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UNIX/WORLD

YOUR GUIDE TO THE FUTURE OF MULTIUSER COMPUTING

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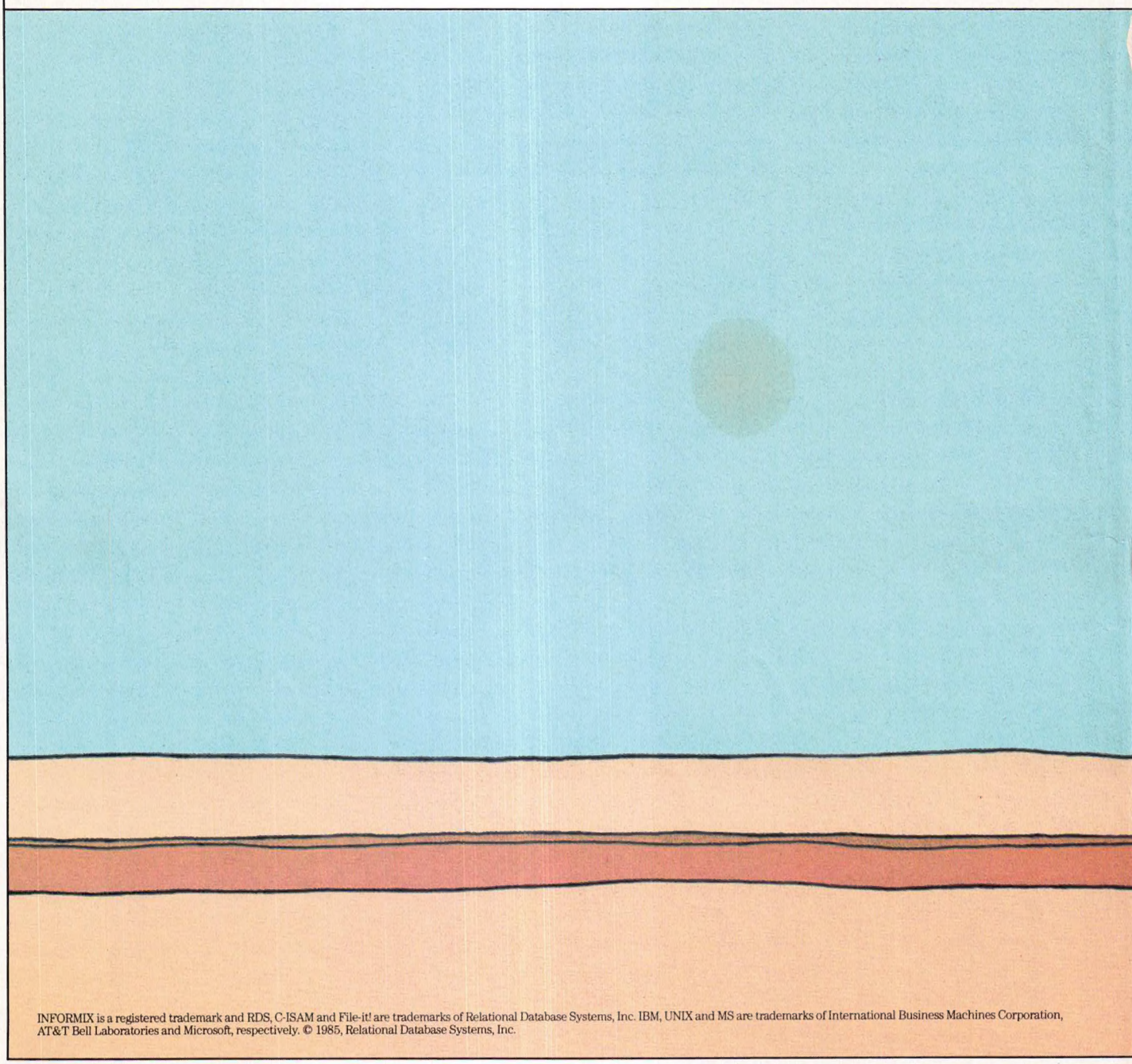

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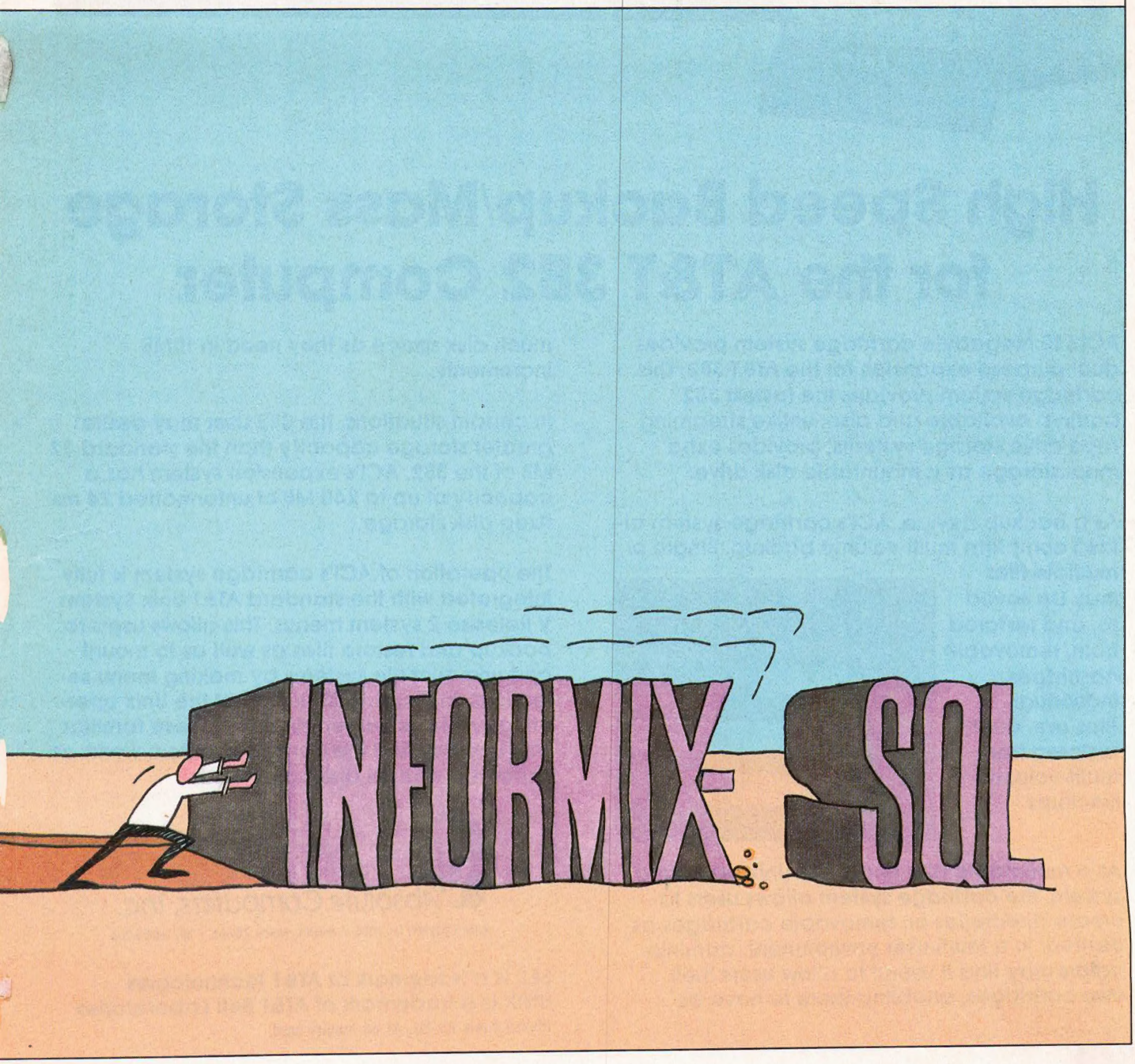

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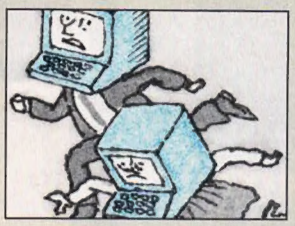

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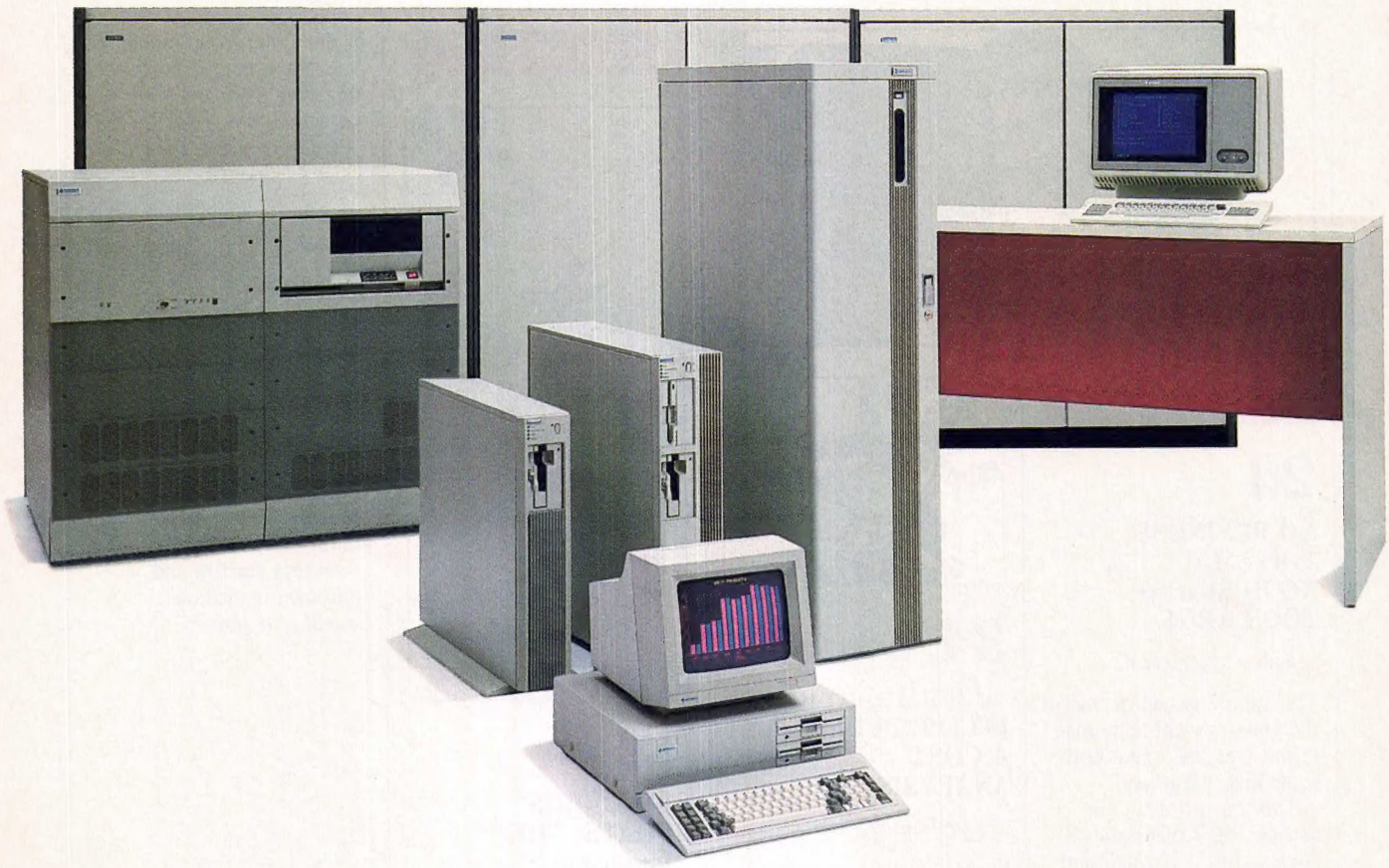

The UNIX* operating system from PC to mainframe.

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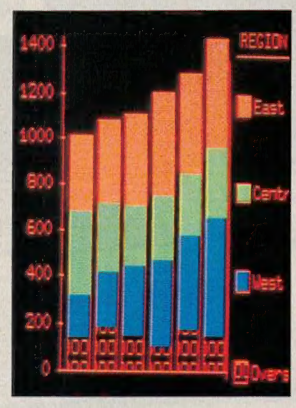

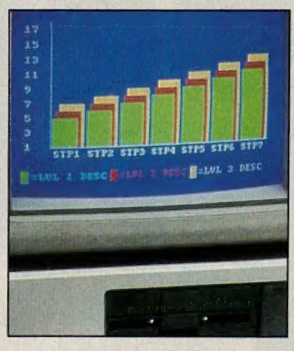

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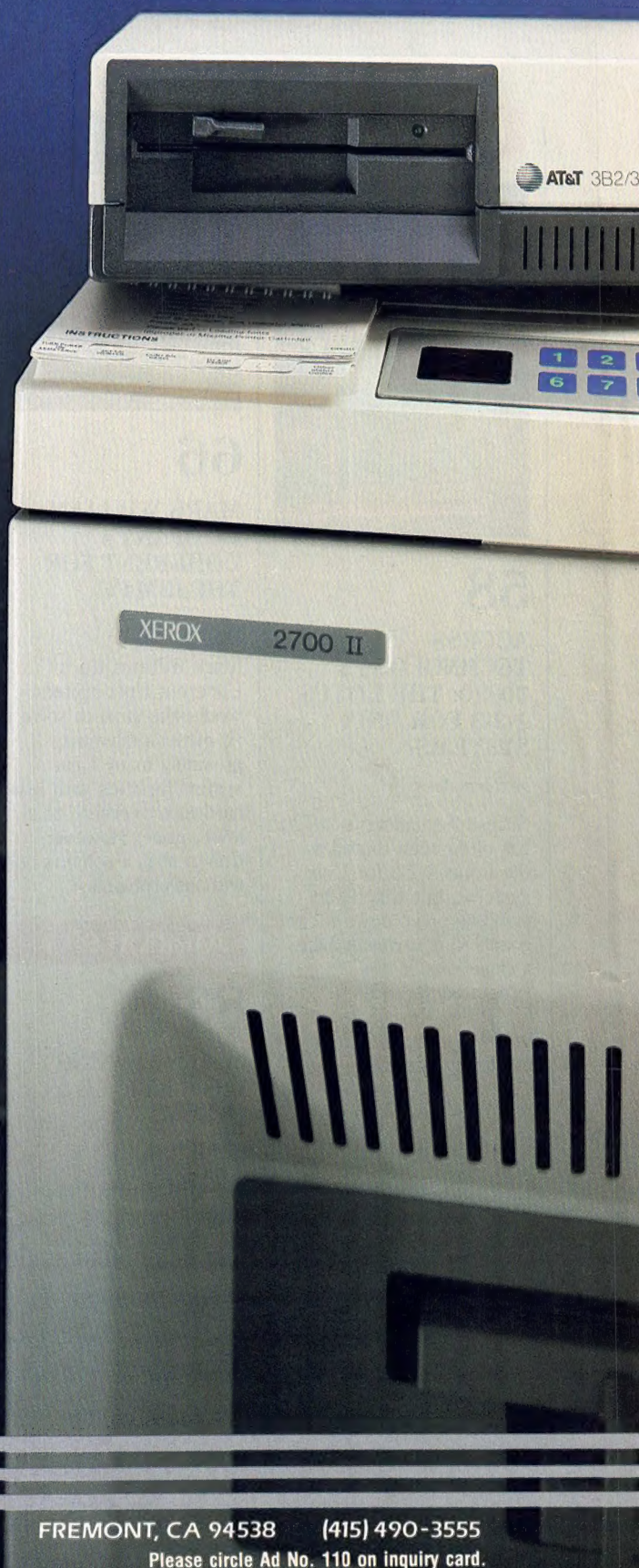
The Expression of Power



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EDITOR'S CONSOLE

I've had enough! No more Mister Nice Guy, no more apologies for the Unix system. It's time to take the gloves off and come out slugging.

Despite the repetitive ravings of those whose vested interests lie in the continued proliferation of stand-alone personal computers, the new wave of computing for businesses small and large belongs to shared-resource multiuser systems—most of which run or will run the Unix system.

Why? Because businesses can no longer afford to let workers plod along in isolation, unaware and uninformed of what is taking place in the office just on the other side of the wall. PCs, more than any other computing technology ever invented, have led to an enormous corruption of data. Managers can't come together to make a joint decision to benefit the entire company if each is working with *different data* stored in individual personal databases (on each person's PC hard disk).

Now the naysayers and vested interests say the solution to your business needs is networked personal computers, as if the personal computer was ever intended to be the panacea for all users. Baloney! *Not one* of the proposed network solutions from IBM, Apple, or anybody else can solve the shared data problem. They can't.

Moreover, while the growth of Unix system applications software has been slow, the growth of applications capable of running over PC networks in a shared multiuser mode is nil. Then there's also the whole site licensing conundrum that the vested interests aren't telling you about either.

Don't be fooled! The original IBM PC architecture (the Intel 8088/PC-DOS combo) is today's throwaway technology. Sophisticated users are moving on to Intel 80286- and Motorola 68000-based machines running Unix, Xenix, and work-alike operating systems.

Nor should Dick Pick and his disciples or Chuck Lombardo and the S1 flakes start kidding anybody this late in the multiuser game. The Unix system is the only multiuser, multitasking operating system available today with the necessary accoutrements (portability, widespread support from large and small vendors, momentum, software, etc.) to set an industry standard.

The sad fact is that what's important to most users about the Unix system—its multiuser, multitasking, communications, and shared data capabilities—has been largely ignored by the so-called industry experts. It's time now for the critics to admit the Unix system's undeniable role and get on with it. □

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Editor-in-Chief

UNIX/WORLD

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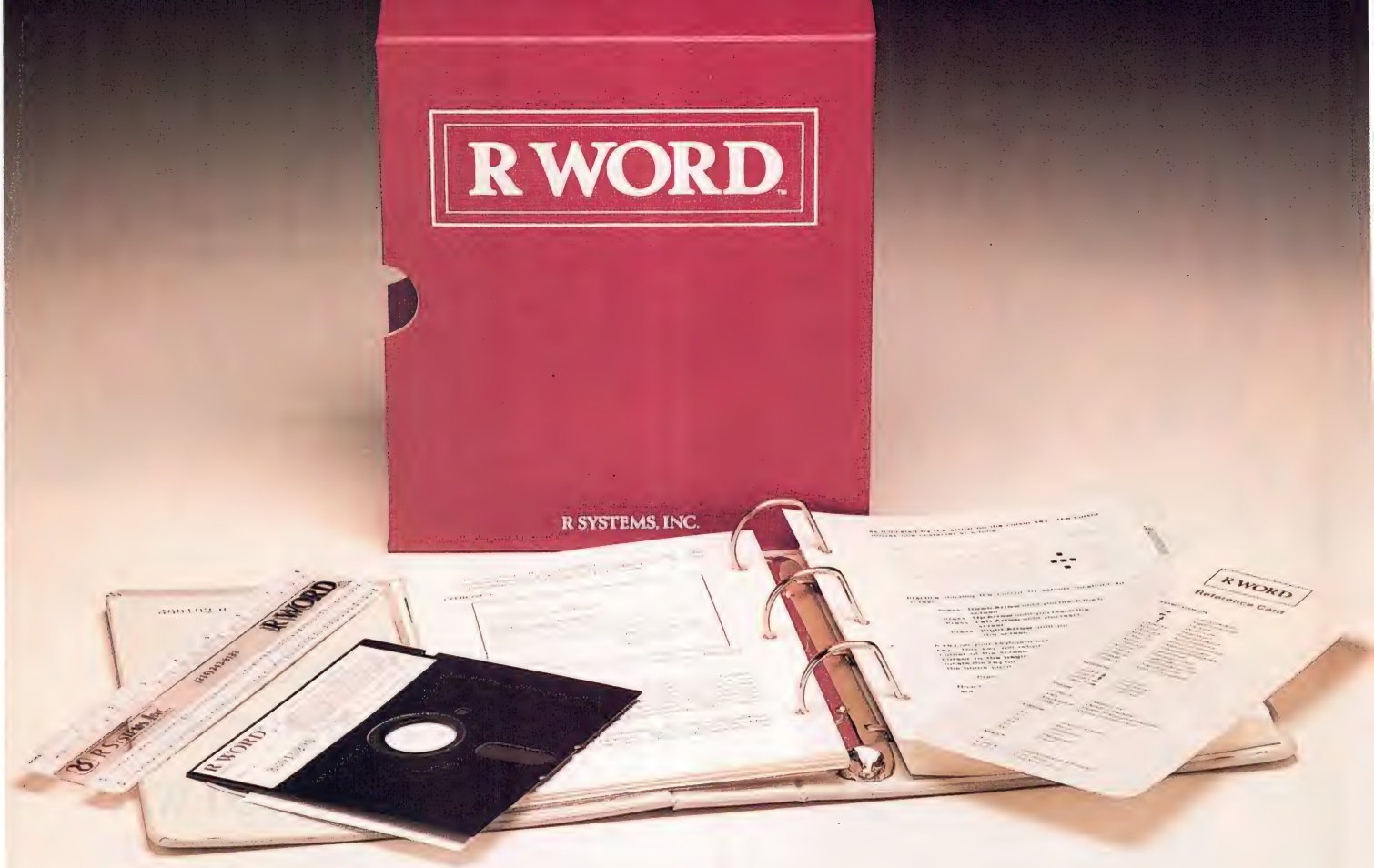

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FOR THE RECORD

Top of the News... AT&T's desktop Unix System V-based machine, the industry's worst-kept secret in a decade, at long last saw the official light of day just as we were going to press. Dubbed the AT&T Unix PC Model 7300, the box pulls no unexpected punches, technologically speaking (Unix System 5.2, communications ports, **Motorola** 68010). Yet it clearly stands out as one of the major products of 1985, both inside and outside the Unix system community. Most importantly, perhaps the machine offers the first serious competitive thrust by AT&T against **IBM** and **Apple** for the desktops of corporate America (against the PC/AT and Macintosh XL, respectively). It also brings an easy-to-use front-end ("user-agent," in AT&T lingo), combining mouse, window manager, icons, on-line help facilities, and soft function keys to the Unix system for the first time. In fact, many analysts believe the Unix PC goes further in fulfilling the promise of those new interface technologies than any other commercial product thus far. There are a few other pluses to give the machine more mass-market sex appeal—optional multiuser capabilities and standard integrated telephony functions, to name but two. Undoubtedly, the Unix PC will play a critical role in the general acceptance of the Unix system and of Unix system-based products in the broad mass market for commercial applications. (Look for an in-depth analysis in next month's "Inside Edge.") If this product doesn't make it, observers said, then more than likely the Unix system won't. The Unix PC's first casualty, in the opinion of many analysts and observers, is the Macintosh XL. Sorry, Apple. Three strikes and Lisa is (finally) out!

Here's a rundown of the basic hardware and software on the Unix PC: a 10-MHz Motorola 68010; a standard 512K bytes of main memory, expandable to 2 Mbytes with 512K-byte boards; 103-key keyboard and integrated three-button mouse; three expansion slots; either 10 Mbytes (standard) or 20 Mbytes of Winchester hard-disk storage; one 5 1/4-inch, 360K-byte diskette with a PC Read function that enables MS-DOS data diskettes to be read into Unix PC files; a bit-mapped, 12-inch, monochromatic, 20-MHz screen with tilt-and-swivel capabilities; Unix System 5.2 bundled with a telephone manager, asynchronous terminal emulator, diagnostics, print spooler, UUCP, user interface, Graphic Software System's drivers, and demand-paged, virtual memory. An entry-level configuration for the AT&T Unix PC with 512K bytes of main memory and a 10-Mbyte hard disk costs $5095. A more fully configured machine with 1 Mbyte of memory and a 20-Mbyte hard disk is priced at $6095.

AT&T also released 28 systems and applications software packages for the Unix PC, including the following: **Ryan-McFarland's** RM/COBOL Run Time and Compiler; **Language Processors Inc.'s** LPI-C, LPI-COBOL, LPI-Pascal, LPI Run Time, and LPI Debug languages and development tools; AT&T's Unix PC Unix Utilities, Development Tools, and Basic Interpreter and Compiler; SVS' FORTRAN and Pascal; AT&T's Unix PC Electronic Mail, Unix PC Word Processor, Unix PC Business Graphics, and the five-module Unix PC Business Accounting System; **Microsoft's** Word, Multiplan, and Basic Interpreter; **Access Technology's** 20/20 integrated financial analysis package; **Ashton-Tate's** dBase III; Graphic Software System's-Chart, and **CDI's** Sound Presentations. AT&T also promised it would announce 25 more software packages in May and another 25 in June of this year. Stay tuned...

Last but not least... Let's not overlook the other three products AT&T announced on the same day as the Unix PC, all of which should be instrumental in helping AT&T compete with IBM and the other office automation players: *(one)* a small, high-speed local-area network called AT&T Starlan, capable of linking Unix system and MS-DOS machines together for about $700 to $800 per connection; *(two)* the AT&T Personal Terminal, a $1795 touch-screen manager's workstation for businesses with AT&T System 75 or 85 PBXs; and *(three)* several enhancements for the PC 6300, including Xenix 3.0 from the **Santa Cruz Operation,** a communications manager, an 8087-2 co-processor, a mouse, a new version with a 20-Mbyte hard disk and 512K bytes of main memory, and a new graphics board.

Future Predicts... At a recent seminar in San Francisco on the role of the Unix and Xenix systems on personal computers, **Future Computing Inc.'s** chairman, Egil Juliussen, said that what the Unix system market needs to kick it to life is a "hit box," a single product that is such a phenomenon that it brings the entire market to life, much as the original IBM PC did for personal computers. What would such a Unix system machine

look like? Well, according to Juliussen, the machine must run "standard Unix" (whatever AT&T endorses), be single-user with multiuser options, use either the 68000 or 80286 microprocessor, be made by a major manufacturer, and have strong communications capabilities. Sound familiar? Like the AT&T Unix PC. Perhaps also like the PC/AT, when equipped with the proper accoutrements.

Yates Predicts... One for the "not to be outdone" department. While at a **Fortune Systems** luncheon for the company's dealers and VARs held in San Mateo, Calif., in March, the indomitable Jean Yates, chief Unix system market cheerleader, leading researcher/forecaster, and one-time *Cosmo* girl, tried to shock the UNIX/WORLD staff by lavishing on us a few off-the-cuff predictions. First, the jovial Yates threw one out that she said we wouldn't believe—that AT&T would finish 1985 by dethroning **Compaq** as the number two supplier of MS-DOS-based personal computers. We said we weren't surprised at all, and that we agreed with her. It's generally agreed that Compaq's days of profitless success are numbered. She next tried to shock us with this one—that AT&T will be number one in supermicros inside of two years! We didn't have a hard time with that one either, we told her. It's either AT&T or IBM, that's it. But she wouldn't give up. Jean finally predicted the fourth quarter '85 appearance of a Unix-system based RISC workstation from IBM for scientific and engineering applications. Com'on Jean, you can do better than that!

Rumors of the Month... After making a big to-do about the Unix system marketplace, **Honeywell Information Systems** group has pulled from the market its QX workstation, first previewed last July in Volume 1, No. 3 of UNIX/WORLD. Now we hear that Honeywell is bidding on a large government contract for some thousands of Unix system-based supermicros and workstations using **Plexus** machines and possibly **Convergent Technologies Inc.** workstations... As we were going to press, we heard definite rumblings that a major shakeup was afoot at Fortune Systems Corp., the Redwood City, Calif., loss-plagued supermicro house. Stay tuned.

Contracts... **Integrated Business Computers** (IBC), Chatsworth, Calif., has announced the sale of 200 multiuser, 16-bit microcomputers to the People's Republic of China. The total retail value of the order is approximately $3.6 million...**TouchStone Software Corp.**, Seal Beach, Calif., has signed a major software licensing agreement with Fortune Systems Corp., Redwood City, Calif. The pact calls for a "customized" version of TouchStone's PCworks and UniHost products that will allow the Fortune 1000 workstation and industry-standard PCs to communicate with the Fortune 32:16 Unix computer...**RealWorld Corp.**, Concord, N.H., has appointed **Financial Information Systems** (F.I.S.) as distributor of its comprehensive, seven-package accounting system. The distribution agreement allows the Phoenix-based F.I.S. to market the RealWorld system through **AT&T Information Systems** and its VARs for use on the AT&T 3B2 and 7300 microcomputers under Unix System V... Applix Inc., Westboro, Mass., has signed a marketing agreement with **Computer Sciences Corp.** (CSC) to market Applix's office software system, Alis (see UNIX/WORLD, March 1985).

Noted... **Apollo Computer Inc.**, Chelmsford, Mass., has shipped its 10,000th unit, a DN320 superminicomputer, to **General Dynamics** Convair Division, San Diego, Calif...**National Information Systems** is proud to announce that both the Accent R fourth-generation language and VUE project management system have won ICP Million Dollar Awards... A Flex/32 MultiComputer was delivered in March to the **Center for Parallel and Vector Computation** (PARVEC) at Purdue University, according to **Flexible Computer Corp.**, Dallas. The Flex/32 will be used to explore parallel programming environments, the use of a massively parallel multicomputer for solving partial differential equations, and other parallel algorithms. □

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This space is yours. Tell us what we're doing right—or wrong. Raise issues and ideas that other readers may respond to. Propose projects. Reject market trends. Take a stand.

LOOKING FOR A HAND

Dear Editor:

I was very interested to read the article "Pseudo-Device Provides SNA Communications for the Unix System" in Vol. 1, No. 7.

I am designing and implementing the emulation system for IBM 3270/3278 with the Unix system Version 7. In the case of our country, the native language, Korean, always raises some problems in implementing the applications software. The author of the article may help us.

Please let me know the author's address. (Network address of UUCP or CSNET is better than postal address.)

Also, I want to find some reviews on public domain sources of software and kinds of the interface boards for Multibus.

Thank you for your endeavor to produce a good magazine.

Chul Chung
Department of Computer Science
KAIST/ SALAB
P.O. Box 150 Chongryang
Seoul, Republic of Korea, 131

Editor's Reply: The article to which you refer was written by Robert Heath of NCR Corp., whose address I will forward to you posthaste. As for the other request, I am at a loss. Would any readers who do know please write to Mr. Chung. —Philip J. Gill

VENDOR GETS FREE AD

Dear Editor:

This letter represents yet another in my unceasing crusade to assure that publications accurately portray Venix when it is referenced. Venix/86, developed by VenturCom and published by Unisource Software Corp. of Cambridge, Mass., was the first licensed Unix operating system for the IBM PC/AT, PC/XT, and certain compatible personal computers. In your February issue, C.A. Felong and Harry Avant reviewed Xenix from The Santa Cruz Operation. In the article they incorrectly report and misrepresent characteristics of Venix on several occasions, namely:

(one) They state that "Venix requires a little less disk space." Well, yes, 3.5 Mbytes is less than the 6-9 Mbytes that Xenix reportedly needs. I, however, would consider 42 percent to 61 percent less to be more than "a little less." Since this difference represents at least one-fourth of the PC/XT's hard disk, I'd call that significant.

(two) They state that "Venix is slightly less expensive." Xenix with the development package and text processing is $1350. Venix/86 is either $800 (two-user license) or $1000 (three-to-eight-user license). Thus Venix/86 is either 26 percent or 41 percent cheaper. That too I consider to be a significant rather than "slight" difference.

(three) Venix/86, Version 2.0 (Encore), released in November 1984, has record locking.

(four) I do not agree that Xenix performance is "within 5 percent of Venix." Perhaps the fact that Xenix requires much more RAM to operate (for example, a minimum 384K bytes versus 256K bytes) was not taken into consideration in the comparison. I note that a full 640K bytes was used in your evaluation of Xenix!

Thanks as always for the opportunity to look over your shoulder.

Sincerely,

Clayton D. Clatur
Executive Vice President
Unisource Software Corp.

Editor's Reply: What are you and Greg Graham trying to hide? Over the last year, various editors from this magazine have attempted to shake loose a review copy of Venix/86 from you or VenturCom to prove or disprove what you say about Venix/86, but to no avail. It's time for Unisource and VenturCom to stop stonewalling, and either put up or shut up. —Philip J. Gill

VAXINATIONS

Dear Editor:

I enjoyed reading your February issue; it was very enlightening. One point that continually surfaced in articles and letters was the advantages of min-

Continued on page 16

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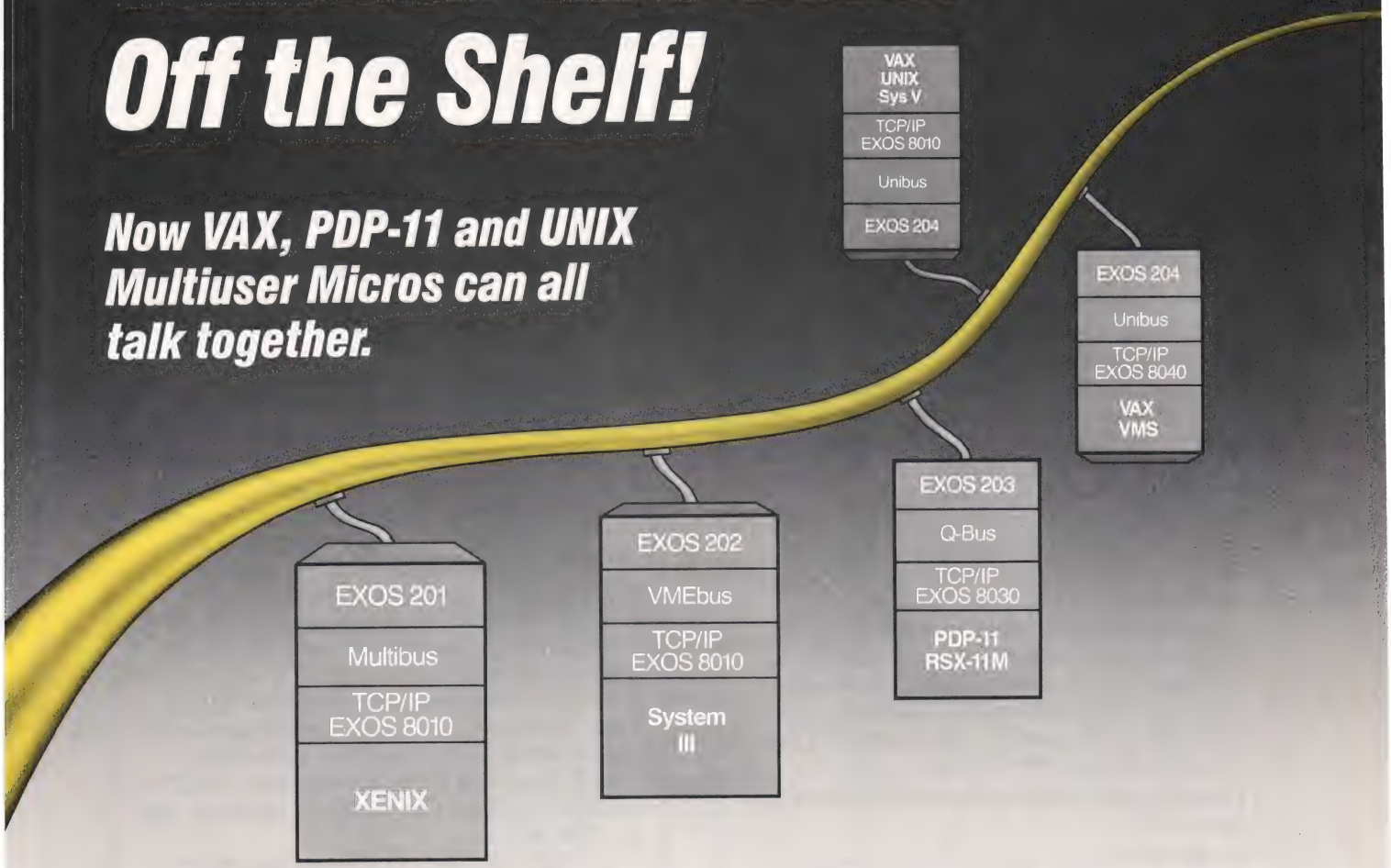

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imizing the numbers of system architectures and operating systems that companies and people have to deal with. It is ironic that the Unix system, which is intended to be the operating system that will provide a common user and programmer environment, exists in many significantly incompatible variations.

