

# Advances in Computer Communications and Networking

Wesley W. Chu

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# **Advances in Computer Communications and Networking**



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Revised Edition

ARTECH HOUSE

610 Washington Street

Dedham, Massachusetts 02026

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International Standard Book Number : 0-89006-049-5

Library of Congress Catalog Card Number : 79-55305

# Preface

*Since the publication of the first, second and second revised editions in 1974, 1976 and 1977, respectively, I have received many favorable comments and responses from students and teachers, as well as practitioners in the computer communications field, both in the United States and abroad. Because of their popularity, both second editions have gone out of print within two years. In an effort to reflect advances in the rapidly growing computer communications field, we have compiled a revised third edition, in which we have made many changes and replaced more than 50% of the papers which appeared in the second edition. We have expanded the chapter on Computer Network Design Considerations into four sections: communication network interface, routing and flow control, network topology, and design methodologies. We have also added two new chapters: communication protocol and its verification, and local networks. In order to limit the size of the book, we have eliminated chapters on loop systems, distributed data bases, inter-process communications, and common carrier facility and services. Readers interested in these topics should refer to the earlier editions of the book. Since this new edition includes many aspects of computer networking, we have also added the word "networking" to the title to reflect the contents of the book.*

*To provide interested readers with further readings relevant to computer communications and networking, we have updated and added new articles, special books, and publications to the reference list. These references are cited in the introduction to each chapter.*

*It is our hope that this edition will serve as an up-to-date text or reference book in computer communications and networking, and the information in the book will be interesting and valuable to the readers.*

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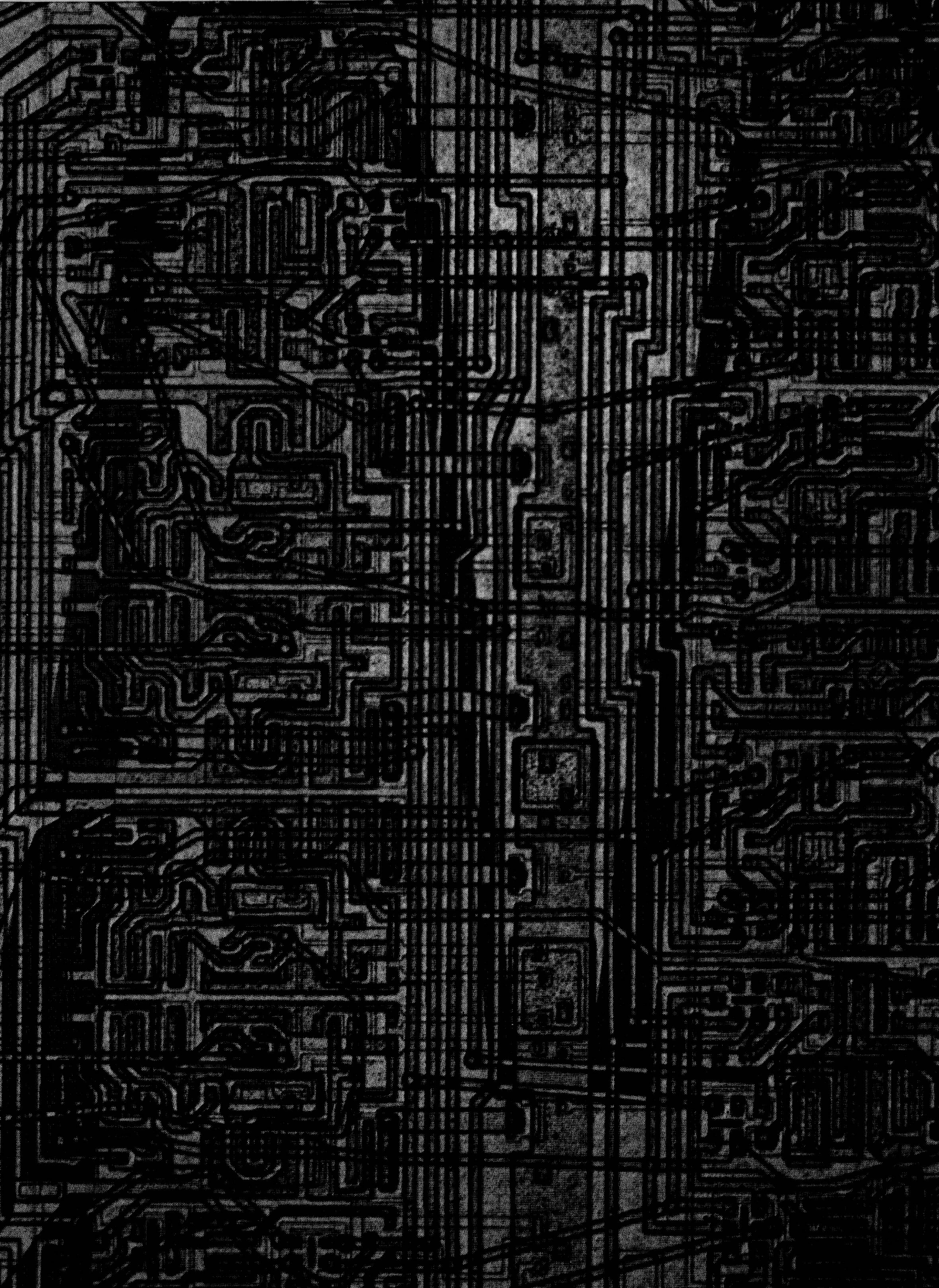
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# Introduction

