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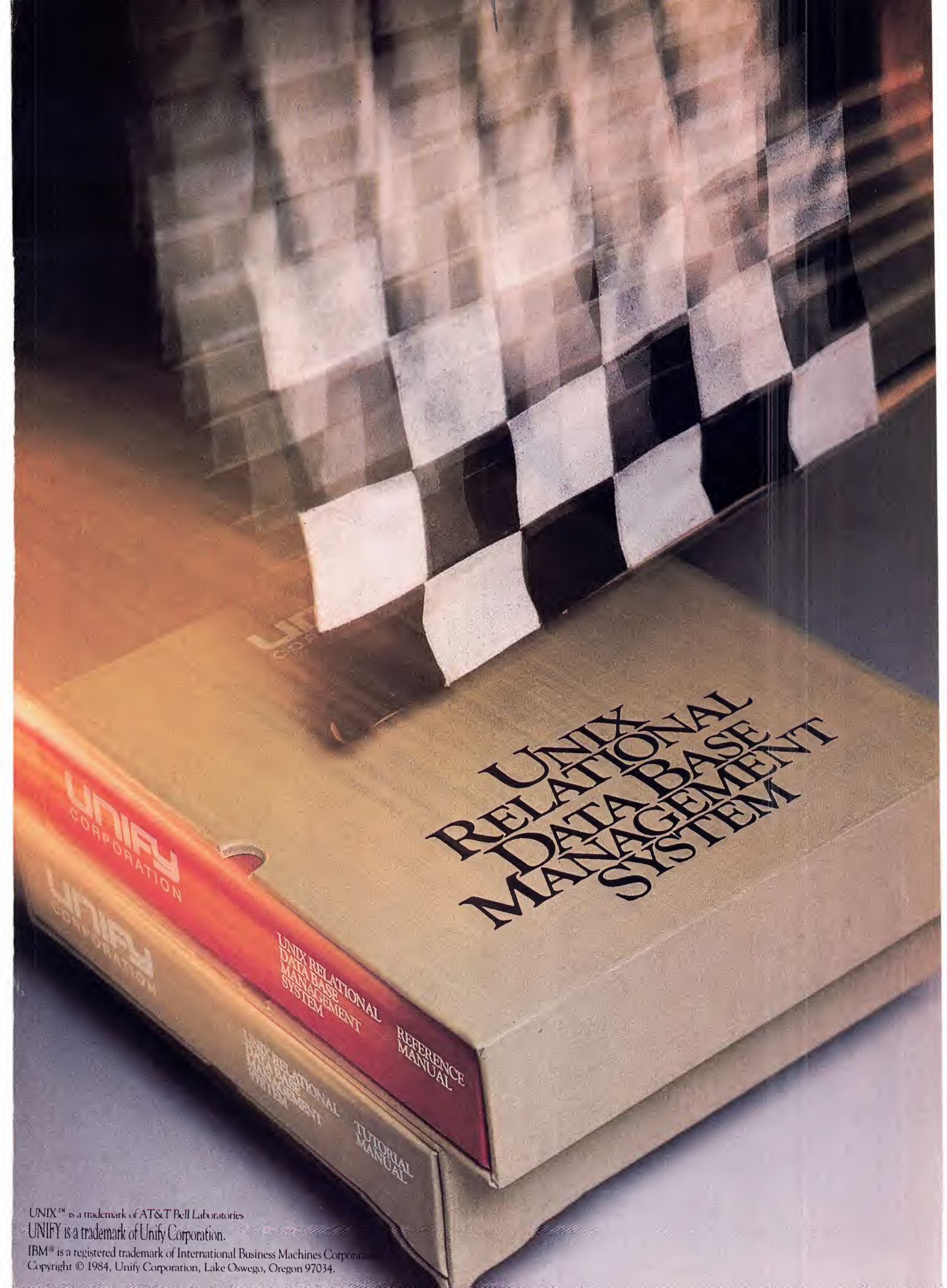
THE UNIX SYSTEM JOB MARKET

THE UNIX SYSTEM AND IBM'S SNA



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APRIL 1984 VOLUME 2 NUMBER 3

UNIX Licensing Confusion Slows System V

Motorola completed its System V port, but hardware vendors may experience delays in obtaining software due to AT&T's licensing procedures.

The recent and dramatic product announcements from AT&T have finally answered the questions about AT&T's position in the computer industry. AT&T left no doubt that it was going to aggressively market these new products, probably at the expense of other hardware vendors now selling UNIX based hardware.

AT&T's entry will greatly expand the total market for UNIX based hardware. At the same time, it could have serious and negative consequences for hardware vendors which rely on AT&T to license and support their software. The recent reorganization and power struggle surrounding the entire licensing process created a atmosphere of confusion and uncertainty. In addition, the decision to delay licensing of Motorola's recently completed System V/68 port may create a microprocessor version shortage when hardware ports are finally made.

Serious doubts have been raised about how AT&T is going to license UNIX in the future. If AT&T is serious about its often stated pledge to promote UNIX System V as the industry standard, then the licensing procedure is going to have to become easier and AT&T is going to have to get some people out into the field and actually sell and support the product.

The conflict within AT&T

These recent actions create a potential conflict of interest between two departments at AT&T; both reporting to the same central management. Can AT&T effectively compete with other hardware vendors from one department and at the same time sell and support UNIX to these same competitors from another department? AT&T obviously believes the answer is yes.

Licensing UNIX has never been easy for AT&T in the past. Uncertainty over deregulation caused licensing slowdowns during most of 1983. This changed somewhat at the Fall COMDEX 1983 trade show (Las Vegas) when AT&T announced new and streamlined procedures for obtaining a UNIX source license. Since that time the licensing process has become more rapid and less complicated. However, a great deal of confusion still remains regarding the future licensing procedures for System V microprocessor versions.

Interview with Motorola's Bill Lowery

by Michael Dubrall

As noted in the accompanying article, Motorola's recently completed System V/68 port will have a profound impact on the UNIX market. In order to better familiarize you our readers with this new development, we are bringing you the following interview with Bill Lowery, the software marketing manager at Motorola. Lowery, recently named YATES VENTURES to explain Motorola's marketing plans in conjunction with the surging popularity of UNIX. The interview that follows includes excerpts from that discussion.