I'd like to share my opinion of utopia with you.

Imagine an operating system that includes or does the following: has a command language comprised of English words; supports hierarchical directories; has a virtual memory architecture; supports on-line and batch environments and spooled printers; provides utilities for evaluating the differences between files, searching through files, sending electronic mail, creating simple text files or full documents; implements many security features; provides for networking as an integral part of the operating system (`node :: device: [directory] filename. extension; version`); provides "Help" and "Message" utilities and common calling sequences; supports 13 languages; runs on small multiuser team computers, huge multiprocessor configurations, and everything in between; and can be managed by your average computer-savvy person.

Does this sound like utopia to you? Does it sound far-fetched?

It's all available *now.* The best-kept secret in the world of computers . . . It's VAX/VMS from DEC. I've been using it for years, and I'm fully VAXinated . . . especially now that Version 4.0 is available.

This is a winning combination that I rarely see written up in articles in any magazine, yet I can't think of an operating system on earth that beats it for general-purpose uses.

Terrific multiuser computing not only lies in the future, it is here now.

Jim Prevo
Williston, Vt.

Editor's Reply: VMS still has one insurmountable problem that the Unix system does not: It is a proprietary operating system inexorably linked to one, and only one, vendor's hardware. Thus, it cannot qualify as an industry standard-bearer, also one of the themes repeated in our articles time after time. —Philip J. Gill

A PORTING UPDATE

Dear Editor:

As founder of Palomino Computer Systems Inc., I read the porting article by Vanessa Schnatmeier ("Wizards' Woes: The Problems of Porting") in Vol. 1, No. 6 with great interest. In that article, the author referred to the Unix Porting Kit under development by Palomino. I'd like to respond to the comments made about this porting kit.

First, the Unix Porting Kit will be restricted to Unix System V versions as released by AT&T. The addition of nonstandard features from other Unix systems (such as 4.2BSD) will be the responsibility of the system developer.

Second, the kit will be restricted to the Motorola M68000 family of microprocessors when first developed. Porting kits for the National, Intel, and Zilog microprocessors will follow when, and if, they complete their AT&T-sanctioned System V ports.

Third, the Porting Kit will permit experienced engineers (not Unix system experts!) to port their systems from as few as two man-months to as long as ten man-months. (Don't let anyone tell you that it takes a "guru" to port the Unix system.)

Fourth, the port does not include quality assurance, packaging, licensing, printing, manufacturing, software reproduction, documentation tailoring, etc., which should be included in the length of time necessary to bring a Unix system product to market. Palomino estimates that taking Unix to market, even with this porting kit, will take from three to nine months. We know of no way to bring a product to market any faster.

Last, the Porting Kit will consist of an integrated hardware/software system plus a Unix source license. Its price, though not yet set, will be mildly expensive while being completely reasonable for its benefits. No one should expect that buying technology of this sort will be cheap.

Thank you,

Luke C. Dion
Vice President
Palomino Computer Systems Inc.
Tempe, Ariz.

IBM UNVEILS UNIX V FOR MAINFRAMES, SERIES/1

BY OMRI SERLIN

With the announcement of IX/370, IBM deprived Unix system promoters of their last excuse for why their pet operating system hasn't yet conquered the world. Previously, every time the Unix system won a major supporter (HP and Sperry, for example) and still failed to become pervasive, its fans would whip out their ace in the hole: "Wait until IBM blesses it." Now, IBM has; if the Unix system fails to catch on now, chances are it never will.

True, the product is a bit expensive, starting at $10,000 (binary only). It runs only as a guest under VM; it is based on the "old" release (January 1983 vintage); and the required configuration is a bit awkward (a 43XX or a 30XX with a minimum of 4 Mbytes and a Series/1 minicomputer acting as a front-end terminal controller). Still, this is clearly the most important endorsement of Unix System V to date.

IBM will most likely *not* market IX/370 aggressively. The product is merely meant for "applications where Unix is a requirement," an IBM spokesman said, meaning that it's there to satisfy those customers who insist on the Unix system (as apparently many in the federal government and defense establishment are doing already).

Some analysts suggested that the move was a response to the UTS/V announcement by Amdahl and AT&T. The more likely scenario is that Amdahl rushed to make its announcement at the January UniForum in order to blunt the impact of the IBM announcement, which has been in the works for quite awhile.

PREVIOUS OFFERINGS

IBM previously tested the waters with VM/IX, a Unix System III-based product that also runs on IBM mainframes as a guest under VM. Now, Big Blue has apparently concluded that there is enough demand to justify the product. The result is IX/370.

A range of Unix system versions have previously been offered by several IBM organizations, including the following: Telecommunications Carrier Products Independent Business Unit (IBU), which offered CPIX, a Version 7-based product for the Series/1; IBM Instruments, which offers Xenix for its M68000-based 9000; the Entry Systems Division, which also offers Xenix, this time for the PC/AT; and the Information Programming Services IBU, which managed the System III-based PC/IX and VM/IX products, supplied by Interactive Systems. IX/370 also contains several of Interactive Systems' products. In addition, the Academic Information Systems (ACIS) IBU is involved in a number of university projects that will support National Semiconductor's Genix, a 4.1BSD-based system.

News Summary: Along with the introduction of the 3090 models 200 and 400 (previously code-named "Sierra"), IBM disclosed plans to support IX/370, a Unix System V-based product operating as a guest under the IBM VM/SP operating system. Although the product is a bit expensive and requires a Series/1 minicomputer as a communications controller, it is the most important endorsement System V has received to date. IBM, however, is not expected to market it aggressively. A more limited version of Unix System V will also be available for the IBM Series/1 16-bit minicomputer.

A few days after the IX/370 announcement, the Independent Systems Group (ISG) also unveiled a System V-based, stand-alone operating system for the Series/1, IBM's venerable 16-bit minicomputer. Although Series/1 IX is much more limited (for example, no FORTRAN), it indicates that IBM is moving toward adopting System V as a standard. To coordinate its diverse Unix system efforts, IBM recently established a "task force," headed by Robert Blake and based in Princeton, N.J.

Unlike VM/IX, which was a "special order" item and which was available only to a select group of customers, IX/370 is a standard licensed program. It is available with full IBM support to any customer having a 4361 or larger machine—the heartland of IBM's mainframes.

IX/370 is based on System V, Release 2.0, with enhancements by both IBM and Interactive Systems. IBM has a System V distribution license with AT&T and will pay royalties to AT&T. IX/370 runs under VM/SP, with or without the high-performance option (HPO).

IX/370 encompasses most of System V's standard features, including the standard (Bourne) shell, `ed`, `ex`, `sed`, and `vi` editors, the Source Code Control System (SCCS), UUCP, source code debugger `sdb`,

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`lex`, `yacc`, `lint`, `nroff`, `troff`, `spell`, C, and FORTRAN (f77).

ENHANCEMENTS

Among the enhancements introduced by IBM is demand-paged virtual memory support. Each Unix system process sees an 8-Mbyte virtual space regardless of the machine's memory size or the number of processes. Because the Unix system is running under VM, the processor can be shared by multiple IX/370s, as well as by CMS and other "guest" systems.

Another IBM enhancement increases the file system block size to 4096 bytes, up from the standard 512 bytes. This is a key to improving the otherwise poor Unix tile system performance. IBM also added special provisions for optimizing small files, as well as an extended file- and record-locking facility, `lockf`.

Among the Interactive Systems enhancements are INed, a full-screen, multiwindow editor; INmail, an electronic mail system; INnet, a facility for both intra- and intersystem communications; and `connect`, a command that allows PC/IX to act as both a main Unix system and as a terminal to a mainframe running IX/370.

Features of System V *not* supported include remote job entry, `crypt` and `cu` (callunix) commands, and the on-line manuals feature. Also omitted are any programs oriented to "non-IBM hardware," IBM said.

At least by implication, IBM intimated that performance of IX/370 will be unimpressive unless unspecified "enhanced programming support" features are first installed in the VBM/SP 3.0 or VM/SP HPO 3.4. IBM specifically warned that "applications and editors that interpret each character as it is entered on the user's terminal have the greatest impact on processor utilization and, therefore, should be used with discretion."

GOVERNED BY MANY FACTORS

Furthermore, although the Series/1 front-end can nominally handle 48 ASCII terminals, IBM noted that "the total number of terminals that can be supported will be governed by many factors, including application mix, terminal line speeds, and the workload on the IBM System/370 that is running IX/370."

Max. CSTUs*	One-Time Charge
16	$10,000
32	$20,000
64	$40,000
65 & over	$75,000

*Currently signed-on terminal users

FIGURE 1: INITIAL LICENSE FEES FOR IX/370

Initial license fees for IX/370, which is scheduled to become available in October 1985, are shown in Figure 1.

The prices shown in Figure 1 are cumulative; that is, a system originally licensed for a maximum of 16 users can be upgraded to accommodate 32 users for $10,000. An upgrade from 32 to 64 users costs $20,000, while an upgrade from 64 to more than 65 users costs $35,000.

The charge for monthly support is $475; quantity discounts are offered, beginning at 6 percent for five to nine copies, and ranging up to 15 percent for 20 or more copies. Support for multiple copies is available at $792 per month, with the user responsible for installing fixes on all secondary copies.

THE NEW IBM

Even those who should know better occasionally refer to IBM as if it were a single, powerful organism, marching to a plan carefully conceived by a single superbrain.

This myth is nurtured along by IBM's recent enormous successes, notably the dramatic shift from its posture as the provider of a price umbrella in the 1970s to that of a low-cost producer in the 1980s, and the legendary accomplishments of its personal computer thrust.

IBM itself is interested in promoting this "unified front" image. This was partly the reason for the massive reorganization IBM undertook in 1981 to 1982. At that time, its product-oriented marketing divisions, which previously had sometimes competed with each other, were replaced by customer-type marketing entities, each of which handles all standard IBM products.

The reality, of course, is that IBM is far too large an organization to ever be guided effectively by edicts from above. Armonk does make long-term strategic decisions, such as the one reached in the mid-1970s to invest untold billions in new plants and machinery to achieve low-cost production.

But tactical market and product decisions are best made by the troops in the field. That is why IBM created the independent business unit (IBU) concept. IBUs are, in effect, small, independent startup companies unburdened by corporate traditions or red tape. Their mission is to expeditiously capture evolving market opportunities. The IBM PC was conceived and swiftly brought to market

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success by one such IBU, now the Entry Systems Division (ESD).

The Stratus agreement, under which IBM for the first time obtained the right to remarket a not-invented-here, complete computer system, is just one of a number of recent events suggesting that IBM is now encouraging even its traditional "mainline" divisions to adopt more entrepreneurial postures.

NARY A BY-YOUR-LEAVE

The Stratus agreement was managed by SPD (System Products Division), evidently without as much as a "by your leave" from other IBM divisions. Many in IBM, even those closely associated with high-availability issues, were unaware of the agreement even on the day it was publicly announced. Now that the floodgates have opened, one wonders whether other such deals might be in the offing, from SPD or other IBM divisions.

The Unix system is another case in point. It was first adopted, in ad hoc, uncoordinated actions, by a number of IBUs. The Series/1 version, based on Version 7, was sponsored by the IBM Telecommunications Products IBU. PC/IX and VM/IX, both System III-based products were sponsored by the IBM Information Programming Services group. And Microsoft's Xenix was adopted by both IBM Instruments (for the 9000) and by IBM/ESD (for the PC/AT).

Now comes IX/370, an endorsement of Unix System V by none other than the Information Systems Group (ISG), the IBM division responsible for marketing all IBM standard products. ISG will also market Series/1 IX, a more limited version also based on System V. So which version of the Unix system is IBM promoting? Until just recently, the question had no answer because in this context there was no single "IBM."

As these (and other) cases clearly illustrate, the entrepreneurial license carries with it a significant risk of incompatible product strategies. So far, Armonk seems to be signaling that it is perfectly willing to assume such risks. Incompatibilities can always be smoothed over later, either through "statements of direction," as was the case in the local-area network situation; or by establishing task forces to deal with the issue, as IBM did in the case of the Unix system. The benefits of market success are well worth such annoying side effects.

The clear lesson to IBM competitors: Understand the IBM organization chart. Operational IBM divisions increasingly will determine the course of the corporation's future product strategies. Far from resisting this trend, Armonk will be cheering them on.

SHORT NOTES

CCI (Rochester, New York) and NBI (Boulder, Colo.) called off their proposed merger in early February. In a prepared statement, CCI chairman Affel and NBI president Kavanagh said they "have jointly concluded that merging the two companies would not have been in the best interest of shareholders and employees." William Stirlen, a CCI vice president, at-

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tributed the move to "differences in philosophies and style." The more likely reason: NBI has had a chance to look at CCI's books in more detail and did not like what it saw.

CCI's 1984 revenues of $131.2 million were up substantially from its 1983 revenues of $103.6 million. But earnings of $6.3 million ($0.54/share) fell sharply relative to year-ago figures ($10.4 million, or $0.87/share).

CCI will be providing the Ingres relational DBMS, marketed by Relational Technology, of Berkeley, Calif., on the 6/32.

Altos Computer (San Jose, Calif.) will be introducing new, high-end models in both its Motorola- and Intel-based multiuser supermicro lines. The Intel model that runs Xenix will feature the 286, while the Motorola model that runs System III will use the 68020. Altos will also speed up its RS-422 local net, approximately doubling its current 800K bits/sec signaling rate.

Apollo Computer (Chelmsford, Mass.) is readying a 68020-based version of its mid-range 400/600 line, now based on the original 68000. Apollo had an installed base of about 10,000 engineering workstations at the end of 1984, about half of which were shipped in 1984.

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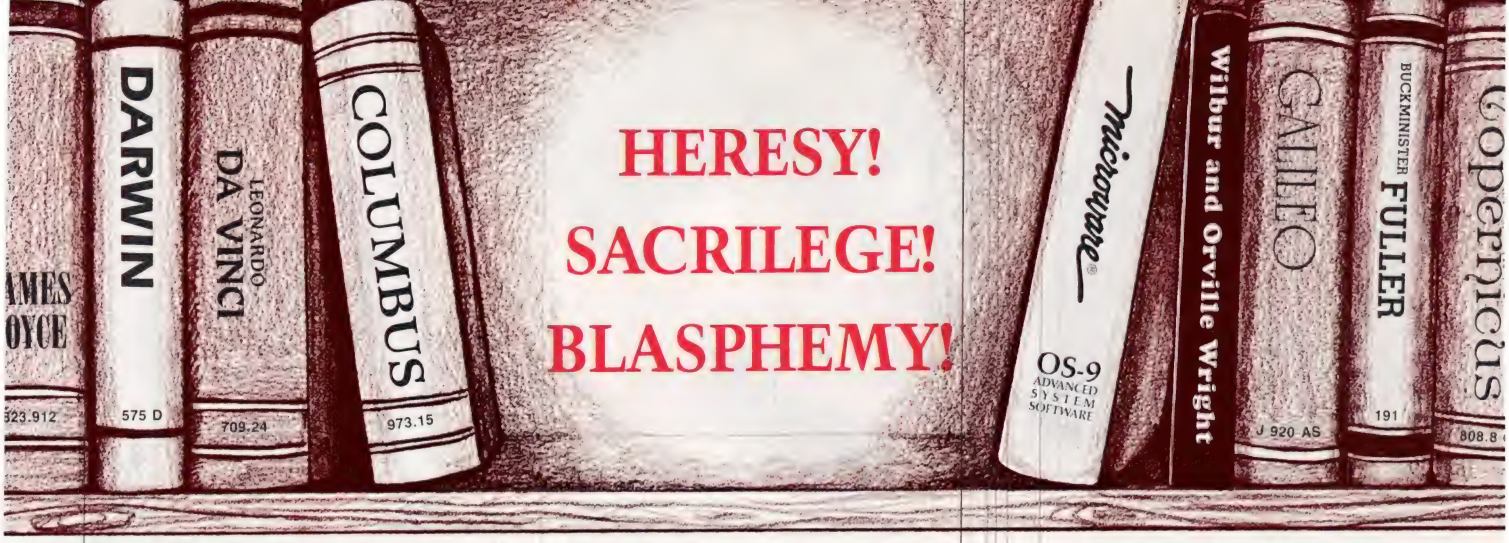
Convergent Technologies (Santa Clara, Calif.) quietly introduced in early February a low-cost version of its N'GEN workstation. The new model, dubbed Cluster Workstation, is a non-expandable, single-board implementation of the N'GEN. It is clearly a response to the IBM PC, although it will apparently not run MS-DOS in addition to CTOS, Convergent's proprietary operating system. Availability is planned for the second quarter of this year.

CT closed 1984 with a loss of $13.8 million on revenues of $361.8 million. The net loss resulted from a loss from discontinued operations (mainly Workslate writedowns) of $14.5 million, applied against income from continuing operations of $687,000. In the fourth quarter, CT lost $11.9 million on revenues of $115.5 million; that loss resulted from a $9.4 million loss on continuing operations and a loss of $2.5 million attributed to discontinued operations

DEC has introduced VAXstation 500, a color graphics workstation combining the MicroVAX I and the Tektronix 4125 286-based color graphics terminal. Prices start at $36,735. The Tektronix subsystem is available separately for $19,950.

MIPS Computer (Mountain View, Calif.), the RISC startup, has named Vaemond Crane president and CEO. Crane, whose most recent position was CEO of Computer Consoles, previously headed the Intel Systems Group. He replaces Robert Wall, the ex-H&Q exec who remains on the MIPS board. □

Omri Serlin heads ITOM International Co., a research and consulting firm in Los Altos, Calif. He is the editor/publisher of Supermicro, *a newsletter from which the material in this column was derived, and of the* FT Systems Newsletter, *a monthly covering developments in fault-tolerant systems.*



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Unix is great for big systems. You don't have to abandon Unix for software development, but consider OS-9 for your target system. You can even do OS-9 software development on Unix using Microware cross-software for VAX systems. Plus, almost any Unix program written in C can be easily recompiled for OS-9. If you know Unix, you'll be up to speed on OS-9 almost instantly. If you don't know Unix, you'll find that OS-9 is easier to learn, understand, and use.

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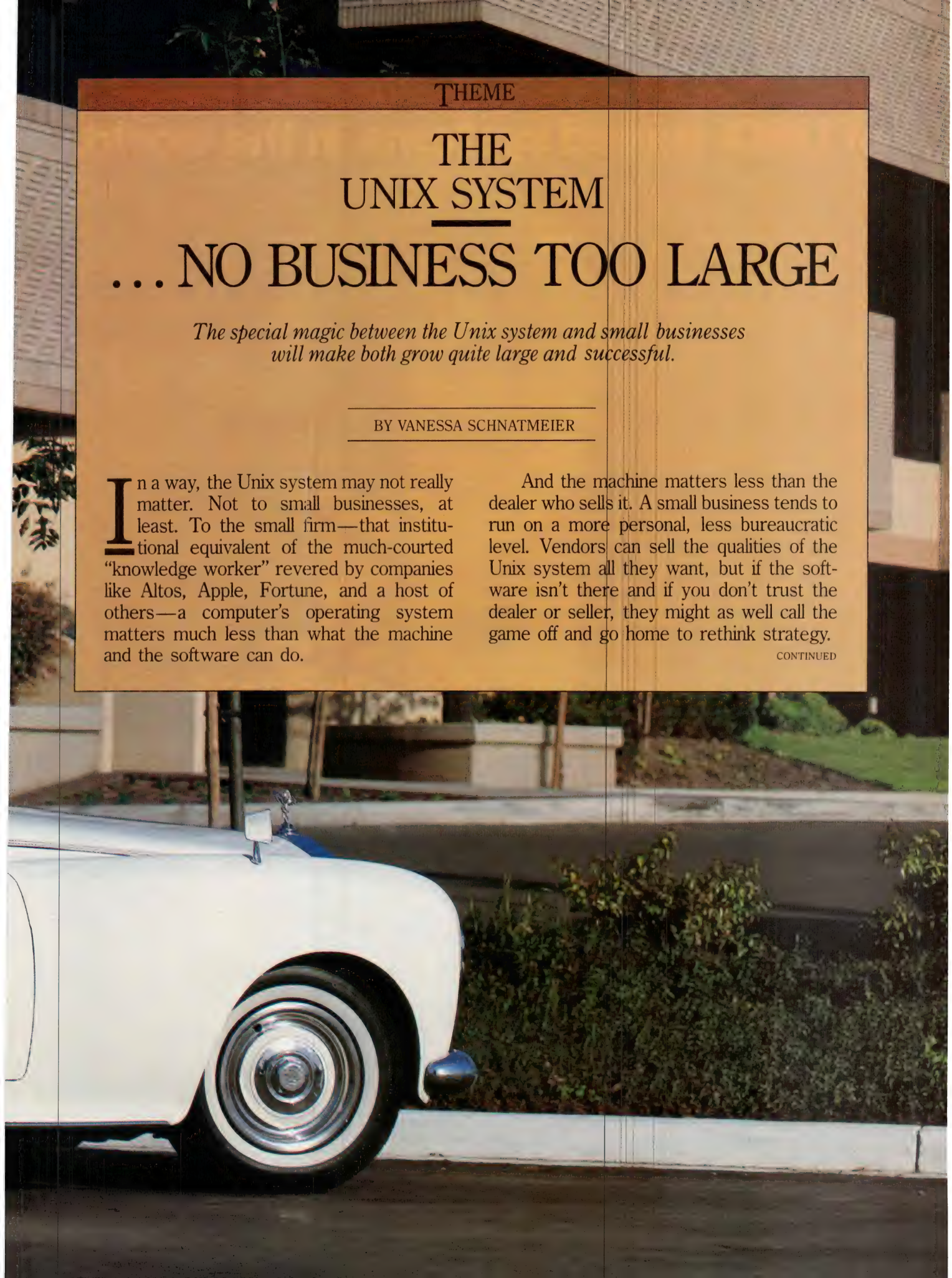

THEME

THE UNIX SYSTEM ... NO BUSINESS TOO LARGE

The special magic between the Unix system and small businesses will make both grow quite large and successful.

BY VANESSA SCHNATMEIER

In a way, the Unix system may not really matter. Not to small businesses, at least. To the small firm—that institutional equivalent of the much-courted "knowledge worker" revered by companies like Altos, Apple, Fortune, and a host of others—a computer's operating system matters much less than what the machine and the software can do.

And the machine matters less than the dealer who sells it. A small business tends to run on a more personal, less bureaucratic level. Vendors can sell the qualities of the Unix system all they want, but if the software isn't there and if you don't trust the dealer or seller, they might as well call the game off and go home to rethink strategy.

CONTINUED

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Let's unwrap this thesis a little more. The relationship of the Unix system to the small-business market is still poorly defined. Quite possibly, though, it is the one market niche that holds the greatest promise for the Unix system. Like most segments of the Unix system market, the small-business segment has barely reached puberty, much less raging money-hungry, money-generous, hearty adolescence.

To tell the truth, the meaning of the term "small business" is also poorly defined. While researching this article, this writer heard definitions ranging from "below $50 million in gross revenues" to "under 100 employees" to "I don't know, what does the Small Business Administration say?" A call to the Small Business Administration elicited this reply: "It's impossible to define the term because there are so many different kinds of businesses." The SBA's offer to send a lengthy pamphlet explaining all the regulations that make a business a small business was graciously declined. (The curious can pick up their own copies at any federal bookstore.)

For the purposes of our discussion, however, we'll loosely peg the small-business market as being up to $20 million in gross revenues.

A survey in the November 1984 *Datamation* showed that the Unix system's small installed base was growing rapidly. Only 7.6 percent of the survey's respondents—all were mini- and microcomputer users—were using Unix as their primary operating system at the time of the survey. However, a further 6.2 percent said they would be installing the Unix system by the end of 1985. In addition, 18.2 percent of the respondents said the Unix system would have at least secondary status at their sites.

THE PRIMARY TARGET

Several companies working with the Unix system and its brethren have made small businesses their primary target. Until recently their market penetration was small outside of the Unix "home areas" such as engineering and academia. But two factors—the new popularity of the Unix system and the speedy takeover of the upstart multiuser supermicro—are turning that situation around.

The same *Datamation* survey also indicates that AT&T's entry into the supermicro market with the highly touted 3B2/300 has boosted the Unix system's fortunes more than just a little, as has IBM's tacit support of multiuser systems with Xenix options for its PC/AT. However, the same study showed that software development houses (often *very* small businesses) have been the chief customer of the 3B2 so far. Next year's high growth fields to watch in small businesses will be manufacturing and wholesale distributing, they say.

> **To the small firm, a computer's operating system matters much less than what the machine and the software can do.**

Jo Jackson, senior analyst with Yates Ventures, Palo Alto, Calif., repeated the general industry estimate that 60 percent of Unix system-related sales go into the small-business sector. For comparison, she noted that of all hardware shipped in 1984, 23 percent was equipped to run the Unix system.

Small businesses are the prime candidates for multiuser systems using operating systems like the Unix system, Jackson said. It's their most economical way to do business; stand-alone PCs don't really cut the mustard in terms of cost-effectiveness. (See the related article by Alan Winston in this issue.)

A multiuser supermicro—offering the performance of a minicomputer for at least a third of the cost—is exactly what a small business ordered. The raw power of the hardware is usually appealing, and such systems can generally support up to eight users if all the users aren't multitasking and trying to run word-processing and graphics programs simultaneously.

INHERENT DIFFICULTIES

These supermicros generally don't use AT&T's vanilla Unix Systems III, V, et al. because of the difficulties inherent in a system that doesn't permit record locking or demand paging, two problems AT&T says it is cleaning up. Instead, many use Xenix from Microsoft (currently, an enhanced version of System III, moving to an enhanced System V), Fortune System's For:Pro, or their own implementation of System III, often incorporating Berkeley enhancements.

Van Chandler, director of merchandising, business computers, for Tandy Corp., put it perhaps more strongly: "There is no other way for small businesses to go than multiuser Unix systems because networking just is not there yet."

Rick Paul, a Yates technical analyst, said that the multiuser aspects of the Unix system are what ingratiate it with the small-business user because such users have the strongest impetus to share informa-

tion and peripherals. The data-entry and accounting clerks at an overnight statewide shipping firm might be the only employees who really need computers there (*pax*, you advocates of the fully automated office!); and they would need a multiuser system to ensure that they don't duplicate invoice numbers, for instance.

Multiuser systems, Paul pointed out, will continue to gain acceptance until the distributed operating system, which transparently connects different machines or even different networks, comes into its own. Once that happens, said Paul, the utility of the stand-alone PC (as long as it possesses a hard disk) will begin to return. Of course, firms could also hook up their multiuser machines with the same distributed operating system. But as matters now stand, it makes less sense for smaller firms to buy networked PCs rather than a multiuser system.

Notice that these multiuser systems don't *have* to run the Unix system. The common wisdom says that the Unix system in one version or another will become the industry's standard operating system because it is the best; however, it would be closer to the truth to say that it *might* become the standard, not necessarily because it is the best, but because it is there at the right time (consider CP/M).

SOFTWARE AND VERTICAL MARKETS

Software is still the main motivating tool to buy any kind of computer—at least, it should be. Unfortunately, here is where Unix system sellers run into their biggest problems. As Jackson of Yates Ventures said, "There is still not a whole lot of software," although that situation is improving daily.

While the flow of Unix system-based software is still a trickle and not a flood, the Unix system market in general, and the small-business sector in particular, won't bloom as quickly as both parties would like. Just because the Unix system is easy to port doesn't mean that software houses *want* in their heart of hearts to port to every version. Thus, small-business users should be patient.

> **'There is no other way for small businesses to go than multiuser Unix systems because networking just is not there yet.'**

Another difficulty with software is a corresponding dearth of widely available vertical-market software. "I haven't heard any company say, 'We're backing the Unix system for the banking industry,' for instance," said Jackson. Most products out there, she said, are available for cross-industry needs such as office automation, but not for specific industries such as construction or car manufacturing.

Until more vertical market packages appear in catalogues, Jackson said, the firms who buy the Unix system will tend to be those that only need the basics such as word processing and spreadsheets, or those that already have a programming staff to write job-specific programs.

However, certain selected markets have been targeted by specific vendors (Altos practically owns the dental office market), which should do much to boost the available vertical market software.

SUCCESS IN CERTAIN MARKETS

Moreover, the Unix system is enjoying success in specific markets. For instance, both the American Dental Association and the American Animal Hospital Association have settled on the Unix system and are advocating that their members install Unix systems to run their businesses.

Another development that augurs well for vertical market software is the fact that several hardware manufacturers with a strong background in vertical markets (such as MAI's Basic Four Information Systems Division) have jumped onto the Unix system bandwagon. In fact, that company is hard at work on moving its vertical market software over to the Unix system, according to one insider.

A recent company survey by Altos Computer Systems (San Jose, Calif.) showed Altos dealers selling to a handful of top vertical markets: Thirty percent of all dealers sold packages to CPA and accounting firms; 23 percent sold to manufacturing companies; 20 percent to wholesale distributors; 15 percent to medical; 12 percent to construction; 7 percent to retail companies; 5 to 6 percent to legal firms, dentists, and pharmacies; and 3 to 4 percent to government and nonprofit agencies.

The total number of packages—about 100—seems impressive until you realize that those packages cover about 75 percent vertical markets. A lot of packages, yes; but in *your* industry, maybe two, or one, or even none.

Chandler of Tandy Corp. said that Radio Shack/Tandy is doing its best to work with value-added resellers (VARs), making source code available to them "at a nominal fee" so they can further develop the lucrative vertical markets.

THE ROLE OF DEALERS

Tom Allen, vice president of planning for Fortune Systems, said that the value-added reseller will become even more important this year, as the software and price crunches set in. Eventually, he said, "retail stores will be able to add VAR capabilities within their own operations." They'll have a front office for walk-in customers and a back office for more specialized solutions.

Okay, it's clear that the small-business segment of the Unix system market is heavily software driven. But another motivating force could be even stronger: the small firm's relationship with its dealer. "Let's face it, people buy from people," Allen said.

Just because the Unix system is easy to port doesn't mean that software houses want in their heart of hearts to port to every version.

A small firm, once it finds a dealer it trusts, will listen to that dealer's advice down the line, even to the point of switching machines if the dealer recommends it. Bill Keating, product marketing manager at Plexus Computers, has seen this happen more than once. Said Keating: "We ask the users why they switched, and they say it's because their dealer started to offer another kind of equipment. And they trust his ability to make a decision. I think that's a valid point."

TODAY'S FORECAST: TURMOIL

The biggest Unix system supermicro winners of 1984 could turn out to be the biggest losers in 1985. That, at least, is the forecast from some leading market-research houses. In other words, for you supermicro users, the watchword this year is to *evaluate* the product and the long-range health of the vendor. Otherwise, you might find yourself out in the cold next January, holding a box with no one behind it to support you.

The changes foreseen are quite radical, although not surprising.

Here's a look at the scorecard, Yates Ventures style, as 1984 was winding down. Leading the pack are the old favorites—Tandy, DEC, Altos, Fortune, and NCR (yes, NCR with the Tower).

However, the AT&T 3B2 supermicro, only a few months old at the time this market barometer was read, is on the fast track up; AT&T already has an estimated installed base of 5000 units. Consider for a moment that most of those machines probably went to software developers so that they could develop application software—that means the 3B2's real market impact is still six months to a year away.

Also, according to Yates Ventures, IBM's PC/IX is selling well, and IBM began shipping Xenix 3.0 on the PC/AT at the end of January. These two influences should push IBM-made systems way up the ladder of installed systems; however, as in the case of the 3B2, expect the real tidal wave to hit after the software does. This means 1986 could be even more interesting than 1985.

To sum it up: A dramatic upheaval in market share and positioning is looming rather quickly. Market share upheaval will come with the arrival of large new players with three-letter names that portend, to the experienced observer, that the proverbial shakeout is just around the corner. This is indeed Ms. Yates' ominous forecast for 1985, even though overall shipment rates and sales would be up.

Here's how another market-research house sees the same situation: Strategic Inc. said that in 1984 IBM, AT&T, and "others" together shared 21 percent of the market, while Convergent Technologies led in market share with some 26 percent of shipments. Convergent was followed at a distance by Altos (13 percent), Fortune Systems (10 percent), Onyx (8 percent), and Tandy and NCR, each with 7 percent.

For 1985, Strategic sees many of those same vendors not even garnering enough market share to get a mention on the charts. Here's how Strategic sees the market division: IBM, the winner with 30 percent, followed (relatively) closely by AT&T with 21 percent, "others" with 16 percent, and Altos and Fortune Systems (still hanging in there) with a respectable 10 and 8 percent market share, respectively. Everybody else, including computer giants such as HP,

Fortune derives anywhere from 40 to 50 percent of its total revenues from small-business sales, said Allen, and this occurs because Fortune tries to keep a good relationship with its dealers.

It traditionally has been harder to sell a Unix system, he said, because it supposedly takes at least one sales call. Most retail stores depend on the volume and turnover generated by their walk-in customers, who like to walk out with a computer under one arm. "For the Unix system, typically the price tag isn't what they expect to pay for something they can walk out with," he said.

Until recently, he added, it has been harder to get a profit from the Unix system because, in many cases, a Unix system needs more support and a longer education process for its users; the typical multiuser business application requires more than a little training. "It's easier to sell and install a PC running Lotus 1-2-3 than it is to install a full multiuser accounting system," Allen said.

> 'It's easier to sell and install a PC running Lotus 1-2-3 than it is to install a full multiuser accounting system.'

On the other, once installed, the multiuser Unix system is likely to stay around much longer because most of today's PCs are based on throw away technology.

