Life in the Fast Lane: Three Multiuser Microcomputers

A comparison of the Altos 586, CompuPro 8/16C, and the Ithaca Intersystems Encore

by Bill Machrone

The number of fast, inexpensive multiuser computers is increasing daily. They occupy a position once reserved for the low end of the minicomputer market. Now, though, you can get a multiuser machine in one of two major flavors: MP/M-based machines that provide the operating familiarity of CP/M, and UNIX-based machines that virtually duplicate the capabilities of their minicomputer forebearers. [*Editor's note: There is a third option: a multi CP/M system running CP/NET on Turbodos. We will publish a review of CP/NET in the October 1983 issue, and a review of Turbodos later.*]

Here we look at a trio of machines, dissimilar except for their multiuser might at an affordable price. One runs Microsoft's XENIX, another runs MP/M-80, and the third uses a homegrown hybrid MP/M-86 that runs 8- and 16-bit programs simultaneously. The XENIX machine is Altos's 586, the compactness of which belies its computational power. The hybrid is CompuPro's 8/16C, an S-100 system built around their famous 8088/8085 dual processor card. [*Editor's note: This was the first S-100 dual processor board to appear on the market.*] Ithaca Intersystems' offering is the Encore, an extension of their longstanding experience with fast Z80 systems. The Altos is a single-board design, the 8/16 is a pure S-100 design, and the Encore uses a slightly modified S-100 bus. This article will be less a direct comparison than a description of their capabilities and limitations.

A bit of history

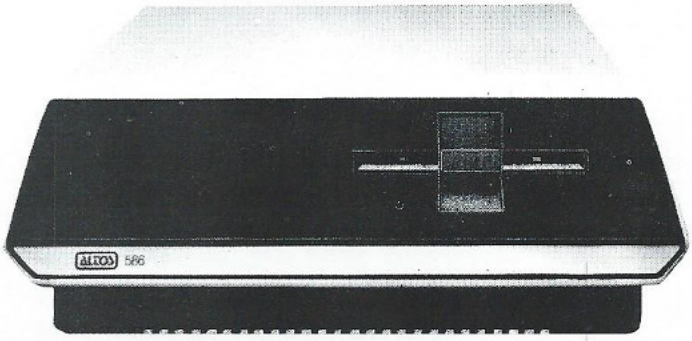
Before we begin, we must first express a debt of gratitude to the progenitor of all microprocessor-based multiuser systems, the Altos 8000 line. Back when many of us were getting started in the microcomputer field, it was great fun to sneer at Altos machines for their single-board design. We S-100 purists wanted nothing to do with them. Altos, unfazed by this rejection, sneered back at the hobbyists and continued on its course of producing inexpensive, reliable, small business computers. Even some of their best efforts left the hobbyists unimpressed.

A case in point is the 8000. In production for about three years, its specs still don't sound all that bad: 208K, 6 serial ports, a parallel port, a double-density 8" floppy, and 10 to 40 MB of hard disk, with MP/M as the resident operating system. The 8000 sported a 4 MHz Z80 and DMA, could boot from hard disk or floppy, and permitted four simultaneous users. It used all the power available in the Z80's Mode 2 interrupt structure and Zilog's excellent peripheral family, including the SIO. The SIO is one of the main reasons the machine works so well. In addition to fast communication with the CPU through the interrupt structure, it has a 4-byte FIFO buffer for incoming characters. This buffer makes it virtually impossible to lose a keystroke.

On the down side, the fourth user area provided only about 30K of transient program area, too small to run significant user programs like WordStar and dBASE, so it was really only a three-user machine. Utilities could run in the short bank, but no serious application programs would fit. The bottom line was that this machine allowed three users to run WordStar or dBASE II or other applications with relatively little conflict. If multiple users went to the disk at the same time, you noticed the degradation of response time. Otherwise, the interrupt-driven console handler kept your terminal well serviced. Altos has sold thousands of these machines to businesses, and they continue to do so. They made small multiuser systems believable.

Altos 586

The Altos 586 bears no resemblance to its 8-bit predecessor. Its stylish case conceals 512K of parity-checked RAM, an 8086 running at 10 MHz, 10 MB of hard disk, and 6 serial ports. Ethernet communications can be handled by the addition of a board containing the new Intel chip set. There is a socket that holds an additional 512K memory board, and expansion is provided for tape backup



The compactness of Altos 586 belies its computational power: this XENIX-driven system is a very fast machine.

