

Millennium has own approach to μ c development systems

Cupertino, Calif.-based Millennium Systems Inc. introduced a universal μ c development system with in-circuit emulation (ICE) in 1977, and Tektronix Corp., Beaverton, Ore., became a leader in that field by selling the system on an OEM basis as the 8002A. But the proliferation of 16-bit μ ps—with sophisticated interrupt handling, multiprocessor-oriented bus-request mechanisms, instruction prefetch capabilities and direct addressing for more than 1M byte of memory—showed that a market for more sophisticated development tools was arising. The Millennium 9500 and Tektronix 8500 μ c development system families are the responses to that shared perception. [Intel Corp. is taking another approach to the need for sophisticated μ c development systems (see "Intel links development system via Ethernet," p. 22).]

Millennium director of marketing Dave West says designing the two companies' second-generation development systems began cooperatively in 1978. The consensus was that the more complex μ cs soon to be under development would produce more hardware-debugging data than engineers could easily digest. The two companies also saw that programs written to use the larger memory capabilities of the new μ ps could easily exceed 10,000 lines of code—more than a programmer can prepare for market in a timely manner given a typical programmer's average daily output of 12 fully debugged lines. But before the consensus could be implemented in a new generation, Tektronix decided to rely on its own engineering capabilities, which led to termination of the OEM agreement between the two companies in April, 1981.

The two companies' second-generation μ c development system families are outwardly similar. Both offer stand-alone, floppy-disk-based software-development systems (the Millennium two-user 9520 and the Tektronix single-user 8550) and stand-alone systems with ICE that allow hardware debugging to be transferred in stages from the emulation processor and memory to the actual prototype. In addition, Tektronix has introduced and Millennium has plans for a hard-disk based, multi-user software-development system with a UNIX-like operating system (the Millennium 9580 and the Tektronix 8560). Both families address single-user, multi-user and host μ c design environments, while allowing migration and high-speed communication within the family.

Comparing the two companies' capabilities in hardware-debugging tools and ICE, West points to the Millennium 9516's menu-driven "advanced human interface," less expensive approach to multiprocessor emulation and new dual-bus architecture that he claims puts the 9516 "an order of magnitude and a generation ahead of the competition."

The backbone of the advanced human interface is a menu tree that guides the user through the most likely sequence of desired tasks (see diagram), with soft keys to set up debugging operations. An on-line manual helps inexperienced users, while system commands are directly accessible for experienced users. West says the interface was designed to simplify the task of handling the factor-of-five data increase that occurs when debugging a multiprocessor 16-bit system as compared to a single 8-bit processor system.

Mark Astengo, vice president of marketing for Advanced Digital Technology, a Bellevue, Wash.-based company that also makes an emulation system (MMS, September, 1981, p. 35), agrees that the menu-driven approach is the wave of the future, but points to the 9516's multi-ICE capability as also being state of the art. The 9516's common control bus with global event lines allows it to emulate a system incorporating two interacting μ ps (or as many as four with a 12-slot expansion box) at their full 256K bytes of memory each.

"With multiple processor systems, some of the problems are just unreal," says Astengo. "Without multiple emulation, it would take forever to find them, especially the ones caused by timing conflicts."

The Tektronix 8540 also allows tying together as many as eight processors, but one 8540 is required per μ p, an expensive proposition, admits Tektronix marketing manager for μ c development systems Bob Hunter. He disagrees, however, with Millennium's claim that its advanced human interface is unmatched. Tektronix offers the same capabilities via the UNIX-like TNIX operating system that is part of the LSI-11/23-based 8560 multi-user system. Hunter says a user can set up a menu-driven TNIX shell that is superior to the Millennium interface because it can be tailored to a user's needs. But there is a catch—TNIX needs a more-than-\$27,500 bare-bones 8560, and some complex software must be developed.

With the increasing size of μ c programs, programming teams are becoming the rule, and the key to the 8560's team orientation is its TNIX operating system. Tektronix uses a menu-driven shell to simplify system operations for a programmer not experienced on the 8560, although TNIX system commands are directly available if a programmer does not need menu prompting.

This TNIX, C-based approach is similar to Millennium's C-based human interface for hardware debugging on the 9516. For a programmer with a frequently repeated task sequence, TNIX pipelining allows multiple commands to be coded into macros.

TNIX also provides a hierarchical filing system, which enables a programmer to restrict access to a program module that isn't ready to run, share it with team members who need it to proceed with their work when it's up but not running flawlessly and share it with the entire team when it's finished.

The 8560 also features a utility program called MAKE, which controls creation of programs having many modules to assure the end program is correctly made from the current version of each module. MAKE documents the interdependency of modules and prevents difficult-to-find bugs that could result if a user forgets to reassemble a routine that depended on a modified module.

Software consultant Carol Anne Ogden lauds the choice of a UNIX-like operating system, calling UNIX the most sophisticated tool kit programmers have. Ogden also likes the electronic-mail capability that is part of the Tektronix system. She says it can be used to capture all decisions made throughout the design process. "Eventually, someone can take that journal of transactions and easily edit it into usable documentation, which takes

care of the normally tough job of documentation," Ogden says.

Tektronix is confident about the success of its 8560—Micropolis Corp. in Southern California holds an order for 1000 45M-byte, 8-in. Winchester-disk drives intended for the system—but Tektronix might be wise to watch over its shoulder for Millennium. Although Millennium's West won't discuss details of the multi-user software-development system due from the company, Millennium president John Caselli is not as reticent. "The difference between what we are going to do and what Tektronix is doing with the multi-user system is the processor," says Caselli. "Using the MC68000 will increase our system response and throughput."

Regardless of the quality of Millennium's product, industry observers say the company faces a big problem: lack of a strong marketing presence in μ c development systems, particularly software development. But Caselli plans to expand the company's field-support staff, and says Millennium's sales are handled "by the best network of independent representatives in the country." And West suggests the impending takeover of Millennium by the much larger Gould Inc. will increase marketing clout for the μ c development system family. "We think we can beat Tektronix in the μ c development system field," Caselli says, "or we wouldn't be in it."

—Kevin Strehlo