BL: In order for an OEM to get a System V/68 source license from Motorola, he will first get from AT&T UNIX System V the 68000 Version source license. Those are not currently being offered. You won't find it anywhere else. You need an AT&T source license.

continued on page 4

Source code for System V.2 was not generally available until April 1, 1984, except to a select group of AT&T OEM's. AT&T has announced that all source code licenses for V.2 will be chip specific. In other words, there will be a M68000/System V license, a Z8000/System V license, etc. Note, however, none of these new licenses have actually been sold, and AT&T has not commented on their availability.

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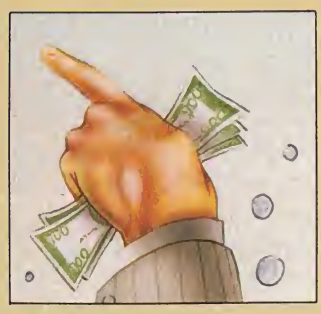

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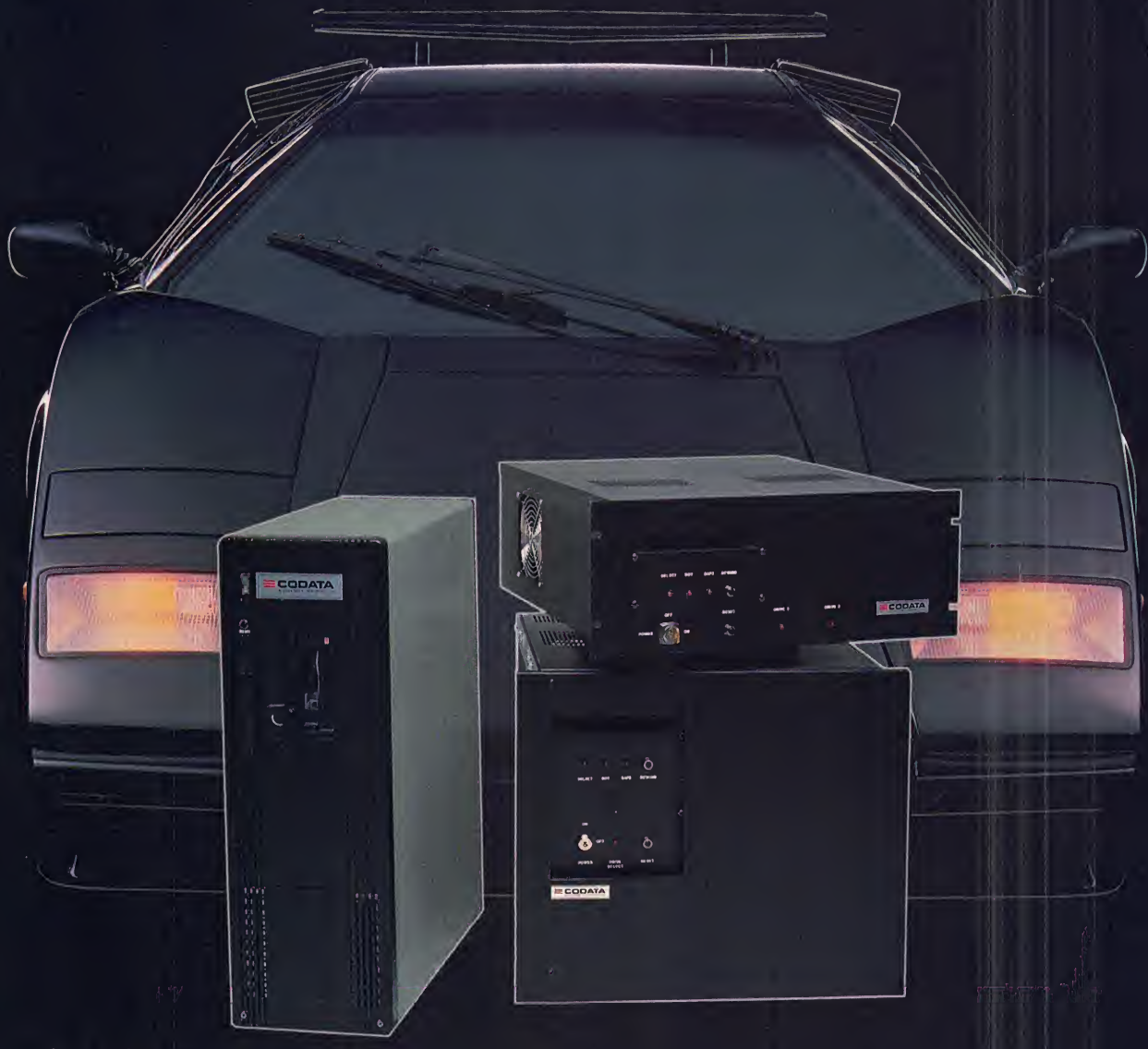

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FROM THE PUBLISHER'S DESK

1984. That portentous year draws to a close. Having survived 12 rather mundane months, it's unlikely that we will fall under the spell of Orwell's desperate visions in the future. Our industry, however, is in the midst of a battle between the light and the dark worthy of such myth-laden battlefields as Oceania, Kurukshetra, or the OK corral.

The guys with the white hats: AT&T, DEC, HP, DG, the Bunch (in yet another incarnation), and hosts of Silicon Valley upstarts. In varying degrees they endorse the standards movement. They base their products on a nonproprietary software environment, the Unix system. They are also casting about in numerous directions to find universal solutions to the common problems of networks, file structure, and so forth.

The guys with the black hats: IBM, Apple, and their followers. Even at this late date they hope to promulgate proprietary and noncompatible operating systems, networks, and protocols like VM, SNA, AppleNet, and so on. Because these idiosyncratic products are available only from a single vendor, the user who purchases these solutions is at the vendor's mercy for software and hardware selection, pricing policies, support, and upgrade paths.

I don't mean to mislead anyone. Neither camp is noticeably philanthropic; both sides have adopted positions that they hope will make scads of money. It just so happens that the guys holding up the Unix system banner have found the only chink in Big Blue's armor: Users are hopping mad about "planned obsolescence" that requires junking hundreds of thousands of dollars of hardware, software, and human training every time their favorite manufacturer announces a new, improved line of computers. Remember the System 38 debacle and the RPG massacres?