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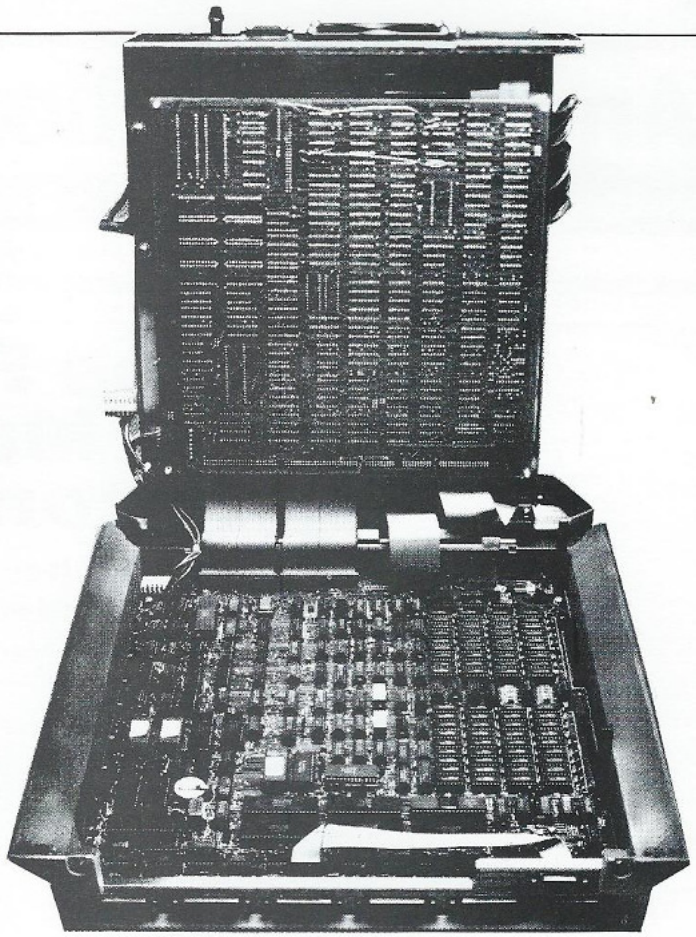
and additional serial ports. The serial ports still use Z80-SIO chips and are controlled by a Z80 dedicated to input/output tasks. In this manner, Altos has off-loaded I/O from the 8086. This, coupled with a buffered hard disk interface with DMA access to memory, results in a very fast machine.

The hard disk controller has an 8089 I/O processor to make things simpler to program while providing a consistent interface to the 8086. Unlike Altos' 8600 series, the 8089 is not on the system bus with the 8086, but communicates through DMA. This allows the 8086 to crank along at 10 MHz, even though 8089s that can go that fast are still not available. There is a real-time clock backed up by a NiCad battery on the main board, but it is not interfaced to XENIX. You have to tell XENIX the time and date when you boot, and it keeps track from there. The minifloppy disk sports 700K of dual-sided quad-density storage. XENIX normally treats it as the tape device, but it can be configured as a random-access device as well. Architecturally, the 586 bears more resemblance to a minicomputer than a micro. Along these lines, Altos elected not to wait for the 80286 and designed their own memory management unit. It assigns workspace to each task dynamically from a memory pool, as though each task had as much contiguous memory as it wanted. In conjunction with XENIX's swapper, tasks share all the memory available on a demand basis.

The machine I tested had the optional XENIX development system in addition to the runtime package. This is essentially UNIX System III with Berkeley enhancements. You get a C compiler, Fortran 77, all the usual UNIX programmer productivity aids, and a selection of text editors. Also included is **uucp,** the UNIX-to-UNIX communication program, the "learn" library, and a host of utilities (7MB worth) that will take you months to go through.

Altos's Business Shell provides a convenient method of harnessing the system's power, even for neophytes. All the system utilities that you are likely to use are callable from one of several menus available to you. Further, every menu item has an associated help screen. There is even a "shell compiler," which permits you to create your own menu-driven applications. The user setup program, also menu driven, permits you to assign each user to a specific shell, based on login ID. A bug in the Business Shell program prevented me from substituting my own menu for the standard, but a UNIX-knowledgeable friend showed me a way around it. Getting the system up and running was a little time-consuming, but straightforward. A utility verifies the structure of the file system following installation, and whenever necessary afterward.