The field of Computer Communications has grown rapidly in its applications during the past decade. Remote terminals are now commonly connected to computers for use in time-sharing systems, reservation systems, bank credit checking, inventory systems, business information systems, etc., to achieve resource sharing of hardware, software and data bases. The resource sharing concept has added a new dimension to the capabilities of the user. Under this new environment, he now can benefit from the versatility and power of the interlinking of computers and terminals. However, marriage of the computer and communication equipment also creates many new problems, both in technical and non-technical areas.

The basic technical problems are as follows: to economically and reliably transmit data from one location to another; to handle interface and interprocess communication among the computers, terminals and communication equipment; to control information flow and to predict system behavior; to efficiently share resources such as software and data bases. All of these questions are related to the goal of designing and planning a computer communications system that satisfies a set of user requirements for such parameters as response time, reliability and security, and yet yields a minimum total system cost (for software, firmware, hardware and maintenance).

The non-technical problems are mainly in the areas of the social and legal impact of introducing such computer communications systems into society, and the establishment of government regulating policies for these systems.

A large body of knowledge and techniques concerning computer communications have been developed during the past decades. This information is scattered in various conference proceedings, transactions and journals. A textbook to summarize these results is very desirable, since there is a critical need in the technical community for textbooks as well as reference materials. However, due to the time required to prepare such a text, the time usually required for publication, and the rapid technological changes and growth in this field, publishing a book containing up-to-date information as well as technical depth in computer communications at this time is very difficult, if not impossible. Therefore, we have taken a different approach. We have selected a set of reprints representing significant advances in computer communications during the past decades, and have organized them into a book with the objective of answering some of the questions which have arisen about the planning and designing of computer communications systems.

Chapters 1 to 5 describe computer traffic characterization, error control techniques, modems, statistical multiplexing, and packet switching via broadcasting channels. Chapters 6 to 11 present local networks, examples of computer networks, computer network design considerations, communication processors for store-and-forward networks, communication protocols and their verifications, and computer communication system reliability. Chapters 12 and 13 discuss computer communication security and social, regulatory, and legal issues in computer communications.