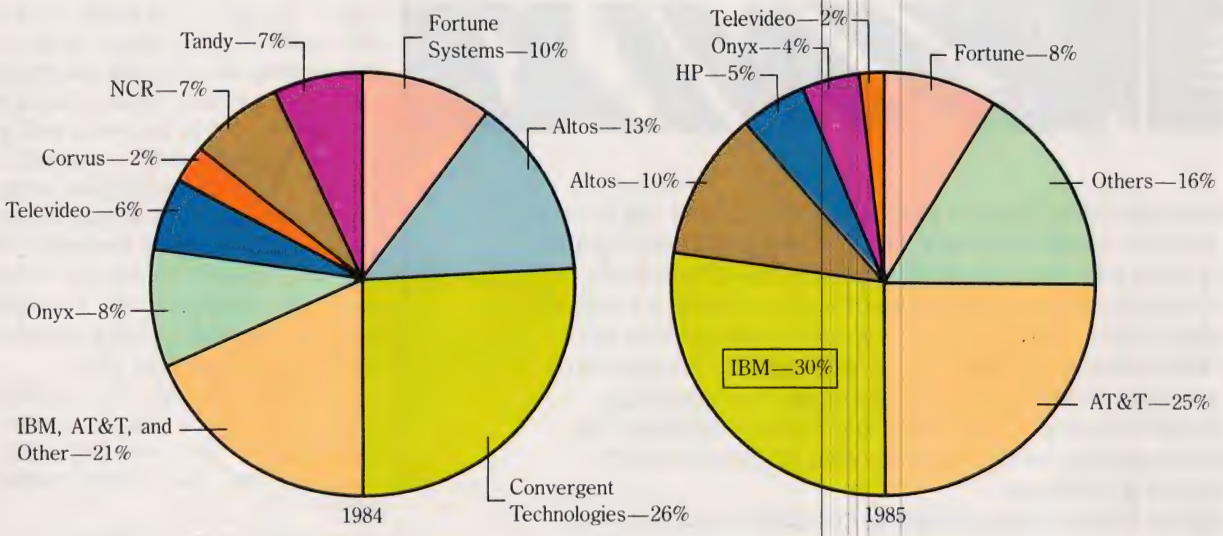
YOUR DEALER AND YOU

Just what should a dealer do to sell you a Unix system? Rich Guttermuth, of Choice, an Atlanta-based firm dealing in Zilog products, said his company's philosophy is to sell the solutions and the software ap-

has 5 percent or less.

Although two different market-research houses see the market lining up in two different ways, their analyses still have two things in common: IBM and AT&T, not necessarily in that order, will be at the head of an ever dwindling number of Unix system supermicro makers.

For users, then, 1985 may be the year to look for brand names and not necessarily for the best price and performance or the most state-of-the-art technology. In short, take a long, hard, cold look around before signing on that dotted line.



VENDOR MARKET SHARE OF MULTIUSER MICROCOMPUTER SYSTEMS

SOURCE: STRATEGIC INCORPORATED

plications, and then spend a lot of time educating the customers and prospects.

"We talk about how we chose to be a Unix system house," Guttermuth said, "and how the benefits we get are passed on to them [the customers]. We explain to them that they won't be vendor dependent, the way they might be with proprietary systems." But in the end, he admitted, "from the buyer's point of view, the operating system *per se* is not important."

Tom Carroll, president of Sierra Systems Group of Saratoga, Calif., has decided to take advantage of the risky but potentially rewarding vertical markets. His firm has written a package for hospitals and companies doing physical rehabilitation work; that is, for hospitals or outpatient clinics with many forms to fill out.

Carroll said the personal relationship between dealer and customer is extremely important. "A lot of the small businesses here are one-person or family-type operations," he said. "We relate well to that type." Two to three of his accounts have actually said something like "'We're talking about a marriage between your firm and ours, and we want to make sure it's successful,'" Carroll said. "One individual bought from us without even seeing a demo of the machine [from Fortune]. We sold him on our knowledge of his particular application. We stay until midnight, running payrolls and stuffing checks—they love this."

Maybe it's time for the Unix system to stop trying to be user-friendly and get user-personal—at least on the small-business level. □

Vanessa Schnatmeier, UNIX/WORLD's Associate Editor for Features, lives in Oakland, Calif.

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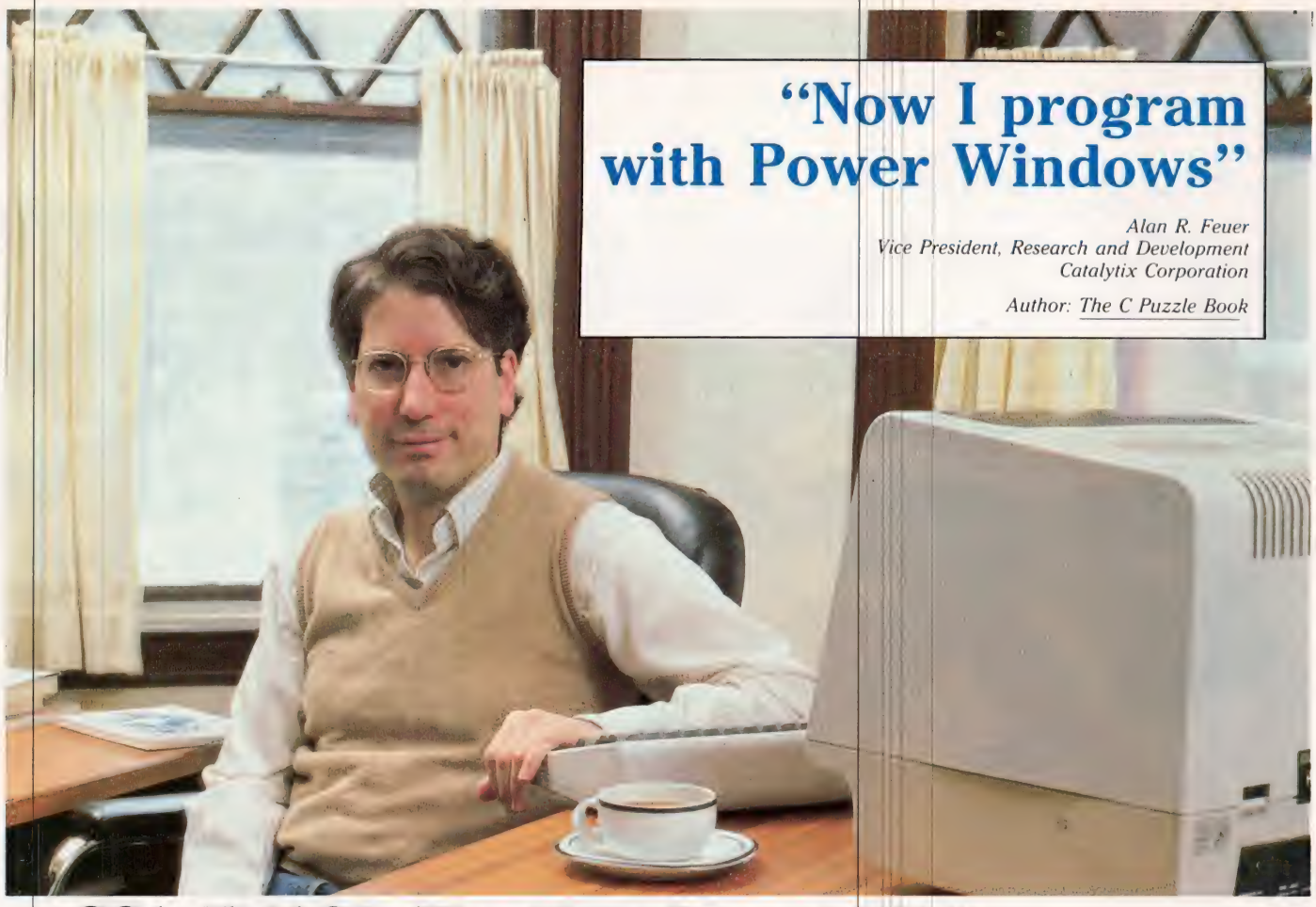

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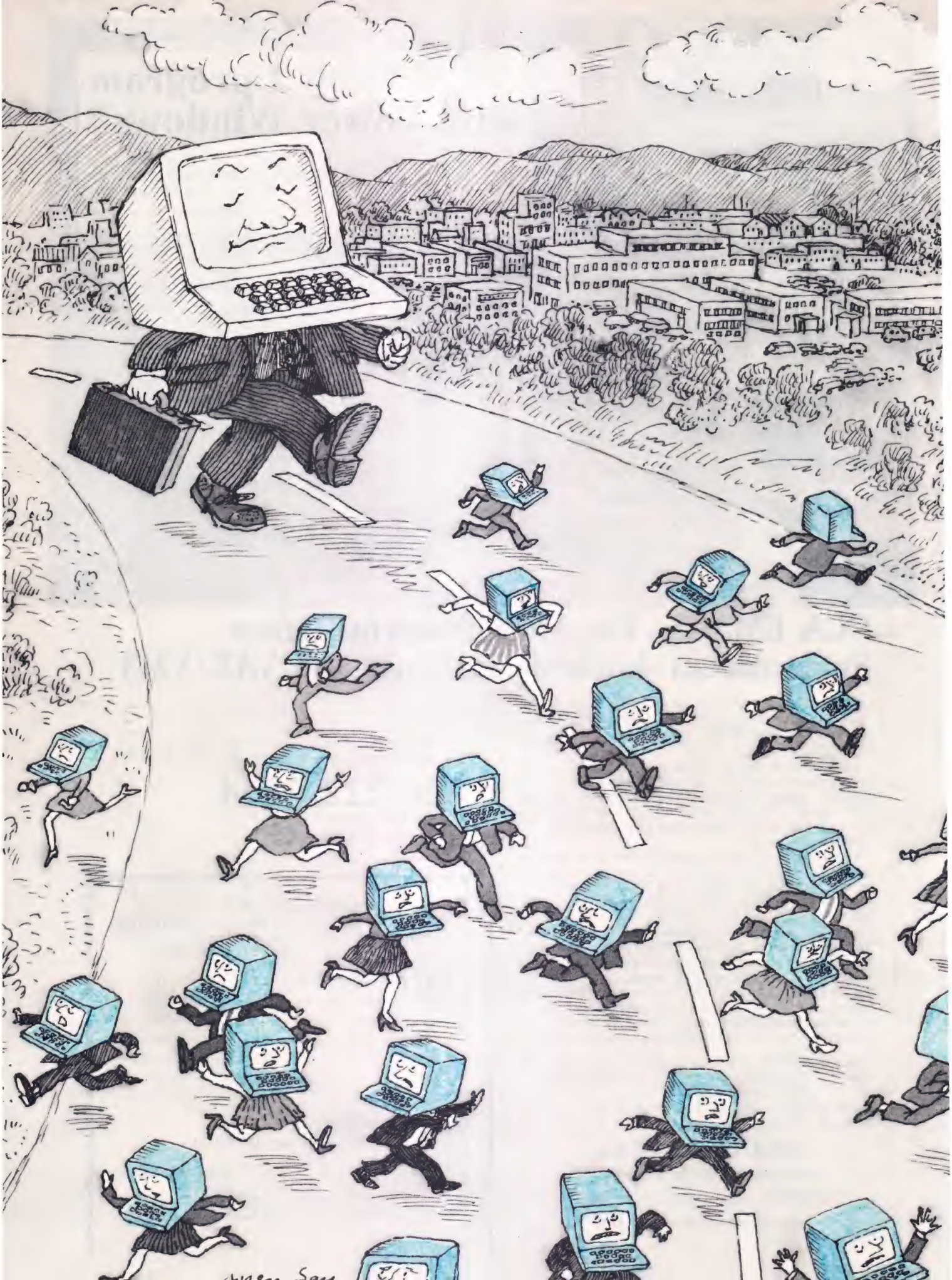


Supermicro beats little Blues:

A COST ANALYSIS

The kind of reasoning executives understand: The Unix system saves money and is more productive.

BY ALAN WINSTON

Watch out, Big Blue! Although PCs are inexpensive compared to what computers cost 10 years ago, when it comes to sharing data or to cutting costs by avoiding duplication of peripherals, multiuser office computer systems running the Unix system have it all over the PC.

Three primary applications—spreadsheets, database management systems (DBMSs), and word-processing packages—get a lot of use in offices. These applications may work well on a user's desk, but problems begin to arise when different users want access to the same information or want to share expensive peripheral devices such as laser printers in order to reduce hardware costs.

IBM is attempting to solve this problem with the PC Network, a hardware and software approach to linking stand-alone personal computers. This system, which IBM has not yet released commercially, was developed by Sytek, of Mountain View, Calif. Each PC, PC/XT, or PC/AT on the network needs a special network board, cable, and a separately priced network program to make the whole thing run. You also need to use a co-axial cable to connect every PC on the net, and on top of that, the network needs a special translator board.

With this network scheme, users can share data and peripherals, provided that each network node has been told the correct location of each file and device it needs.

Users, however, cannot share purchased software. Buying a popular application such as Lotus 1-2-3 brings with it a single-user, single-CPU license, the circumvention of which is illegal. It's also risky, as Lotus proved with its $10-million suit against Rixon for unauthorized copying; and it is difficult, too, because some copy-protection schemes require the original release disk to be in the floppy drive of the PC running the program, at least when you load the program initially.

A PC on each desk also puts an "operations" load on nontechnical users. They must now back up their own data, take responsibility for ensuring that information they take from a mainframe is up to date, and in general be concerned with the physical functioning of their machines—when all they really want to do is answer a question. Not only is all this a considerable waste of time, but it also results in such horror stories as that of the executive who, upon reading that he should remove a floppy disk from its protective en-

velope before placing it into the drive, took scissors to the Tyvek sleeve.

In addition, a PC on every desktop occupies a fair amount of space: The footprint of an IBM PC is considerably larger than that of most terminals.

The answer to these multiple-CPU woes is the multiuser, single-CPU system. Until a few years ago, such a system was, of necessity, a minicomputer and tended to be expensive.

UNIX SYSTEM-BASED SOLUTIONS

Several vendors now make multiuser supermicrocomputers that run the Unix system, and a variety of office support software is available for these systems. Some examples follow.

Altos Computer Systems, the San Jose, Calif.-based firm that is one of the top three vendors of Unix system computers, offers for $9990 the Model 586, a 16-bit computer that runs Xenix (Microsoft's port of System III). The 586's price tag includes a 40-Mbyte hard disk, one terminal, 512K bytes of random-access memory (RAM), and the operating system itself. Another ½ Mbyte of RAM costs $1290. The 586 has input/output (I/O) ports for five users and one printer, and you can add another four parallel ports for $850. Altos sells additional terminals for prices ranging from $795 to $995, depending on the model.

Unix-based multiuser systems will save users money in software as well. For instance, Altos has put together what seems to be an extraordinary value in application software: the Altos Office Executive, a menu-driven system that integrates the Uniplex word processor, the Multiplan spreadsheet, the File-it DBMS, and an electronic mail system. All of this costs only $695 for all users on the central processing unit, the same as a single copy of Ashton-Tate's Framework or Lotus' Symphony.

One executive, who read that he should remove a floppy from its envelope before placing it into the drive, took scissors to the Tyvek sleeve.

Codata Systems Corp., of Sunnyvale, Calif., makes the Model 3300, which supports Unix Version 7. This machine includes a 33-Mbyte hard-disk drive, 10 serial I/O ports, a 1-Mbyte floppy drive, and a 1-Mbyte memory, and lists for $12,000. Codata sells terminals for $800 each (none are included in the basic system).

The office application software that Codata sells is the Unify DBMS at $2100, the CrystalWriter word processor at $900, and Horizon—a combined word processor and spreadsheet—at $450.

Integrated Business Computers (IBC), of Chatsworth, Calif., has two Unix system products: Ensign, a 32-user system, and the System 68, an eight-user system based on a 10-MHz M68010 chip. The System 68, which comes with an 85-Mbyte hard disk, a 1.6-Mbyte floppy disk, eight serial ports, a Centronics printer interface, and 512K bytes of RAM, costs $19,995. IBC charges $1995 to upgrade to 1 Mbyte of memory and another $1500 for a System V license. Kimtron terminals are available for $579 each.

IBC distributes the Unify DBMS and Quadratron's Q-Office system, a

UNIX VS. PCs

Electronic spreadsheets **allow the entry and automatic calculation and recalculation of many related numbers. If a final determination of profit or loss depends on the quantity sold, an electronic spreadsheet program can generate the answer for any hypothetical quantity. The first electronic spreadsheet, VisiCalc, ran on the Apple II computer and is credited with selling a lot of personal computers to business offices. The most popular spreadsheet, Lotus 1-2-3, has sold a lot of IBM PCs and compatibles. Another popular spreadsheet: Microsoft's Multiplan.**

Database management systems **for microcomputers are intended for use by nonprogrammers. They maintain data in easy-to-access files and allow ad hoc queries as well as retrieval of information in predefined ways. A typical use for such a system in an office would be to maintain an employee roster or office inventory. The most popular DBMS for micros is Ashton-Tate's dBase II; other entries include dBase III, R:base, and Omnifile.**

Word-processing packages **allow for easy production of memos and reports. Some managers use them to get their thoughts together in a rough form before handing the draft to a secretary for a final copy. With some packages you can produce "personalized" letters or memos. Well-known word-processing packages are WordStar, Volkswriter, Volkswriter Deluxe, pfs:Write, and Microsoft Word.**

menu-driven system that is also available from several other hardware vendors. No prices are available yet.

The Logical MicroComputer Company (LMC), of Chicago, Ill., offers the LMC MegaMicro, which runs Genix, the National Semiconductor port of 4.1BSD for the 32016 chip. A system with 1-Mbyte of RAM, a 1-Mbyte floppy drive, a 42-Mbyte hard disk, and eight I/O ports costs $20,000, including the operating system. LMC sells Wyse 50 terminals for $700 each. The company also sells the Q-Office package for $2500 and the Unify DBMS for $2000.

Onyx Systems, of San Jose, Calif., the first vendor to offer commercial multiuser Unix systems, has two models aimed at the office market. The 5012 is a five-user system with 512K bytes of RAM, including a 40-Mbyte hard disk, five I/O ports, one CRT, and a Unix system license. Small enough to fit easily on a desktop, the 5012 costs $13,490. For $3000 more, you can get a system with 1 Mbyte of RAM and 11 I/O ports. Onyx sells terminals at $850 each.

The Onyx Office package is a collection of office support software developed by Onyx. It includes ONtext, a word-processing package; ONcalc, a spreadsheet; ONbase, a DBMS; and a menu system that allows users to add other applications. Onyx licenses this package for $2241.

The footprint of an IBM PC is much larger than that of most terminals.

One of the newest entrants to the Unix system multiuser market, Visual Technology Inc., of Tewksbury, Mass., sells the Visual 2000, a system built around Intel's 80286 chip. The 2000 runs Xenix (which costs $1500) and comes complete with a 40-Mbyte Winchester disk drive, an 800K-byte floppy, six RS-232 terminal ports, and a parallel printer port—all for $10,990. Additional I/O ports cost more. No terminals are bundled with the system. Visual provides the XED word processor, Supercomp 20/20 spreadsheet, and Informix DBMS to customers.

Other companies aiming at the office market include Zilog, with its System 8000; Convergent Technologies, with the MiniFrame; Plexus, with the P15; and just about anyone else with a brand name in computers. Many vendors have products on the way that cost even less than those cited here.

PRICE COMPARISONS

To make a comparison of prices, I have imagined an average or "generic" multiuser Unix system, in both five- and eight-user versions. The five-user version has at least 512K bytes of RAM, while the eight-user version has at least 1 Mbyte. Each version has at least a 33-Mbyte hard disk (actual systems range from 33 Mbytes to 85 Mbytes), and each has a word processor, spreadsheet, and DBMS. The system has five or eight terminals.

This average machine costs $14,910, with an average cost of $1260 in order to upgrade to 1 Mbyte. The average terminal costs $760. Software averages $450 for a spreadsheet, $2050 for a DBMS, $900 for a word-processing system, or $2012 for an integrated system, with actual prices ranging from $695 (Altos) to $2500 (Q-Office).

Thus, the complete generic five-user system costs $20,722, while the generic eight-user system costs $24,262 (see Figures 1 and 2). You could probably beat these prices by getting some components or soft-

	IBM PCs ($)	'GENERIC' UNIX SYSTEM ($)
CPU Hardware	17,365	14,910
Network or Terminals	4050	3800
Network Software	450	N/A
Applications Software	7425	2012
Total for Five Users	29,040	20,722

FIGURE 1: PRICE COMPARISON FOR FIVE USERS

	IBM PCs ($)	'GENERIC' UNIX SYSTEM ($)
CPU Hardware	23,350	16,170
Network or Terminals	6235	6080
Network Software	675	N/A
Application Software	11,880	2012
Total for Eight Users	42,140	24,262

FIGURE 2: PRICE COMPARISON FOR EIGHT USERS

ware from a source other than the hardware vendor. Some products cost considerably less; Altos' machine and software, for instance, run at least 30 percent below this figure.

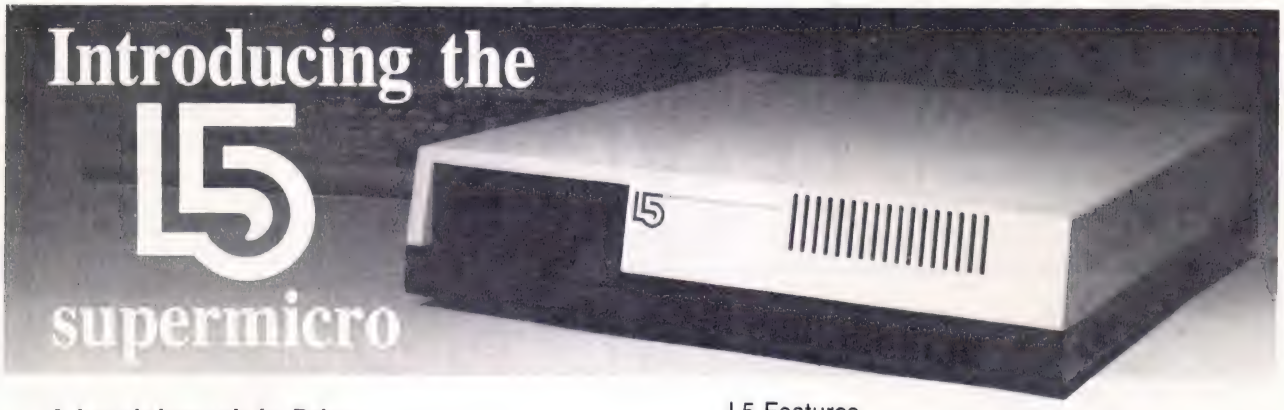
Networked PCs are expensive by comparison. Vanilla PCs with 128K bytes of memory, a monitor, and one disk drive cost approximately $1995. (This price is sometimes less if you don't buy through IBM.) For the network, each PC requires a board at $695 and a network program at $75. The network itself requires a translator board at $575. A 40-Mbyte PC/AT to be used as a file server lists for $7390. Thus, a five-user PC network costs $21,565 for hardware and systems software, while an eight-user network costs $29,860.

The generic Unix system costs only about two-thirds as much as a PC network that does the same thing.

A reasonable PC software package, consisting of Lotus 1-2-3, WordStar, and dBase II lists for $1485 per PC (each program lists for $495). Applications software for five users costs $7475; for eight users, $11,880. So the price for a complete five-user network is $29,040, while a complete eight-user network costs $42,140.

The generic Unix system costs only about two-thirds as much as a PC network that does the same thing, and it offers considerable advantages in ease of use, security of data, and utilization of desk space. All in all, the Unix system saves money and is more productive. That's the kind of reasoning that executives understand. □

Alan Winston, a freelance writer and full-time programmer/analyst, has followed the Unix system for several years. His last work for this magazine, "The Locus PC Bridge," appeared in Vol. 1, No. 6.



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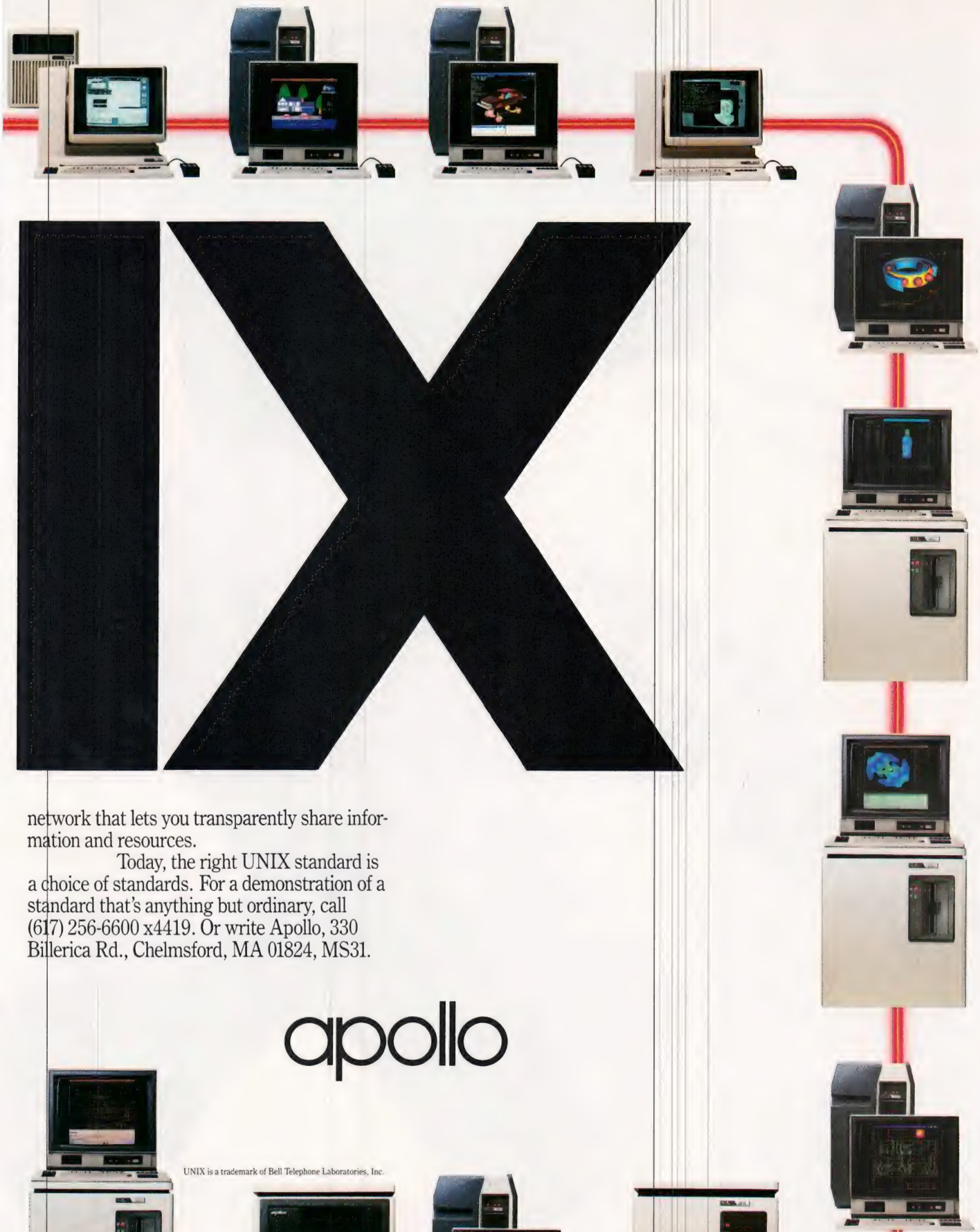

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THE /usr/group STANDARD: APPROVED

Amidst the chaos, one of the essential promises of the Unix system has been forgotten—application portability.

BY DAN LADERMANN

The computer media today are full of articles that hype the Unix system and Unix computer systems. Add to these articles the myriad of Unix system application software and the various versions, and you've got chaos on your hands! Amidst this chaos, one of the essential promises of the Unix system has been forgotten—application portability. This promise hangs on one small detail that everyone rants and raves about but which, alas, seems to have eluded us—until now. That is, a Unix system standard. Is there one, you ask. There certainly is.

The /usr/group, the largest Unix system users group, has put forth a standard proposal for the Unix system that has been approved by the interested user and vendor communities. It is the purpose of this article to define and explain the current status of the /usr/group standard, as well as its future.

Figure 1 shows statistics on the number of subroutines and functions found in various versions of the Unix system, including those defined in the /usr/group standard, System III, System V.2, and 4.1BSD (Berkeley Software Distribution). System calls are those primitives that the lowest level of the Unix system provides. They provide the basic functions of process management, file management, and input/output (I/O) services and are commonly referred to in Unix system terms as the "Section II" calls. (Section II refers to that section of the Unix system manual in which they are defined.) The system calls are the building blocks for Unix system applications.

In order to aid program developers, the standard also defines a large set of subroutine calls, commonly referred to as "Section III" calls. Some of the subroutine calls provide higher-level functions, such as formatted I/O functions, which in turn utilize the system calls. Other subroutines provide stand-alone functions, such as math functions and string manipulation.

As you can see from Figure 1, the standard defines 52 system calls and 170 subroutines. If the standard had been developed to be the superset of the systems listed, it would have included 100 system calls and 483 subroutines. Several system calls and subroutines that were available on Unix systems were not included in the standard because they were implementation dependent or inherently nonportable. These include calls dealing with system administration and other interfaces to functions and capabilities that were not defined by the Unix system command interpreter or shell.

As you can see from the first line of Figure 2, which shows the number of system calls in base systems that are not in the comparison system, the standard contains only two system calls that are not in System V and System III, and seven system calls that are not in Version 7 and the Berkeley distribution. The two calls that differ between the standard and System 5.2 are the `lockf()` and `dup2()` system calls. The `dup2()` call, which allows you to specify the new file descriptor when duplicating a current open file descriptor, was added for compatibility with existing software. This call is not available on System V, although a C library subroutine can provide it easily.

The `lockf()` system call was a more controversial and time-consuming addition to the standard. Almost everyone agreed that some form of file locking was required for commercial systems and, in particu-

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	Number of System Calls Defined	Number of System Calls Common with Standard	Number of Subroutines Defined	Number of Subroutines Common with Standard
/usr/group standard	52	52	170	170
System V	72	50	426	167
System III	60	50	219	169
Version 7	65	45	213	150
4.1BSD	72	45	229	150
Total Superset	100		483	

FIGURE 1: COMPARISON SYSTEM

		STD	SV	SIII	V7	BSD
BASE SYSTEM	/usr/group standard	0	2	2	7	7
	System V	22	0	12	19	20
	System III	10	0	0	7	8
	Version 7	20	12	12	0	9
	4.1BSD	27	20	20	16	0

FIGURE 2: NUMBER OF SYSTEM CALLS IN THE BASE SYSTEM THAT ARE NOT IN THE COMPARISON SYSTEM

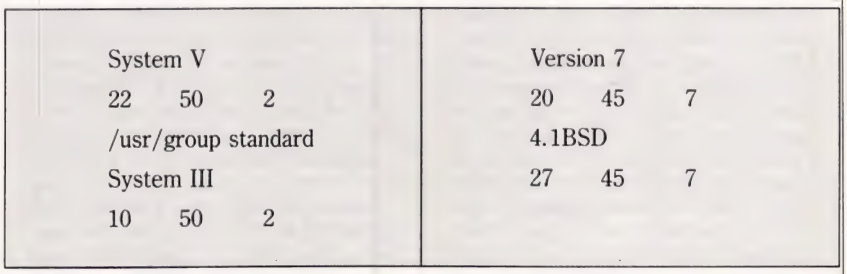


FIGURE 3: THESE VENN DIAGRAMS SHOW THE OVERLAP BETWEEN THE /usr/group STANDARD AND VERSIONS OF THE UNIX SYSTEM

lar, for database management systems. The lack of file locking under the Unix system has long been one of its noted shortcomings. Several proposals were made, and after many discussions, a standard finally emerged that provides for two forms of file locking.

One form is an "advisory" lock, which, when one application program locks a file or range of data (record or records), allows another invocation of the same or a different application program to detect (using the `lockf()` call) that the lock exists and then to wait for its removal if the application desires to do so.

The other form of locking is mandatory locking. With mandatory locking, you can set a flag on individual files so that, if you lock an area of a file (using the `lockf()` call) and another program tries to access the locked region using standard read and write calls (use of `lockf` to check not required), it will either block until the area is unlocked or return an error message denoting that the area is currently locked and that you should try the operation again later.

The choice between blocking and nonblocking access is up to the application developer, who can set it through other system calls. The addition of the `lockf()` call requires additional descriptions of interactions to be added to several other system call manual pages, as in read and write above.

The `lockf()` call is not available on System III or System V.2. AT&T has announced that the next release of System V will contain a version of advisory locking that is compatible with the /usr/group standard.

From Figure 2, line 3, where System III is the base reference, note that all of System III's calls are in System V. The major difference between their system calls is the addition of several calls in System V that deal with shared memory operations, messaging, and semaphores. These calls are not available in any other system and have been left out of the standard nucleus.

The Venn diagrams in Figure 3 show the overlap between the /usr/group standard and versions of the Unix system. When the standards

effort began, System III was the latest version of the Unix system available from Bell Labs/AT&T, so it was chosen as the starting point for the standard. As you can see from the figures, this was fortunate because System III maps well to the subset of interfaces available on other versions. With the exception of record locking and the `dup2()` system calls, System V is basically a superset of the /usr/group standard.

A first glance at Figures 1 and 2 seems to reveal that System V (with 22 additional system calls) and Berkeley 4.1 (with 27 additional system calls) are similar. In fact, though, out of the additional calls over the standard, only eight are common between System V and Berkeley 4.1, and most of them were removed from the standard because they were implementation dependent or inherently nonportable. The newest Berkeley distribution, 4.2BSD, increases the difference between System V and the Berkeley Unix system with the addition of 40 additional system calls over 4.2BSD. These new system calls include networking, new group primitives, symbolic links, and new signal-handling routines.

In order to aid program developers, the standard also defines a large set of subroutine calls, commonly referred to as "Section III" calls.

In addition to system call and subroutine standardization, the standard replaced hard-coded magic numbers (wherever it was practical) with symbolic constants in all the systems that had previously contained them. These were placed in one of two new include files, `unistd.h` and `limits.h`. The `limits.h` file also specifies minimum values that any system meeting the standard must meet or exceed. Other implementation-dependent values, such as word length, maximum values, and different C language and machine types,

APPLICATIONS PORTABILITY: A MATTER OF DEFINITIONS

The key to the explosion in the Unix system market is and will continue to be application portability. The Unix system has long been recognized as a classic model for structured operating system development, research, and development environments. During the 1970s the Unix system was mainly used in these environments and was appealing because of its efficiency, capabilities, flexibility, and portability. The primary considerations of licensing, price, available support (or lack thereof), and the lack of application programs determined where the Unix system was, and was not, accepted. In spite of these shortcomings, the Unix system continued to spread and enjoy wider use.

In the 1980s the Unix system started gaining acceptance in the commercial area. Several companies began to support the Unix system commercially, and others transported it to non-DEC host computers. Because the Unix system was so easy to transport, it underscored the advantages of operating system portability (providing an identical environment to users of diverse hardware). Companies discovered that they could move tools, application programs, and entire systems easily from one Unix system to another. It is this leveraged application portability across a wide variety of systems that the Unix system—and only the Unix system—can provide, and it represents a potentially vast return on software investment.