This system is productivity heaven. UNIX utility programs tend to be large compared with equivalent CP/M programs. The time required to load them from the hard disk is noticeable. After that, though, look out! Multiple tasks from one terminal, spooling, other users—bring 'em on! It was tough to find anything that would slow this system down. With two or three users on the system, it appeared to do most everything in memory, with few disk accesses. Only when five users had the machine fully busy did the operation of the swapper become apparent, and then only when one or two of the users were running disk-intensive relational database stuff or compiling. I suspect that the 512K add-in board would make much of that go away, too. I've used some largish minicomputers that were slower than the 586. Maybe they handled more users, but they also cost at least an order of magnitude more.



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CompuPro 8/16

CompuPro is committed to excellence in the S-100 field. As such, they offer the most comprehensive line of high-performance S-100 boards available. Recently, they have offered their products integrated into systems of varying capabilities. Most interesting of their offerings is the 8/16C, built around the dual-processor board and fast static RAM. The unit I tested has 384K of RAM (six RAM 17s) and 1.5 megabytes of M-Drive/H fast disk-emulating RAM. It also had nine serial ports and provisions for handling up to seven users. Eight of the ports are provided by an Interfacer 3-8, while the ninth is the serial port on the system support board. The system support board also contains a battery backed-up clock, ROM sockets, a socket for a math chip, and a bagful of interrupt control lines. The test unit contained the CSC (Certified System Component) boards, offering 12 MHz operation of the 8088 and a 6 MHz rate on the 8085. The Disk 1 floppy disk controller uses DMA to transfer data in and out of memory. The box, motherboard, and power supply are simply the toughest and best-built around.

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The software that ties all these pieces together is MP/M 816. It is a modified version of MP/M-86 that detects when you want to run 8-bit programs and hands those tasks off to the 8085. It does this by requesting a 64K workspace from the 8088, then setting up a small BIOS at the top of the workspace. It intercepts CP/M calls, translates them to the MP/M-86 equivalent, then hands them back to the 8088 for execution. Thus, the 8088 is the I/O processor for the 8085. There is also a "shell" program instead of the usual terminal message processor (TMP). Through login IDs, it controls the user areas to which each user may have access and can be set up to force a given user to a specific disk and program. Terminal and printer setup is done through configuration files. This permits rapid and simple system reconfiguration by editing these files. Baud rates, number of stop bits, and the like, can all be changed at will.

The 8/16 came with a pair of dual-sided Qume 8" floppies in a matching cabinet. No one would want one of these without a hard disk and, fortunately, they are available so configured from CompuPro's growing number of System Centers. These System Centers, or "super dealers" are a vital link in the chain from CompuPro to the customer. They provide technical support, service, custom systems, and support of smaller dealers with fewer technical resources. The first System Center was Gifford Computer, owned by Dale Gifford, also of G&G Engineering, the firm that first made hard disk subsystems a reality for CompuPro hardware. Most of the System Centers choose the Fujitsu or Memorex 8" drive. All use the G&G/CompuPro system software. Having had one of each on other CompuPro systems, I can attest to their speed and reliability.

I had a few problems with the 8/16 in multiuser mode. One of them was traced to a faulty 50-pin connector going to the disk drives. Another one, which remained unsolved, was that one user would occasionally cause another to crash. For example, if two users were running WordStar and one exited, the other would sometimes find himself out of WordStar and back at the system level. This only happened when both users were running 8-bit programs and did not seem to follow any set pattern. The folks at CompuPro were stumped, as this is evidently not a problem on other 8/16 systems.

Although the 8/16 is fast, I liken its performance to that of a dragster compared to a sports car. It's super in a straight line, but it isn't so adaptable when things get twisty. Slower machines can appear to outperform it through good hardware design. Specifically, the lack of interrupt-driven I/O is a limiting factor. This is somewhat ironic, since CompuPro has a very sophisticated I/O processor (the MPX board) that could be integrated into this system. The real measure of how "fast" a system is does not lie in clock speed, but in how quickly it can process characters from the keyboard. A "fast" system is one that can convince the user that he is not being ignored.

