Microarchitecture of VLSI Computers

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edited by

P. Antognetti

University of Genova
Genova, Italy

F. Anceau

INPG
Grenoble, France

J. Vuillemin

INRIA
Paris, France

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PREFACE

We are about to enter a period of radical change in computer architecture. It is made necessary by advances in processing technology that will make it possible to build devices exceeding in performance and complexity anything conceived in the past. These advances, the logical extension of large - to very-large-scale integration (VLSI) are all but inevitable. With the large number of switching elements available in a single chip as promised by VLSI technology, the question that arises naturally is: What can we do with this technology and how can we best utilize it? The final answer, whatever it may be, will be based on architectural concepts that probably will depart, in several cases, from past and present practices. Furthermore, as we continue to build increasingly powerful microprocessors permitted by VLSI process advances, the method of efficiently interconnecting them will become more and more important. In fact one serious drawback of VLSI technology is the limited number of pins on each chip. While VLSI chips provide an exponentially growing number of gates, the number of pins they provide remains almost constant. As a result communication becomes a very difficult design problem in the interconnection of VLSI chips. Due to the insufficient communication power and the high design cost of VLSI chips, computer systems employing VLSI technology will thus need to employ many architectural concepts that depart sharply from past and present practices.

This book focuses on the internal microarchitecture of present and future microprocessors and microcomputers in VLSI technology. The authors of the different chapters represent a well balanced blend of academic and industrial backgrounds. The academic authors describe more general, research-oriented topics, while the authors coming from industry describe in detail the architecture of their latest products. In this way the readers have a unique opportunity to obtain a full description of the present (industrial) and future (academic) architectural concepts for VLSI computers.

The content of this book results from the lecture notes handed out at the NATO ASI, held at SOGESTA, Urbino, Italy, from July 9 to

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July 20, 1984.

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*P. Antognetti
Director of the NATO-ASI*

*University of Genova, Italy
January, 1985.*

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