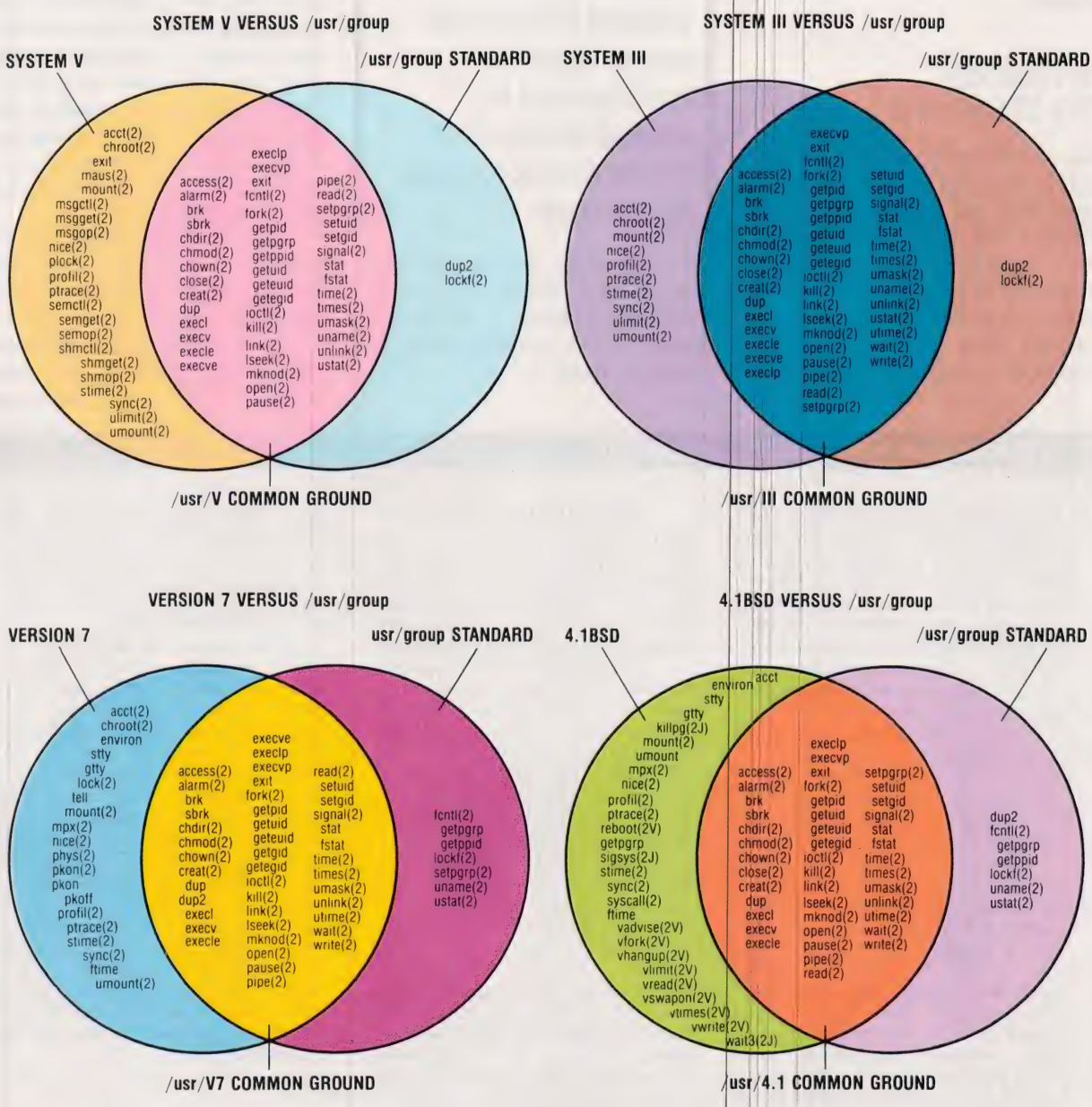
TWO PRIMARY FACTORS

Two key factors contribute to this inherent portability of Unix system applications. First is the C language, which is used to implement almost all Unix system applications and the Unix operating system itself. C is available on all versions of the Unix system and is now becoming an international standard through the auspices of the American National Standards Institute (ANSI).

The other key area is system call and subroutine portability, which the /usr/group standard has only recently defined. By providing a standard set of operating system primitives and subroutine calls, portable applications written in C can easily be moved from system to system. The implementation of the Unix system on a diversity of hardware architectures has set the stage for a level of portability that has heretofore been unavailable. The /usr/ group standard enhances Unix system portability to "ultraportability" and provides a documented standard.

Before we go any further, let's examine what software

HOW THE /usr/group STANDARD COMPARES



may hold. Each implementation must fill in these values, and application programs that care about these values can use them at compile time in order to make the applications portable.

FUTURE OF THE STANDARD

Now that I've told you what the standard is today, let me say that future extensions and adjustments to the standard will allow for growth to meet expanding market requirements and to provide guidelines for optional features that system developers want to implement. The Standards Committee is currently considering many proposals for extensions and adjuncts. These include real-time support (contiguous files, priorities, etc.), networking interface, special terminal I/O control, screen-manipulation media-interchange formats, shell interfaces, and command subsets.

> **Future adjustments to the standard will allow for expanding market conditions and for optional features that system developers want to implement.**

Judged by the standard's current acceptance by the /usr/group general membership and by its potential to track new and expanded requirements, the /usr/group standard has a very bright future. Future extensions to the standard are favoring System V wherever possible. AT&T and Bell Labs likely will continue to support the standard effort, as evidenced by their announcement that the next release of System V will support the standard's definition of record locking (`lockf`).

The standard will continue to receive additional acceptance through support from application developers, system developers, and end-users. Additional requirements will cause it to grow and expand

Continued on page 51

APPLICATIONS PORTABILITY CONTINUED

portability means. Before the advent of the Unix system, and in non-Unix system environments still, the typical definition of portable software was software that could be ported or moved to a new system for a lesser investment than it would take to rewrite or re-implement the software. It is not unusual for government or commercial concerns, for example, to spend many man-months to many man-years in moving a large application or system to a new computer.

In the case of Unix system applications, *portability* has assumed the following definitions: An application is portable if reading tape in, typing `make`, and building it takes from five minutes to one hour; it's semiportable if you can move it to a new computer or Unix system version in one hour to four hours; and it's nonportable if moving it takes four hours to a week or longer.

Many standards are out of date by the time they are approved, and they are not defined in a way that allows growth or provides options. When the /usr/group standard was developed, it was designed to encompass future requirements. This benchmark was met by defining the standard in terms of a nucleus and optional levels and adjuncts. This allowed the base standard (which defines the nucleus) to be approved, while permitting further growth and expansion.

The genesis of the nucleus concept was derived from the experiences of operating system (OS) designers and application developers. By using certain standard interfaces, application developers have learned, by trial and error, how to write code that can easily be ported among Unix systems. This experience was well represented through the constituency of the Standards Committee and other members of /usr/group. The result is a standard that application developers and system developers can rely upon to define the necessary interfaces.

The result of defining the nucleus in the current standard can be divided into four major areas: first, defining the subset of system calls and subroutine interfaces common to most Unix and Unix-like systems; second, resolving any ambiguities that standard documentation contained and that could cause portability and implementation problems; third, defining constants and limits in a machine-independent form; and fourth, providing standards for common extensions that most systems implemented and used. A notable example of such an extension is record locking.

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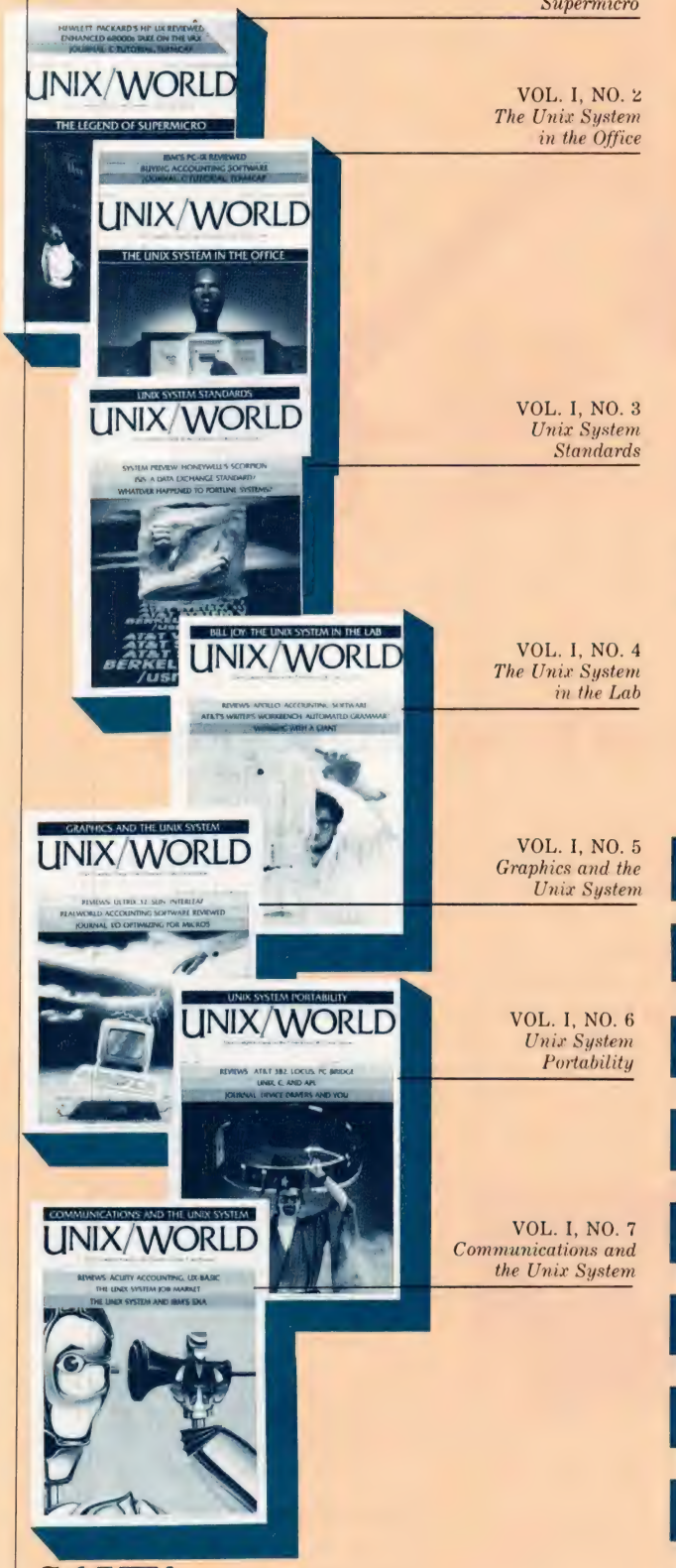

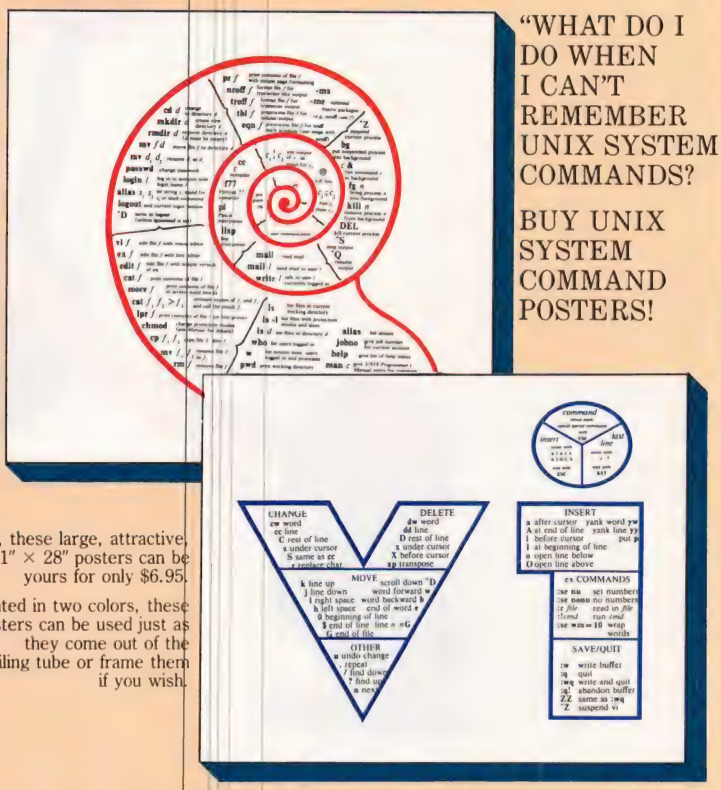

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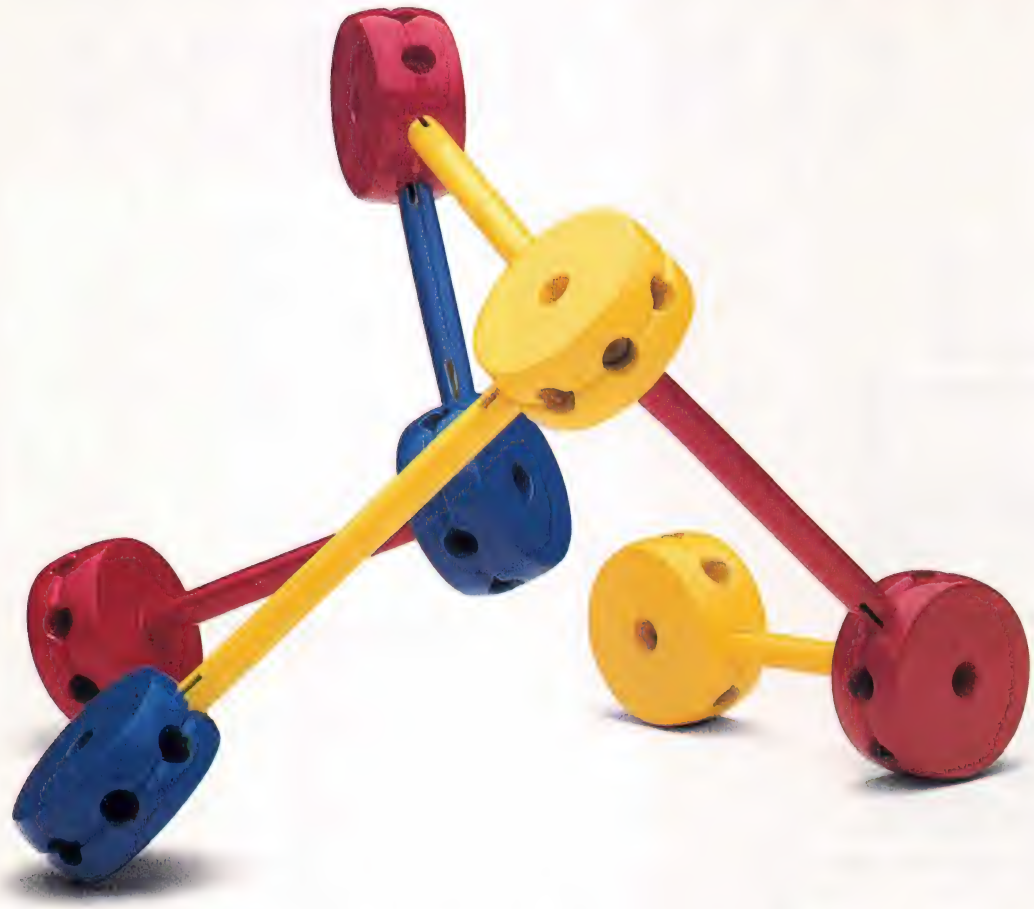

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A HISTORY LESSON

In June 1984 the general membership of /usr/group overwhelmingly approved the standard that the /usr/group Standards Committee proposed. /usr/group is the Unix system community's leading users' group, and it was formed to foster the growth of the Unix system in the commercial marketplace. It is composed of over 2300 people representing companies active in the Unix system area.

The /usr/group standard, which was the result of three years' work, defines an environment that enhances application portability to "ultra-portability." That is, you can move an application that has been developed in accordance with the standard to another system that also implements the standard without any modifications to the program.

In order to develop the standard, /usr/group formed a vendor-independent Standards Committee. The committee comprises 40 key representatives of suppliers of Unix-based systems, Unix-like systems, and application developers and suppliers. This cross section of members (including representatives from Bell Labs) enabled the committee to define a standard upon which the Unix system community could agree.

As of the UniForum '85 show in Dallas, that committee became part of the IEEE P1003 working group. The move was undertaken because the IEEE already has mechanisms in place that will lead to a swift approval of the proposed standard by the American National Standards Institute (ANSI).

You can purchase copies of the /usr/group standard and Readers Guide from /usr/group, 4655 Old Ironsides Dr., Suite 200, Santa Clara, CA 95050.

through the defined means that optional levels and adjuncts provide. Efforts are underway to provide validation, either from private organizations or national standards organizations. Other standards efforts are working closely with the /usr/group Standards Committee to promote the /usr/group standard as a national and international standard.

At the time of this writing, the /usr/group Standards Committee has joined forces with the IEEE (Institute of Electrical and Electronic Engineers) P1003 working group (IEEE Standards Committee). Under this plan, the /usr/group Standard Committee will become the technical working group for the IEEE group, which could lead to the /usr/group standard being adopted as an IEEE standard as early as June 1985. □

Dan Ladermann is a founder and vice president of research and development of The Wollongong Group, Palo Alto, Calif. He has worked with different versions of the Unix system for the last ten years and has been a member of /usr/group and the /usr/group Standards Committee.

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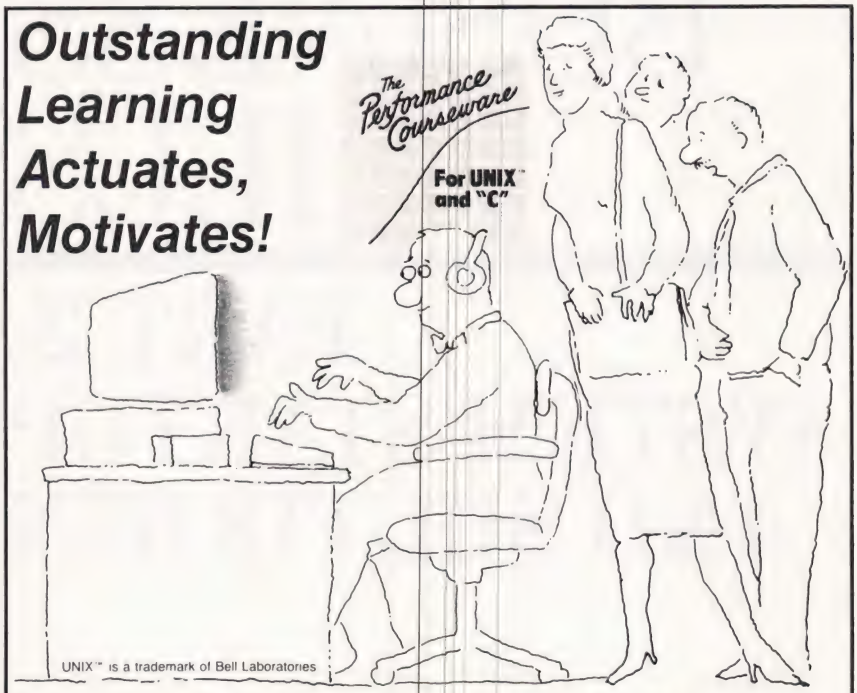

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SYSTEMS ADMINISTRATION: CURES FOR BUSINESS ILLS

PART 2, SYSTEM STARTUP AND SHUTDOWN

BY DR. REBECCA THOMAS

As we saw in our overview of system administration last issue, system startup involves several steps that are similar in general procedure from one Unix system to another. In this installment we will discuss these steps in detail.

The procedure of "bootstrapping" (or, simply, "booting") involves reading a copy of the kernel program into memory from disk or tape and then executing it. The details of bootstrapping vary from system to system, so you should consult the documentation that comes with your system for the proper commands to enter. However, we will outline a typical example of bootstrapping.

In general, a "bootstrap" program in read-only memory (ROM) is executed after power is applied or after the reset switch is pressed on a system that is already running. The program initializes the hardware—setting up the system console terminal to communicate with the CPU—and performs hardware diagnostics such as testing main memory.

When these checks are complete, the bootstrap program may prompt you for further action. Because the procedures at this point differ greatly from system to system, you must consult your system documentation for the proper commands that will load the Unix kernel from disk (or tape) into computer memory. You may find that your system is automated so that it performs the entire bootstrapping sequence—from power on to starting the single-user shell—without your intervention.

If the Unix system kernel has been successfully loaded, you should see a shell prompt, which is generally a number sign (#), to signify that

you have superuser powers. At this point, the system is operating in single-user mode; that is, you can only access the system from the main terminal or system console (the terminal that you used to bring up the system).

SETTING THE SYSTEM CLOCK

Your next task should be to set the system time-of-day clock. If the system clock has been set, any file that is created or updated will have the correct time and date stamp. Related functions, such as those controlled by the `cron` process, will be executed when they are supposed to be. You use the `date` command to set the clock. Figure 1A shows the general command line format for setting the clock with the Bell Version 7 or Berkeley `date` command.

Here `yy` represents the last two digits of the year (00-99); the first `mm` is the month number (01-12); `dd` is the day of the month number (01-31); `hh` is the hour (00-23); and the final `mm` is the minute (00-59). When you shut down the system, the current setting of date is preserved on the file system and is later restored to the `date` command when the system is brought back to life. Thus if the year, month, and day are the same, they may be omitted from the command line. The `ss` is the number of seconds past the minute (00-59) and is also optional.

As an example, let's assume that you shut down your system over the lunch hour and just brought it up again. The current time is 1:20 P.M., and the date is November 1, 1984. First let's enter the `date` command without any argument in order to display what the system thinks the current time is. Figure 1B shows the result. In this case it shows the time when the system was last brought down.

Your system may be automated so that it performs the entire bootstrapping sequence without your intervention.

Then we use the `date` command to reset the system clock, as shown in Figure 1C. Notice that we omitted the leading "841101" because the year, month, and day have not changed since the system was last brought down. The `date` command displays the new date and time after the clock has been set.

The Systems III or V command line format for setting the date and time is slightly different, as shown in Figure 2A. Here the first `mm` is the month number; `dd` is the day of the month number; `hh` is the hour; and the second `mm` is the minute. You have to specify the month and day number with this version of the `date` program; however, the year (indicated by the two digits `yy`) is optional. Because there is no field for seconds, you must set the clock on the minute.

Figure 2B shows an example of setting the clock (to the same date and time as shown in the last example) using the Bell System III or V version of `date`. Notice that with this version of `date` we specified the current month and day number, but since the year was not changed, it did not have to be indicated on the command line.

Every time you set or change the system clock, the `date` command records the event in the log-in history file. This file, `usr/adm/wtmp` (or `/etc/wtmp` for System V), would have a vertical bar (`|`), then the previous time setting followed by an opening brace (`{`), and finally the new time setting. You can examine this file by entering `who /usr/adm/wtmp` (or `who /etc/wtmp` for System V) to see when the clock setting was last changed. A record of all system sign-ons is also kept in this file.

a. General Command Line Format:

```
date [yymmdd]hhmm[.ss]
```

b. Current Setting of the System Clock:

```
# date
Thu Nov 1 11:48:30 PST 1984
#
```

c. Resetting the System Clock:

```
# date 1320
Thu Nov 1 13:20:01 PST 1984
#
```

FIGURE 1: SETTING THE SYSTEM CLOCK (BELL VERSION 7 AND BERKELEY)

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a. General Command Line Format:

```
date mmddhhmm[yy]
```

b. Resetting the System Clock:

```
# date 11011320
Thu Nov 1 13:20:01 PST 1984
#
```

FIGURE 2: SETTING THE SYSTEM CLOCK (BELL SYSTEMS III AND V)

CHECKING THE UNIX FILE SYSTEM

The Unix file system is fragile, and it can be easily corrupted if the Unix system is not properly shut down. To be on the safe side, you should check the condition of the file system every time you bring up the Unix system. If there is an error in the filing system, you must repair it immediately, before the system is used further; otherwise, the error in the file system will spread like a cancer until the entire file system is useless.

If your system shell script file, `/etc/rc` (used to precondition the system for multiuser operation), doesn't run a file system check automatically, you should check the status of the file system manually while still in single-user mode. The file system check program, `fsck`, is available with most Unix systems for this purpose. This program performs the same functions as the outdated `icheck`, `dcheck`, and `ncheck` programs. Because the use of these latter programs was more complicated, and thus prone to operator error, the Bell System replaced these utilities with the single `fsck` program.

You should check and repair (or "clean") all file systems before they are mounted. This way, file system corruption will not spread to any mounted file system. One reason for performing `fsck` while the system is still in single-user mode is that additional file systems are not generally mounted until multiuser operation has begun. Note that some systems do mount additional file systems in single-user mode; however, the system is quiescent because you are the only user.

The Unix file system is fragile, and it can be easily corrupted if the Unix system is not properly shut down.

In the next installment of this system administration series, we will discuss the operation of the `fsck` program and how to interpret the error and informational messages it gives.

GOING MULTIUSER

If your system is only a single-user one, you can begin your interactive session with the Unix system. Many microcomputer Unix system implementations are single-user systems, but you can upgrade them to be multiuser systems. If your system supports multiple users, you should invoke multiuser mode even if you are the only user on the system. This way, all necessary system functions will be enabled.

To initiate multiuser mode, you must first log out of the single-user shell. For the Bell Version 7 and Berkeley-derived systems, simply type a "Control-D." If you are using System III or V, enter `init 2` to initiate multiuser mode and then type a "Control-D" when you are prompted to do so. All other terminals connected to the system should then display the "login:" prompt.

After you exit your single-user shell, the `init` process takes control. It runs a special shell script with the pathname `/etc/rc` that preconditions the system for multiuser mode. You can place almost any shell command in the `/etc/rc` shell script, so you might want to place one or more commands in this file.

In general, the commands placed in this file perform the following: *(one)* housekeeping tasks, such as erasing temporary files and accounting log files used in the last session, and perhaps prompting you for setting the system clock; *(two)* file system-related tasks, such as running the `fsck` program; and *(three)* starting daemon processes, such as the clock daemon (`cron`), the line printer spooler daemon (`lpd`), and so on.

MOUNTING ADDITIONAL FILE SYSTEMS

Some implementations of the Unix system may require you to mount additional file systems after going to multiuser mode. Mounting another file system, in effect, extends the existing file system tree.

a. General Command Line Format:

```
/etc/mount devicename directory
```

b. Mounting **/dev/fd00** onto **/usr**:

```
# /etc/mount /dev/fd00 /usr
#
```

FIGURE 3: MOUNTING ADDITIONAL FILE SYSTEMS

The syntax for using the `mount` command is shown in Figure 3A. Here *devicename* is the name of the storage device (a special device filename) for the file system you wish to be mounted. You must look up the device name in your system documentation because the name depends on your particular implementation of the Unix system. The *directory* specifies the name of the directory (sometimes called the "mount point") to which the newly mounted device will be attached. Of course, *directory* must already exist on the current filing system. If not, use the `mkdir` command to create the directory.

You should check and repair (or 'clean') all file systems before they are mounted.

As an example, let's say you want to mount a file system with the special device name `/dev/fd00` (for floppy disk 0) onto the existing `/usr` directory. Enter the command line shown in Figure 3B.

The new file system is now simply an extension of the `/usr` directory. You can then create directories and ordinary files in the `/usr` directory subtree just as you would in any other part of the file system.

Logging on a user to the Unix system requires a chain of cooperating program processes. The system administrator should be aware of this process sequence. In many cases, the administrator can diagnose log-in problems by examining a `ps` listing for all system processes, paying particular attention to the processes mentioned in the accompanying sidebar ("The Log-In Process Sequence").

GOING SINGLE USER

As with the system startup, the system shut-down procedure involves several steps that are similar from one Unix system to another. However, the details of each step may vary greatly from system to system. The general steps were outlined in our first installment of this series. Let's examine these important steps more closely now.

Log in to the system console as the superuser if you have not already done so. The system console is the same terminal from which you booted up the system. If you are running in multiuser mode, first warn the other users that you are about to bring down the system in a few minutes. You can use the `wall` command for this purpose because it can broadcast to all on-line terminals simultaneously.

You can invoke the `wall` program, which generally resides in the `/etc` directory, by entering `/etc/wall`. When you're finished entering your message, type an end-of-file code (`^D`), and your message will appear on all terminals currently logged on. Wait until the other users log off (you can use `who`). If neces-

THE LOG-IN PROCESS SEQUENCE

Each of the following processes is responsible for a different step of the user log-in procedure:

`init`: This process is the predecessor of all other system processes, which (except for the kernel program) are derived ultimately from `init`.

`getty`: This process is invoked by `init` as the first step in allowing users to log on to the system. It supplies the "login:" prompt and then monitors the terminal line for a log-on request. The `getty` process then tries to adapt to the terminal line protocol (baud rate, parity, and so on) to the terminal being used for log-on.

`login`: This process is invoked by `getty` as the second step in the log-on sequence. `login` would prompt the user for a password (if necessary), and if the correct password is supplied, it invokes the appropriate log-on program.

`logon program`: This program runs immediately after the user logs on. The actual identity of this program is determined by the last field in the password file entry for the account user. Usually, a general-purpose shell, such as the Bourne or Berkeley C Shell, is specified (as `/bin/sh` or `/bin/csh`, respectively). But a program such as an editor may be used instead.

a. General Command Line Format:

```
/etc/umount devicename
```

b. Dismounting **/dev/fd00**:

```
# /etc/umount /dev/fd00
#
```

FIGURE 4: DISMOUNTING ADDITIONAL FILE SYSTEMS

sary, write directly to the stubborn users who refuse to log off.

If you are using System III or V, enter `init 1` to return to single-user mode. (Other versions of the Unix system don't require this step.) Next you must terminate all processes except your own shell process with the `kill` command. The kernel program and the `init` process, however, can't be terminated with `kill`.

If your system has a "killall" program that can terminate all other processes, then invoke it. Otherwise list all system processes with `ps -ax` (for Version 7 and Berkeley) or `ps -e` (Systems III and V), and then use `kill` to terminate all processes except your log-in shell. Finally verify that `kill` has done its job by examining a `ps` listing for all system processes. Terminate any stubborn processes with the `kill -9` command.

The most important step in shutting down the system is *to properly update the file system* by writing the contents of the computer memory to disk. To update the file system, you use the `sync` command. This command writes all the appropriate information that is in volatile memory (the contents disappear when power is removed) to the disk memory. Simply enter `sync` and wait several seconds until all disk activity stops.

DISMOUNTING ADDITIONAL FILE SYSTEMS

If you mounted any additional file systems during the system startup procedure, this would be a good time to dismount those file systems. (You don't have to dismount a file system when shutting down.) Otherwise simply skip this step.

The most important step in shutting down the system is to properly update the file system by writing the contents of the computer memory to disk.

A file system can't be dismounted if it is "busy"; that is, if a file on that file system is being accessed. All file systems, other than the root file system, should be quiescent at this point because all other users have logged off and all nonconsole processes have been terminated.

Use the `umount` (correct spelling) command for dismounting the file systems. The syntax is shown in Figure 4A. Here *devicename* is the same name you specified when the file system was mounted. You can determine this name by simply typing `/etc/mount` (with no arguments), and `mount` will report all the file systems and the device on which they are currently mounted. Figure 4B shows `/dev/fd00` being dismounted.

If you don't have time to carry out every step of a normal shutdown procedure, you should at the very least enter the `sync` command and then power down immediately before any more file system activity occurs. The system users may lose some of their work, but at least the file system should be relatively intact when you bring the system back up.

It is also a good idea to have a separate account on the system that only executes the `sync` command as the log-on program. This way, any system user can execute `sync` by merely logging on to this account. We will discuss setting up such an account in a future installment of this series. □

Based on A User Guide to the Unix System, *second edition, by Dr. Rebecca Thomas and Jean Yates.* *Copyright © 1985 by McGraw-Hill Inc. Used with the permission of Osborne/McGraw-Hill.*

Dr. Rebecca Thomas, UNIX/WORLD's Editor Emeritus, is an author of A User Guide to the Unix System, *the second edition of which is now available. She is currently writing a book on Unix system administration.*

Acknowledgments

I wish to thank Nancy Blachman and Rik Farrow for many interesting discussions on various aspects of system administration.

20/20: THE 1-2-3 OF UNIX-LAND?

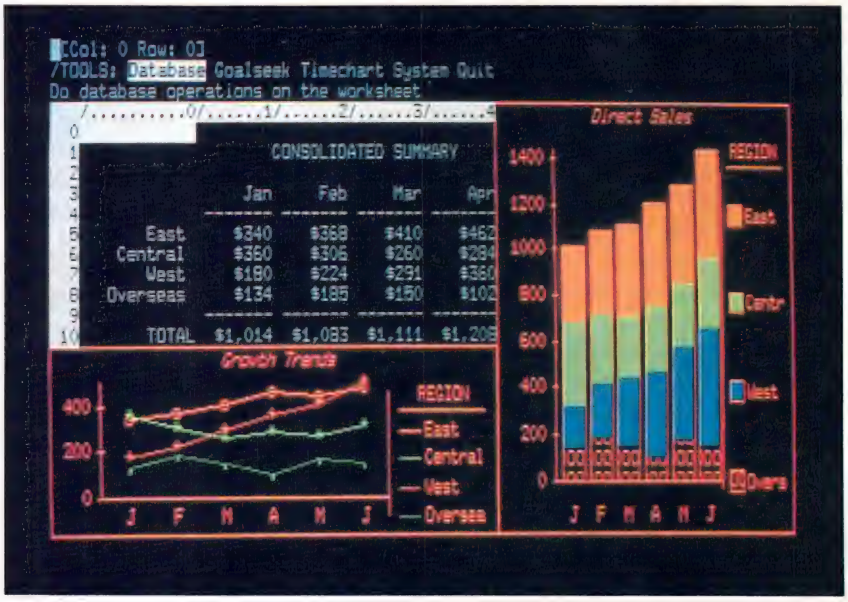
BY HARRY AVANT

Fast, versatile, and easy to use, 20/20 also runs on a wide variety of computers, including micros, minis, and mainframes.

The 20/20 software program is an integrated spreadsheet and financial analysis package that goes beyond being just another pretty spreadsheet. In fact, 20/20's maker, Access Technology Inc., often touts its product as the Lotus 1-2-3 of Unix-land. Among its added features—ones you don't ordinarily find in spreadsheets—are graphic representation in both video form and hard copy, consolidation of linked worksheets, database capability, project modeling facilities, and use of command files.

20/20 also has an added benefit not available with most spreadsheets and financial analysis programs: It runs on a wide variety of computers, including micros, minis, and mainframes. Perhaps most importantly, all share common data and command structures, allowing for portability of financial models between computer types. For this review, I used an AT&T 3B2/300 with 2 Mbytes of memory, a 32-Mbyte hard disk, and a feature card containing one parallel and four serial ports. During most of the testing, I used a Teletype Model 5420 terminal for console input. For evaluating video graphics, I used a VT-125 via a modem operating at 1200 baud.

20/20 offers functional integration that one has come to expect in



20/20 provides spreadsheets, graphics, and windowing capabilities.

top-selling programs designed for the MS-DOS microcomputer world, but this one runs under the Unix system. It is fast, versatile, and easy to use. However, its large worksheet size, which can be as big as 1000 rows by 1000 columns, is not really feasible because of the memory limits of most computers.

In its AT&T 3B2 version, 20/20 is limited in its graphics hard-copy output because it offers support in this release only for a plotter. Future versions are slated to support some popular dot-matrix printers under the Unix system, as does the current MS-DOS implementation of this program. With a suggested list price of $950 for the version I tested, 20/20 is competitive with other spreadsheets running under the Unix system, but it offers more features than some others.

BUSINESS SITUATIONS

This program typically would be used in business situations, where large spreadsheets need to be combined with graphics as well as limited project forecasting and model analysis. The ability to run essentially the same program on a variety of computers is a definite plus for business users. A consistent set of commands and portability of worksheet data between microcomputers running MS-DOS and Unix system machines minimizes problems of operator training and intercomputer communication.

The command file capability allows for spreadsheet template generations that untrained users can fill in, much the same way that command files are used with popular database programs such as dBase II. With 20/20's ability to link worksheets, data entry may be spread over various individuals or departments, yet another benefit of this program.

Access Technology also supplied an MS-DOS version of the product so that I could confirm that commands, functions, and operating characteristics were indeed computer independent.

