book's first edition, as well as adding new and interesting topics and changes demanded by the evolution of the field involving hardware description languages VHDL and Verilog as driving forces in digital hardware synthesis.

Chapter 1 discusses the fundamentals of digital computers. Chapters 2 and 3 give detailed and elegant descriptions of combinational logic circuit and combinational logic design. Chapter 4 explains sequential circuits. Chapter 5 covers registers and counters. Chapter 6 discusses the memory and programmable logic design. Chapter 7 treats register transfer notation and data-path design. Chapter 8 is devoted to sequencing and control. Chapter 9 presents basic principles of instruction set architecture. Chapter 10 deals with central processing unit design. Chapter 11 is concerned with the organization of input–output subsystem and data-transfer techniques. Chapter 12 provides standard treatment of memory hierarchy design.

More important expansions with respect to the first edition of this book are the following: (a) Chapter 3 – HDL representations of VHDL and Verilog; (b) VHDL and Verilog representation for sequential circuit are presented in Chapter 4; (c) Chapter 5 – VHDL and Verilog based representation for shift register and counters; (d) Chapter 8 – HDL representations of a binary multiplier (VHDL and Verilog).

Each chapter ends with subsections: chapter summary, references and problems to be solved. Many of the homework problems are either new or modified, some of which are excellent for instructional purposes. Two CDs for Xilinx Student Edition 1.5 Foundation Series Software for Microsoft Windows are provided for classroom use.

The book is easy to read and quite motivating. It is a fine textbook, suitable for a two semester course to a student of computer engineering, and is useful to both the senior graduate student and a practicing engineer who wants to refresh his understanding of the vast background of digital logic and computer design.

M. Stojcev
Faculty of Electronic Engineering, University of Niš, Beogradska 14, P.O. Box 73, 18000 Niš, Yugoslavia
Tel.: +381-18-547597; fax: +381-18-46180,
E-mail address: stojcev@elfak.ni.ac.yu

PII: S0026-2714(00)00017-2

***High Performance Cluster Computing vol. I & II*; Rajkumar Buyya ed. Prentice Hall PTR, Upper Saddle River, NJ 07458, 1999, Hardcover, vol. I. p. 849, $55.50, vol. II, p. 664, $55.50, ISBN: 0-13-013784-7 for vol. I, 0-13-013785-5 for vol. II**

Computer architecture design and programming are exciting and competitive disciplines. The unprecedented rate of change and progress during the last three decades in the field of low-cost high-performance microprocessors, high-speed networks and standard tools for high performance distributed computing has motivated many researchers to move away from expensive and specialized parallel supercomputers towards cheaper and general purpose clusters. According to the author, "A cluster is a true parallel or distributed processing system, which consists of a collection of interconnected stand-alone computers (PCs, workstations and SMPs) working together as a single, integrated computing resource".

Buyya divides the book into two volumes. The first volume "High Performance Cluster Computing: Architectures and Systems", contains four parts that are further organized into 36 chapters. The volume begins with a short preface and a general introduction to the area of cluster-computing. Then, each part is preceded by a short introduction, including further details concerning topics presented in the appended chapters. Part I/vol. I consists of Chapters 1–8 and discusses the component, technologies, environments, and service standardly used in local- and wide-area network (LAN and WAN) cluster-based systems.

Starting from the fact that cluster systems will be the supercomputers of tomorrow, Part II/vol. I (Chapters 9–19) presents a detailed view of potential performance bottlenecks of clusters. It addresses the principles and techniques concerning how to achieve high-speed interconnection network and protocols, and efficient input/output subsystem.

Part III/vol. I (Chapters 20–25) deals with the three crucial services provided by the operating system which make the cluster (composed of different machines) to work like a single system: scheduling, load sharing, and load balancing. Several interesting topics such as

scheduling parallel jobs, load sharing, and fault-tolerance manager, techniques for parallel program scheduling, dynamic load balancing, and mapping and scheduling are discussed.

Since the early nineties, the field of cluster computing systems has experienced dramatic advances. As a new area of computing, it is also one of the hottest areas of research, design and development. In part IV/vol. I, the reader will find many interesting details related to some typical representatives of dedicated and non-dedicated cluster systems such as Beowulf, COMPaS, MARS, ParPar, RS/6000 SP system, and others.

Volume I concludes with an index.

The second volume, "High Performance Cluster Computing: Programming and Applications" has 29 chapters, which are divided into three parts.

Part I/vol. II (Chapters 1–11) addresses the software aspect of clusters. Various programming paradigms (pipelining, divide-and-conquer, master-slave, etc.), parallel programming models (parallelizing compilers, message passing, virtual shared memory, etc.), categories of parallel programming environments (MPI, PVI, and other implementation), debugging parallelized code, and OS services for a wide area of applications are discussed.

Part II/vol. II (Chapters 12–15) concentrates on JAVA as an object-oriented language which efficiently supports distributed computing (each computer in a distributed network may be a different platform). Several JAVA implementations which support MPI, JVM, SPMD paradigm, and web-based parallel computing are presented.

Part III/vol. II (Chapters 16–29) focuses on numerous parallel algorithms and applications created for execution on the cluster-computer systems. Some typical are parallel genetic algorithms, hardware system simulation, content-based image retrieval, climate modeling, computational electromagnetics, biomedical applications modeling, and others.

A glossary and index concludes the second volume.

Cluster computing encompasses many disciplines and is finding applications in fields as diverse as real-time processing, computer networks, parallel processing, distributed and concurrent systems and programming, etc. The simultaneous appearance of this two-volume book is indicative of the current activity in the field. An impressive amount of data is given in this (two-volume) book. This book presents a well-written up-to-date collection of research articles organized as chapters dealing with both the theoretical and application aspects of numerous current topics of interest in cluster-computing. Each chapter is written by experts in the corresponding area. Contrary to many edited books, Buyya's book does not suffer from varied and inconsistent writing and presentation style. The comparative analysis towards the end of this two-volume book does portray a fairly unified picture.

I agree with the author "The book is primarily written for graduate students and researchers in the area of parallel and distributed computing. However, it is also suitable for practitioners in the industry and government laboratories". In short, I consider this book to be required reading not only for those who are interested in applications of cluster-computer systems but also for those who are not yet convinced that there are many important, difficult, and interesting computer science problems to be solved in the design and implementation of these systems.

M. Stojcev
Faculty of Electronic Engineering, University of Niš, Beogradska 14, P.O. Box 73, 18000 Niš, Yugoslavia, Tel.: +381-18-547-597; fax: +381-18-46-180
E-mail address: stojcev@elfak.ni.ac.yu

PII: S0026-2714(00)00016-0