AT&T et al. have discovered in the Unix system the great equalizer. By offering a relatively hardware-independent software environment, the good guys are loosening the shackles of forced loyalty. These newcomers hope to open doors once-closed because no user dared to switch vendors. Many analysts fear, however, that these do-gooders risk plunging the industry into a no-holds barred bloodbath as hardware becomes a commodity, sold solely based on price/performance and brand-name recognition. (Ironically, some startup companies who first supported the Unix system may be the first to shake out in the emerging fierce competition.)

Users can only gain. As hardware dependence recedes as a purchase issue, substantive concerns will re-emerge: support, supplier reliability and stability, and, yes, price/performance. No matter what happens to the survival rate of our industry, it seems highly unlikely that users will ever knowingly walk back into the dungeons of vendor-dependence. The guys in the black hats had better take heed.

The year is over. The lines are drawn. The battle has just begun.

John M. Knapp
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EDITOR'S CONSOLE

Gone forever are the days when understanding communications meant knowing how to use a telephone.

Today, the word "communications" has become a generic label for a broad spectrum of often distinct technologies, from telephones to local-area networks, mobile radios, data communications, satellites, and beyond.

In my mind, however, the simplicity of the word does not adequately define the array of products and services currently available, nor does it represent the depth or complexities of today's communications technologies.

Moreover, the once seemingly insurmountable barriers between the communications and data processing industries came crashing down this past January 1, leaving AT&T and IBM as new-found rivals eagerly looking to take a bite out of each other's markets.

In an attempt to shed some light on this confusing jumble, our lead article this month, "Watson Come Here; I Need You," offers a clear and concise history and explanation of the state of most of today's major communications technologies. It also examines how AT&T will combine its communications expertise with its vaunted Unix system in its bid to become a kingpin of the emerging information age.

The battle is not over yet. In fact, with IBM's recent introduction of the PC/AT, which will offer a Xenix operating system option sometime in the first quarter of next year, Big Blue has begun to make a serious move into AT&T's home court advantage. Omri Serlin, our *Inside Edge* columnist, offers the first of a two-part, in-depth look at who won and who lost with the debut of the PC/AT. The series will conclude next month.

No magazine devoted to the Unix system marketplace could rightly say it had fairly addressed the topic of communications without an article on Usenet, a semi-underground network that links Unix system users worldwide. Eric Fair of Dual Microsystems takes a look at this phenomenon, as well as `uucp`, the Unix system to Unix system communications program.

Elsewhere in this issue, author Steve Auditore recounts a "Tale of Software Woods," a satirical and informative look at why so many of the once high and mighty microcomputer software companies have been falling by the wayside this past summer. Then Dave Small, president of Scientific Placement, takes a look at "Unix Types." We all know that people involved in the Unix system market are unusual, but can you tell which of the four types you are?

Also this month Bruce Mackinlay takes a look at UX-BASIC, a BASIC programming language for Unix systems that AT&T has recently licensed for re-marketing here in the U.S. What's that you say? BASIC for the Unix systems environment! Sounds like heresy, you say. Maybe, and maybe not. Read on.

We pick up again with our accounting series reviews; this month William J. Donnelly takes a look at Computer Cognition's Acuity Series.

Have you ever wondered what the most popular Unix system-based hardware and software products are? Or did you ever need to know exactly how many Unix systems were shipped each month? Well, look no further. The inimitable Jean Yates, president of Yates Ventures, and colleague Peter Marvit present this month the first ever Yates Ventures' Market Index. They take a look at what products buyers are purchasing and in what quantities.

Once again, our Editor Emeritus, Dr. Rebecca Thomas, has requested that any interested parties submit useful software tool programs. Accepted submissions will be used as part of her *C Tutorial* series in upcoming issues. Guidelines for submissions are available in Vol. 1, No. 4. Submissions to Dr. Thomas may be mailed to our main editorial office. □

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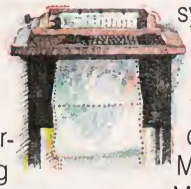

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YATES VENTURES' MARKET INDEX

The end of 1984 heralds steady but unspectacular growth for Unix systems. Tandy, DEC, Altos, and Fortune dominated 1984 as they dominated 1983. NCR and Sun are rising stars, while many small vendors slipped off our forecasts altogether as they discontinued products or ceased business.

AT&T and IBM are the rising stars of this forecast. Although IBM views the Unix system as a secondary offering at best, PC/IX *is* selling, and Xenix for the PC/AT should take off well in 1985. After a slow start, the 3B2 is gaining popularity with system integrators and VARs. Convergent Technologies' OEMs should start shipping in larger quantity in 1985, perhaps making our top 10 list by mid-year.

HARDWARE: TOP 10 INSTALLATIONS

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Sun Workstation (all models)	4,000
DEC VAX (all models)	4,000
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Onyx C8002	3,000

