READER'S GUIDE

This book, with its accompanying Web site, covers a lot of material. Here we give the reader an overview.

0.1 OUTLINE OF THE BOOK

The book is organized into five parts:

Part One: Provides an overview of computer organization and architecture and looks at how computer design has evolved.

Part Two: Examines the major components of a computer and their interconnections, both with each other and the outside world. This part also includes a detailed discussion of internal and external memory and of I/O. Finally, the relationship between a computer's architecture and the operating system running on that architecture is examined.

Part Three: Examines the internal architecture and organization of the processor. This part begins with an extended discussion of computer arithmetic. Then we look at the instruction set architecture. The remainder of the part deals with the structure and function of the processor, including a discussion of RISC and superscalar approaches, as well as a detailed look at the IA-64 architecture.

Part Four: Discusses the internal structure of the processor's control unit and the use of microprogramming.

Part Five: Deals with parallel organization, including symmetric multiprocessing and clusters.

A more detailed, chapter-by-chapter summary of each part appears at the beginning of that part.

This text is intended to acquaint you with the design principles and implementation issues of contemporary computer organization and architecture. Accordingly, a purely conceptual or theoretical treatment would be inadequate. This book uses examples from a number of different machines to clarify and reinforce the concepts being presented. Many, but by no means all, of the examples are drawn from two computer families: the Intel Pentium 4 and the IBM/Freescale PowerPC. These two systems together encompass most of the current computer design trends. The Pentium 4 is essentially a complex instruction set computer (CISC) with some RISC features, while the PowerPC is essentially a reduced instruction set computer (RISC). Both systems make use of superscalar design principles and both support multiple processor configurations.

0.2 INTERNET AND WEB RESOURCES

There are a number of resources available on the Internet and the Web to support this book and to help one keep up with developments in this field.

A special Web page has been set up for this book at **WilliamStallings.com/COA/ COA7e.html**. See the two-page layout at the beginning of this book for a detailed description of that site.

An errata list for this book will be maintained at the Web site and updated as needed. Please e-mail any errors that you spot to me. Errata sheets for my other books are at **WilliamStallings.com.**

I also maintain the Computer Science Student Resource Site, at **WilliamStallings .com/StudentSupport.html;** the purpose of this site is to provide documents, information, and useful links for computer science students and professionals. Links are organized into four categories:
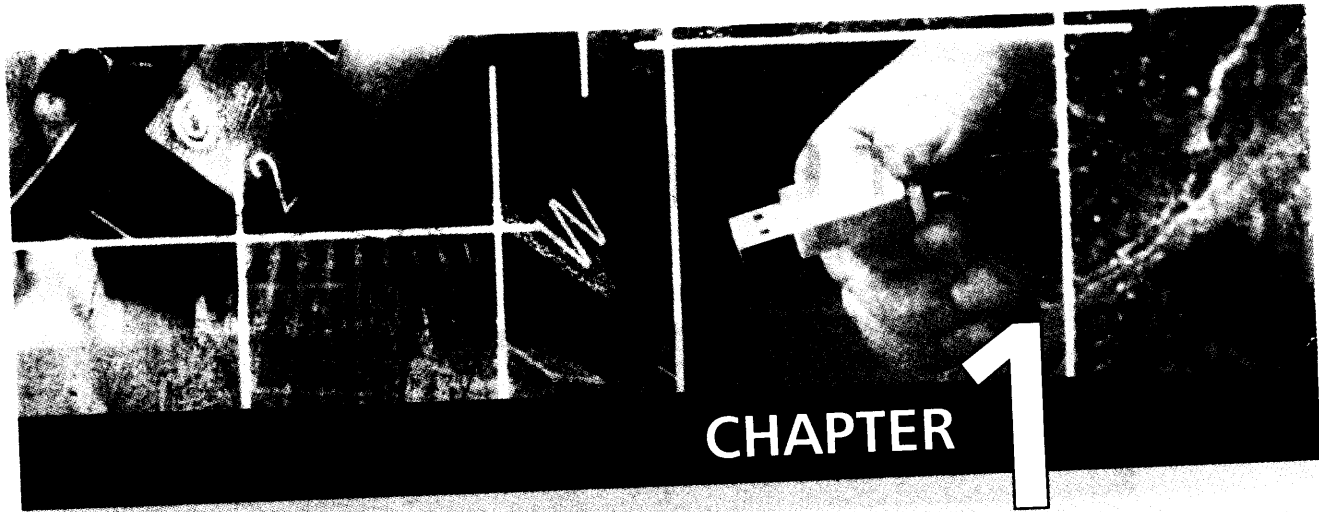
- **Math:** Includes a basic math refresher, a queuing analysis primer, a number system primer, and links to useful math Web sites
- **How-to:** Advice and guidance for solving homework problems, writing technical reports, and preparing technical presentations
- **Research resources:** Links to important collections of papers, technical reports, and bibliographies
- **Miscellaneous:** A variety of useful documents and links

Other Web Sites

There are numerous Web sites that provide information related to the topics of this book. In subsequent chapters, pointers to specific Web sites can be found in the "Recommended Reading and Web Sites" section. Because the URLs for Web sites tend to change frequently, I have not included these in the book. For all of the Web sites listed in the book, the appropriate link can be found at this book's Web site. Other links will be added when appropriate.

The following are Web sites of general interest related to computer organization and architecture:

- **WWW Computer Architecture Home Page:** A comprehensive index to information relevant to computer architecture researchers, including architecture groups and projects, technical organizations, literature, employment, and commercial information
- **CPU Info Center:** Information on specific processors, including technical papers, product information, and latest announcements
- **Processor Emporium:** Interesting and useful collection of information
- **ACM Special Interest Group on Computer Architecture:** Information on SIGARCH activities and publications
- **IEEE Technical Committee on Computer Architecture:** Copies of TCAA newsletter

CHAPTER

1

INTRODUCTION