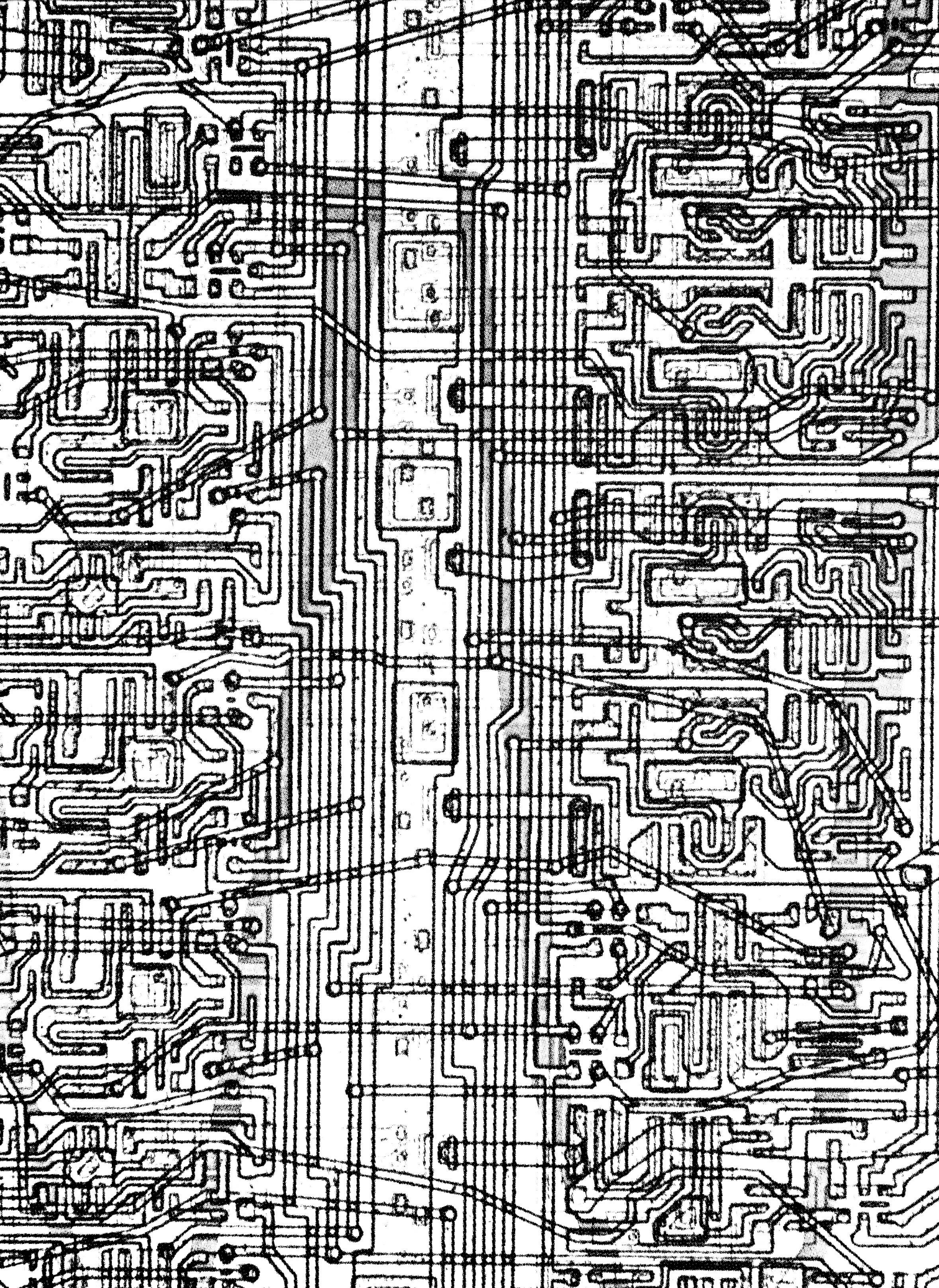
This book of reprints is an outgrowth of a summer short course entitled "Recent Advances in Computer Communications and Computer Networking," which has been offered at UCLA for a period of ten years. Most of the papers in this volume have also been used in a first year graduate course entitled "Data Communications in Computer Systems." Therefore this collection of reprints can be used as a text or reference book for a graduate course in computer communications. It can also be used for reference by engineers or scientists who are engaged in the design and development of computer communications systems.

Considering the large number of fine papers available, and the limited number that we can collect into one book, the selection of the set of papers for this volume has been a difficult task. Many excellent papers that could not be included here are mentioned in the list of references.

Several authors have added comments on and corrections to their papers. This material is appended to their papers.

We wish to express our appreciation to all of the authors and publishers for permission to reprint the papers in this volume. The majority of the papers are publications of the IEEE, AFIPS, ACM and Computer Networks. We have also received helpful comments from G. Bochmann, M. Gerla, L. Kleinrock, J. Spragins, C. Sunshine and R. Turn in selecting the materials for this book.

WESLEY W. CHU  
Westwood, California, 1979



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Preface

Introduction

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