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Ultracalc	Olympus Software
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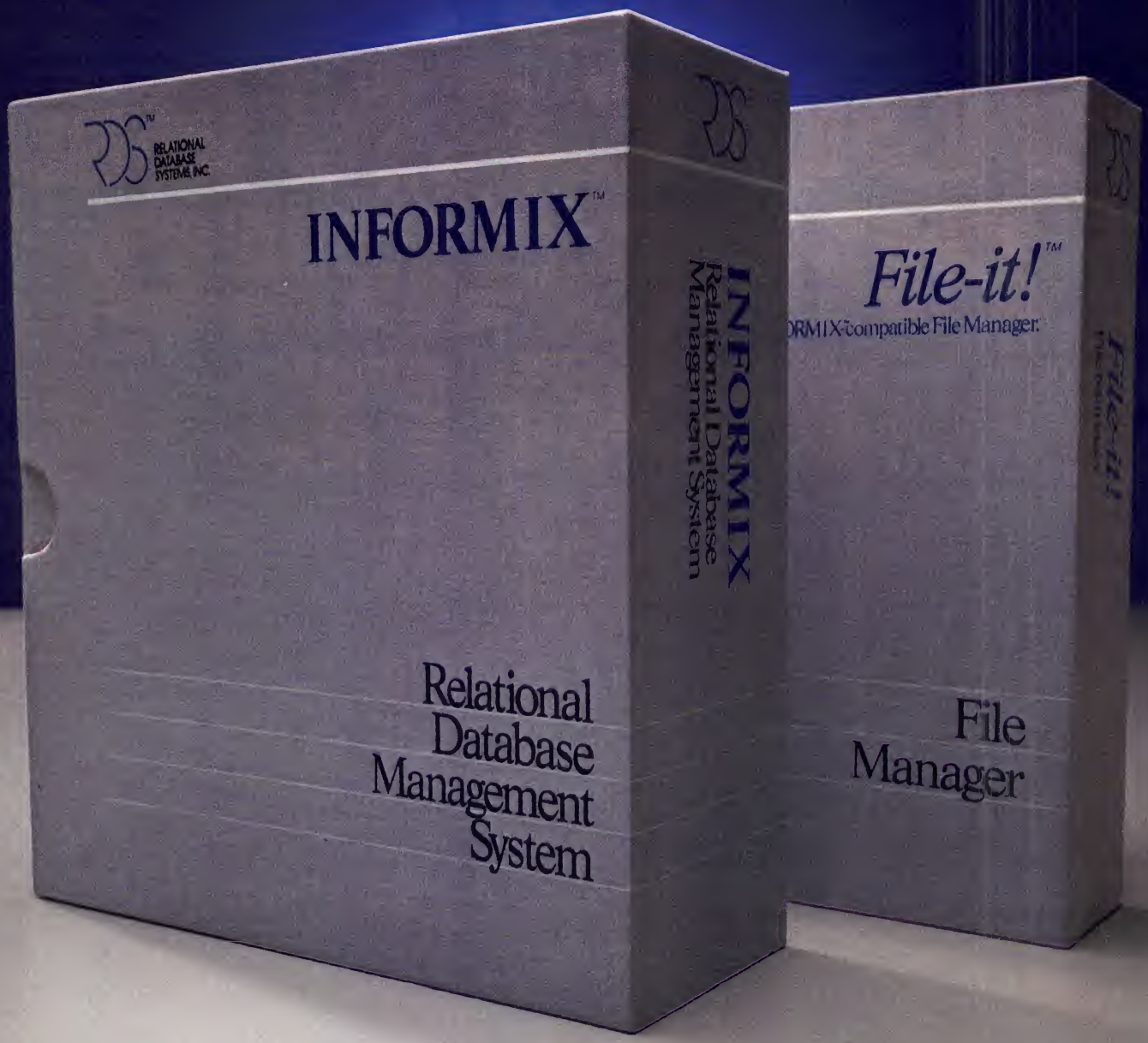

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- Cromemco System 1
- DEC 11/23, 11/34, 11/44, 11/60, 11/70, VAX 11/730, 11/750, 11/780
- Dual Systems System 83
- Fortune 32:16
- Forward Technology 320
- General Automation Zebra (all models)
- Hewlett Packard 150, 9000 Series 200, 9000 Series 500
- IBM PC, PC-AT, PC-XT
- Intel System 86/380, 286/310
- Masscomp NC 500
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- Onyx C8002, C8002A
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- Perkin-Elmer 32 Series, 7350
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THE BATTLE THAT MAY NEVER HAPPEN

BY PHILIP J. GILL

There has been a lot of posing in the press (perhaps even too much) that bills a coming confrontation between giants IBM and AT&T in the Unix system marketplace based on the two companies' currently wholehearted support of Unix Systems III and V, respectively. In fact, this posturing has even gone so far that some have proclaimed Unix System III as "IBM's System III."

It is quite understandable that these proclamations have been made in the press when one looks at the surface evidence presented by IBM thus far. *All* of IBM's current Unix system ports are indeed based on System III. That includes both PC/IX for the IBM PC/XT and VM/IX for 370-type mainframes, as well as the various Microsoft Xenix versions for the IBM Instruments Inc. CS9000 and the new PC/AT.

First of all, these statements declaring System III as IBM's ignore the obvious historical fact that *all* Unix system versions have their roots at AT&T Bell Laboratories. To the new Unix system users, many of whom are not steeped in the history of the system, "IBM's System III" is misleading.

More important, however, is that executives at Interactive Systems Corp. (ISC), which has so far performed two major Unix system ports for IBM (PC/IX and VM/IX), have assured us that they have recently begun work on a System V port as well.

Why then, you might ask, are both PC/IX and VM/IX System III derivatives? The answer is quite simple, according to our friends at ISC, which is based in Santa Monica, Calif. System III was all that was available when the firm won the contract work from IBM two years ago. Will there then be System V-based ports for the IBM products? Our friends are elusive on this point, but indications point toward the affirmative.

Let's also remember that Bill Gates, Microsoft's chairman, has publicly proclaimed his intentions to move Xenix from its current status as an enhanced System III to an enhanced System V as well. So much for "IBM's System III."

When and if System V-based ports appear in the IBM product line, as appears to be the trend, then the obvious result for AT&T is that it will have succeeded in establishing System V as *the* Unix system industry standard.

LOST IN THE SHUFFLE

One important aspect of IBM's recent PC/AT introduction that was largely overlooked in the excitement of the moment is that PC/IX is available immediately for the new machine, while Microsoft's Xenix won't be available until sometime in the first quarter of next year.

Moreover, a recent discussion with IBM's "Dancing" Bob Blake, PC/IX product manager, indicates that Xenix may not be the only multiuser Unix system-based operating system available for IBM PC/AT in the coming months. For now, Blake says, PC/IX is single-user. That may change, however, if Blake's unspoken yearnings come true.

When asked how IBM would avoid conflict between PC/IX and Xenix, Blake smiled slyly and said: "By very careful positioning of the two products."

UNIX SYSTEM TRADE SHOWS—BOOM OR BUST

The Unix Systems Expo '84, held September in Los Angeles, was a major disappointment for most. Although it was billed as an end-user show, end-users were in scarce supply. So too were attendees of any kind, although many vendors who primarily cultivate the OEM and VAR distribution channels were generally pleased. That's the good news.

The bad news is that it appears that the Unix system marketplace is still in the "selling it back and forth to each other" mode. The expected boom in direct-to-end-user-sales is still fleeting. However, complaints that the long-awaited boom in Unix system sales is still to come are grossly off the mark. An estimated installed base of over 100,000 Unix systems is nothing to sneeze at. Remember, some products that have installed bases of 20,000 to 30,000 systems are considered successful at this point.

Nevertheless, Computer Faire Inc. plans to hold both a spring and fall version of the Unix Systems Expo (USE) next year. The spring show is slated for San Francisco's Moscone Center, site of this summer's Democratic National Convention. Just a stone's throw up the highway from California's Silicon Valley, the spring USE '85 show will have a natural, built-in audience of several tens of thousands of computer marketeers and systems developers within an hour's ride, if nothing else. The fall show, to be held in Boston, has the same potential.

