Consequently, the aims of the text, constrained by space, are dictated by concerns of breadth rather than depth. The articles and original material have been selected on the bases of topics and style to support these aims.

In terms of topics, the tutorial explores the key issues in the field in the following general categories:

- *Technology and architecture*: There is a small collection of ingredients that serves to characterize and differentiate local networks, including transmission medium, network topology, communication protocols, switching technique, and hardware/software interface.
- *Network type*: It is convenient to classify local networks into three types, based partly on technology and partly on application. These are local area network (LAN), high-speed local network (HSLN), and digital switch/digital private branch exchange (PBX).
- *Design approaches*: While not attempting to be exhaustive, the tutorial exposes and discusses important issues related to local network design.

Conspicuously missing from this list is a category with a title such as "Typical Systems." This tutorial is focused on the common principles underlying the design and implementation of all local networks and should, therefore, give the reader sufficient background to judge and compare local network products. A description of even a small sample of such systems is beyond the scope of this book. Articles about specific systems are included herein only when they are the best vehicle for communicating the concepts and principles under discussion.

In terms of style, the tutorial is primarily:

- *Descriptive*: Terms are defined, and the key concepts and technologies are discussed in some detail.
- *Comparative*: Wherever possible, alternative or competing approaches are compared, and their relative merits, based on suitable criteria, are discussed.

On the other hand, analytic and research-oriented styles are present to a much lesser degree. Virtually all of the mathematical content is confined to the section on performance, and, even there, the emphasis is on results rather than derivations.

Also, much of the material presents concepts and approaches that have moved beyond research and are commercial realities today. Both the Bibliography (Section 10) and the references contained in each article suggest additional sources for the interested reader.

P.2 Intended Audience

This tutorial is intended for a broad range of readers interested in local networks.

- *Students and professionals in data processing and data communications*: The tutorial is a convenient means of reviewing some of the important papers in the field. Its organization and the original material aid the reader in focusing on this exciting aspect of data communications and data processing.
- *Local network designers and implementors*: The tutorial discusses the critical design issues and illustrates alternative approaches to meeting user requirements.

- *Local network customers and system managers*: This text alerts the reader to some of the key issues and tradeoffs, as well as what to look for in the way of network services and performance.

Most of the material can be comfortably read with no background in data communications. The glossary and original material provide supporting information for the reprinted articles.

P.3 Organization of Material

This tutorial is a combination of original material and reprinted articles. Its organization is intended to clarify both the unifying and the differentiating concepts underlying the field of local networks. The organization of the sections is as follows:

1. *Introduction*: This section discusses local network technology, focusing on the key characteristics of transmission medium and topology. The classification of types of local networks used in this book is presented and discussed.
2. *Local Area Networks*: The term LAN is often mistakenly identified with the entire field of local networks. LANs have a general-purpose application, and most of the better-known local networks fall into this class. The major types of LANs (baseband bus, broadband bus/tree, and ring) are described and compared. The important issue of medium access control protocols is explored. The standards currently being developed for LANs are also described.
3. *High-Speed Local Networks*: This section focuses on a special-purpose high-speed type of local network and examines current technology and standards as well as possible future directions.
4. *Digital Switches and Digital Private Branch Exchanges*: Networks in this category constitute the major alternative to LANs for meeting general local interconnection needs. This section explores the technology and architecture of these devices and examines their pros and cons relative to LANs.
5. *The Network Interface*: The nature of the interface between an attached device and a LAN or an HSLN is an important design issue. This section explores some alternatives.
6. *Performance*: The purpose of this section is to give some insight into the performance problems and the differences in performance of various local networks.
7. *Internetworking*: In the majority of cases, local networks will be connected in some fashion to other networks. Some alternatives are explored.
8. *Design Issues*: The purpose of this section is to give the reader some feel for the breadth of design issues that must be addressed in implementing and operating local networks.
9. *Glossary*: Includes definitions for most of the key terms appearing in this text.
10. *Bibliography*: Provides a guide to further reading.

P.4: Related Materials

Local Networks, Second Edition (Macmillan, 1987) by William Stallings is a companion to this tutorial text, and follows the same topical organization. It is intended as a textbook as well as a reference book for professionals. *Handbook of Computer-Communications Standards, Volume II: Local Network Standards* (Macmillan, 1988) by William Stallings is a detailed examination of the IEEE 802 and FDDI standards. Both books are available from Macmillan Publishing Co., 866 Third Avenue, New York, NY 10022; 800-223-3215. The author has also prepared a videotape course on communication networks. About half of the course is devoted to local networks and the digital PBX; the remainder covers packet-switched, packet-radio, and satellite networks (available from the Association for Media-Based Continuing Education for Engineers, 500 Tech Parkway N.W., Suite 200A, Atlanta, GA 30332; 404-894-3362).

P.5: The Third Edition

The first edition of *Local Network Technology* appeared in 1983, and this is its second revision since that time. This compressed revision schedule reflects the rapid changes that are taking place in this area. The changes affect the technology, standards, internetworking strategies, and protocol design approaches for local networks. This third edition contains 24 new articles, reflecting these changes. Every section of the text has been revised, and the bibliography and glossary have been updated. The revision of this text has been an interesting and rewarding experience, and I hope that its readers find it a useful guide to this fascinating field.

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