RAM disk is one way to accelerate the performance of a system, but is not without some risk. There is no disputing the speed of the M-Drive/H on this system. However, I would never depend on it unless the system were connected to an uninterruptible power supply. Systems like XENIX do their work with RAM copies of disk files, but the operating system automatically writes changed buffers back to disk several times a minute. MP/M has no equivalent capability. Furthermore, you wouldn't want it in a floppy disk environment.

On the other hand, I know of a fellow in California who teaches dBASE II programming with the aid of an 8/16C. He has half a dozen terminals hooked up to it, and his students use them simultaneously. There is an electronics design shop on the East Coast that uses an 8/16 to support four engineers and a secretary. They run everything from word processing to a C compiler to spreadsheets. The machine comes with dBASE II and Sorcim's Supercalc-86, by the way. As you might expect, Supercalc really flies at 12 MHz on the 8088.

Ithaca Intersystems Encore

The Encore is a departure from Ithaca Intersystems' standard line of S-100 machines. Although it uses an S-100 bus, the power lines are all regulated, and the on-board regulators have been removed. Some contend that the S-100 bus should have been designed this way in the first place, but it wasn't, so you can't use regular S-100 cards in this machine without modifying them. The reason they modified the boards was so they could use a compact, cool-running switching power supply instead of the usual behemoth. Another interesting difference in Intersystems boards is that they do a parity check on all board-to-board data transfers. One of the non-defined S-100 lines is used as a ninth bit, and another is used as a parity request line. True to the S-100 standard (even though the power arrangement makes them nonstandard), the feature is automatically disabled when boards incapable of providing parity are mixed into the system. Selection of state-of-the-art components permitted Intersystems to pack this machine with a lot of features. There's an 8" floppy for compatibility with the CP/M world, a 5¼" Winchester and room for a "removable Winchester" (which is surely a contradiction in terms) and a 5¼" floppy. The Encore that I tested had a 10 MB hard disk and no SyQuest. The floppy is a Shugart half-height unit. It also had a half megabyte of dynamic RAM, which, in addition to user areas under MP/M, also holds a track buffer for disk access. It is an adaptation of the Intersystems Cache BIOS, reworked for MP/M. It buffers disk directory information, in addition to the most recently used sectors. This really accelerates the system's performance. Large chunks of WordStar overlays, files you are accessing, and system utilities wind up in the buffers when you use them repeatedly. Thus, even the hard disk is accessed less frequently, and everything gets done faster.

In addition to MP/M, the Encore also comes with a proprietary Intersystems word processing package and Pascal/Z. Pascal/Z was one of the first true Pascal compilers for CP/M which, despite a buggy beginning, has gained wide acceptance and has a very active user group. I didn't get a chance to try the word processor, but it looked like good quality stuff.

Booting the Encore for the first time produced a horrendous grating sound from the floppy disk drive. At first I feared that something was wrong, but it was nothing more than the sound the stepper motor makes at slow speeds. After the system is all set up, it boots from the hard disk. No more horrible noises. My test machine supported five users and a serial printer. If you're used to a 4 MHz unbuffered system like the Altos 8000-10, you'll notice the difference on this machine immediately. Cold loads of big programs are no faster, since it always takes a finite amount of time to get programs off the hard disk, but actual operation is significantly better. User setup is done via a convenient menu-driven program that permits each terminal to run at different speeds and have different device characteristics. Thus I was able to set up one port to answer a Hayes Smartmodem and used MP/M's version of Submit to route the caller into a password/login program.

I've done this on several MP/M systems, and it works well. The configuration program, ICONFIG, is powerful, but potentially confusing for a new user. Some of the available options require "tuning" decisions, and there is precious little discussion in the documentation to guide you. For instance, into how many logical drives do you want to divide your hard disk? How many directory entries do you want? Do you want to use Cache BIOS's write-back feature? How often? There should be a simplified version of this program that takes some standard default values. But I'm carping. Experienced users will really appreciate the tailoring power of this program.

There is another system-tuning aid called Command Mode. Pressing a certain (user-definable) control code during normal operations puts you into a BIOS-resident system monitor. It allows you to display the contents of various queues, toggle various analytical and running modes, and get a general "window" into the operating system while it's running. I was impressed. The average business user will never know or care that this feature is there, but if you are at all curious about the internal operation of Cache BIOS, it is fascinating.