Several terminals are supported, including the following: Tektronix 4105, Teletype 5420 and 5460, and DEC VT100, VT101, VT125, VT220, VT240. Users can utilize additional terminals by making simple and well-documented changes to the program's terminal description file.

When you first bring up the program, it displays a screen with 19 rows by 8 columns for data entry. In the default state, the cell is wide enough for eight characters. Current cell location is displayed in the upper left corner, and below that is a "Ready" prompt. For 5420 terminals, the current cell is also identified by a reverse video block.

Pressing the virgule, or slash (/), key replaces the "Ready" prompt with a selection of commands such as "Copy," "Modify," "Format," and so on. The current selection is highlighted by a reverse video cursor. Immediately below the selections is a "Mini-Help" line, which lists the major capabilities of each command as they are cycled through using the cursor keys. Entering a carriage re-

COMPANY OVERVIEW

CORPORATE

Company name	Access Technology Inc.
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In business	Four years
Headquarters	Six Pleasant St., South Natick, MA 01760

MANAGEMENT

CEO	Allen Kluchman, President
VP marketing	Carl Nelson
General sales contact	Russell Gee, VP Sales

FINANCIALS

	This Year	Last Year
Gross revenue	Approx. $4.5 million	—
Net income	N/A	—
Employees	65	35
% of total expense spent on R&D	30%	—
Units shipped	10,500 (total for all computers)	
Major support centers	South Natick, Mass. Ashford, Kent, England	
Major funding	1st and 2nd rounds: John Hancock, Oxford Partners Mass Technology Development Corp.	

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turn selects the highlighted command, and any submenu options are displayed. You may bypass the sequencing of menus if you can remember the keystroke sequences for the operation you want to perform.

DOCUMENTATION

Documentation for the 20/20 program is first class. Contained in a single 7-by-9-inch, three-ring binder, the documentation is divided into sections entitled "Getting Started," "Reference," "Commands," "Functions," and "Appendices/Index." Except for the appendix and a few pages of computer-specific information in "Getting Started," the material is printed on high-quality stock in two colors. Also supplied is a keyboard template that defines special function keys.

Because Access Technology assumes that the purchaser is familiar with operating fundamentals for the computer, the documentation presents very few elementary concepts. For the 3B2 version, however, the documentation gives detailed instructions for loading software and altering default parameters.

Within the 'Appendices/ Index' section is a glossary, an item software houses often overlook.

Two on-line tutorials are supplied. The first, which covers basic instructions for using the program, includes most material you need to use 20/20's elementary features. The second, or advanced, tutorial highlights 20/20's special features, including spreadsheet consolidation, graphics, and the database commands.

Within the "Appendices/Index" section is a glossary, an item software houses often overlook. Yet a glossary is a real plus when you are dealing with programs that introduce terms such as "branching command files" or "mixed cell reference."

Even though the documentation is, overall, very complete and well organized, I wish that a summary card had been provided. I have found that summary cards are handy when

SUMMARY OF FEATURES

FUNCTIONS

ABS	absolute value of an expression AVG calculates average value of a list
BLANK	counts number of blank cells in a list
COL	returns the column number of cell containing a function
COUNT	counts non-blank cells
DATE	converts value of an expression to a date
DAYS	converts a date to a number of days
DEPR	computes four types of depreciation functions
ERR	sets a value for an error
EXP	computes the value of "e" raised to a power
FV	computes future value of a cash flow
IF	logical test for "if" or "then" values
INDEX	indexes a sorted list
INT	returns the integer part of an expression
IRR	computes internal rate of return
LABEL	counts number of cells containing labels
LN	calculates natural logarithm
LOG	calculates common logarithm
LOOKUP	computes value against values in a range argument
LSQ	linear regression analysis
MAX	returns largest value in a list
MIN	returns minimum value in a list
MOD	modulo division
MONTH	returns three-letter abbreviation for a month (number)
NA	data-not-available function
PI	fixed value depending upon computer
PV	returns present value of a cash flow
RANK	ranks number in a list by order
ROW	current row number
SEL	selects an item in a list depending on value of expression
SORT	sorts a list in ascending order
SQRT	computes square root
SDT	computes standard deviation
SUM	computes sum of a list

Trigonometric functions: SIN, COS, TAN, ASIN, ACOS, $ATAN^2$, ATAN

COMMANDS: Thirteen major commands with 128 subcommands, addressing topics such as format of data, link and consolidate worksheets, synchronize windows, various parameters to specify graphic output, and usual spreadsheet-type commands.

LIST OF SUGGESTED PRICES FOR 20/20

Computer System Vendor	Machine/Operating System	Machine Model	Retail List Price
DEC	VAX (VMS)	780, 785	$5800
		750	4800
		730/725	3800
		Micro VAX	1200
	Rainbow (MS-DOS)		500
IBM	VM/CMS		9700
	PC (MS-DOS)		500
Prime	PRIMOS	9750/9950	5800
		9650/50 Series	4800
		2550	3800
		2250	2800
Data General Corp	MV Series (AOS/VS)	10000	5800
		8000	4800
		6000/4000	3800
	DG One	(MS-DOS)	500

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DEC	VAX (Unix)	750, 780, 785	4800
		725, 730	3800
	PDP-11 (RSX-11, TSX+)	11-70	2200
		11/40-11/50	1400
	RSTS/E (Unix)	11/03-11/34	950
	RT-11	All	750
	Micro-11		750
	Professional	300 Series	400
Prime		9750/9950	4800
		9650/50 Series	4800
		2550	3800
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Cadmus	Unix		950
Charles River	UNOS		950
Onyx	Unix		950
Perkin-Elmer	Unix Multiuser	7350	950
	Single User	7350	495
	Unix	3250	4800
	Unix	3230	3800
	Unix	3210	2700
	Unix	3205	2000
Pixel	Unix		950
Plexus	Unix	P40, P60	950
	Unix	P25, P35	950
SGS	Unix		950
Western Electric	Unix	3B20	4800
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I use complex application programs that offer too many commands to be memorized. Access Technology evidently agrees, for the firm has begun designing a summary card. Another deficiency is that the documentation does not contain any information about the numerical accuracy of the software.

FEATURES THAT IMPRESS

If you have had complaints with other spreadsheets because of limited worksheet size, 20/20 will impress you with its 1000-rows-by-1000-column capacity.

20/20 also includes a page-move feature that allows you to move up or down, as well as left or right, a screenful at a time.

A contex-sensitive, on-line help file is available, which you may call up by using the "Help" key. This key will vary, depending on the terminal you are using. On an IBM PC, for example, the "Help" key is the "F1" key, on the VT240, it is the "Help" key found on the keyboard. When you call up on-line help, you are given a choice of six major topics.

You move the window around the spreadsheet with the usual cursor keys or with `goto` commands common to other spreadsheets. 20/20 also includes a page-move feature that I found very nice. It allows you to move up or down, as well as left or right, a screenful at a time.

As displayed on the screen, commands are multilevel; that is, se-

lecting a particular one can bring up a submenu of additional commands. The program also allows you to use a type-ahead method for selecting commands and subcommands. If, for example, you want to force the program into automatic recalculation (as opposed to recalculation on demand), you would select the `/O` (for "options") command menu, which would bring up a second menu offering `Recalc` as one of the items.

If you select `Recalc`, you are presented with a choice of manual or automatic recalculation. The type-ahead feature allows you to bypass the submenu options by simply typing `/ORA`. Of course, you have to know what the various submenu commands and options are in order to do this. This situation is an example when a summary card could be handy.

Any spreadsheet will allow you to play "what if" games with numbers, but 20/20 offers a capability not found in simple spreadsheet programs. 20/20 has a goal-seeking capability that works backwards. One of the tutorials offers an excellent example of this: A worksheet for an Individual Retirement Account (IRA) is set up using a fixed amount for annual contributions and interest rate. You can easily change either the annual contribution or the interest rate to determine what the account value will be after 10 years.

Now suppose that you want to work the problem backwards; you want to know how much money you must put in yearly at some interest rate in order for the result to be a specific accrued amount. By using the goal-seeking function, you can put your desired final amount, say $50,000, on the bottom line, and the program will work backwards to tell you how much money you must contribute each year to achieve that amount.

Another of 20/20's capabilities not found in all spreadsheets is its command file capability. These files allow you to store routines in files that control the cell entries, cursor positioning, and spreadsheet commands. This allows you to write spreadsheet templates and instructions for data entry within a single file.

The tutorial programs appear to have been composed in this manner. When the command file is executed, appropriate material and conventional text prompts for data entry are displayed. Because command files may invoke other command files, very complex routines are possible. The branching ability may be controlled by calculated results, which in effect allows for conditional branching. You may prepare command files with either the spreadsheet file itself or by using a text editor.

FOUR MAJOR FUNCTIONS

A limited database facility is also integral to this software. Four major functions are supported. A `sort` command will perform a sort on alphanumeric data in either row or column order. `sort` is specified by the operator in either ascending or descending order. You must specify the range of data and the rows or columns, as well as a location to place the sorted data.

The second database function is a `find` operator. 20/20 presumes that columns are fields and that rows are records comparable to a conventional relational database. The `find` function will locate and identify data that match the criteria specified. You can extract matches to different locations within the worksheet, which is the third database function available. The fourth function consists of several operators such as "find the maximum value of data" or "sum selected fields."

The `graph` command allows you to create line, bar, comparison bar, stacked bar, and pie chart graphics. You can also simultaneously display four different graphs on the video display, one graph for each of the four possible windows. Graphic data is automatically redrawn whenever the worksheet from which it is derived is updated.

20/20 contains full provisions for title, subtitles, and assorted labels. You can store and later recall completed graphs, and you can plot graphs in color using an HP 7475A plotter.

GLOSSARY OF TERMS

You now know most of 20/20's anatomy. It consists of the following:

- **Worksheet:** the area where a spreadsheet is created
- **Cell:** location on the worksheet that holds a label, number, or formula
- **Cell cursor:** a highlighted cell
- **Current cell:** indicated by the cell cursor
- **Worksheet window:** the area of the screen that displays portions of the worksheet
- **Border:** the highlighted column and row number indicators
- **Header:** the top three lines of the screen

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A useful set of mathematical functions is included in 20/20. Provided are the usual assortment of transcendental functions, including trigonometric, natural log, and common log. Enough primitives are present to allow you to construct almost any formula. Both date and days between dates are available. Four of the most-used depreciation functions—straight line, sum-of-digits, double declining, and crossover—are available. Other built-in monetary functions include future value of a cash flow, internal rate of return, and present value of cash flow.

You can execute a Unix shell command by selecting the SYSTEM option from within the tools command. The shell command will execute just as though you were at the Unix system shell prompt. When you are done, a carriage return brings you back to 20/20 where you left off.

JUDGING PERFORMANCE

It is difficult to judge the performance of a program such as this one. The 1000-by-1000 size potential boggles the mind, and I did get curious whether I could really set up a worksheet that big. I tried the following experiments to see if it was possible. In Window One, I displayed columns 0 to 8 of row 0. I set up Window Two to show columns 0 to 2 of rows 982 to 999. A third window was set up to display rows 982 to 999 of columns 994 to 999. I replicated the number 1 in column 0, rows 0 to 998, and the sum of the columns in 0,999.

I set up the same sum function in 0,999,999,0 and in 999,999 (stated in row-column order). Next I changed the number 1 in row 1, column 0 to the number 2 and measured how long it took to place the new sums in the three locations. This little test required 11 seconds. As a point of interest, I used the /OPTIONS command to check memory used. The indicated usage was 60,728 (or 32 percent in a 2-Mbyte system).

As is the case with most spreadsheets, it is not possible to use all the available cells because of memory limitations. I did not alter the default worksheet maximum size, even though 2 Mbytes of memory are installed in the 3B2 I used for these evaluations. According to the vendor, 20/20 will allow you to use the full 1000-by-1000 size when running the program on computers such as a DEC VAX or an IBM mainframe.

In 20/20's case, I was able to enter the number 1 in a total of 4104 different locations (no, I didn't type all of those—I used the copy function) before an out-of-memory message appeared. A check of memory indicated 187,512 used locations, or 99 percent. Well, 4104 cells are not the full 1 million cells that a true 1000-by-1000 spreadsheet would give, but it still represents a lot of locations.

20/20, from Access Technology, is a helpful tool that users could apply to solving many types of business problems. It offers a large worksheet size, integration of graphics and database functions, and a command file feature. Linking and consolidation of worksheets is included, providing an easy method for breaking large data entry tasks into manageable units. It appears that Access Technology has used knowledge derived from its popular Supercomp 20 program and combined it with the current trend of programming functional integration to produce a versatile and valuable program. □

Harry Avant is a member of the technical staff at the Jet Propulsion Laboratories, Pasadena, Calif. His work involves evaluating micro- and minicomputers and their related software for office automation applications. Mr. Avant's last work for UNIX/WORLD *appeared in Vol. 2, No. 2.*

ACCESS TECHNOLOGY RESPONDS

Thank you for the opportunity to review the draft of Harry Avant's article about 20/20. Harry did a good job, and I enjoyed reading it. I hope that you don't find my comments overly picayune.

First, the statement "20/20 is limited in its hard-copy output. . . ." is inaccurate. Although 20/20 is limited in its graphics hard-copy output device support, it is *unlimited* in its ability to print text/numbers to any line printer supported by the system.

Second, the paragraph on spreadsheet/memory size is misleading and inaccurate. We ship the product configured to allow users a 200K worksheet. This parameter is easily altered by users. The only memory limit 20/20 has is the real memory on the system.

Also, as a test case, we built a model in which we put the number *1* in more than 12,000 cells on our 3B2. This used only 284K of memory, with plenty left to build a full 1000-by-1000 model if desired.

Jay Yesselman
Product Manager

MARK WILLIAMS COMPANY'S COHERENT ON THE IBM PC

BY RONALD BERG

Coherent is a good choice for the IBM PC /XT owner who wants a Unix-compatible operating system at a reasonable cost and low system hardware overhead.

The Coherent operating system from Mark Williams Company could solve a common quandary for many potential IBM PC and compatible Unix system users, although it is not without drawbacks. Most personal computer Unix systems require expensive software licenses and a significant hardware investment compared to MS-DOS/PC-DOS machines. Coherent, on the other hand, solves that dilemma because it requires only 256K bytes of main memory and a 5-Mbyte hard disk. Even better, it costs only $500.

Coherent is a Unix-compatible operating system that runs on your IBM PC/XT and compatible systems; it can also support two additional terminals through the IBM serial ports. Coherent is system-call compatible to Unix Version 7 and includes some of its multiuser and multitasking capabilities.

Written in 1980 for the PDP-11 computer, Coherent was moved two years later onto the IBM PC. However, Coherent did not become commercially available until the spring of

Courtesy of IBM

COHERENT WAS MOVED TO THE IBM PC IN 1982.

1983. It is now available for several different hard-disk drives, including the IBM PC/XT, Corvus, Davong, and Micronetworks systems.

The Coherent version 2.3.30 comes with seven double-sided diskettes and a large binder of documentation. The diskettes include a build/boot disk (configured for the XT) and six disks of archived programs, which make up a little over 2 Mbytes of programs. This is actually quite small for a typical Unix system, which runs from 5 to 15 Mbytes.

Although the binder is a little intimidating to the average PC-DOS user, the documentation is quite complete. The documentation, which is a rewrite rather than a copy of the Unix manuals, is in many cases much clearer than its Unix system counterparts.

The documentation is organized on a functional basis rather than by strict alphabetical order. It contains a section on the history of Coherent, an administrator's guide, a general command guide, a shell command language tutorial, tutorials on the `as`, `bc`, `ed`, `lex`, `nroff`, and `m4` commands, and a Coherent system manual (C programming guide). However, a more complete installation guide is needed—one designed for the average DOS user, rather than for the Unix system user.

COMPANY OVERVIEW

Corporate	
Company name	Mark Williams Company
Public/private	Private
Year founded	1976
Headquarters	1430 W. Wrightwood Chicago, IL 60614
CEO	Robert Swartz
General sales contact	Denise Lesyna 800/MWC-1700 312/472-6659
Financials	N/A
Major support center	Chicago, Ill.
Major funding	N/A

HARDWARE SUPPORTED

Manufacturer	Model Number(s)
IBM	PC/XT, PC/AT
AT&T	6300
IBM PC compatibles	
DEC	PDP-11 series
Motorola	68000
Commodore	Z8001-based business machines

COMMAND COMPLETENESS AND INSTALLATION

Coherent is surprisingly complete for a rewrite of Unix Version 7. It includes `lex`, `awk`, `yacc`, `sh`, `tar`, `sed`, `mail`, and `nroff`, as well as C, of course. Some of the commands missing from the Version 7 implementation are `cu`, `uucp`, `nice`, `spell`, `f77`, and all the typesetting commands.

Some of the commands such as `adb` and `fsck` have been replaced by different commands that perform similar functions such as `db` and `check`. The C compiler automatically produces the `lint` messages, making `lint` unnecessary. A future release of Coherent will include Pascal.

The C compiler follows all the "standards" in Kernighan and Ritchie's *The C Programming Language*. The compiler supports only the small memory model, which restricts program size to 64K. The optimizer is standard and global rather than peephole, which should make most programs smaller than they would be under other C compilers. A note to Unix system programmers about Coherent: Be sure you look up the `cc` command in the manual because there are some differences in the compiler options.

Coherent would be an even nicer development system with several of the System III and Berkeley commands such as SCCS, `vi`, `csh`, `tset`, `clear`, `xstr`, `xargs`, and `xref`. Also missing was a `curses` subroutine package. This facility might not be missed, except by those who run additional terminals from their PC/XT, or by those who want to run other Unix system

applications. I found a `termcap` file, but there were no references to it in the manual.

AN INTERESTING EXPERIENCE

Installing the Coherent system was an interesting experience. To get the most speed from each type of hard disk, the system has different drivers for the various popular hard disks on the market. Unfortunately, my hard disk was not one of those offered. I have a 640K IBM PC with a Sigma 10-Mbyte hard disk (Cogito drive, DTC controller). I backed up my hard disk and tried to install Coherent anyway. It didn't work. When I booted the Coherent boot/build disk and typed the command `build`, my computer said, "Not found."

The Coherent manual says, "If your installation of Coherent does not succeed, either your hardware is not configured correctly, or the software supplied on diskettes is unreadable or inappropriate for your system. Reread the installation instructions carefully, then repeat the installation procedure. If you still cannot install Coherent, make sure the problem is not with your IBM PC hardware." Because the boot/build diskette was tailored for an XT, I assumed the disk would not work on my system and went out to obtain an XT.

After renting an XT at my local computer store, I brought it back to the office and set it up, confident that this time the build procedure would work; it didn't. Build was still "Not found." It was time for a call to the Mark Williams Company (MWC).

A technician for the company told me that I had the wrong installation instructions. Apparently a smaller floppy-disk version of Coherent that you bring up with the command `fdcoherent` contains the necessary initialization routines. With correct instructions I had the system up and running in about 15 minutes. As it turned out, it also ran fine on my PC.

Because I had problems getting the benchmark programs up and running under Coherent, the actual performance numbers were not available at press time. The loader gave me an "outdated ranlib" warning message. A more serious problem was an "out of tree nodes" message from the code generator. This was probably due to the 64K code size limit in the version 2.3.30 compiler.

> **I could compile one program and edit another while my dog looks at his retirement plan on the other terminal.**

After talking with the Mark Williams folks again, I discovered that the 2.3.30 version is an interim version that the company said fixes some problems in the 2.3 and 2.3+ versions. Version 2.4, which they said will fix many of the problems, is in the works.

After much effort, I was still unable to execute the benchmarks. Because the Aim benchmarks have executed correctly on over 50 different Unix system machines and are compatible with all major versions of the Unix system, the problem was probably due to minor variations in Coherent. Still, I would like to thank Bill Lederer, general manager, for his help in trying to solve the problems. With more time, I am sure the MWC staff could have solved the problem. I hope the MWC staff will obtain a copy of the Aim benchmarks to further improve the Unix system compatibility.

SYSTEM PERFORMANCE

The system performance was very good—at least it felt very good. A small C program compiled very quickly, and the response from the system utilities was excellent. I configured my computer as a terminal and had two users running at the same time on the XT.

Working under a development system with tools such as `make`, `db`, `move`, `grep`, `find`, and `tee` makes program creation much quicker. Using the Coherent C compiler was almost effortless compared to what you must do when compiling a program under most PC-DOS C compilers. With a single command, the Coherent C Compiler compiled, optimized, and linked my code about twice as fast as my PC-DOS C compiler.

I could compile one program and edit another while my dog looks at his retirement plan on the other terminal, all at the same time. Moreover, I didn't have to take a coffee break while my programs compiled. Try that under the PC-DOS environment.

With Coherent's swapping option enabled, I was able to run five different tasks while at the same reducing the system response to about two-thirds of the single task speed. Ten tasks slowed the response down to about one-third speed, and at 18 tasks the system took 20 minutes to do a two-minute sleep

loop. From this I concluded that between four and eight tasks could be run at the same time without making the system impossible to work with. Increasing the system memory from 320K to 640K would certainly make for faster system response time because more tasks could be run without swapping.

The Coherent documentation includes a section on leaving part of your hard disk for PC-DOS. This gave me visions of a development environment with a Unix-like system and the ability to download software to the PC-DOS environment. By partitioning your disk using the DOS `FDISK` command and the Coherent `mkfs` commands, you are able to put both environments on the same hard disk and get the best of both worlds.

NOT WITHOUT ITS PROBLEMS

The Coherent/PC-DOS marriage is not without its problems, however. The `dos` utility allows you to transfer files from Coherent to PC-DOS, but you must use an eight-sector diskette, and the options to the `dos` command must not have a leading dash. The MWC-86 C compiler is available for $495, but it is a separate product that runs under PC-DOS. The MWC-86 compiler is source-compatible with the Coherent C compiler and even includes a C-source language debugger.

As long as you don't mind transferring the source files to and from the Coherent environment, this combination of Coherent and DOS creates an excellent development environment for many programmers and system houses. They can cross-develop their PC-DOS programs for the Unix system environment and create new programs for PC-DOS while working in a Unix system-like environment.

I was surprised to find that log-in and process-accounting functions are included in the IBM version. This provides a wonderful means of keeping a daily use log for those software developers working out of their homes. The only problem with the log-in accounting is that it takes up a large amount of disk space if it is not printed and purged regularly. For most people, this would be about once a month.

Product support is possibly the second most important item in purchasing a product. The MWC staff members appear to be committed to supporting their product. First, they provide an 800 number to call if you have problems, and they called me back the same day to answer my questions. Second, they showed an interest in my general comments concerning the install procedure, and they were also helpful and patient in areas with which I was unfamiliar. The MWC technicians responded rapidly to the problems with the Aim benchmarks.

Version 2.3.39, which became available in February, features a full-screen editor, support for nine-sector diskettes, and the `cu` command. A Mark Williams spokesman said the `uucp` command would be included in Version 2.4., which should become available this summer. The documentation will be typeset in the popular IBM size.

MARK WILLIAMS COMPANY RESPONDS:

First, we want to thank you for the excellent review of our product. At Mark Williams we are constantly striving to improve our products. Present releases of Coherent include `cu`, and we will soon be releasing `uucp`, which we have running in-house.

With respect to the Aim benchmarks, the reviewer has been in contact with us about the specific problem he encountered. We sent him a later version of the compiler but have been unable to reach him to determine if the problem remains. This revision of the compiler successfully compiled the fragment of code that the previous revision would not.

The DOS program currently supports nine-sector per track floppies and has done so for some time. In the current revision, it defaults to nine sectors and double-sided disks.

We appreciate the comments about our documentation being superior. We constantly strive to make it clear and readable to all users, particularly the first-time user.

We do not include the spell programs with the standard distribution since many of our customers have only 5-Mbyte disks. However, it is available from us for a nominal fee.

Finally, we appreciate your comments about Coherent having excellent performance and command response time.

William G. Lederer
General Manager

Those who have previous versions should be receiving a notification of the new release once it is available. Diane Treacy of MWC told me the update will cost $50, a lot less than many companies charge for their updates. An update to the compiler should be available as this review goes to press.

The Coherent operating system is a good implementation of Unix Version 7. I am concerned, though, with the problems in getting the benchmarks to work. I would also like to see a few items that would improve the system, such as the Berkeley C shell, the System III Source Code Control System (SCCS), and a better user guide. However, Coherent is still a good choice for the IBM PC/XT owner who wants a Unix-compatible operating system at a very reasonable cost and low system hardware overhead. □

Ronald Berg is the senior partner of Mega-Micro Computers, a software development and consulting firm in Concord, Calif. He has programmed extensively on a wide variety of computers and has also worked for a major spreadsheet software company.

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APPLICATIONS SOFTWARE

BLAST COMMUNICATIONS SOFTWARE FOR UNIX SYSTEMS

Communications Research Group has released Blast for Unix systems. Unix Blast products provide file transfer and terminal access to link Unix systems with other computers running Blast software.

The new Unix Blast offering includes AT&T 3B2, 3B5, and 3B20; DEC VAX (Unix System V and Berkeley 4.2); NCR Tower; Plexus; Pixel; Masscomp; Charles River Data Systems; Zilog (Zeus); and Altos 586 (Xenix).

Blast is priced at $250 (for micros), $595 to $895 (for minis), and $2495 and up for mainframes. Any computer with Blast can transfer files to any other computer with Blast. No add-on hardware or boards are required to use Blast via standard RS-232 ports.

For more information, contact Communications Research Group, 8939 Jefferson Highway, Baton Rouge, LA 70809; 504/923-0888.

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For more information, contact Computone Systems Inc., One Dunwoody Park, Atlanta, GA 30338; 404/393-3010.

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R SYSTEMS' OFFICE AUTOMATION PACKAGES

R Systems Inc. has announced three software packages for Unix-based systems. The first, priced at $1295, is R Word III, an office automation package that incorporates word processing, database/file management, and office time management.

Also new is R Office Manager, an office management software package. The program replaces the desktop rolodex card files, calendar/daily scheduler, appointment book, calculator, and phone/interoffice message sheets. The package provides password protection for each user and is priced at $295.

The third product, R Word II, is a production word processing package that offers editing, formatting, printing, and report-generation capabilities. The package, priced at $895, includes screen and help prompts, a spelling checker, mail merge capabilities, and a three-level file structure with password protection of documents.

All packages are written in assembly language, and all run under Unix and Xenix systems on

The R Word word-processing package

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The beauty of UNIPLEX II is its simplicity. One personality and one command structure throughout the program provide an ease of use never before experienced with UNIX application software.

UNIPLEX II integrates sophisticated word processing, spreadsheet, and relational database applications into a powerful one-product solution.

UNIPLEX II uses termcap, so it can run on virtually any computer terminal. "Softkeys" allow the user to define function keys which are displayed on the 25th line of most terminals to provide versatility and ease of use.

All this at a price you'd normally pay for a single application software package.

UNIPLEX II is available immediately from UniPress Software, the company that's been at the forefront of quality UNIX software products longer than anyone else.

OEM terms available. Mastercard and Visa accepted.

Call Today! Once you've got it, you'll see why UNIPLEX II is the most widely used integrated office automation software for UNIX-based systems.

Write to: UniPress Software, 2025 Lincoln Hwy., Edison, NJ 08817 or call: **1-800-222-0550 (outside NJ) or 201-985-8000 (in NJ)**; Telex: 709418. Japanese Distributor: Softec, Telephone: 0480 (85) 6565. Swiss Distributor: Modulator SA, Telephone: (031) 59 22 22.

UniPress Software

Your Leading Source for UNIX™ Software

UNIX is a trademark of AT&T Bell Laboratories. Uniplex II is a trademark of Uniplex Integration Systems

Please circle Ad No. 77 on inquiry card.

M68000/10/20- or Intel 80186/286-based computers.

For more information, contact R Systems Inc., 11450 Pagemill Rd., Dallas, TX 75243; 800/527-7610.

Please circle Reader Service Number 162.

PRECISION VISUALS' NEW GRAPHICS PACKAGE

Precision Visuals Inc. has introduced PicSure, a software package that offers on-line tutorials, screen prompts, and preconstructed layouts that let beginners produce pie charts, vertical and horizontal bar charts, X-Y plots, text charts, and scattergrams.

More sophisticated users can create customized graphs having multiple charts, extensive annotation, variable type fonts, and color shadings and patterns.

PicSure is available for IBM systems with VM/CMS or MVS/TSO, and for the DEC/VAX with VMS as well as Unix System V. Precision Visuals also offers a standard ASCII version of PicSure.

Prices for the PicSure package range from $6500 to $25,000, depending on machine class.

For further information, contact Precision Visuals, 6260 Lookout Rd., Boulder, CO 80301; 303/530-9000.

Please circle Reader Service Number 163.

LBA's MACINTOSH/UNIX NETWORK

Lutzky-Baird Associates (LBA) has announced Ultra-Office, a family of office information system products. Ultra-Talk, the first product in the Ultra-Office line, allows users to connect Macintosh personal computers from Apple with a Unix-based information management system.

The first release of Ultra-Talk provides a personal file management system, a system library available to all users, electronic mail, password-protected access, and callback-protected remote access. For more information, contact Lutzky-Baird Associates at 5601 Slauson Ave., Suite 222, Culver City, CA 90230; 213/649-3570.

Please circle Reader Service Number 164.

LOGICAL SOFTWARE's SOFTSHELL GOES MULTIUSER

SoftShell, Logical Software's full-screen user interface, is now available on a number of multiuser machines, including the IBM PC/XT under PC/IX, PC/AT under Xenix, DEC Pro-350 under Venix, and the NEC APC III under PC-UX.

SoftShell's three programs include Yelp (which provides structured help information and templates for Unix commands), LSLS (SoftShell's directory walk program), and the LShell (a full-screen scroll handler).

Systems integrators can customize SoftShell, adding a consistent interface for new applications by writing an outline of the application; no changes to the underlying Unix programs are required.

License fees for binary copies of SoftShell range from $295 to $995, depending on the CPU. OEM and distributor agreements are available.

For more information, contact Logical Software Inc., 17 Mt. Auburn St., Cambridge, MA 02138; 617/864-0137.

Please circle Reader Service Number 165.

UNISOURCE SCHEDULING SOFTWARE

Unisource Software Corp. has announced "The Skeduler," a program that functions as both a personal appointment book and as an interoffice bulletin board. Users can print out a daily, weekly, or monthly appointment schedule, plan a schedule on the terminal, unlock the file, and let their secretary or associates check their availability.

For $140, the Venix, PC/IX, Xenix, and MS-DOS user can purchase a single-diskette scheduling program with automatic reminder, on-line documentation, and help features on every level.

For more information, call Unisource Software Corp., 71 Bent St., Cambridge, MA 02141; 617/491-1264.

Please circle Reader Service Number 166.

QUADRATRON's INTEGRATED VOICE AND TEXT CAPABILITIES

Quadratron Systems' software is now available for digital voice telephone workstations. Major voice functions such as store and forward, annotation, transcription, and mail are now compatible with Quadratron Q-Office office automation tools.

With the integrated voice and text messaging system, users can send, receive, and forward formatted documents and letters containing phone messages. Although voice digitation software is not included, all data management functions such as search, locate, and reference are fully supported.

Quadratron software is currently part of office information man-

TEXT EDITING

NEW RELEASE

UNIPRESS EMACS™

VERSION 2

Another in a series of productivity notes on UNIX™ software from UniPress.

Subject: Multi-window, full screen editor.

Multi-window, full screen editor provides extraordinary text editing. Several files can be edited simultaneously, giving far greater programming productivity than vi. The built-in MLISP programming language provides great extensibility to the editor.

New Features:

- *EMACS is now smaller and faster.*
- *Sun windows with fonts and mouse control are now provided.*
- *Extensive on-line help for all commands.*
- *Overstrike mode option to complement insert mode.*
- *New arithmetic functions and user definable variables.*
- *New manual set, both tutorial and MLISP guide.*
- *Better terminal supoort, including the option of not using unneeded terminal drivers.*
- *EMACS automatically uses terminal's function and arrow keys from termcap and now handles terminals which use xon/xoff control.*
- *More emulation—TOPS20 for compatibility with other EMACS versions, EDT and simple WordStar™ emulation.*

Features:

- *Multi-window, full screen editor for a wide range of UNIX, VMS™ and MS-DOS™ machines.*
- *"Shell windows" are supported, allowing command execution at anytime during an edit session.*
- *MLISP™ programming language offers extensibility for making custom editor commands! Keyboard and named macros, too.*
- *"Key bindings" give full freedom for defining keys.*
- *Programming aids for C, Pascal and MLISP: EMACS checks for balanced parenthesis and braces, automatically indents and reformats code as needed. C mode produces template of control flow, in three different C styles.*
- *Available for the VAX™ (UNIX and VMS), a wide range of 68000 machines, IBM-PC,™ Rainbow™ 100+, and many more.*

Price:

	Binary	Source
VAX/UNIX		$995
VAX/VMS	$2500	7000
68000/UNIX	395	995
MS-DOS	475	*

**Call for terms*

For more information on these and other UNIX software products, call or write:
UniPress Software, Inc.,
2025 Lincoln Hwy.,
Edison, NJ 08817.
Telephone: (201) 985-8000.
Order Desk: (800) 222-0550.
(Outside NJ). Telex: 709418.
Japanese Distributor:
Softec 0480 (85) 6565.
European Distributor:
Modulator SA (031) 59 22 22.

OEM terms available.
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Trademarks of UniPress EMACS & MLISP, UniPress Software Inc. UNIX & AT&T 3B Series, AT&T Bell Laboratories, VAX/VMS & Rainbow 100+, Digital Equipment Corp. MS-DOS, Microsoft Corp. WordStar, MicroPro

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agement systems offered by AT&T, Sperry, NCR, and others. The software runs on most operating systems, including Unix, Unix derivatives, MS-DOS, and PC-DOS.

For more information, contact Quadratron Systems Inc., 15760 Ventura Blvd., Suite 1032, Encino, CA 91436; 818/789-8588.

Please circle Reader Service Number 167.

IMSL LIBRARY NOW AVAILABLE FOR VAX/UNIX

IMSL Inc.'s IMSL Library is now compatible with VAX systems running the Unix operating system with a Unix FORTRAN-77 compiler.

The IMSL Library contains 540 FORTRAN subroutines applicable to many mathematical and statistical functions. Designed to reduce the time and cost involved in developing scientific and engineering application programs, the IMSL Library allows programmers to select subroutines from the library, rather than writing them themselves.

IMSL markets its software products on an annual subscription basis and offers a substantial discount to educational institutions. First-year subscriptions to the VAX Library cost $2500, with renewals priced at $2000.

For more information, contact IMSL, 7500 Bellaire Blvd., Houston, TX 77036; 800/222-IMSL.

Please circle Reader Service Number 168.

WORDMARC ON AT&T 3B2 AND 3B5

Marc Software International has announced that its WordMarc word-processing package now runs on AT&T's 3B2 and 3B5 computers.

WordMarc features include interactive pagination, an abbreviation glossary, quick-skip cursor, bold face typing, column move, copy and erase, multiple line headers and footers, and cursor-controlled document selection and document deletion.

WordMarc runs on mainframes, minicomputers, and microcomputers, including the DEC VAX family, NCR Tower, HP 9000 Series 500 and 200, Sun Microsystems, Pyramid, Wicat, Masscomp, and Cadlinc computers running on their own proprietary operating systems, as well as the IBM PC family of microcomputers and its compatibles.

