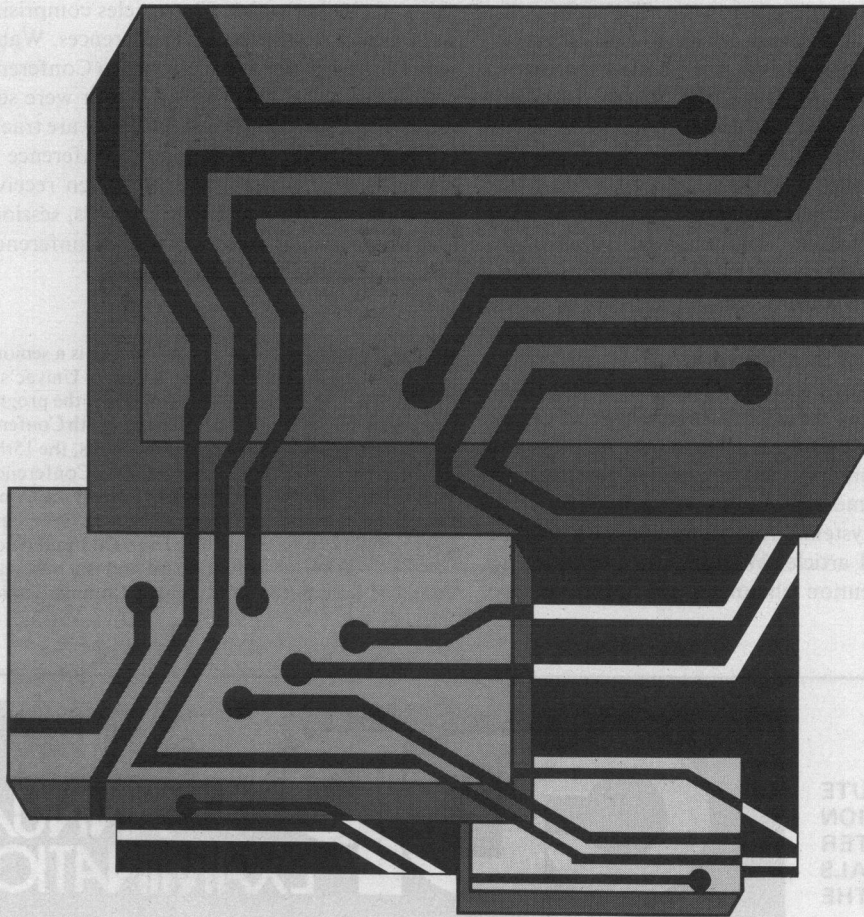


Advances in Hardware: Chips to Systems



Guest Editor's Introduction

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Computer system hardware continues to advance by leaps and bounds. The cost of many types of logic and memory circuits is decreasing at annualized rates of 25 to 50 percent, and new interconnection strategies are being developed as circuits on a chip begin to resemble complex processors. We can foresee complete systems on a single chip, a computer in every home, an automated system in every office, and international assemblies of computer systems communicating via satellite networks. The future is now.

As hardware becomes more complex, its uses become more varied. This issue brings together five articles that look at new hardware or hardware-based systems concepts from different levels of abstraction. It does not attempt a comprehensive overview of the hardware field;

rather, it contains selected, detailed sample points which we feel will be of interest to the reader.

In the first article, Barbe discusses the very-high-speed integrated circuit program. The VHSIC program has been undertaken by the Department of Defense to develop an advanced LSI chip capability oriented toward speed and environmental requirements that are seen by DoD but, according to many DoD planners, are ignored by commercially oriented semiconductor houses. Barbe reviews IC development and trends, defense needs, the VHSIC concept, and the development and demonstrations necessary to prove the VHSIC technology for DoD.

Next, Siegel and McMillen describe a new system concept. It uses a special form of a circuit or crossbar switch to build partitions of microprocessors from an SIMD/

MIMD system for image processing. If large systems of microprocessors are to be developed and applied to special applications, such switches will be required; the authors consider overall system design as well as details of the communication switch.

In the third article, Szewerenco, Dietz, and Ward discuss a new processor architecture being developed by the Army. This architecture is being implemented in several models with varying hardware. The authors list possible implementations and review the architecture/hardware trade-offs considered in the design process.

The fourth article discusses the design problems associated with building a distributed system containing many processors connected via a local computer network. Local networks are one of the most rapidly growing fields of computer hardware, and the majority of local network vendors advertise system solutions. In actual fact, however, the field is 90 percent hardware vendors selling interconnection mechanisms. In this article, Le Lann overviews not only the hardware but also the system aspects of a particular local network.

So far we have previewed four examples of hardware advances—a new chip concept, a special type of circuit switch, a CPU system, and a local network. As chips and systems become more complex, measuring performance becomes more and more difficult too; testbeds for comparing distributed systems, for example, are difficult to obtain. In the final article, Watson uses simulation to compare the contention channel mechanisms of two

local network communication devices—Ethernet and HYPERchannel—for delay, throughput, and stability characteristics.

All five articles illustrate important trends and results; however, they have more than a passing relationship to each other. As hardware becomes more complex, more of what used to pass as design is really system integration, and many specialized conferences are emerging to address this and similar topics. The articles comprising this issue were drawn from two such conferences. Watson's article won the best paper award at the 5th Conference on Local Computer Networks; the other four were selected from approximately 30 papers in the hardware track at the 14th Annual Hawaii International Conference on System Sciences, where Siegel and McMillen received the best paper award. We thank the reviewers, session chairmen, and program committees of these conferences for their assistance with this special issue. ■



Kenneth J. Thurber is a senior professional consultant at Sperry Univac's Defense Systems Division. He is the program chairman of the forthcoming 6th Conference on Local Computer Networks, the 15th Annual Hawaii International Conference on System Sciences (hardware track), and the 7th Data Communications Symposium. He is a member of the Computer Society's Governing Board and is a past chairman of its Technical Committee on Computer Communications.

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