Although the phrase "engineering workstation" is difficult to define precisely, there's little doubt that the workstation has had a profound impact on the practice of electronic system, subsystem, and integrated circuit design. In this issue we consider an engineering (or CAD/CAE) workstation as a turnkey user-design environment that integrates applications tools with processing hardware.

We chose articles that would help answer today's pragmatic questions about workstation usability yet provide insight into what is likely to be the functionality of tomorrow's workstations. These articles should help answer the following questions:

1. How can I integrate engineering workstations into a real design environment?
2. What are the underlying performance issues of workstation hardware?
3. What role will general-purpose accelerators play in the workstation environment?
4. What might next-generation user interfaces look like?

Workstation processing power and the number of available workstation application tools have increased dramatically in the last five years. Sophisticated users now find that "real work" can be accomplished on CAD/CAE workstations. In "Conversion of an IC Design Capability from a Mainframe to a Workstation Environment," Dave Palmer and John Wisniewski from Sandia National Laboratories recount the rationale for (and problems encountered in) migrating toward a workstation-based design environment. Interestingly, they point out that workstations alone represent only half of the investment necessary to create a usable workstation-based design environment.

The approach of running CAD/CAE application programs on general-purpose, commercially-available workstation hardware seems to be an increasing trend. The popularity of the UNIX operating system and the support of UNIX by many major workstation hardware suppliers is a key factor. Those readers who will need to choose workstation hardware based on several key performance metrics will be sure to find "Benchmarking Engineering Workstations," by Mark Linton from Stanford University, enlightening. Mark describes the benchmark tests that he used...
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to evaluate processor, graphics, file access, and multitasking performance. In addition, he summarizes the results of running these tests on many of the leading UNIX-based workstations.

While several workstation makers use special-purpose hardware accelerators to speed up various CAD/CAE functions such as logic simulation, at least one CAD/CAE supplier is taking a different tack. In "A Supercomputer Workstation for VLSI CAD," Rolf-Dieter Fiebrich from start-up Thinking Machines Corporation describes a VLSI workstation based on a general-purpose accelerator called the Connection Machine. Thinking Machines' VLSI CAD system is primarily written in the LISP language, and Fiebrich argues that in the LISP environment, interactive circuit design is analogous to program development.

The first CAE workstations had a relatively primitive (by today's standards) user interface—simulation waveforms were represented as an alphanumeric approximation of the actual waveform, and only rudimentary black-and-white graphics capabilities were provided. While today's systems are a far cry from their predecessors, we still have a long way to go to reap the maximum benefit of a user interface that is optimized for design productivity. In "VEGA: A Visual Modeling Language for Digital Systems," Akira Sugimoto from Mitsubishi Electric Corporation's Central Research Laboratory describes the results of a research project to develop next-generation human-computer communication techniques for digital system design. Although simulation is highlighted in the article, Sugimoto says that the VEGA visual modeling language is applicable to other facets of digital systems design.

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