WordMarc for the 3B2 and 3B5 costs between $850 and $3500, depending on the number of users. Maintenance, upgrade support, and training are also available.

For more information, contact Marc Software International Inc., 260 Sheridan Ave., Suite 200, Palo Alto, CA 94306; 415/326-1971.

Please circle Reader Service Number 169.

CROMEMCO's COMPUTER GRAPHICS FOR VIDEO APPLICATIONS

New color graphics products are available for Cromemco's M68000-based computer systems. Cromemco computers can now generate images to the maximum resolution of television standards (either NTSC or PAL) and provide I/O interface to standard video equipment.

The products include SVID, a color video generator board available for NTSC or PAL video standards; SDMA, a video memory controller; 256KTP, a 256K-byte two-port memory; and SDCM-NTSC, an RGB-to-broadcast color modulator board, also available for NTSC or PAL video standards.

The S-Series of graphics products provides features for graphics computer systems, including I/O video flexibility, image overlaying, full-color image digitization, hierarchical image planes, four-to-one continuous zoom, pan and scroll, 1024-by-1024 image size resolution.

For more information, contact Cromemco Inc., 280 Bernardo Ave., P.O. Box 7400, Mountain View, CA 94039; 415/964-7400.

Please circle Reader Service Number 170.

ABS SOFTWARE PACKAGES FOR PC/AT UNDER XENIX 3.0

American Business Systems (ABS) Inc. has released its multiuser BACS accounting and BACS vertical application packages under Microsoft's Xenix 3.0 for the IBM PC/AT.

The Xenix 3.0 system on the IBM PC/AT allows businesses using the Business Accounting Control System (BACS) modules to add up to three terminals to the AT.

The BACS products include record locking, file locking, multikeyed index files, and shared file capability. The BACS products include vertical applications and accounting modules, and run under Xenix, Unix, CP/M, CP/M-86, PC-DOS, MS-DOS, RM/COS, TurboDOS, MmmOST, UNOS, and Muse. They are available for most popular microcomputers, including those from IBM, AT&T, Apple, Altos, Intel, NCR, Digital, Wang, Sperry, HP, and NEC.

For more information, contact ABS Sales Dept., 3 Littleton Rd., Westford, MA 01886; 617/692-2600.

Please circle Reader Service Number 171.

NEW UNIX IMPLEMENTATIONS FOR ULTRALINK

Creare Inc.'s Unix-to-VAX/VMS communications software, UltraLink, is now available for 15 additional Unix machines. The new ports increase the total number of Creare's Unix implementations to 20.

New UltraLink implementations are available for the following systems: AT&T 3B series, Apollo, Burroughs XE series, Cadmus, Callan Unistar Series, Charles River Universe 68 series, Convergent Technologies Megaframe and Miniframe, DEC Micro-VAX, Gould PowerSeries and PowerNodes, Harris Station 10 and 20, HP 9000 series, NCR Tower, Plexus, Perkin Elmer 3200 series, and Zilog System 8000 computers.

UltraLink has been available since August 1984 on a variety of systems, including Masscomp, VAX/Ultrix, Pyramid, and the Sun-2 computers.

For more information, contact Creare Inc., Etna Road, P.O. Box 71, Hanover, NH 03755; 603/643-3800.

Please circle Reader Service Number 172.

ARENS GRAPHICS SOFTWARE ON DEC VAX

Arens Applied Electromagnetics Inc. has released its graphics software package, Presentation Graphics, on the entire line of DEC VAX su-

Another in a series of productivity notes on UNIX™ software from UniPress.

Subject: C Cross Compiler for the 8086 Family.

The Lattice C Cross Compiler allows the user to write code on a VAX™ (UNIX or VMS™) or MC68000™ machine for the 8086 family. Lattice C is a timesaving tool that allows a more powerful computer to produce object code for the IBM-PC™. The compiler is regarded as the finest C compiler for the 8086 family and produces the fastest and tightest code.

Features:

- *For your UNIX or VMS Computer.*
- *Use your VAX or other UNIX machine to create standard Intel object code for the 8086 (IBM-PC).*
- *Highly regarded compiler produces fastest and tightest code for the 8086 family.*
- *Full C language and standard library, compatible with UNIX.*
- *Small, medium, compact and large address models available.*
- *Includes compiler, linker, librarian and disassembler.*
- *8087™ floating point support.*
- *MS-DOS™ 2.0 libraries.*
- *Send and Receive communication package optionally available. Price $500.*
- *Optional SSI Intel Style Tools. Package includes linker, locator and assembler and creates executables for debugging on the Intel workstation or for standalone environments. Price $8,550.*

Price:

VAX (UNIX or VMS)	*$5000*
MC68000	*3000*

For more information on these and other UNIX software products, call or write: UniPress Software, Inc., 2025 Lincoln Hwy., Edison, NJ 08817. Telephone: (201) 985-8000. Order Desk: (800) 222-0550 (Outside NJ). Telex: 709418. Japanese Distributor: Softec 0480 (85) 6565. European Distributor: Modulator SA (031) 59 22 22.

OEM terms available. Mastercard/Visa accepted.

CROSS COMPILER FOR THE 8086™ FAMILY

LATTICE® C CROSS COMPILER

Trademarks of Lattice. Lattice, Inc. VAX and VMS, Digital Equipment Corp. UNIX, AT&T Bell Laboratories. IBM PC, International Business Machines. MS-DOS, Microsoft. MC68000, Motorola. 8086/8087, Intel.

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perminicomputers running 4.2BSD.

The package contains Business Graphics, the Graphics Toolbox, Draw Manager, and the Menu program. The emphasis is on providing useful graphics for those in business without requiring computer or graphics skills.

The package supports all Hewlett-Packard, Tektronix, Nicolet-Zeta, and Houston Instruments plotters; Tektronix, Hewlett-Packard, and Chromatics graphics terminals; Versatec printer/plotters; and cameras. Ordinary Alpha-only CRT terminals are used for all chart creations.

The system, which costs $7500, includes two days of on-site installation and training, 90 days of maintenance, and telephone support.

For more information, contact Arens Applied Electromagnetics, 435-B E. Diamond Ave., Gaithersburg, MD 20877; 301/258-0970.

Please circle Reader Service Number 173.

COLORGRAPHICS' GRAPHICS PRODUCTION SYSTEM

Colorgraphics Systems has announced ArtStar, a graphics production system that offers multiple font generation, animation effects, paint box utilities, color video digitizing, and special map databases.

Cromemco's S-Series graphics boards provide design capabilities for graphics art production. The output of the system is to the standard NTSC video specification, making it compatible with standard television transmission requirements. Versions that conform to the PAL video standard, commonly used outside the U.S., are also available.

The systems are designed for television program and commercial design and production, graphics art design, and presentation graphics.

For more information, contact Colorgraphics Systems Inc., 5725 Tokay Blvd., Madison, WI 53719; 608/274-5786.

Please circle Reader Service Number 174.

SYNTACTICS' CRYSTALWRITER PORTED TO DEC VAX AND SUN WORKSTATION

Syntactics Corp.'s CrystalWriter word-processing system is now compatible with Sun Microsystems' Sun-2/120 Workstation as well as with five models of the DEC VAX series running 4.2BSD—the 725/730 750, 780, 785, and the MicroVAX.

CrystalWriter is a Unix-based program written for multiuser environments. It incorporates "what you see is what you get" screen display, soft-key commands, and object-based design.

CrystalWriter also supports hardware from 14 other manufacturers, including AT&T, NCR, Altos, Plexus, and Convergent Technologies.

The suggested cost of a single license is $995 for the MicroVAX, $1795 for the VAX 725/730, $2995 for the VAX 750, and $4995 for the VAX 780 and 785. The Sun-2/120 version costs $995. Quantity discounts are available.

For more information, contact Syntactics Corp., 3333 Bowers Ave., Suite 145, Santa Clara, CA 95051; 408/727-6400.

Please circle Reader Service Number 175.

HARDWARE

GOULD's NEW UNIX SUPERMINI

Gould Inc.'s Computer Systems Division has announced the Gould PowerNode 6031, the newest desk-high, 32-bit member of the Gould PowerSeries product family.

A company spokesman said the PowerNode 6031 concentrates the computational power of one and a half to two VAX 11/780s in a 30-inch desk-high "cube." The PN6031 can serve as a general-purpose, multiuser Unix system, as a back-end computational node, or as a network file server. The basic system costs $89,900.

The PN6031 runs Gould's proprietary UTX/32 operating system, an implementation of 4.2BSD and System V.

For more information, contact Gould Inc., Computer Systems Division, 6901 W. Sunrise Blvd., Fort Lauderdale, FL 33310; 305/587-2900.

Please circle Reader Service Number 176.

HP's 32-BIT MULTIUSER SYSTEM FOR ENGINEERS

Hewlett-Packard has announced the Model 550, the newest 32-bit multiuser engineering computer system in the HP 9000 Series 500 line. The Model 550 features new floating-point math hardware, up to 10 Mbytes of memory, and an enhanced HP-UX operating system (derived from the Unix operating system) that permits up to 32 users.

Four major software packages are available for the Model 550 (and most other Series 500 computers). These include Anvil-4000 integrated

CAD/CAM, Ansys finite-element analysis, Tatran solid modeling and analysis, and Graftek mechanical design and analysis.

The Model 550's HP-UX operating system provides virtual memory and graphics/file-system integrity, and includes a C compiler, two- and three-dimensional graphics libraries, database management, and asynchronous datacomm.

Prices range from $19,425 to $36,325, depending on configuration.

For more information, contact your local authorized Hewlett-Packard personal computer dealer or HP sales office.

Please circle Reader Service Number 177.

IRIS SERIES 2000 WORKSTATIONS FROM SILICON GRAPHICS

Silicon Graphics Inc. has introduced the Iris Series 2000, a family of engineering workstations suitable for three-dimensional solids modeling, molecular modeling, circuit design and layout, architectural engineering and plant design, geophysical and seismic analysis, animation, and simulation.

The Geometry Engine and Geometry Accelerator—custom VLSI circuits designed by Silicon Graphics for real-time three-dimensional graphics—are the heart of the Iris Series 2000.

The workstations include a 32-bit M68010 CPU, a demand-

Another in a series of productivity notes on UNIX™ software from UniPress.

SPREADSHEET

Q-CALC

Subject: Extraordinarily powerful spreadsheet with extensive math and logic facilities.

Powerful spreadsheet specifically designed to take advantage of the UNIX operating system. Q-Calc uses termcap to support any terminal. Interactive prompts and help text make it very easy to use.

Features:

- *Extensive math and logic facilities.*
- *Large model size.*
- *Allows sorting and searching.*
- *Interfaces with the UNIX environment and user programs via pipes, filters and subprocesses. Spreadsheet data can be processed interactively by UNIX programs, with output placed into the spreadsheet.*
- *Q-Calc command scripts supported.*
- *Uses termcap.*
- *Optional graphics for bar and pie charts. Several device drivers are included to support graphics terminals.*
- *Available for the VAX™, Sun™, Masscomp™, AT&T 3B Series™, Cyb™, Apple Lisa™, Perkin Elmer™, Plexus™, Gould™, Cadmus™, Integrated Solutions™, Pyramid™, Silicon Graphics™, Callan™, and many more.*

Price:

	Binary
VAX, Perkin Elmer, Pyramid, AT&T 3B/20	*$2,500*
(with graphics)	*3,500*
MC68000™	*750*
(with graphics)	*995*

Source Code available.

For more information on these and other UNIX software products, call or write: UniPress Software, Inc., 2025 Lincoln Hwy., Edison, NJ 08817. Telephone: (201) 985-8000. Order Desk: (800) 222-0550 (Outside NJ). Telex: 709418. Japanese Distributor: Softec 0480 (85) 6565. European Distributor: Modulator SA (031) 59 22 22.

OEM terms available. Mastercard/Visa accepted.

Trademarks of: UNIX: AT&T Bell Laboratories. VAX: Digital Equipment Corp. Sun: Sun Microsystems. Masscomp: Masscomp. Cyb: Cyb Systems. Lisa: Apple. Plexus: Plexus Computer. Gould: Gould. Pyramid: Pyramid. Integrated Solutions: Integrated Solutions. Silicon Graphics: Silicon Graphics. Cadmus: Cadmus Computer. Perkin Elmer: Perkin Elmer. Callan: Callan Data Systems. AT&T 3B Series: AT&T. MC68000: Motorola.

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paged, virtual memory Unix operating system, expandable system memory and disk storage, and an optional floating-point processor. Software development tools include Unix System V with 4.2 enhancements, C, FORTRAN, and Pascal compilers, utilities, and editors.

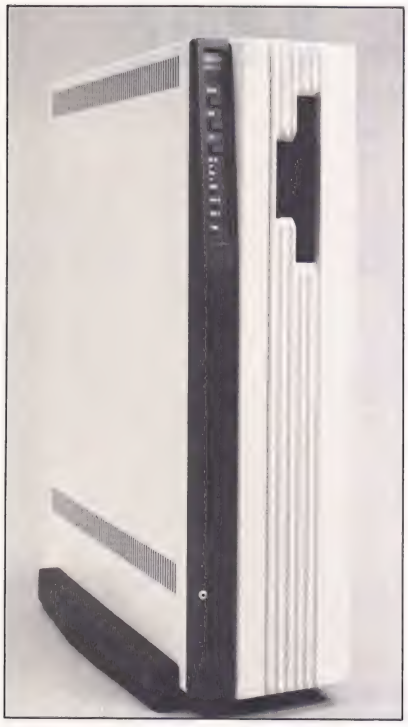
List prices range from $27,500 to $76,500.

For more information, contact Silicon Graphics, 630 Clyde Court, Mountain View, CA 94043; 415/960-1980.

Please circle Reader Service Number 178.

MULTIUSER COMPUTER FROM NBI

NBI Inc. has introduced its new S! Technical Computer System, a Unix-based multiuser computer that provides time-sharing services and shared resource capability for NBI's stand-alone U! Technical Workstation.



NBI's S! Technical computer system

As a file server, S! provides centralized storage for U! and other workstations with industry-standard networking capability. Up to 24 users may share information interactively when S! is used as a time-sharing system. S! is based on the M68010 microprocessor, utilizing dual-bus architecture and a high-speed memory management unit. The deskside model is available with 1¼, 2, 3, or 4 Mbytes of main memory and 52 to 224 Mbytes of hard-disk storage.

Standard system software includes the 4.2BSD Unix system (with integrated Ethernet networking software) and a library of editors, programming languages, document preparation, and data manipulation utilities.

For more information, contact NBI Inc., P.O. Box 9001, Boulder, CO 80301; 303/938-2795.

Please circle Reader Service Number 179.

CROMEMCO's 16-MBYTE ECC-RAM HARD DISK

Cromemco Inc. has introduced a new supermicrocomputer that according to the manufacturer is the first complete hard disk-based computer system with 16 Mbytes of error-correcting RAM under $50,000.

All models of the System 400 are delivered with an installed Unix System V operating system. The computers utilize Cromemco's XPU processor, XMM memory manager, 64 FDC and STDC controllers, and the Octart I/O board (with capacity for 21 boards).

Cromemco System 400

Prices range from $24,995 for a 9-board system with 4 Mbytes of RAM and 140-Mbyte hard-disk capacity, to $53,995 for a 16-board system with ECC, 16 Mbytes of RAM, and 280-Mbyte hard-disk capacity.

For more information, contact Cromemco, 280 Bernardo Ave., P.O. Box 7400, Mountain View, CA 94039; 415/964-7400.

Please circle Reader Service Number 180.

TANDY 6000 COMPUTER WITH XENIX 3.0

Tandy Corp. is now offering its 6000 computer with Xenix 3.0. Standard memory on the Tandy 6000 computer is 512K bytes RAM (double the standard memory on the Model 16B) and is expandable to 1 Mbyte.

Three or six employees can use a single Tandy 6000 computer at the same time, and everyone on the system can share the computer's

optional printer, modem, and other accessories.

The M68000 microprocessor accepts 16-bit data and processes it internally as 32-bit "words." A second microprocessor—the Z-80A—handles I/O and a variety of other "housekeeping" chores.

The Tandy 6000 is offered with two built-in 1¼-Mbyte double-sided, double-density, 8-inch floppy-disk drives for $4499, or with one floppy disk drive and an internal 15-Mbyte hard-disk drive for $5499.

For more information, contact Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817/390-3300.

Please circle Reader Service Number 181.

PYRAMID's MULTIPROCESSOR SUPERMINI

Pyramid Technology Corp. has introduced a new Unix system-based multiprocessor superminicomputer, the Pyramid 90Mx.

Like the original 90x, the 90Mx is a 32-bit, virtual-memory computer based on RISC (Reduced Instruction Set Computer) architecture. A spokesman said Pyramid's OSx operating system is the first dual-port, multiprocessor version of 4.2BSD and System V.

The new system configuration can include 16 intelligent terminal processor ports (for a maximum of 256 user connections) and slots for

Another in a series of productivity notes on UNIX™ software from UniPress.

MULTI-USER OPERATING SYSTEM

MAC XL™ UNIX

Subject: Full-multi-user UNIX for the MAC XL.

MAC XL UNIX, the UniPlus™ + Bell Labs UNIX System V, as ported by UniSoft Systems, transforms your MAC XL into a low-cost, high performance multi-user desktop workstation.

Features:

- *The full multi-user system includes powerful UNIX utilities, C compiler and development tools, text processing tools, along with vi, csh and termcap.* ***New lower price*** *for full system-**$1,350.***
- *Supports Apple 5 and 10-Mbyte drives. Increased disk space is available with hard drives which range from 16 to 92 Mbytes.*

Optional UNIX Applications Available:

Unify® Multi-user relational database.
Lex™ Word Processing.
Q-Calc Spreadsheet.
UniPress EMACS™ multi-window text editor system.

Programming Languages Available:

SVS Fortran
SVS Pascal
SVS Basic +
SMC Basic 4
RM Cobol
Irvine ADA

For more information on these and other UNIX software products, call or write: UniPress Software, Inc., 2025 Lincoln Hwy., Edison, NJ 08817. Telephone: (201) 985-8000. Order Desk: (800) 222-0550 (Outside NJ). Telex: 709418. Japanese Distributor: SofTec 0480 (85) 6565. European Distributor: Modulator SA (031) 59 22 22.

Dealer terms and demonstration systems are available. Mastercard/Visa accepted.

MAC XL is a trademark of Apple Computer, UNIX is a trademark of AT&T Bell Laboratories, UniPlus+ is a trademark of UniSoft Systems, UniPress EMACS is a trademark of UniPress Software, Inc.; Unify is a trademark of Unify Corp.; Lex is a trademark of ACE Microsystems

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eight memory boards (for a maximum of 32 Mbytes of main memory).

The systems range in price from $220,000 to $420,000, with the entry-level 90Mx consisting of OSx, a 415-Mbyte disk, a 1600-bpi magnetic tape drive, a black-and-white console, 16 user ports, and 4 Mbytes of main memory.

For more information, contact Pyramid Technology, 1295 Charleston Rd., Mountain View, CA 94043; 415/322-7200.

Please circle Reader Service Number 182.

MORROW's SLAVE BOARDS

Two versions of an MS-DOS-compatible slave processor board for Morrow's Tricep Unix-based multiuser supermicrocomputer are now available.

One version, priced under $800, has 128K bytes of dual-port random-access memory; the other, priced near $1600, has 512K bytes of RAM. A $100-per-board discount is offered on any slave unit purchased at the same time as the system.

The slave boards, based on the 80188 16-bit CPU, reflect Morrow's philosophy of dedicating inexpensive processors to each user or application. Tricep is priced starting at less than $8500 retail, and less than $5500 in OEM quantities.

For more information, contact Morrow, 600 McCormick, San Leandro, CA 94577; 415/430-1970.

Please circle Reader Service Number 185.

UNIX/WORLD's "New Products" section is provided as a service to our readers, and our selection criteria are based solely on the needs of our readership. If you would like to have your product news considered for publication, please address your correspondence to UNIX/WORLD Magazine, New Products Editor, 444 Castro St., Suite 1220, Mountain View, CA 94041. Because of the large number of press releases we receive, UNIX/WORLD cannot verify the accuracy of claims made by a product's manufacturer. We advise that you thoroughly test any product before buying.

How to share a computer.

It couldn't be any easier.
Just plug the new LimeLight™ computer projector into virtually any personal computer, or terminal, turn it on and focus.
It's like having a six foot screen on your computer. So everyone gets a first-class view.
Whatever you create on your computer screen is projected onto any large screen or wall. And of course, every change you make is projected instantly.
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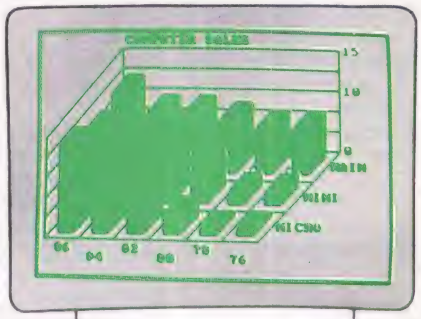

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SPRING-TUNING YOUR KERNEL

There's still time to do some spring-cleaning on your Unix system kernel. This month our author tells you how.

BY RIK FARROW

PART TWO

Although most system administrators aren't interested in tuning their kernels, perhaps in part 1 of this series I caused some of you to consider it. For those of you still wavering, or for those of you who have just joined us, here are several good reasons for changing your kernel: First, you are working with the minimal-configuration kernel on your maximally configured system; second, you have encountered some of the error messages mentioned last month in part 1; or third, you're just plain curious.

Well, if you can find a time to reboot your system without inconveniencing other users, you may be able to try a little tuning, provided, of course, that you have the necessary system files. Few vendors provide these files, but you can certainly ask for them if you don't have them. The changes suggested here won't affect files in any file system, and the old kernel will still be available to fall back on.

The files you need to generate a new kernel seem to be located in about as many different directories as there are Unix system ports. One approach is to look for the unlinked kernel itself by using the `find` command. Enter `find / name unix.o -print`, and the `find` command will traverse the entire directory structure looking for a file named `unix.o`.

Of course, if you are using a variant of the Unix system such as Xenix, Enix, Serix, or Cromix, you had better substitute the name of your own kernel file with a ".o" appended to it. If you don't know the name of your kernel, look in your root directory and see if you recognize it. The kernel is a large (50K bytes plus) executable file whose name usually ends with the "ix" suffix.

Even better, the name of the kernel is usually displayed on the console when you boot the system. In fact, you may even be forced to type it in. On systems I have used, a message (like that shown in Figure 2A) appears after some diagnostic testing. Loading begins after you have pressed "Return." The name of the file that appears after the device specifier (which is `hd(0,0)`, in our example) is your kernel name.

If your `find` command doesn't turn up a directory with a `unix.o` (or `xenix.o`, etc.), the rest of this discussion is somewhat academic. Also, if you are using Berkeley 4.2BSD (see sidebar), or if your system includes specific instructions for generating or patching kernels, good for you—follow the specific instructions for your system.

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a. The prompt for loading the kernel

```
Press RETURN to continue
Standalone boot

: []
```

b. Typical device specifier and kernel name

```
hd(0,0)unix
```

FIGURE 2: SOME MESSAGES DURING BOOTSTRAPPING

THE BERKELEY 4.2BSD APPROACH

The folks at Berkeley have taken a different approach to configuring systems. For one thing, they have taken most of the limits I've talked about and made them dependent on one value: the maximum expected number of users.

4.2BSD provides a tool named `config`, which uses a human readable file to construct the other files necessary to generate a kernel for a particular hardware configuration and user load. This file allows system administrators to determine exactly what configuration their kernel was built for. The configuration description file allows for some hardware flexibility in the configured kernels as well. For example, you can specify at boot time the physical device where the root file system will be located.

The configuration procedure is straightforward. The system architect creates a configuration file and then uses `config` to generate other appropriate files and a "makefile" named `Makefile` for creating the desired kernel. The "makefile" is adjusted by the `make depend` command so that the dependence of certain files on their system-include files is established. Finally, the `make` command is entered without arguments to generate the new kernel to be loaded and tested.

I haven't tried `config` personally, and the documentation states that it only works with VAX and Sun processors. This may have changed since the Leffler paper (Leffler, 1983) was written, and additional systems may have been included. Leffler's paper describes configuration for minicomputers such as the VAX 11/780, so the limits suggested in that article should be scaled for your particular system. The limits I borrowed all seemed comfortably large to me, but they may be too large for some micro-based Unix systems.

THE `make` COMMAND

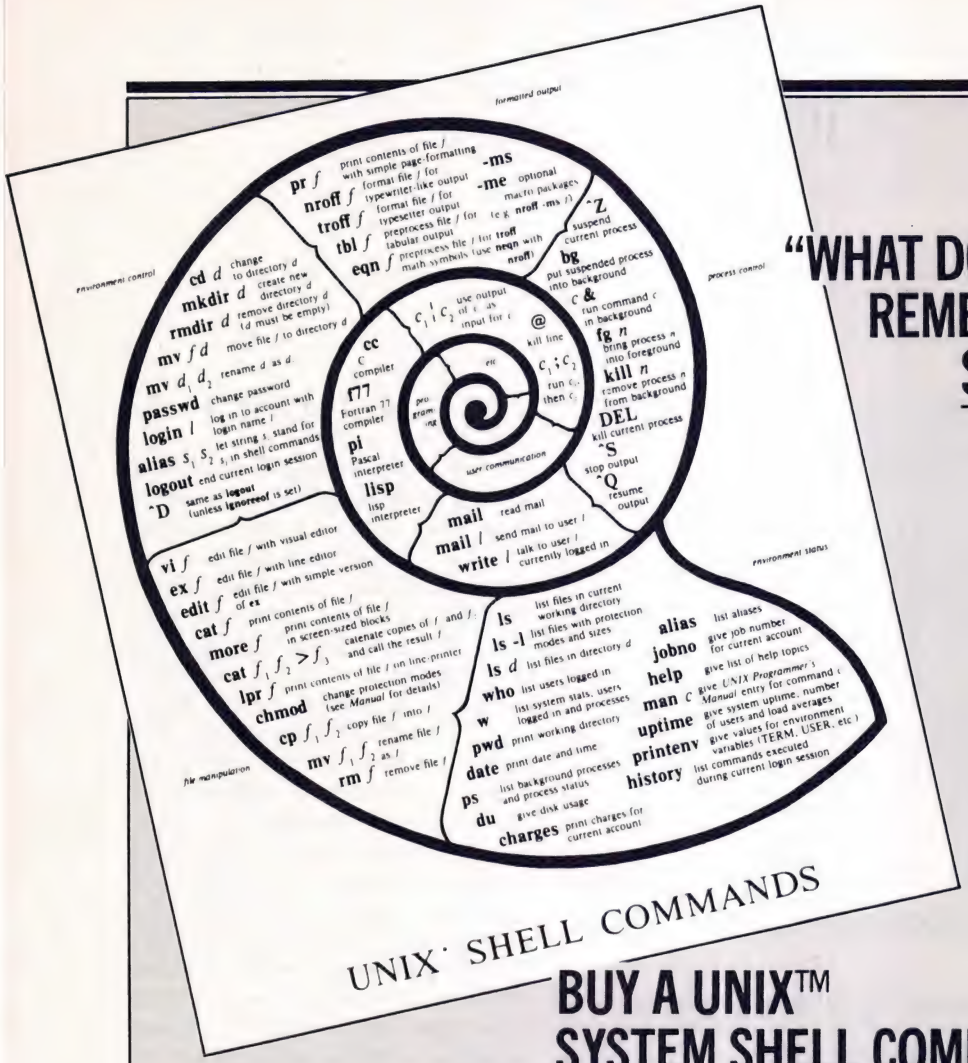
Once you have found the unlinked kernel, move to the directory where it is located and list the contents with `ls`. There should be other files named with the ".o" suffix and one named `Makefile`. This file contains directions for generating your kernel that the `make` command understands. To test it, enter `make`.

This step isn't dangerous. The `make` command follows the directions in `Makefile`, telling it to check for the existence of certain files and to see if any of these files have been changed. If a file has been modified, `make` arranges the recompilation and linking of any files that were dependent on the modified file. If everything is fine and if no files have been changed, `make` simply reports that `unix is up to date`.

If a file has been changed, `make` begins compilation of the file and relinking of the kernel. This takes a while, and you can stop it easily (by pressing your interrupt key), or you can just let it finish. If `make` can't find a file it needs, it complains. The message `can't stat io.o`, for example, means that the file `io.o` can't be located and that you can't generate a kernel.

You are now almost ready to generate the kernel. The last thing you must locate is the file containing the configuration limits. This file might be called `conf.c` and could be located in your current directory. You can also look for the limits in a file located in the `/usr/include/sys` directory. I have encountered two names—`param.h` and `space.h`—for the appropriate file when it occurs in that directory.

If this fails, you can put `grep` to work for you. Have it look through files for the one that defines the value of the constant NPROC, as



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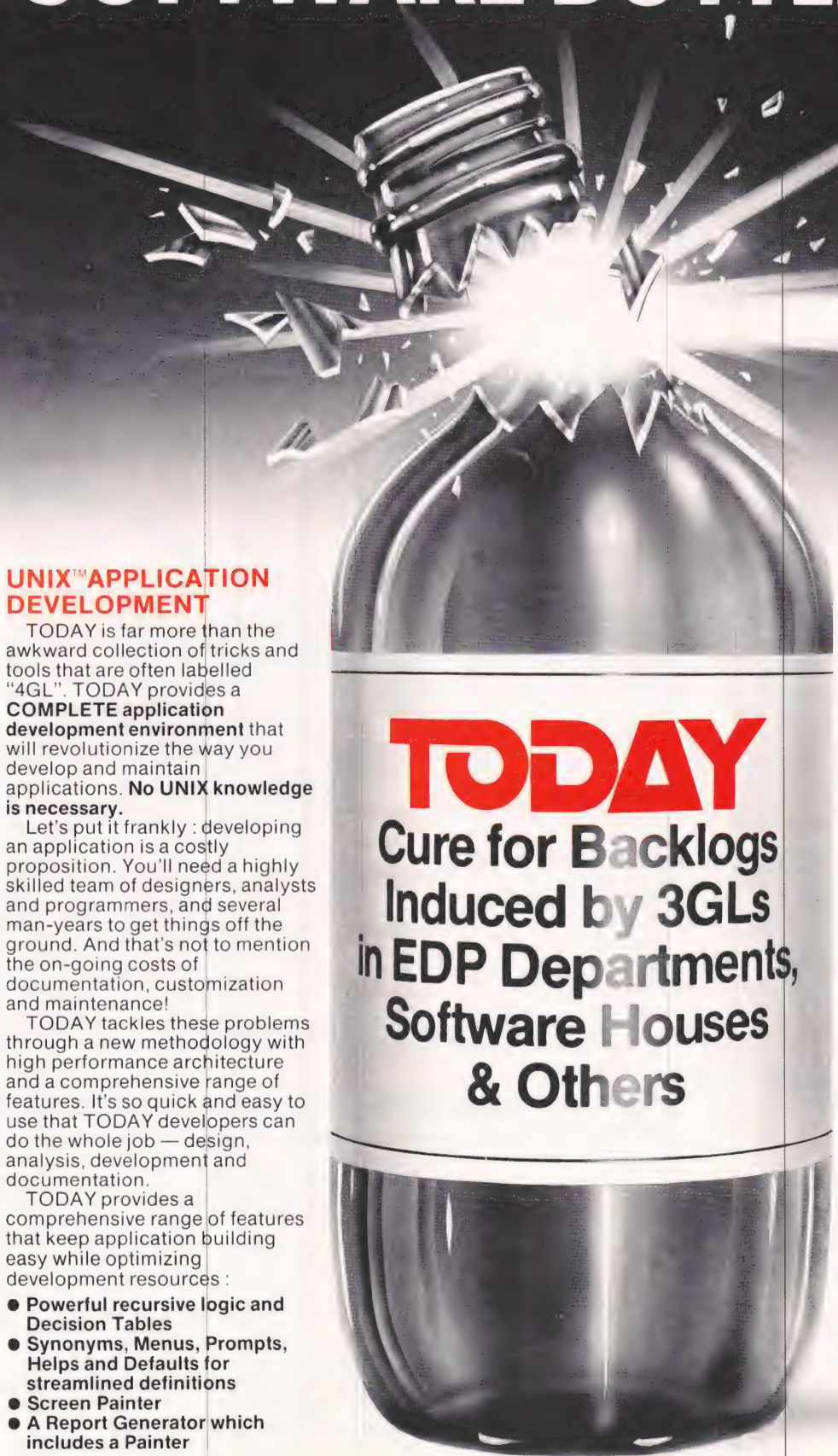

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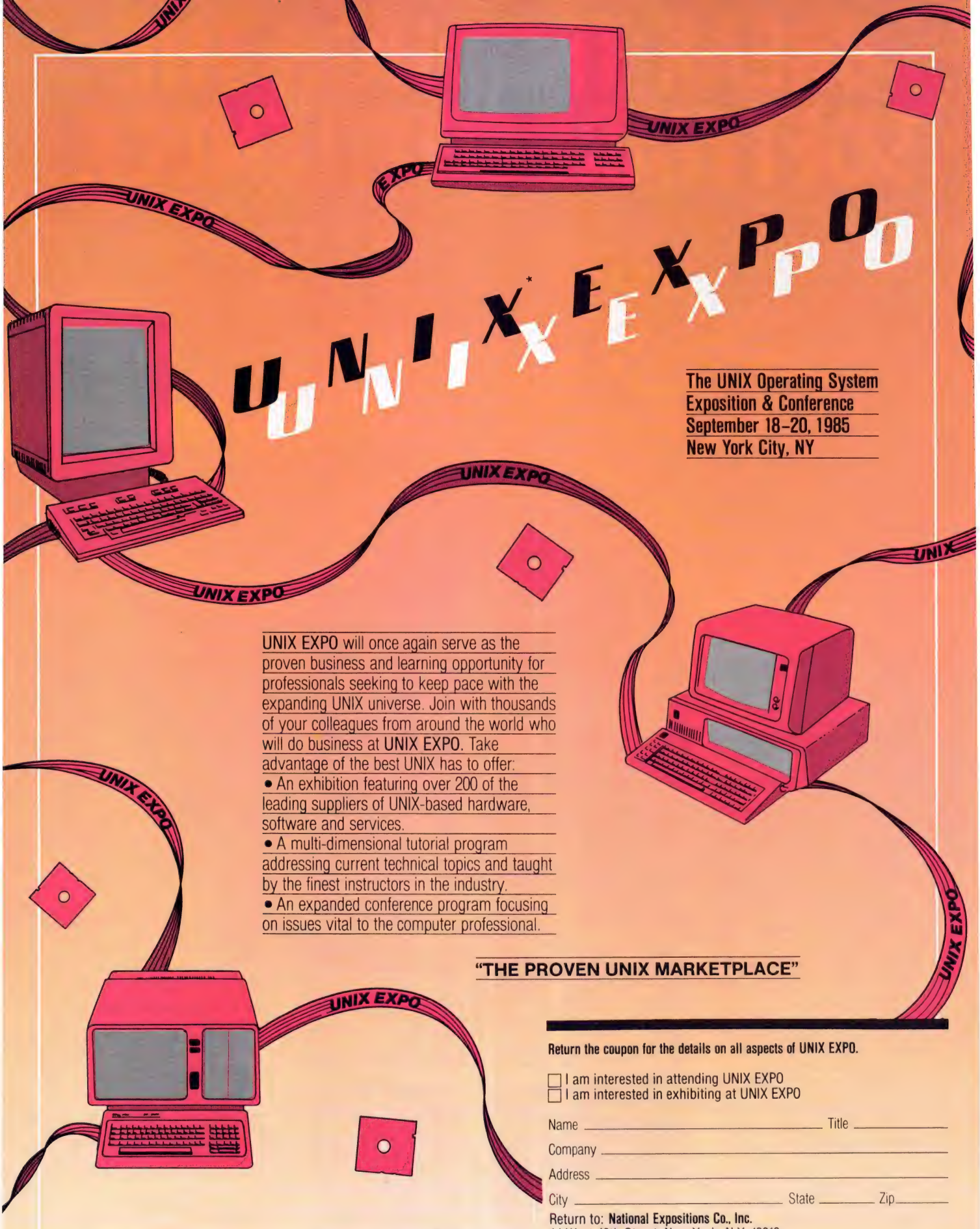

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in `define NPROC 40`. You must edit this file to change your configuration limits.