LATE NEWS....

Karan Kaupilla-Eriksson, president of Unix system software house Handle Corp., has resigned from the Tahoe City, Calif.,-based firm. Handle has a major contract with AT&T to supply its Handle Office Automation software for the 3B2 line of computers. Kaupilla-Eriksson's new company, The Eriksson Group (also of Tahoe City), will specialize in offering high-tech marketing expertise and capital acquisition for software companies.

HEARD WANDERING ABOUT THE HALLS....

A number of enhancements are planned by Sydis Inc. of San Jose, Calif., for its Unix system-based integrated voice and data office automation system. These enhancements include a field-upgradable Motorola Inc. M68020 processor option and simultaneous captive keystroke and voice playback capabilities....A major shake-up may be in the works at Convergent Technologies' Data Systems Division. Divisional Vice-President of Marketing Steven Gary Blank has been reassigned to a corporate strategic planning post. Jim Perry is temporarily filling in.

It looks like a unanimous vote of approval for the Unix system is coming from the "Bunch," otherwise known as Burroughs, Univac (now Sperry), NCR, Control Data Corp., and Honeywell. Burroughs is planning a mainframe Unix system product. Other details are not available, but an announcement appears imminent. Indications are that Honeywell is thinking the same way, and in an earlier *On-Line* we reported that Sperry is also working on a Unix System V port for a chip-level implementation of its 1100-family mainframes. □

m a i l

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.

A TEACHING TOOL

Dear Editor:

Thank you for sending me the first issue of UNIX/WORLD. I found "An Introduction to `termcap`" and "Putting Supermicros in Perspective" especially informative and useful.

My organization, the Systems Marketing Center, provides technical support to our field sales people on a national level. My product area is our 3B2 and 3B5 computers, with related hardware and software. I think UNIX/WORLD will be a valuable tool for our people, to teach them about the Unix marketplace. Therefore, I have recommended the magazine to our sales forces. I wish you success with the new magazine.

Paul M. Craig
Staff Manager
NSMC—Denver

LIKES LYCKLAMA

Dear Editor:

I was interested to read Heinz Lycklama's article "The /usr/group Standards Explained" in Vol. 1, No. 3, of UNIX/WORLD. However, I noticed one omission: Jeff Schriebman, the president of UniSoft Systems, is a member of the /usr/group standards committee, and his name was not on the list.

We would appreciate that an errata statement be printed to that effect in the next issue of UNIX/WORLD. Thank you!

Sincerely,

Carolyn S. Carr
Marketing Communications
UniSoft Systems

Thanks for the correction. We apologize for the oversight.

BUG REPORT BUGS

Dear Editor:

Last spring you ran an article about Mt. Xinu distributing 4.2BSD bug reports and fixes. Purchase orders were, however, returned by them because of some undescribed legal hassle. I think a brief note on what the problem is and when it might be resolved would be appreciated by your readers.

Yours truly,

Stewart A. Levin
Dept. of Geophysics
Stanford University

Mt. Xinu vice-president Ed Gould told me that the snag occurred when a competitor raised a legal objection. He said, however, that Mt. Xinu has since signed a contract with UC Berkeley and will begin delivering the 4.2BSD bug reports and fixes almost immediately. He added that the firm would be contacting those interested parties whose purchase orders were returned.—Philip J. Gill, Executive Editor

A PARTICULAR PREJUDICE

Dear Editor:

I have thoroughly enjoyed the first four UNIX/WORLD issues as they have been characterized by having informed, skilled authors and a minimum of rah-rah B.S. for the Unix system. It is especially gratifying to see [that you recognize] the fact that there simply *is* no standard Unix sys-

Continued on page 20

Correction: In Issue 5, the Table of Contents, on page 3, incorrectly identified two contributors as the authors of each other's articles. "Iconic Design and Corporate Identity" was written by Aaron Marcus, not William Elmore. William Elmore was the author of "Unix and GKS in a New Age." We regret the oversight.

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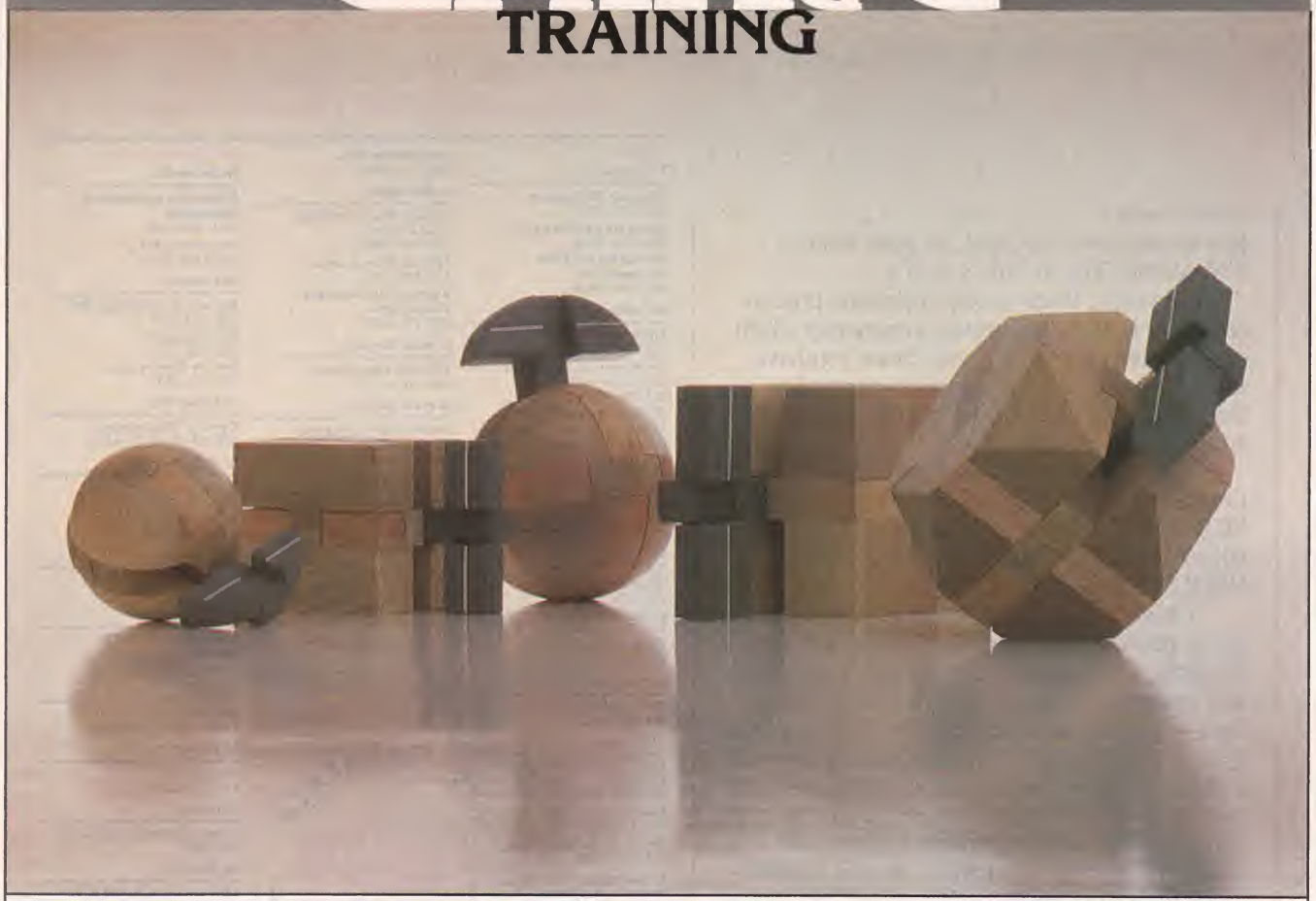