Documentation

I've reserved a separate subsection for documentation because it is becoming more and more critical to the success of a product. It is also an area in which such dissimilar machines can be successfully compared.

Intersystems was the hands-down winner. The documentation came in two large, well-prepared three-ring binders, one for hardware, the other for software. In addition to the usual Digital Research manuals, there are workmanlike manuals for the hardware and the software unique to the Encore. The hardware manual explains the system on a board-by-board basis, and an overview chapter ties it all together. There is complete documentation for the word processing package and the Intersystems-supplied utilities.

From the standpoint of sheer volume, the Altos 586 should get some kind of prize. The documentation for the XENIX development system, coupled with a book on XENIX and all of the hardware-specific manuals, nearly outweighed the machine. This is not an exaggeration. There are literally thousands of pages, most of which, fortunately, you'll never have to read. The sheer volume makes for some basic disorganization. Some of the facts you need to know are in the book, some are in a hardware manual, and others are in an "Intro to XENIX" prepared by Altos. I can't really comment on the quality of the documentation, since it comes from all over and was written by many different people at many different times. In a way, it would be like knocking the literary quality of the Dead Sea Scrolls, but the bottom line is that it's pretty unreadable. My UNIX-savvy friend (he works in the UNIX development department at Bell Labs) could only say that "It reeks of Berkeley."

If brevity is the soul of wit, then CompuPro's manuals are hilarious. You get little more than a hardware manual for each of the boards and a brief writeup on MP/M 8/16. You do get an impressive number of Digital Research manuals, since the machine is shipped with three operating systems; CP/M-80, CP/M-86, and MP/M-86. Yep, you get 'em all, regardless of the inherent duplication. CompuPro is still selling to the hardware sophisticate. No neophyte could make heads or tails of all this. They should have included a copy of their excellent primer, *Bits, Bytes and Buzzwords.* Maybe I'm wrong, but I think the days when you can sell hardware on its technical specifications alone are over. Since dBASE and Supercalc-86 are provided, you get documentation for them, too. The dBASE manual is rebound into book form instead of the three-ring binder—a convenience.

Summing it up

I'll make no bones about it. I fell in love with the Altos 586. The amount that I had to learn about UNIX and the amount of time I had to do it in were horrendous. Shells are friendly to the beginner; UNIX is not. But I saw the inherent beauty and simplicity of this operating system, and saw it executed quickly and flawlessly on an amazingly inexpensive microcomputer. So what if I had to throw away everything I ever learned about CP/M? The 586 is a time machine—one that will transport us into the future.

Ithaca Intersystems' Encore is another outstanding example of how to be a successful multiuser micro. It doesn't write off 8-bit processors as incapable of handling multiple users, but draws on the inherent strengths of the hardware in a design that maximizes performance. The result is an environment familiar to CP/M users that provides true multiuser capabilities.

The 8/16 is CompuPro's first cut at an integrated system. While the design and performance of the hardware, taken on a board-by-board basis, is exemplary, it needs better integration with the operating system. As I mentioned above, it also needs to be interrupt driven if it is to live up to its potential. I tend to view the 8/16C as a transitional system, one that sets us up for the potentially phenomenal performance of the upcoming 16-bit processors like the 80286, while maintaining ties to CP/M. CompuPro is very much on top of the upcoming generation of superchips, but by no means do they have an exclusive.

Dennis Thovson's review of CompuPro's MPX board in the May 1983 *Microsystems* makes the point that interrupts are beyond the capabilities of the casual hacker. So are the innards of the multiuser operating systems. Manufacturers must not be afraid to incorporate all the high-tech components necesssary to make a system perform properly. Furthermore, they must pay for the software engineering to make it work. Lastly, they should charge whatever they have to for such systems. If the quality is there, they can't miss. Sales volumes will pay for the development costs.

Finally, be prepared to leave CP/M behind (O Heresy!) if it doesn't do the job for you anymore. Don't get me wrong; I'm writing this article on a CP/M system and will have one at home for years to come. At work, however, wherever that may be, it's a whole different ball game.

Prices: Altos 586-10, $7,990; CompuPro's 8/16C, $8,995; Encore (configuration reviewed here), $8,995.

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