You then make a copy of this configuration file and give it a different name, such as `conf.c.old`, so that you can return to your starting position if you need to. Edit the original file with an editor such as `ex` or `vi`. Please don't use an editor that generates control characters or that sets the high bits of a character byte.

ONLY A TEST

Figure 3 lists the names of the constants that correspond to the configuration limits I have discussed. I have not included the mount table size because you probably don't need to change it. In addition, changing that value may have undesirable side effects.

You may change the value of any of these constants. Remember that making one of these limits too small cripples your system and that making it too large wastes memory. Remember also that this is only a test. You are not playing for keeps; you are allowed to make mistakes. You can restore this configuration file from the backup of the original file at any time. When you have finished editing the configuration file, write out the file and exit from the editor. Then type `make`.

When the `make` command finishes, you will have a modified kernel in your current directory. You must perform the next part of this exercise in single-user mode because you will be rebooting the system.

When you are ready, rename the original kernel (as in `mv /unix /unix.old`) and then move your modified kernel to the root directory with `mv unix /unix`.

NPROC	maximum number of processes
NFILE	maximum number of open files
NINODE	maximum number of inodes
NTEXT	maximum number of text files
NBUF	number of block buffers

FIGURE 3: TYPICAL NAMES FOR SOME CONFIGURATION LIMITS

SYSTEM V AND PERFORMANCE REPORTING

The AT&T System V release of the Unix system kernel includes counters that constantly measure system activity. You can use `sadc`, the system activity data collector, and `sar`, the system activity reporter, to examine how well your system is configured for your real-world environment.

The `sadc` program is set up by entries in two files. The first entry, a line in `/etc/rc`, makes a dummy entry in the collection file each time the system is reset. This is important because resetting the system resets the counters. You may need to add this line—`su sys -c "/usr/lib/sa/sadc /usr/adm/sa/sa `date +%d` &"`—to the `etc/rc` file.

The second set of entries goes into the `contab` file, `/usr/lib/contrab`. These entries start `sadc` at 20-minute intervals during working hours and every hour otherwise. If they aren't present, add the entries shown in Figure 4 to start collecting data.

Once you have made these entries (and your `cron` daemon is running), you will have automatic collection of the system activity counters.

The `sar` program produces reports on the data collected by `sadc`. You are interested only in a small portion of this data, that pertaining to the cache hit rates, swapping, and table overflow. The `sar -v` command reports the size of the tables and the number of times they have overflowed. The values for overflow (labeled with a "-ov" suffix) should be zero. Nonzero values for the file, inode, or text table suggest that you must increase the limits on these tables.

The `sar -b` command reports statistics about block buffer usage. Most important among these are the hit ratios for reading and writing. A high hit ratio means that requested data was found in the cache and that the cache is working well. The hit rate for read requests (`%rcache`) should be over 90 (percent). The hit rate for write requests (`%wcache`) can be a little lower, over 80 (percent).

Because the `ps` (process status) command uses the kernel file with the "standard" name when it examines the kernel for process status, it is important to name the new kernel properly. Now comes the moment of truth (and greatest apprehension): Shut down and reboot the system. You may wish to copy down the amount of memory available to user processes if this is reported during booting, as in `mem`

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```
0 *** 0,6        su sys -c ''/usr/lib/sa/sal''
0 8-17 ** 1-5    su sys -c ''/usr/lib/sa/sal 1200 3''
0 18-7 ** 1-5    su sys -c ''usr/lib/sa/sal''
```

FIGURE 4: ENTRIES IN `crontab` FOR INVOKING `sadc`

= 348160, and compare this with the memory available under the original kernel.

If you have confined yourself to the changes I have outlined, your system should boot normally and you should be able to test it. Run benchmark scripts and programs if you have them. Perhaps, you will want to repeat changing the kernel and testing it. But please test the system thoroughly before you return it to normal use (with other users).

Your system didn't boot properly? That's not impossible. One hazard of changing the kernel is that it can become so large that it has overwritten the loading program. This loading program has the job of locating a file in a file system, loading it into memory, and executing it. The loader was compiled to run at a safe location in the minimal ("one size fits all") system, and you may have just made it a little too large. You might be able to relocate this loader program or, failing that, reduce your kernel's size.

Want your old kernel back? It's not hard. Simply reboot, but don't press "Return" at the colon prompt (:). Instead, enter the device specifier, followed by your old kernel name after the colon prompt. The device specifier looks something like `hd(0,0)`. If you don't remember what it is, press "Return," and it will be supplied for you on the line after the colon. Typing `hd(0,0)unix.old`, for example, loads your old kernel. Good job, doctor. □

A San Francisco resident, Rik Farrow is a freelance technical writer who has written installation and maintenance guides for micro-based Unix systems. His last work for UNIX/WORLD, "All About Device Drivers," appeared in Vol. 1, No. 6.

References

Ritchie, D.M., and Thompson, K. "The Unix Time Sharing System." *The Bell System Technical Journal,* July-Aug. 1978, Vol. 57, No. 6.

Leffler, S., "Building 4.2BSD Unix with Config." June 1983, UC Berkeley, Berkeley, CA 94720.

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THE C STANDARD IS COMING

PART 1

BY STEVE HERSEE

Like the Unix system, the C programming language has found a home in a variety of applications in business, industry, and academia. Also, like the Unix system, the widespread acceptance and success of the C language have led to a divergence in how it is actually used in real-world applications. Hence, the need exists for a consensus on which facilities and capabilities should be part of the standard repertoire of the C language and which should not.

To this end, I will be reporting to you regularly in this magazine on the developments at the American National Standards Institute (ANSI) X3J11 committee meetings, the official and rather ominous sounding name for the ANSI C language standard committee.

Before I begin, though, let me make several points about this and future reports. First, what you read here is not an official X3J11 committee statement; instead, it is the opinion of Steve Hersee. Second, I am not unbiased. As one of the founders of Lattice Inc., which produces C compilers for many different machines, I have my own opinions about the issues before us, so I expect to get some mail that calls me to task. Finally, and most important, please feel free to send any comments or opinions concerning the new C standard to me, either at Lattice's headquarters or in care of UNIX/WORLD.

X3J11 meets every three months for a five-day meeting (see Figure 1 for a list of upcoming meetings). The first meeting of the X3J11 committee that I attended, in March 1984, was hosted by Microsoft Corp. (This was actually the committee's third meeting.) My aim in this article is to brief you on what has taken place so far.

COMMITTEE GUIDELINES

First, let's take a look at the committee guidelines. The committee has a set of rules concerning the standard that we, its members, try hard to follow. First, the standard should break as few existing programs as possible. We have to be careful not to add new keywords that would collide with your variables. Because the standard we are proposing must be voted the "official standard," we know that it would be voted down if

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FIGURE 1: DATES AND LOCATIONS OF FUTURE X3J11 COMMITTEE MEETINGS

```
A. i = &port10; /*i is set to address of Port*/
               i = 10;
               i = 20;          /* init the port */
               i = 30;

B.     while(i & 0x20); /* wait memory to change */
```

FIGURE 2: `volatile` TYPE

it were to break all the rules of Unix system code or prevent implementation on many machines.

Our second rule is that if work has to be done, let it be the implementors who have to do it. We as implementors don't like to work harder than we already do, but if we are going to add to or change the C language, then the work should fall on us.

The third rule is that we will not invent a new language. In other words, we must keep C as close to the current practice as possible. When the draft standard is ready for publication, its chances for approval will be linked directly to the amount of invention in which the committee has indulged.

The fourth rule is known as the rule of the fighting chance. The committee cannot guarantee that a C program using only valid C with no extensions will be portable to all "standard" C compilers. Users should have at all times a fighting chance of being able to produce programs that are portable across a wide range of machines.

THE NEW KEYWORD

The committee's current C language draft contains a new type, "volatile." The committee was asked to consider whether we need another descriptive type to control the level of optimization that the compiler does. Hold on while I try to explain the problem with the help of Figure 2.

Let's say you first want to put the values *10,* then *20,* and then *30* into memory (see Figure 2A). But what if your compiler is very good and waits before it actually puts values into memory? The smart compiler says, "Why should I write three times when I know that the final value I must put into memory is a *30*?"

Some of you must be wondering why you would want to use this silly code? Several machines use what is called "memory-mapped input/output (I/O)," which means that the designer has tied something other than random-access memory (RAM) to a location in memory and has given the memory location special meaning.

It might be a sound port or a universal asynchronous receiver-transmitter (UART), for example. Both of these devices may require a series of values to be sent to them in order to make them operate. If the program is waiting on the status value from the async controller and the compiler does not actually access the status location in memory, then the program will wait forever for the incoming character.

Currently, the only way to ensure that the memory location is actually accessed is to check the code your compiler produces and verify that it is correct or to write the section of code in assembler. Both of these methods are nonportable and require the programmer to know the target machine's assembler language.

A smart compiler might say, "Why should I reload the register *X* with the value to test because I (the compiler) have not done anything to change the value at location `i`?" (See Figure 2B.) Therein lies the rub: If `i` is a status register or a shared-memory location, some other program may change it. The current C language has no way to tell the compiler that a particular location is "magic," "slippery," "volatile," memory-mapped, or in shared memory.

The most common solution to this problem in the Unix system is not to optimize, but this means that the entire module must be compiled by telling the compiler to be as dumb as possible.

The committee decided that the new standard C language would be better if it included this functionality, and it chose the type of "volatile." By adding volatile to the information that the C compiler knows about variables, the compiler will reload `i` each time (see Figure 2B), and each value for `i` must be stored (see Fig-

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FIGURE 3: OFFICERS OF THE X3J11 C STANDARDS COMMITTEE

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ure 2A). Adding this feature to the C language will make it easier for C programmers to use C as an alternative to assembler.

WHEN A `char` IS NOT A `char`

My second technical point is the need for a new flavor of `chars`. Currently available C compilers have been free to implement `chars` as they pleased for their own best efficiency. Compiler designers have been free to choose whether a `char` is a "signed" or an "unsigned" value. The rules say that a `char` must be big enough to hold all the printable characters on the machine and that when they are put into an `int`, the value will still be a positive number. These rules cause some problems for the different character sets now available.

Of critical importance to users is what type of `chars` their compilers have. For example, if you assign the value *127* to a `char` and then add *1* to it, what will the value of the `char` be? If you have signed `chars`, the value will be a large negative number; if you have unsigned `chars` as the default, you will get *128*.

A signed `char` has been available on C compilers for DEC Unix systems for a long time. With the addition of "unsigned" as a modifier in later versions of C, you could have either "signed" or "unsigned" `chars`. No problem, right?

If your character set is from IBM, or if it is more efficient to implement a `char` that is unsigned, then how do you get a signed `char`? Because many compilers have had signed `chars`, they have been used as a very short `int` of 8 bits wide. These programs require that the compiler offer a signed `char`. We discussed `short short int`,

`char int`, `int char`, `signed char`, and `tiny int` as possible solutions.

Again, one of the committee's goals is to keep the number of new keywords we add to C to the absolute minimum. The reason is that any working programs in use today may use a variable name that the standard uses as a new keyword. Any existing programs using these new keywords would then no longer be valid C code and would have to be changed.

The committee is concerned with the number of programs now available and working; we do not want people to have to change them to fit the new standard for C. The constructs of `short int`, `int char`, and `char int` do not allow the C standard to introduce a new keyword. The committee did decide, however, that "signed" was more readable than "unsigned" and that it better stated the programmer's intent.

Once the committee was on a roll, we allowed the keyword "signed" to be used anywhere that the keyword "unsigned" was allowed. As of the September 1984 meeting, the committee allowed `signed char`, `signed int`, and `signed long`. There was also a lot of talk about bit fields, but that's another story.

A note of caution is called for here. Please do not add "signed" to your compiler yet because something the committee adds at one meeting is often removed at its next meeting. □

Steve A. Hersee is currently the vice president of marketing at Lattice Inc. As a member of the ANSI X3J11 C standards committee, he is working on a draft standard for the C programming language. You can contact him at Lattice Inc., P.O. Box 3072, Glen Ellyn, IL 60138; 312/858-7950.

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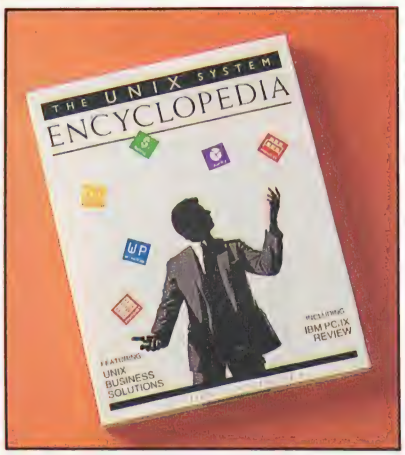

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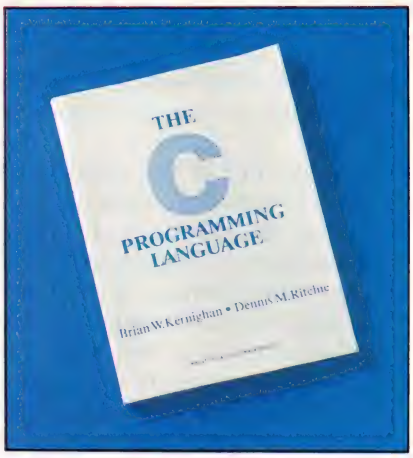

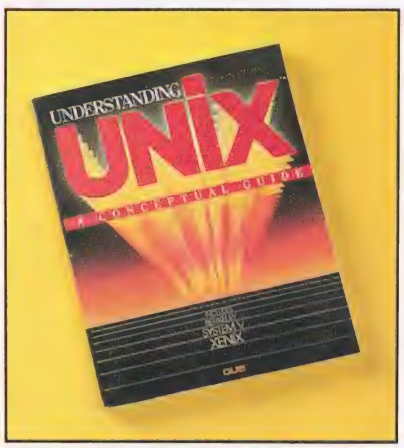

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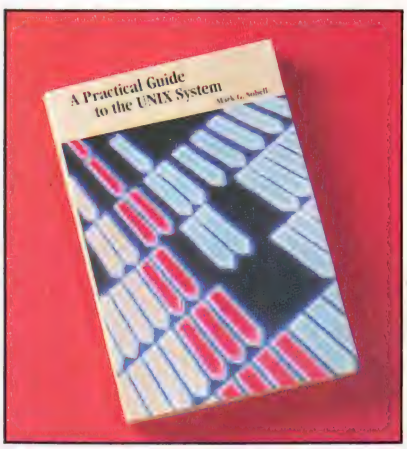

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THE C TUTORIAL:

AN INTRODUCTION TO C POINTERS

Although C pointers are based on a simple concept, they give the C programmer capabilities and programming power just not available in most other high-level languages.

BY GARY BRONSON

In this issue we are publishing a C tutorial installment contributed by one of our readers. If you program in C and would like to write about this language, send your inquiries to Dr. Rebecca Thomas, in care of UNIX/WORLD magazine. —Dr. Rebecca Thomas

Pointers are one of the C language's distinguishing features. Although based on a very simple concept, pointers provide an extremely powerful programming tool. They allow C programmers to penetrate directly into the inner workings of the computer's memory. The ability to get into the computer's basic storage structure gives the C programmer capabilities and programming power that is just not available in most other high-level languages.

For such a powerful tool, the concept of a pointer is based on the rather simple observation that the values assigned to all variables are ultimately stored somewhere in the computer's memory.

Consider the simple C program in Figure 1. All this program does is print out the value *22*, which was assigned to `x`. We can go further, however, and ask, "Where is the number 22 actually stored?" Although a high-level programmer would answer, "In `x`, of course," this is only half of the answer. The variable `x` is only a convenient symbol for real, physical location in memory, as illustrated in Figure 2. C lets us determine and print the addresses of the locations where the variables are stored.

To determine the address of `x`, C provides us with an address operator, `&`, which means "the address of." Thus, `&x` means "the address of `x`." The program `SHOW_ADD` in Figure 3A uses the address operator and prints both the value contained in `x` and the address of `x`, as shown in Figure 3B. Figure 4 illustrates the additional address information provided by the program `SHOW_ADD`.

High-level languages (HLLs) use English-like syntax to speed the programming process by allowing programmers to perform many detailed data manipulations by using a single abstract "high-level" command. The advantages are less time spent coding and easy comprehension of code for lay maintenance. The disadvantage is less efficient (slower and larger) programs. Most HLLs do not allow bit-manipulator control of data storage compactness, or address manipulation. C is unusual in that it allows both high-level features in its syntax and efficient, low-level manipulation of data and addresses.

```
main()
{
    int x;

    x = 22;
    printf("x = %d\n", x);
}
```

FIGURE 1: SIMPLE C PROGRAM FOR PRINTING THE VALUE *22*

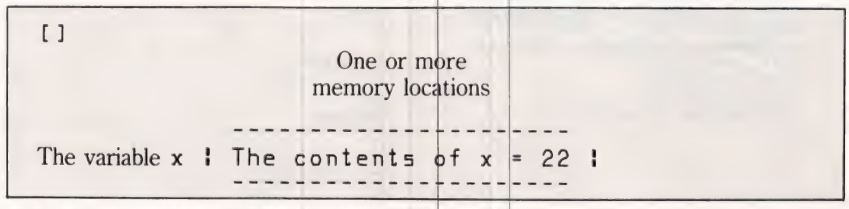
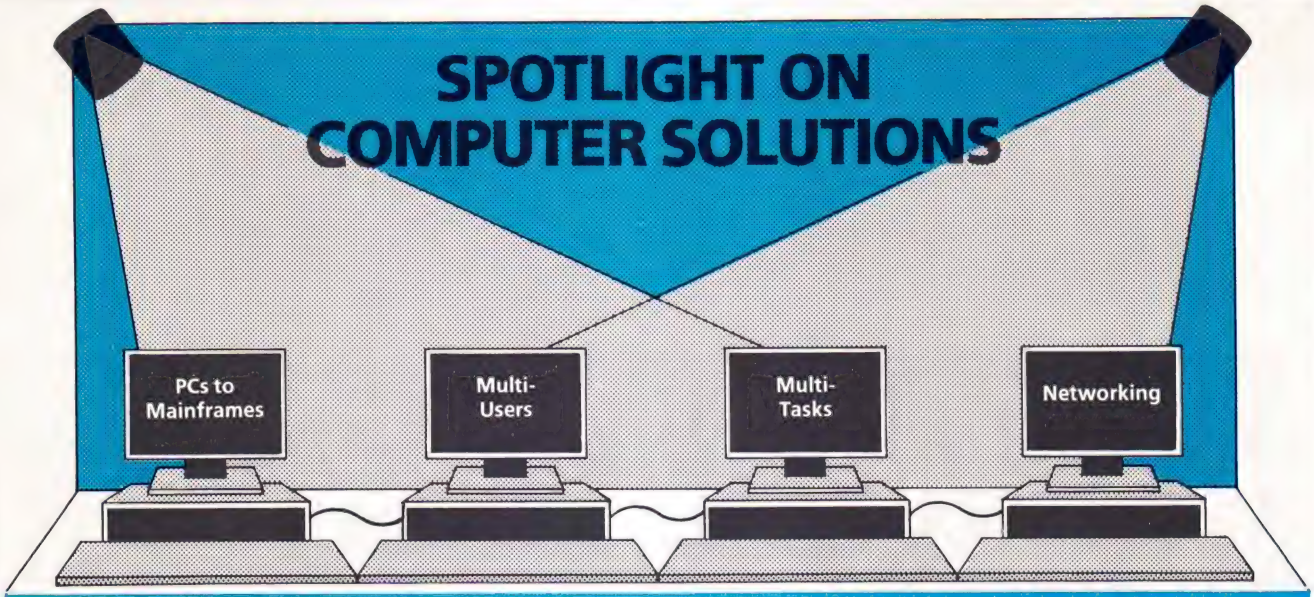


FIGURE 2: SOMEWHERE IN MEMORY



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```
main()
{
    int x;

    x = 22;
    printf("x = %d    The address of x = %u\n",x, &x);
}
```

FIGURE 3A: THE SHOW_ADD PROGRAM

```
x = 22              The address of x = 65460
```

FIGURE 3B: THE OUTPUT OF THE SHOW_ADD PROGRAM

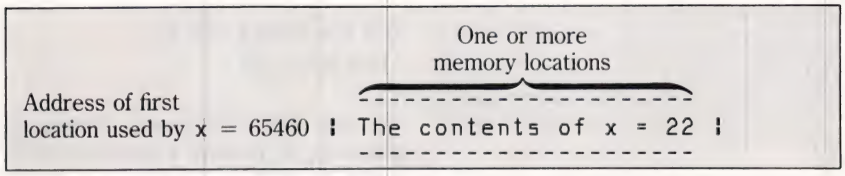


FIGURE 4: A MORE COMPLETE PICTURE OF THE VARIABLE x IN MEMORY

HLLs include BASIC, FORTRAN, COBOL, Pascal, and many others.

ADDRESS OUTPUT

Clearly, the address output by SHOW_ADD depends on the computer being used to run the program. Every time SHOW_ADD is executed, however, it will faithfully tell you the address of the first location where the variable x is stored. Note also that the address is printed using the unsigned conversion character, u, because addresses are unsigned integers.

Unbeknownst to many programmers of high-level languages, addresses run rampant throughout the executable versions of their programs. These addresses live in a symbiotic relationship with the executable machine code, which is hidden from view and the light of day by the use of high-level source code. The exceptionally strong relationship between addresses and arrays, for example, is completely concealed by the use of subscripts.

Figure 5 illustrates the storage of the table Num[], which contains four long integers. (Each long integer requires four bytes of storage.) Using subscripts, the fourth element in the table is referred to as Num[3]. Internally, however, array elements are never referenced this way. The computer uses the subscript to calculate the address of the desired element based on both the starting address of the table and the length of each entry. Calling the fourth element Num[3] forces the computer into the address computation &Num[3] = &Num[0] + (3 x 4). If we use the address operator, this last statement is read "the address of Num[3] equals the address of Num[0] plus 12."

Using pointers, a C language programmer can openly and directly use, store, and manipulate addresses. Programmer-controlled address operations can both significantly improve execution speed and facilitate creation and use of sophisticated high-level data structures.

In C, variable addresses—including table addresses—can be stored into other suitably declared variables. For example, the statement y = &x; puts the starting ad-

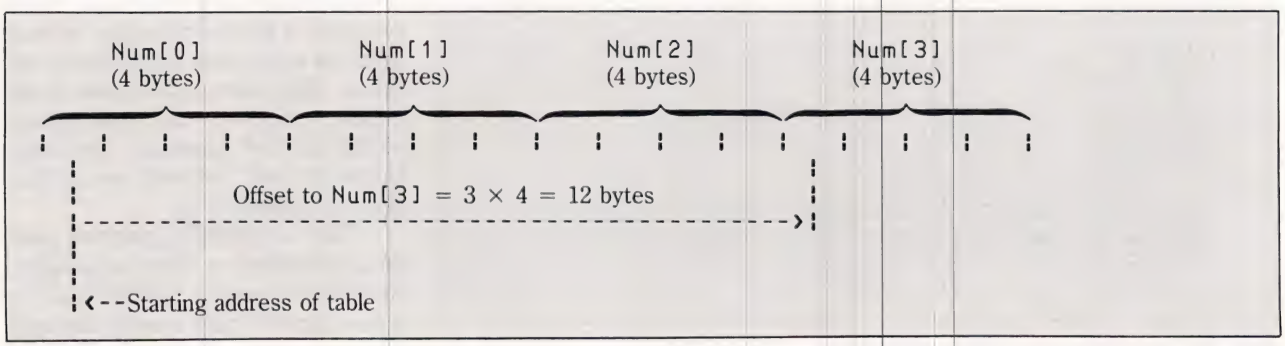


FIGURE 5: THE TABLE Num[] IN STORAGE

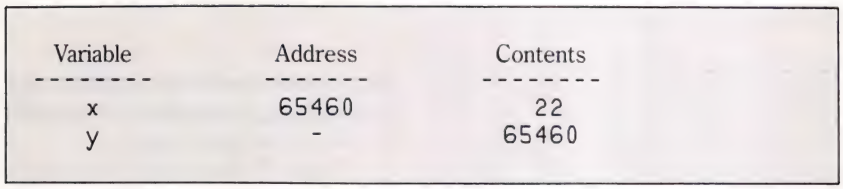


FIGURE 6: STORING x's ADDRESS INTO y

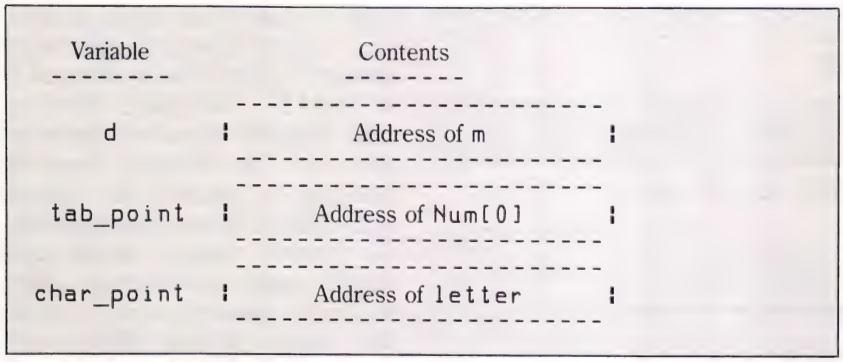


FIGURE 7: STORING MORE ADDRESSES

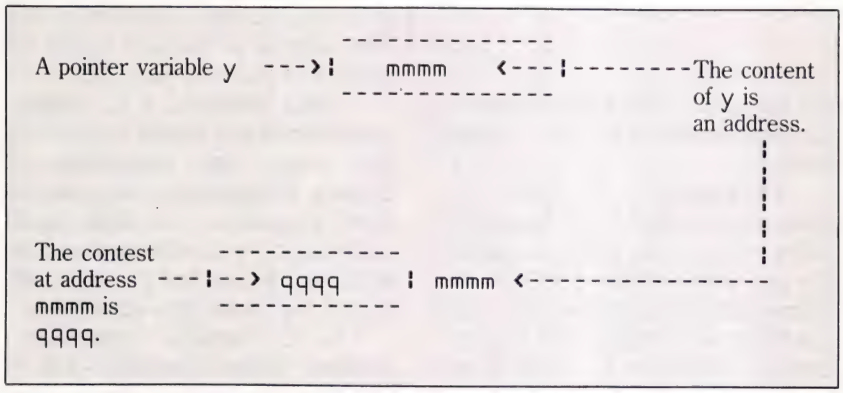


FIGURE 8: INDIRECT ADDRESSING USING A POINTER

```
main()
{
   int x;
   int *y;

   x = 22;
   y = &x;

   printf("The address stored in y is %u\n",y);
   printf("The value pointed to by y is %d\n", *y);
}
```

FIGURE 9A: THE MORE_ADD PROGRAM

dress of x into the variable y, as shown in Figure 6.

Similarly, the statements `d = &m; tab_point = &Num[0];` and `char_point = &letter;` assign the starting addresses of `m`, `Num[0]`, and `letter` into the variables `d`, `tab_point`, and `char_point`, respectively, as shown in Figure 7.

The variables `y`, `d`, `tab_point`, and `char_point` are called pointers. Pointers are simply variables that contain addresses of other variables.

AN INDIRECTION OPERATOR

To use the addresses stored in pointers, C provides an indirection operator, `*`. This operator, when followed by a pointer, means "the variable whose address is stored in." Thus, if `y` is a pointer, `*y` refers to "the variable whose address is stored in `y`," (or "the thing pointed to by `y`," for short) which is, of course, the variable `x`. Similarly, `*tab_point` means "the variable whose address is stored in `tab_point`, while `*char_point` means "the variable whose address is stored in `char_point`."

Figure 8 shows the relationship between the address contained in a pointer variable and the variable ultimately addressed. The term *indirect addressing* is used to describe this procedure because the value finally obtained is gotten indirectly by first going to a pointer variable for an address. The address contained in the pointer variable is then used to get to the desired contents. Certainly, this is a rather "indirect" way of getting to the final data.

Like all variables, pointers must be declared before they can be used. In declaring pointer variables, C requires that we also specify the type of variable that will be referenced by

```
The address stored in y is 65460
The value pointed to by y is 22
```

FIGURE 9B: THE OUTPUT OF THE MORE_ADD PROGRAM

the pointer. For example, if the variable pointed to by y is an integer, the correct declaration for the pointer y is `int *y;`.

Notice that this declaration specifies two things: First, that the variable pointed to by y is an integer; and second (by implication) that y must be a pointer (because it is used with the indirection operator). Similarly, if the pointer variable `tab_point` contains the address of a table of integers, and `char_point` contains the address of a character variable, the required declarations for these pointers are `int *tab_point;` and `char *char_point;`.

Program MORE_ADD (Figure 9A) illustrates a program using pointers. Notice from Figure 9B that in the output of MORE_ADD the contents of the pointer y are the starting address of the variable x. The computer on which MORE_ADD was run requires that each integer have two bytes of storage. The address printed by MORE_ADD is the first address of the two storage bytes required by x.

MUCH SIMPLER

Of course, it would have been much simpler if the pointer used in MORE_ADD could have been declared as `point y;`. Such a declaration, however, conveys no information as to the storage used by the variable whose address is stored in y. This information is essential when the pointer is used with the indirection operator, *.

Addressing an integer indirectly, for example, typically requires that two bytes of storage be retrieved after the address is obtained. If a character was referenced, only one byte of storage would be retrieved, and a long integer typically requires the retrieval of four bytes. The declaration of a pointer, therefore, must include the type of variable being pointed to. See Figure 10 for an illustration of this concept.

One unique feature of pointers is that their declaration conveniently permits automatic scaling of address offsets (refer to Figure 5). Assuming that `tab_point` had been declared as a pointer to a long integer and initialized to the address of `Num[0]` using the statements `long *tab_point;` and `tab_point = &Num[0];`, then the fourth element in the `Num` table can be referenced as `*(tab_point + 3)`.

Because the declaration of `tab_point` included the information that long integers are pointed to, any offset added to the address in `tab_point` is automatically scaled by the size of a long integer. Thus `(tab_point + 3)` equals the address of `Num[0]` plus an offset of 12 bytes (3 x 4). This, of course, is the address of `Num[3]` illustrated in Figure 5.

An incredible world of array and structure combinations and function parameter passing (using pointers) is opened to you once you fully understand the relationship between the address and indirection operators, & and *. □

Dr. Gary Bronson is a professor in the Department of Computer and Decision Systems at Fairleigh Dickinson University, Madison, N.J. He also conducts corporate seminars and workshops in C, Lotus 1-2-3, and dBase III.

Editor's note: In a future installment we'll put pointers to work as we learn how to access and manipulate the arguments on the command line used in invoking a C program.

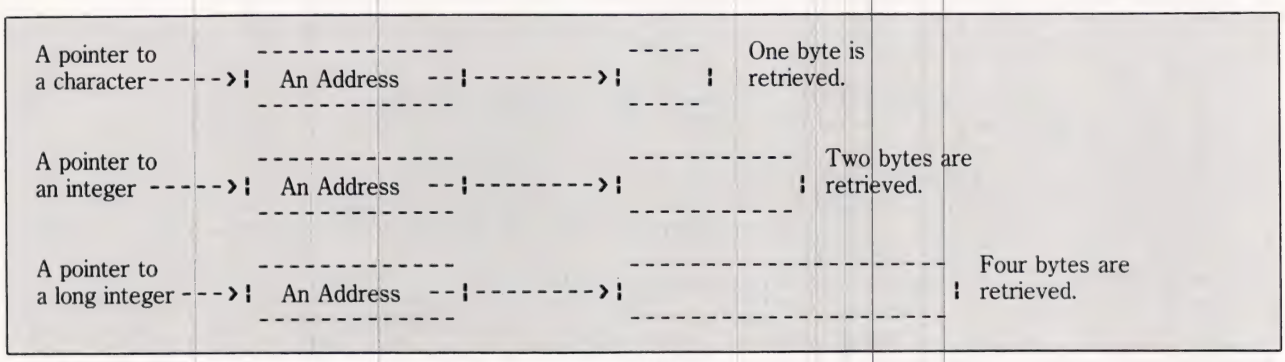


FIGURE 10: ADDRESSING DIFFERENT DATA TYPES INDIRECTLY

AN INTERACTIVE SPELLING CHECK/ CORRECTION SHELL SCRIPT

BY DR. REBECCA THOMAS

A well-designed spelling check and correction program would be a useful utility for almost any Unix system user. The `spell` program supplied with most Unix systems simply lists words that are not in the system dictionary or that can't be derived from that group of words by certain rules. Once you have this list of misspelled words, you still must edit your document manually to correct any misspellings. Unlike earlier versions, System V's `spell` program does let you specify a supplemental dictionary, but you still must maintain this dictionary manually.

This month's contribution, from Mike Elola, a frequent contributor, features a Bourne shell script that checks spelling, corrects misspellings in your document directly without editing, and uses and maintains a supplemental dictionary! The accompanying figure lists this useful shell script. Enter this script (without the line numbers) using your favorite editor, and then make it executable—`chmod +x spellproofer`. Use this script by typing `spellproofer` followed by the names of the files containing the text you want checked for spelling errors.

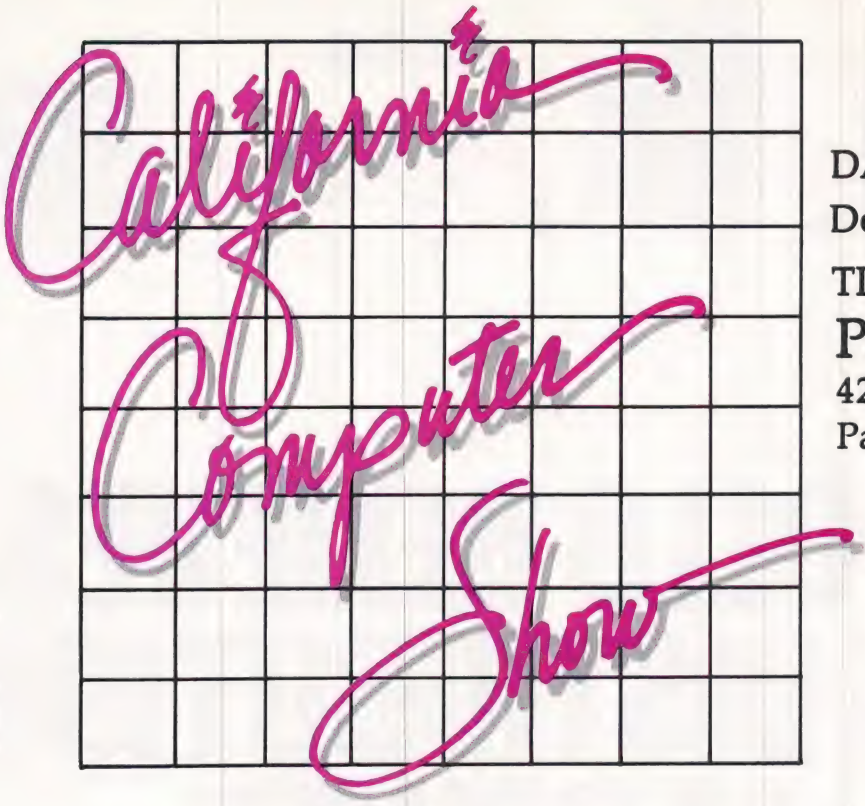
For each word that doesn't occur in either the system spelling dictionary or a local dictionary (and thus presumed to be misspelled), you are prompted for the correct word. If you do enter a word, you'll be shown the line of text containing the corrected word, and then you'll be asked if you'd like the correct word to replace the incorrect word. If you answer affirmatively, the shell script will replace the incorrect word with the one you suggested. You don't even have to use an editor!