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Continued from page 18

tem in existence reported, as your *Editor's Console* did (Vol. 1, No. 3, p. 7).

However, there is one ubiquitous practice prevalent in the Unix system community which simply drives me up the wall. Since you have transgressed against my particular prejudice in that same *Editor's Console,* permit me to vent a small amount of spleen here:

The Unix system community has an obligatory headline: "THE UNIX SYSTEM PICKS UP MOMENTUM IN THE MARKETPLACE AS BEWEIDER INDUSTRIES ANNOUNCES UNIX SYSTEM XXXIX!"

I have always thought that a marketplace was a place where things are bought and sold. Similarly, I have always thought that if something was gathering momentum in the marketplace, then it was selling increasingly well. In the Unix system community, the marketplace is evidently a place where product announcements are made and the amount of momentum gathered is proportional to the number of product exchange for coin of the realm (how about those 90-odd M68000-based Unix systems?), but *boy, has Unix picked up momentum from those announcements!*

You, for example, write that "AT&T's year-old System V is picking up momentum in the marketplace . . . ." What does that mean? Do you have actual sales figures to back that assertion, or are you counting press releases?

Isn't the Unix system's biggest problem the fact that it has too many press releases and too few actual sales?

Sincerely,

Hal W. Hardenbergh
President, Digital Acoustics Inc.
Santa Ana, Calif.

My comment was made in the course of a discussion on what will emerge as the industry standard for Unix systems. In that context, the increasing number of hardware and software vendors supporting a product (in this case, AT&T's System V) does indeed constitute "picking up of momentum in the marketplace . ."—Philip J. Gill, Executive Editor

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THE IBM PC/AT: WINNERS AND LOSERS, PART I

BY OMRI SERLIN

It is with a tinge of sadness and a strong sense of *déjà vu* that one watches AT&T cockily proceeding along a path that leads straight to the edge of an abyss. Below, the bones of those who have made the trip before are still plainly visible: RCA, General Electric, Xerox (the latter even managed the fall twice—first with SDS, then with the 820 PC). All had massive resources, and all had thought they could pose a meaningful challenge to IBM on its home turf. All were expensively wrong.

The sad thing about AT&T is that it didn't have to follow the same script. It had an ace up its sleeve that no one before it had possessed: the Unix system. Despite its shortcomings and limitations, this operating system could have—if properly played—forced IBM to become a follower rather than a leader. Alas, AT&T felt the Unix system card wasn't strong enough by itself, and it decided to become a computer supplier as well.

That dual-thrust strategy might have worked, if AT&T's computers were clearly superior to anything else on the market. Worse still, if the Unix system must be established as a standard first, then AT&T badly needs the support of existing hardware suppliers, most notably and preferably IBM.

Thus, it should come as no surprise that IBM decided to throw its support behind Microsoft's Xenix in conjunction with IBM's recently unveiled PC/AT. Xenix is based on System III, a version of the Unix system not fully compatible with System V (the one AT&T has been promoting as a standard).

Microsoft has put much value added into Xenix, making it more palatable in the commercial micro environment. Also, Microsoft has done much to achieve external compatibility between Xenix and its immensely popular single-user system, MS-DOS, which is the basis of IBM's PC-DOS. Assuming the PC/AT is as successful as it promises to be, the outcome may well be to establish Xenix, rather than System V, as *the* Unix system standard. This is a claim Microsoft is already making, with a good deal of justification.

In sum, I believe that AT&T's decision to jump into the computer hardware business before its Unix system became accepted as a standard will eventually be recognized as one of the most serious strategic errors in American business history.

IBM'S PC/AT, MULTITASKING PC-DOS, AND XENIX

What follows is a summary: In mid-August, IBM unveiled a 286-based, upward-compatible PC with both multitasking and multiuser software to come, and a Sytek-based broadband local net. This was good news for IBM, IBM dealers, Microsoft, and Sytek, and was bad news for AT&T, Digital Research, Motorola, National, Convergent Technologies, and a host of others.

At a "dealer-only" gathering in Dallas, which was timed to fall on the August 14 anniversary of the original IBM PC's announcement three years ago, IBM let loose another broadside volley that is likely to sink the "PC-compatible" boat and seriously rock a host of "multiuser" Unix system-based rafts.

Specifically announced were the following key products, among others:

(1) The IBM PC/AT—about two to three times as powerful as the original 8088-based PC and featuring 1.2-Mbyte floppies, a 20-Mbyte Winchester, and up to 3 Mbytes of memory. The PC/AT (Advanced Technology) is available immediately at $3,995 (256-Kbyte, 1 floppy) or $5,795 (512-Kbyte, 20-Mbyte hard disk). The monitor is extra for both.