If you don't suggest a replacement word, you presumably consider the "misspelled" word correct;

FIGURE 1: AN INTERACTIVE SPELLING CHECK/CORRECTION SHELL SCRIPT

```
$ cat -n spellproofer
  1   echo "SPELLPROOFER+ - Version 1.0 Copyright 1985 by Michael Elola"
  2   echo "working ..."
  3   filelist="$*"; excused=""
  4   if test -z "$filelist"; then
  5        echo 'Usage: spellproofer file...'
  6        exit 1
  7   fi
  8   wordlist=`spell $filelist`
  9   echo -n "Use a local dictionary? (RETURN=none), named: "
 10   read localfile
 11   for word in $wordlist
 12   do
 13        found=`grep $word, $localfile /dev/null`
 14        if test -z "$found"; then
 15             echo
 16             echo "=======================WORD======================="
 17             echo
 18             echo -n "Press RETURN for no change or replace \"$word\" with"
 19             read correction
 20             if test -n "$correction"; then
 21                  hitlist=""
 22                  for file in $filelist
 23                  do
```

Continued on page 113



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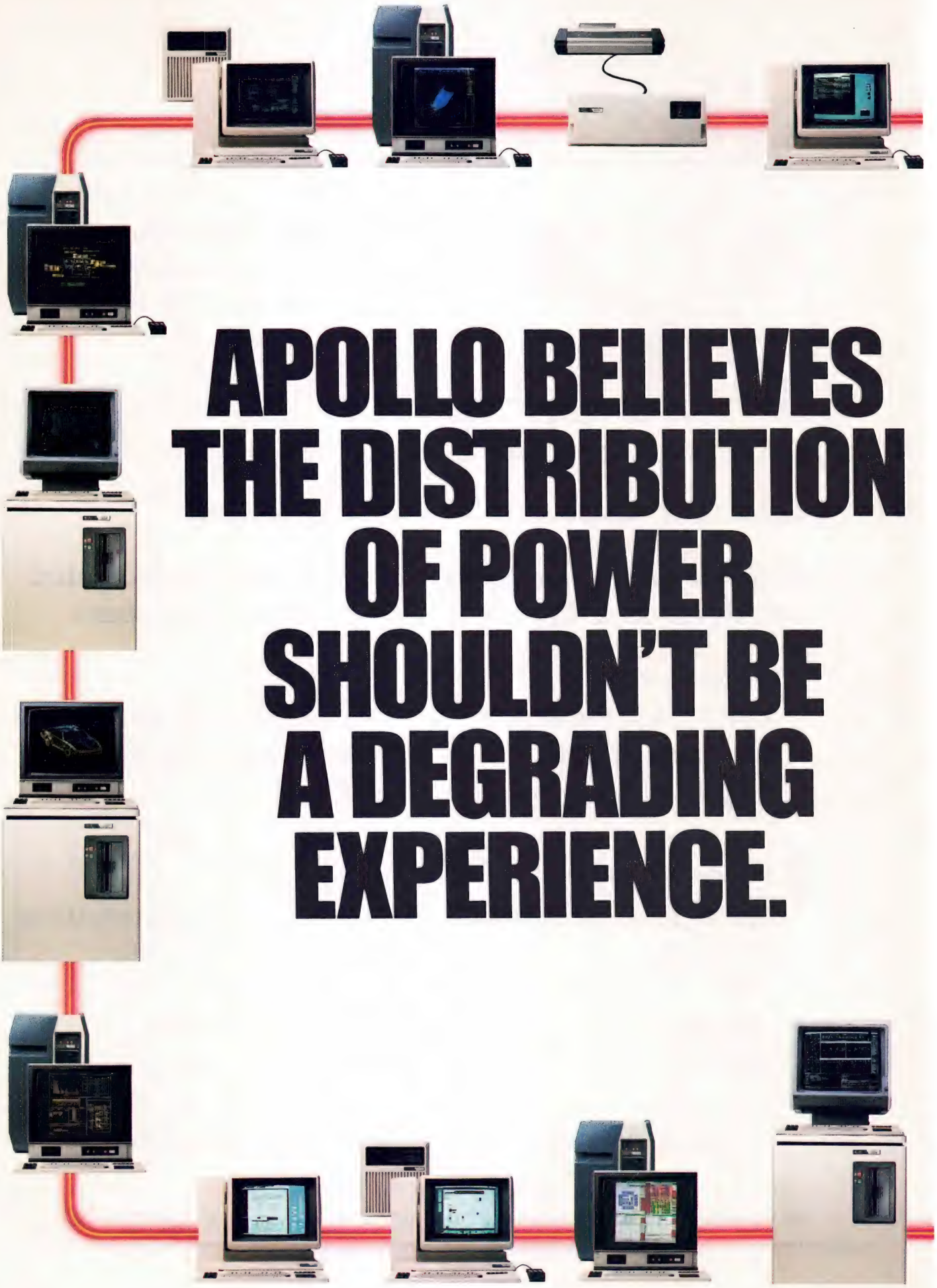

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SYSTEM V BIDS FOR WORLDWIDE STANDARD, SIX VENDORS SIGN ACCORD

Six leading European computer manufacturers—ICL of the United Kingdom, Siemens and Nixdorf of West Germany, Philips of the Netherlands, Olivetti of Italy, and Bull of France—have joined forces and declared their common intention to standardize future operating system and software development on AT&T's proposed worldwide standard-bearer, Unix System V.

The accord is seen as an important step toward the standardization of European information technology and a significant coup for AT&T in its battle to have System V adopted as the worldwide, standard version of the Unix operating system. Most important, however, observers here and abroad believe the accord stems from the six computer vendors' common desire to strengthen their competitive positions against rival giant IBM and its 40 or more percent dominance of the European computer market.

Each of the six is a major computer company in its own country (Siemens, for instance, is one of the three largest employers in West Germany). But the group has been unable for several years now to keep pace with IBM's flurry of technological advances and product announcements.

This move is seen as an attempt by the consortium to harness its collective efforts and to cut product and software development time in order to gain some clout and stave off IBM's apparent thirst for dominance of the worldwide computer market.

"By banding together and adopting a common architecture, they [the six companies] become something akin to IBM in size and power," said a European source who attended many of the meetings leading up to the agreement.

The pact calls for the six companies to work together to develop proprietary enhancements, additions, and upgrades that would be shared among all six participants, according to informed sources. These same sources said the six would

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cooperate in developing additional systems calls and graphics extensions for AT&T's System V, as well as extending capabilities of the FORTRAN, COBOL, and C programming languages for the Unix system environment.

All six manufacturers have pledged wholeheartedly to support these common enhancements, most of which should be incorporated into the six companies' Unix System V releases by the end of this year.

Although this agreement marks a major coup for AT&T in its battle to have System V declared the worldwide standard, it could also go against the company in the end, our informed source warned. The six have pledged to support their own commonly developed enhancements to System V regardless of whether AT&T decides to go along with them.

AT&T-IS ADDS TWO WORD-PROCESSING PACKS

AT&T Information Systems (AT&T-IS) has announced the availability of Emerging Technology's EDIX and WORDIX software packages for the Unix system-based AT&T 3B computer line.

The new packages enable writers to produce lengthy, complex documents—such as textbooks, manuals, or scripts—that have demanding formatting requirements, AT&T said.

The EDIX software features multiple-window text manipulation, allowing writers to edit up to 12 documents simultaneously. The WORDIX software offers such formatting features as multiple-column output, mailmerge, automatic footnote placement, and section numbering.

The new packages are available through the AT&T-IS sales force. The EDIX and WORDIX software for the 3B2 Version 2.0 cost $680; for the 3B5, they cost $1360.

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GUIDANCE FROM ON HIGH

The Unix Programming Environment by Brian Kernighan and Rob Pike
PUBLISHED BY PRENTICE-HALL, 357 PAGES, $19.95

REVIEWED BY RAY SWARTZ

The Unix system is sometimes spoken of in religious tones, and it is said to have a cult following. Those blessed with great knowledge are reverently called "gurus"; even the commands are oddly cryptic. If all this is true, then *The Unix Programming Environment,* by Brian Kernighan and Rob Pike, should be considered one of the truly "Great Books" of the Unix system.

In many ways, this book can be viewed as *the* definitive book on the Unix system environment. This is not surprising because it was co-authored by Brian Kernighan—whose books always strive to provide maximum insight. Not only is the material thoroughly covered, but the addition of historic anecdotes and philosophic discussions of design helps to extend the reader's understanding of what the Unix system is and why it works the way it does.

The principal reason for reviewing this book is simple: Anyone interested in the Unix system should know about it. Its authors are two bona fide Bell Labs Unix gurus attempting to show us the tricks of the trade. While reading this book, I often felt like an apprentice magician taking note of the great master's technique.

The books written by Brian Kernighan are not intended to be used as basic introductions. They generally assume that the reader has a sophistication about computers, their design, and their uses. But neither are they written for those interested in knowing a little something about the Unix system. *The Unix Programming Environment* is designed to be studied until the concepts become clear. In fact, much of the material will require more than one reading.

In reality, the audience for this book includes anyone who "uses" a Unix system. I'm not speaking about those doing word processing or accounting on a computer that runs the Unix system; I'm speaking of people actually dealing with the Unix system, one on one. In fact, the book's viewpoint is that of a programmer or experienced user who needs to take full advantage of what the Unix system environment has to offer.

HOW THIS BOOK IS WRITTEN

This book is written very much like *The C Programming Language,* a book Kernighan wrote with Dennis Ritchie. The explanations are terse, the examples varied and numerous, the exercises probing (and unsolved). It even uses the same type style.

REVIEW SUMMARY

- Not recommended for the Unix system beginners
- Recommended for the Unix system users who have some experience with the Unix shell
- Maximum recommendation for all other Unix system users, especially programmers

The book is written in compact prose and relies heavily on illustrative examples. Because much of the material covers interacting with the Unix system shell, most of the examples include sample results. While many of the programs demonstrated are designed as general tools useful in almost any Unix system environment, some of them seem to be more complex than necessary. On occasion, the examples left me with more questions than answers!

Although this book covers an extraordinary amount of material, it sometimes merely presents it in the hope that the reader will "figure it out." For example, in an attempt to explain some of the Unix system's program development tools, the authors create a programmable calculator. In the chapter's introduction they write, "We simply don't have space to explain every nuance. Hang in, and be prepared to read the chapter a couple of times." Unfortunately, this could be said of the entire book.

CONSISTS OF TWO PARTS

The Unix Programming Environment can actually be viewed as consisting of two parts. The first, which includes Chapters 1 through 5 and Chapter 9, covers the Unix system shell. The second part, Chapters 6 through 8, focuses on programming in C in a Unix system environment. Without question, this book is written for readers who have significant programming experience. However, even non-C programmers who absorb only the book's first part can learn a tremendous amount.

Chapter 1, "Unix for Beginners," begins with the usual introductory items: logging in, correcting typing mistakes, interrupting an executing program, sending and receiving mail, creating files with `ed`. The chapter briefly presents other topics, including file-manipulation

tools and directories. Also covered are most aspects of the shell: metacharacters, input-output (I/O) redirection, pipelines, processes (foreground and background), tailoring the user's environment, and using the setup file `.profile`. All of this takes place in 39 pages! Some *entire* books cover little more than this.

The second chapter, "The File System," talks at length about files on the Unix system. The chapter begins by using `od` to examine a simple text file and then explains the representation of "special" characters within the Unix system. This leads into an excellent but brief discussion of why the Unix system treats all files the same, from those containing only text to those storing executable code.

Chapter 3, "Using the Shell," shows some "commonly used shell features." This is done in a logical fashion that makes it easier to understand. Discussed in this chapter are the shell's command line structure, metacharacters, the creation of new commands using the shell, command line arguments, the shell's quoting mechanism, shell variables, redirection of input and output, and the shell command language. Although Chapter 3 covers a lot of ground, the extensive use of examples helps the reader absorb the material.

In Chapter 4 the authors are concerned with programs known as filters. Virtually all of the Unix system tools are filters—programs that read and write information as a data stream. The chapter covers `grep`, `sort`, `tr`, `uniq`, `tail`, `sed`, `cat`, and `awk`. Both `grep` and `sort` are thoroughly documented, and `awk` is examined in depth.

"Shell Programming," Chapter 5, combines the information from the previous chapters with the shell programming language to create a number of enlightening examples of shell usage. The reader is introduced to the shell command language through sample applications, a move that provides insight into what should be done with the shell and how to do it.

USING C

The next three chapters stop using the shell and begin using C. Chapter 6, "Programming with Standard I/O," shows C programmers how to take advantage of the Unix system's file redirection facility. Although readers unfamiliar with C will find little of interest here, C programmers who have never worked in a Unix system environment will find this chapter indispensable. Even experienced Unix system programmers will find useful information here. Some of the programs used as examples are the C equivalent to shell programs devel-

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oped earlier in the text, which provides a nice continuity.

Chapter 7, "Unix System Calls," looks into the depths of the Unix system, discussing how Unix works from the perspective of a system programmer (one who uses C).

Chapter 8, "Program Development," attempts to demonstrate the Unix system tools available for program development. Primarily, the tools covered include `yacc`, which is the real focus of this chapter, `lex`, and `make`. One extended example is used throughout: creating a "high-order calculator (HOC)." This is done in six stages, each stage extending the previous one. Essentially, the authors document how an application grows from a simple idea into a full-fledged utility. Even though this chapter is the longest in the book (six program versions are written), it tries to do little more than present the material.

Chapter 9, "Document Preparation," discusses the formatting programs `nroff`, `troff`, and to a lesser extent `tbl` and `eqn`. The chapter shows how the manual for `hoc` was formatted, an intriguing idea because the manual is printed as an appendix.

The last chapter, "Epilog," is a three-page opinion piece that also chronicles the development of the Unix system from a two-person project to the massive system it is today.

CONCLUDING REMARKS

This book provides the best overall examination of the Unix system I have yet read. In most cases, the examples included in the text are useful utilities in their own right. I've learned a lot from this book, and I haven't even come close to understanding everything it contains.

Although not designed as a reference, *The Unix Programming Environment* has a good index, one I have used many times. In fact, I keep my copy next to my terminal for fast access.

I recommend this book to anyone familiar with the Unix system who wants to learn more. Besides being indispensable to programmers on a Unix system, it is a tremendously valuable book to the Unix system community as a whole. It not only pulls together a great deal of information, but it also succinctly states the philosophy behind the Unix system. □

Ray Swartz is the founder and president of Berkeley Decision/Systems Inc., a Santa Cruz, Calif.-based computer consulting and training firm. The company has designed and programmed geologic simulations, business applications, and computer models.

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Continued from page 102

FIGURE 1: CONTINUED

```
24                        found=`grep -c $word $file`
25                        if test $found != 0; then
26                             hitlist="$hitlist $file"
27                        fi
28                   done
29                   for file in $hitlist
30                   do
31                        echo
32                        echo" FILE " [PROD: See orig here; add underline]
33                        echo
34                        sed -n -e s/$word/$correction/gp <$file
35                        echo " [PROD: See orig here] "
36              echo -n "Save corrections in \"$file\" file (y or n)? "
37                        read response
38                        if test "$response" = y; then
39                        sed -e s/$word/$correction/g <$file >/tmp/$file
40                             mv /tmp/$file $file
41                        fi
42                   done
43              else
44                   excused="$excused $word,"
45              fi
46         fi
47   done
48   echo "=============================================="
49   echo;echo;echo
50   if test -n "$excused"; then
51        echo $excused | tr \ '012' | pr -5 -t
52        echo
53        echo "Do you wish to have some or all of the above words entered"
54        echo -n "into a local dictionary file (y/n)? "
55        read response
56        if test "$response" = "y"; then
57             if test -n "$localfile"; then
58                  echo -n "Append to $localfile (y/n) ? "
59                  read response
60                  if test "$response" != y; then
61                       localfile=""
62                  fi
63             fi
64             if test -z "$localfile"; then
65                  echo -n "Enter new/alternate local dictionary file: "
66                  read localfile
67             fi
68             echo
69             echo -n "Do you wish to be selective (y/n) ? "
70             read select
71             for word in $excused
72             do
```

Continued

FIGURE 1: CONTINUED

```
                if test "$select" = y; then
                     echo -n "Include $word (y/n) ? "
                     read response
                     if test "$response" = y; then
                          echo $word >>$localfile
                     fi
                else
                     echo $word >>$localfile
                fi
                done
           fi
      fi
      echo
      echo "Done."
$
```

as a result, the script asks if you'd like to add any of the "correct" words to your local dictionary so that they won't be flagged as misspelled in the future. Furthermore, you may selectively add these correct words from the displayed list to the local dictionary.

I have found this interactive spelling utility easy to use and a real timesaver because spelling correction and dictionary maintenance are done for you as well. □

Contributed by Mike Elola
Independent writer/programmer
San Jose, Calif.

Dr. Rebecca Thomas, UNIX/WORLD's Editor Emeritus, is an author of A User Guide to the Unix System, *the second edition of which is now available.*

"Wizard's Grabbag" is a regular feature of UNIX/WORLD. Submit your shell scripts, C programs, or tips and techniques that ease the burdens of system administrators and programmers to "Wizard's Grabbag," UNIX/WORLD, 444 Castro St., Suite 1220, Mountain View, CA 94041. Authors of published entries receive $50 for shell scripts, `awk` scripts, `sed` scripts, `lex`, `yacc`, and C programs, or tips.

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Use the standard I/O library when writing C code. In addition, use the lint syntax checker to eliminate nonportable constructions and compile the code with a portable C compiler such as `pcc` to help ensure portability. Hardware dependencies, such as terminal control sequences, should be eliminated or at least minimized and isolated to one code region or to a separate module. Keep your example as short as possible, say under 100 lines of code.

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Continued from page 119

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The solution? Maybe some cooperation could do the trick. Perhaps the UniForum planners can realize that Usenix technical conferences represent an extremely important element to companies' commercial success. Perhaps, then, they'd be somewhat more cooperative when it comes to working with Usenix to help make simultaneous conference scheduling, in nearby locations, a reality instead of an impossibility.

I personally feel that this could represent a major step back from the schism that has now been created between these two conferences, a schism that can do nothing but harm the community as a whole. There are some indications that such cooperation is now beginning to take place—let's hope that it continues and grows in a meaningful manner. □

```
--Lauren--

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Lauren Weinstein is a computer/telecommunications consultant living in Los Angeles. He has expertise in computer networking, the Unix system, microcomputer technology, and telecommunications systems.

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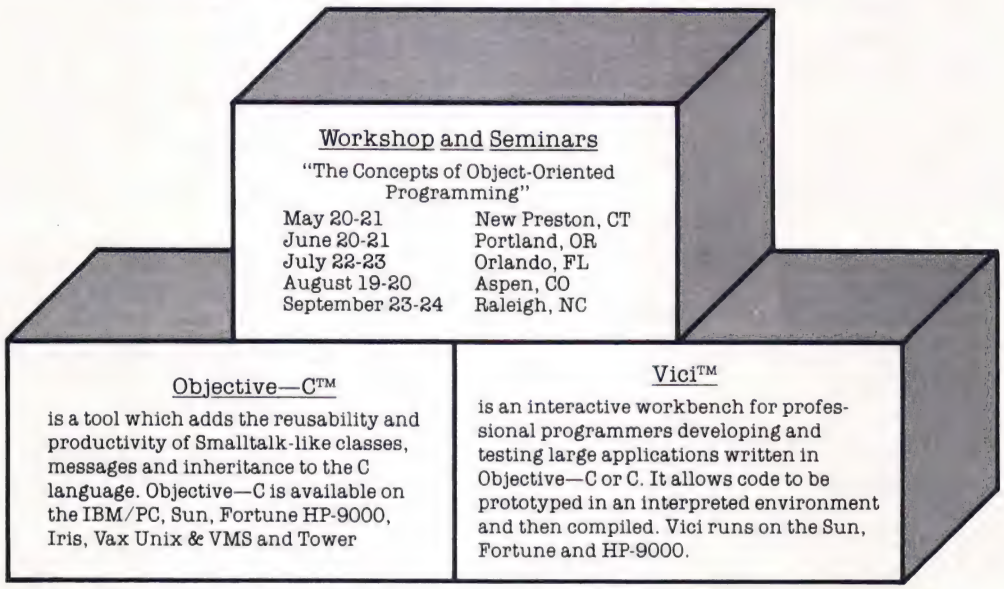

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Continued from page 120

UniForum was promoted in a manner that brought everyone from the District of Columbia and the surrounding area who had ever read or heard of Unix systems into the conference hotel. Many of these people were only peripherally interested, but it was apparently fun to wander around the exhibits—and what the hell, it must have been a good way to get a day off work.

This would have been fine if Usenix wasn't trying to have a technical conference at the same time. But the crush of UniForum attendees was so great that some of the Usenix meetings had to be canceled for lack of room, and it was pretty obvious that Usenix had been largely overshadowed by the crush of humanity who had come to see the UniForum exhibits.

In 1985, Usenix and UniForum were again scheduled at the same time but in different (nearby) locations in Dallas, with shuttle service between the two. The attempt here was to avoid unwanted interference between the two conferences, but to make it possible to easily attend both conferences if desired. In a way, the strategy was successful. UniForum had a massive turnout, and Usenix did have useful technical meetings. I might add that the hype level over at UniForum was impressive to behold, but as I've said, that can be part of the game, so long as it doesn't go *too* far.

CRACK!

Alas, it appears that things *have* gone too far. UniForum has grown so large and so totally dedicated to putting on the biggest (and hype-loaded) trade shows possible that the expected attendance is pushing the possibility for meaningful coexistence with the technical Usenix conferences out of the realm of practicality.

Part of this problem is simple mathematics. There simply aren't that many cities where large conferences can be booked sufficiently far ahead, and hotel space is at a premium in such locations. Because UniForum considers "bigger to be better" (seemingly without limit), they have become so large that it simply isn't possible to also get sufficient space during the same periods, in the same cities, to hold simultaneous Usenix conferences.

For example, an upcoming UniForum will be held in Anaheim, Calif. UniForum has reserved a tremendous number of hotel rooms in the area. Usenix tried to get the (much smaller) number of rooms they needed for a simultaneous conference. They couldn't. There weren't sufficient rooms available any closer than downtown Los Angeles—too far away from Anaheim to be practical.

UniForum was apparently unwilling to relinquish any of their reserved rooms to make some space for Usenix. In essence, UniForum told Usenix: "Beat it! Thanks for getting Unix systems going. But we don't need you any more. We'll take it from here."

This is an extremely unfortunate turn of events. Although UniForum likes to promote itself as if it has significant technical sessions, many reports indicate that these are frequently ill-prepared (often without handouts being included in the cost of the sessions) and often are simply thinly veiled excuses for new product presentations without significant technical content. There's nothing wrong with new product presentations, but there don't seem to be many supportable reasons, at this stage of the game, for trying to present them in the guise of technical sessions.

CROSSROADS

We've clearly reached a certain crossroads. If the commercial promoters of Unix and similar systems are to continue their pattern of growth, it is extremely important that they support both the commercial *and* the more technical conferences. If they truly believe that UniForum-style "technical" sessions can completely replace the Usenix sessions in the eyes of those technical people who have brought these systems to today's level, they are sadly mistaken. The Usenix conferences have an important and permanent part to play in the continued technical evolution of these systems—and it is ultimately through such evolution that continued commercial success can be attained.

It isn't enough to simply suggest that the conferences be held in separate cities at separate times. Many companies only budget enough money to send their technical people to a single conference location a year. This puts these people in a very difficult situation. On one hand they need to attend the commercial UniForum conferences to make technical appraisals of the various available products and, where appropriate, of customer reaction to their own products.

On the other hand, they also need to attend the Usenix conferences to participate in significant high-level technical sessions and to engage in technical dialog with the other "wizards" in the field. Such technical sessions and dialog can be critical to their companies' ability to

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THE CONFERENCE SCHISM

BY LAUREN WEINSTEIN

I have nothing against people who wear suits! Let's face it—if people really *want* to dress that way, I think that's clearly their right, and we shouldn't hold such a peccadillo against them.

Some time ago I joked in this column about the increasing ratio of three-piece suits to jeans at Usenix conferences. I suggested that this measure might be useful to judge the changing character of conference attendees and thus the overall change that Unix systems have undergone in the world at large.

Since I wrote those words, the acceleration of what we might call the "three-piece tailored takeover" at the Unix system-related conferences has lost any of the humorous aspects it once possessed. In fact, I'm concerned about the future of the community and of the Unix system itself.

I'm certainly not condemning the commercialization of Unix systems per se. Commercialization is a necessary and important aspect of the system's spread from academia into the "real world." I fully and strongly support the efforts of responsible firms to create useful software products and to receive a good profit in exchange for their work.

But I *do* find it distressing when marketing techniques transcend the reasonable and find themselves more and more in the domain of unbridled advertising "hype." There have been occasional signs of such a transition in the past, but now the trends seem unmistakable and increasingly ominous.

What's wrong with hype? Well, that depends on your point of view. To a limited extent, it might be said that hype is just a tolerable extension of the desire to gain attention for a particular product in a crowded and highly competitive marketplace. A bit of hype may even be somewhat amusing—in the proper context. But while hype may be expected and even enjoyed at the circus, and tolerated to some extent in the commercial world, it's clearly possible to take things too far.

THE CONFERENCES

In particular, it's instructive to look at the evolution of the Unix system-oriented conferences and how they've come to affect each other in the presence of increased advertising and related promotional activities. It is now almost exactly the tenth anniversary of the first Usenix conference. The Usenix organization has always considered itself to be primarily a technically oriented organization. In the early days of Unix systems, there was very little real commercial activity associated with these systems, and Usenix was formed almost completely by the various "techies" from the assorted organizations using Unix and related software—universities, Bell System companies, and other entities.

Usenix conferences were thus always most concerned with technical issues. They have primarily been an exchange forum for these issues by those who have worked long and hard on the implementation and expansion of Unix, similar systems, and the various extensions thereof. While occasionally in the past a technical talk turned out to be something of a new product announcement rather than a genuine full-scale technical dissertation, so many new developments were occurring so rapidly that even those talks usually had considerable new technical content.

Sometime later, the /usr/group organization, oriented primarily toward the commercial marketplace, came to be. They held their own "UniForum" conferences, which echoed their commercial focus. Once again, allow me to emphasize that I support such commercialization. But a schism has developed between the commercial world, as represented by /usr/group, and the technical world, as represented by Usenix.

At first, an attempt was made to hold these conferences as joint events, sharing the same hotel and related conference facilities. But where Usenix strove to hold a high-level technical conference, the UniForum conferences were understandably concerned with attracting large numbers of people to view the various new products and announcements. In a very real sense, UniForum is based on a "high volume" of attendees to gain as much exposure as practical. Usenix conferences, to be successful, need to attract the best technical people for their own discussions, but not necessarily a very *large* number of people.

THE DEVELOPING SCHISM

It didn't take very long for problems to develop. At the combined 1984 conference in Washington, D.C.,

Continued on page 119

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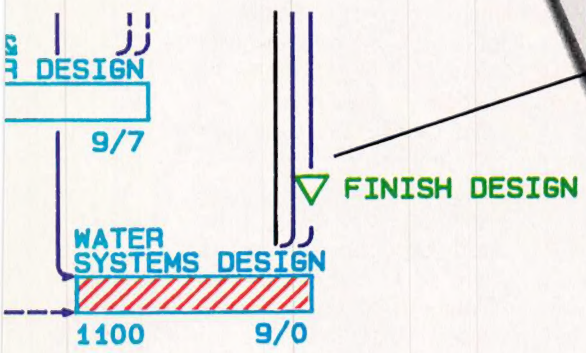

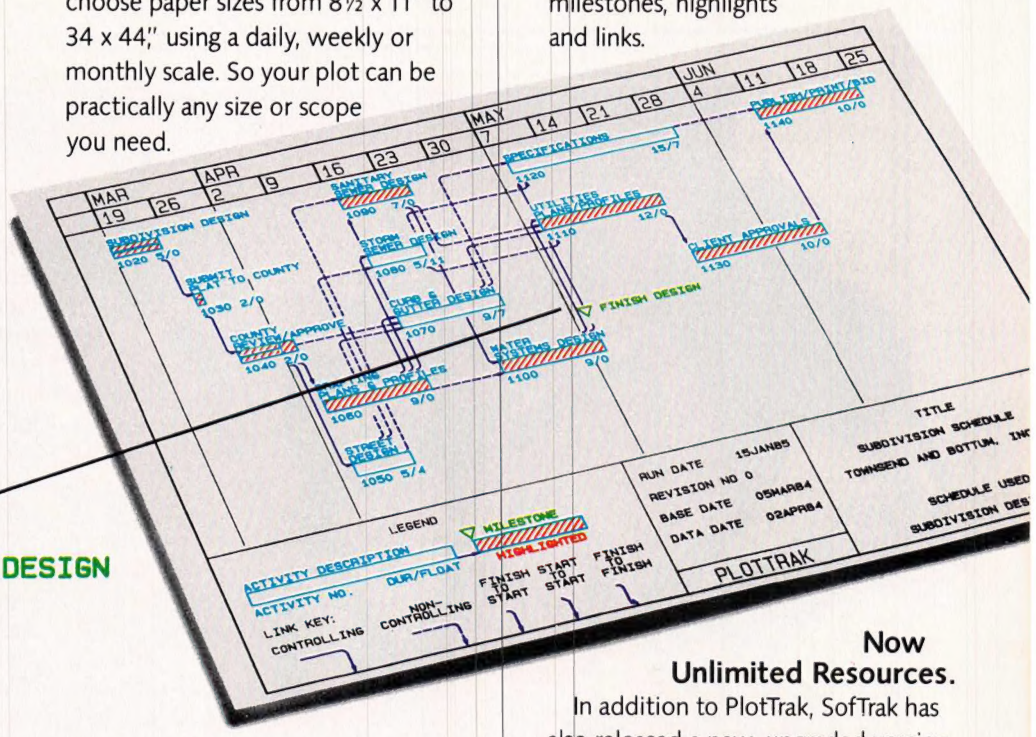

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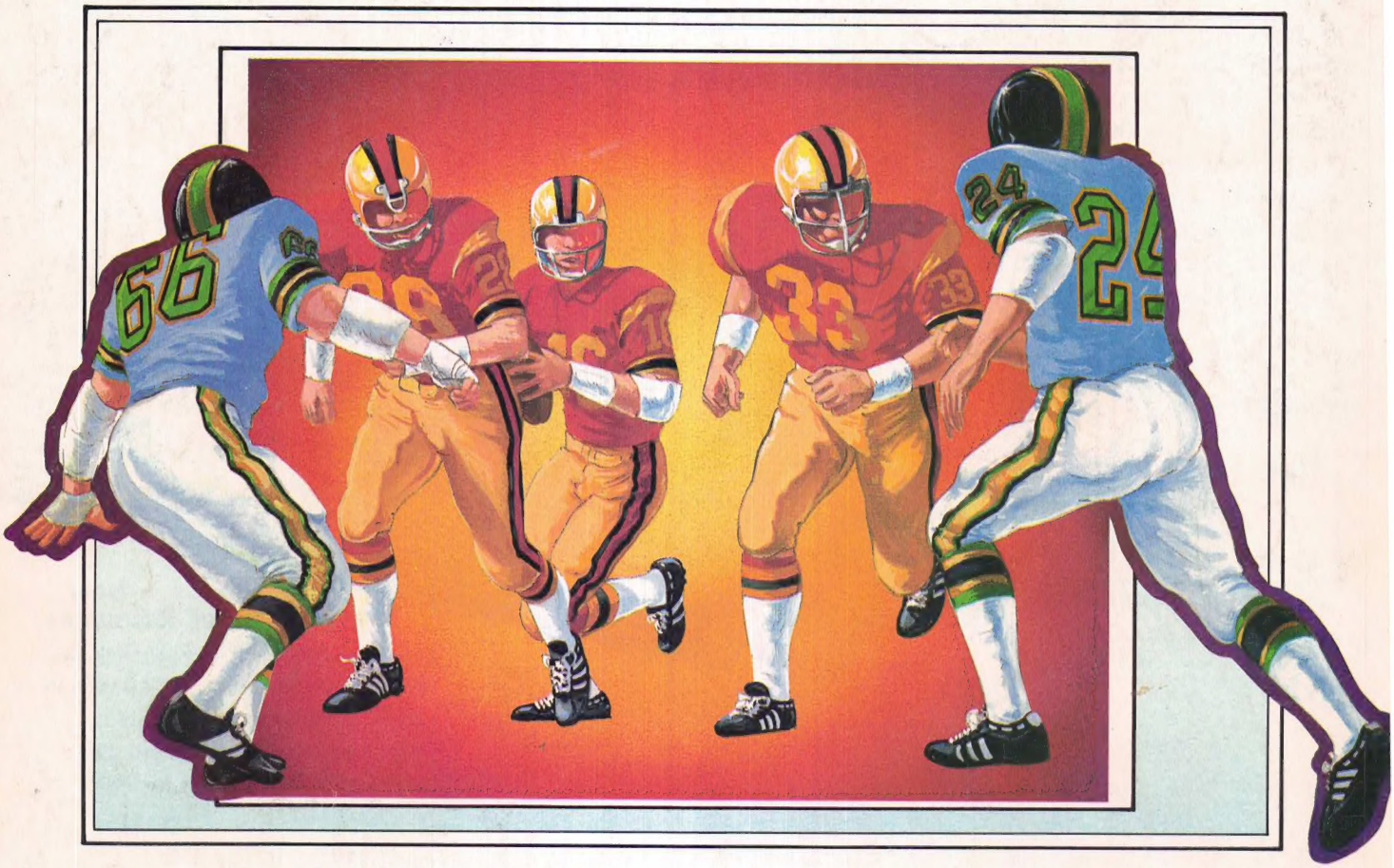

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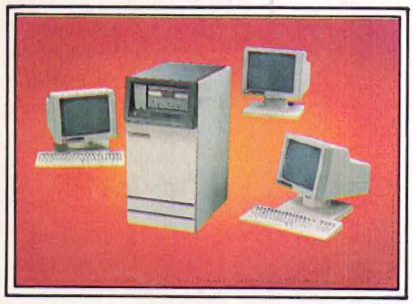

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