(2) IBM PC-DOS 3.0—a multitasking version of the popular operating system from Microsoft. Promised for the first quarter of 1985 is PC-DOS 3.1, an enhanced version with native support for local networking.

(3) The IBM PC Network—a low-cost ($695/interface card), user-installable local-area networking scheme based on broadband hardware and a CSMA/CD protocol from Sytek (a small Mountain View, Calif., local-area network supplier). October availability was planned for the 2-Mbit/sec. hardware; software support is promised for the first quarter of 1985.

(4) Xenix—the enhanced Unix System III from Microsoft that will support up to two additional terminal users hooked to a PC/AT (minimum 512 Kbytes), scheduled for availability in the first quarter of 1985.

IBM also announced additional

PC software, most notably the TopView windowing package and the keyword-in-context filing system, OCRS.

THE WINNERS

IBM—It has another "winner" product on its hands.

IBM/ESD (Entry Systems Division)—It is stronger than ever and is throwing its weight around.

Microsoft—Despite product delays, it is still deeply "in bed with" IBM.

Intel—Despite the promise of more advanced chips from others, IBM likes the Intel offering because of its upward compatibility from the 8088.

Sytek—A virtual unknown, it is now destined for prominence.

Unix System III—It is the basis of all the key IBM Unix offerings; that is, Xenix (PC/AT and 9000), PC/IX (PC), and VM/IX (mainframes).

PC/AT peripheral suppliers—This includes Computer Memories (20-Mbyte Winchesters), YE Data (1.2-Mbyte floppies), and Western Digital (disk controller boards).

Local networking—This is evidently (and logically) IBM's preference over the multiuser system approach in the PC arena.

Retail dealers—IBM/ESD underlined its commitment to this channel with a bash worthy of, and evidently patterned after, the recent Apple product introductions.

THE LOSERS

AT&T—The communications giant suffered grievous blows against the Olivetti PC, Unix System V, and the 3B2.

Digital Research Inc. (DRI)—It is out in the cold again. Any hopes it had of latching onto an IBM product with any DRI software have been dashed.

Motorola and National—They lost their last chance to have their advanced MPUs designed into a mass-produced system.

Apple—It is probably hearing the death knell for the Lisa.

PC Compatibles (Compaq et al.)—They have been leapfrogged effectively; most, if not all, will be out of the game by year end.

Other PC suppliers—This includes TI, DG, DEC, HP, Wang, et al., whose PC offerings are even less viable than before.

Multiuser Unix system-based box suppliers—Those offering one to four user boxes (Altos, Fortune, Tandy, et al.) must look for ways to move up into the 8-to-16-user-and-above niche.

SCI Systems, the current supplier of boards for the PC—Its recent introduction of its own, 186-based multiuser system was evidently in anticipation of the eventual loss of IBM's business.

Suppliers of add-in boards for the PC—These won't play in the AT.

IBM/CPD—It got egg all over its face in its forlorn effort to establish the token ring LAN as an IBM standard. Other IBM divisions aren't paying any attention.

IBM Instruments—It would do well to abandon its ill-fated, M68000-based 9000 system and jump on the AT bandwagon.

Editor's note: Next month, Omri Serlin continues his analysis of the IBM PC/AT with an in-depth look at its namesake, "advanced technology."

SHORT NOTES

Altos Computer Systems (San Jose, Calif.) earned $9.75 million ($0.65/share) on revenues of $102.7 million in the year ended June 30. Revenues improved 38 percent, while earnings were up 23 percent relative to last fiscal year. In the last quarter, net income was $3.7 million (up 57 percent).

AT&T plans to lay off about 11,000 people before year end, primarily in AT&T-IS Services Division. In March, AT&T gave all employees of that division an early retirement option, but too few people took advantage of the offer. The latest move, the largest workforce reduction in a two-year pattern of layoffs and plant closings, is part of the painful adjustment AT&T is making from a cost-plus regulated utility to a participant in the fast-moving, highly competitive markets for data processing and unregulated communications equipment and services.

Meanwhile, AT&T-IS marketing chief Bob Casale has been shuffled to a strategic planning post, most likely because of dissatisfaction with the group's sales record so far. Richard Holbrook takes over field sales.

Celerity Computing (San Diego, Calif.) is preparing to introduce shortly a 32-bit, Unix system-based, 2-MIPS, networkable, color graphics workstation for engineering design applications. Celerity has $4.4 million in venture capital (as of September 1983), obtained from such sources as Hambrecht & Quist, John Hancock, and Venture Capital Fund.

EnMasse (Acton, Mass.) named Ted White vice-president of sales. White was previously with Interactive Systems, a leading Unix system VAR. EnMasse is readying a Unix system-based multiprocessor system for a first-quarter 1985 unveiling.

Filenet Corp., née Filex, (Costa Mesa, Calif.) has introduced an optical-disk-based document storage and distribution system. The M68000-based disk handling box has a 64-platter capacity—each with 1 gigabyte—and is priced at $80,000. The company raised $12.7 million in a second financing round (in September 1983) from Hambrecht & Quist, Olivetti, General Electric, IBM pension fund, and five other venture

capital firms. The total investment is about $17 million.

Fortune Systems (Redwood City, Calif.), which has been slowly stemming its quarterly losses and which is still sitting on a big pile of cash from its public offering, is looking at acquisitions as a way to strengthen its posture. Two known candidates: (1) North Star Computer, a microcomputer pioneer whose latest product is a multiuser system offering IBM PC compatibility at each terminal; and (2) Wollongong Group, a software supplier whose key product is Eunice, a merged VAX/VMS and Unix environment.

North Star and Wollongong are privately held, and both have had losses in their latest fiscal year. Wollongong trimmed its staff substantially in June. Fortune supplies M68000-based, Unix Version 7-running desktop systems that can nominally support up to eight users.

Meanwhile, Fortune is being sued by ComputerLand; the franchise chain alleges Fortune misrepresented the capabilities of its 32:16 multiuser desktop system. A Fortune spokesman dismissed the suit as "grandstanding."

Hewlett-Packard (Palo Alto, Calif.) was scheduled in September to introduce the lowest-price member of the 3000 supermini family. The HP 3000 Series 37 is said to be able to support up to 28 users and 2,400 Mbytes of disk storage and to require no special power or air conditioning. A minimum office cabinet configuration with 512 Kbytes (expandable to 2 Mbytes), a new 55-Mbyte disk, cartridge tape, console, operating system, and the Image DBMS is listed at $19,950. HP says more than 15,000 HP 3000s have been installed worldwide so far. □

4.2BSD

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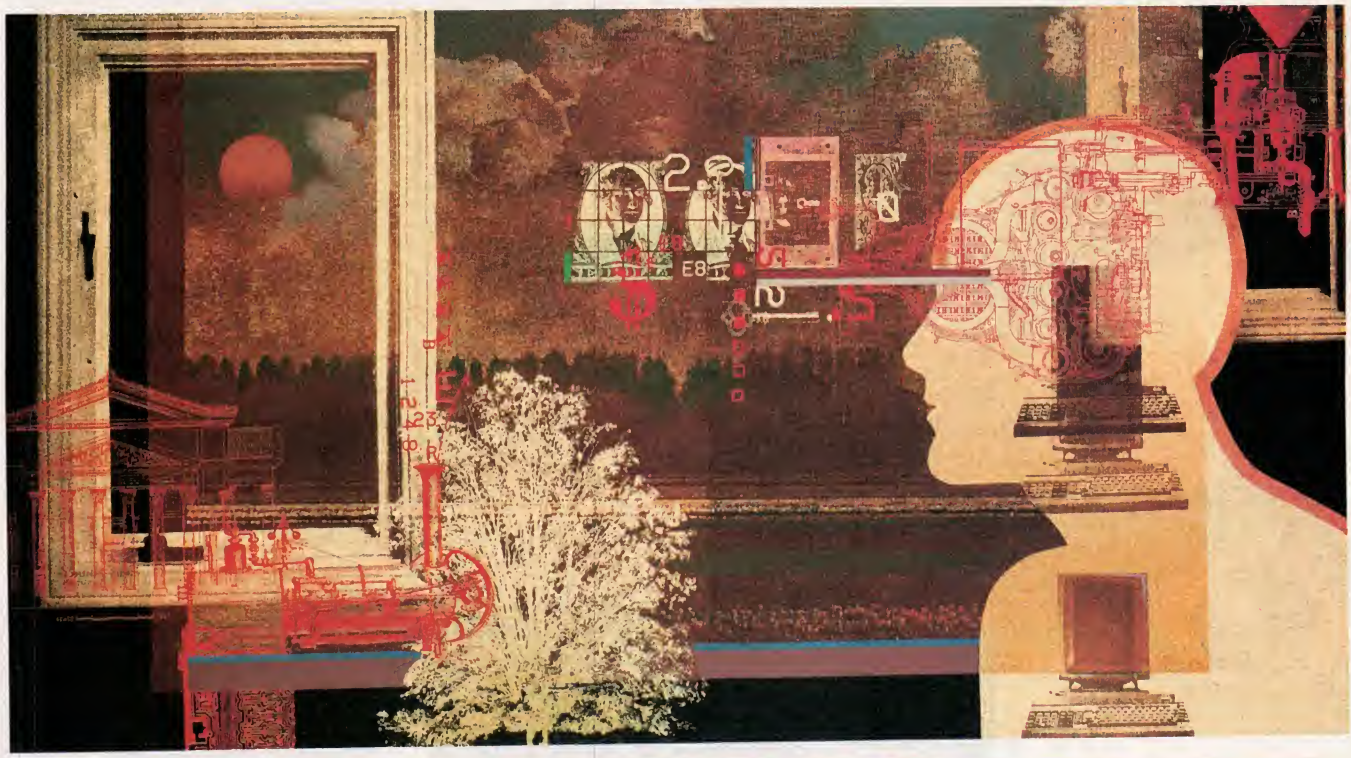

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"Mr. Watson, come here; I want you."

BY ANTHONY ADVERSE

Following history's most fortuitous elbow jostle, these words launched a new world in 1876. Since the day Alexander Graham Bell burned acid holes in his fine Victorian suit, three industries have arisen from that tinny flow of analog electrons: telecommunications, data processing, and space travel. And for over a hundred years, the three have been as tightly bound as twisted-wire cable.

A shorter version of this article appeared in *Interact* magazine, May/June 1983.

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GOULD
Electronics

The theory of switched networks, which governs both local-area and telecommunications networks, was first practiced in the 1930s. The first applications ensured that Bell Telephone customers received only their own telephone messages and not their neighbors', without memorizing annoying ring patterns. (Message switching also prevented village gossips from listening in on salacious neighborhood tidbits—proving that data integrity has concerned more than one generation of communications specialists.)

The clacking of closing telephone relays greeted the infant data processing industry. It was Claude Shannons' work at MIT on electronic relays similar to AT&T's switching relays that inspired the first digital computers: Alan Turing's COLOSSUS and the later ENIAC. Within a few decades, combining teleprocessing and telecommunications made national space programs possible.

In turn, the insatiable hunger of the infant space agency for remote processing in alien environments brought forth the microchip that revolutionized earthbound data processing. When the first national geosynchronous satellite was launched by Telesat Canada in 1972, the circuit of the three industries was finally closed. Telecommunications that had birthed data processing was now served by space technology.

Communications is the oldest and largest electronics industry of them all: Annual sales and services are pushing $200 billion worldwide. Over 85 percent of telecommunications remains analog voice, but computer-generated digital transmission has grown to almost 15 percent since the mid-1950s. (Interestingly, although we tend to think of the communications industry as analog in its origins, the first wires to cross the globe carried Morse code —whose immortal dot, dash, or silence was a ternary digital code.)

Initially AT&T controlled the phone lines exclusively. All lines and all connect equipment were leased, never sold, to customers. The only alternative was stringing costly private cable. The high cost of either choice ensured that computer networks and time-sharing were largely restricted to very large corporations and national defense organizations.

A NEW INDUSTRY

In the 1960s the world was in the thrall of a vast political and social upswelling whose greater waves had largely become calmer by the early 1970s. However, a 1968 Federal Communications Commission (FCC) ruling in favor of an obscure electronics corporation unleashed a flood of social change that has yet to ebb. Prior to 1968, AT&T's charter made it illegal for anyone to modify or connect devices to telephone company lines. But by allowing the Carter Electronics Corp. to connect its mobile radio system to the Bell System, the FCC ruling induced the birth of a new industry:

> A customer desiring to use an interconnecting device . . . should be able to do so, so long as the interconnecting does not adversely affect the telephone company's operations or the telephone system's utility for others. . . . The appropriate remedy is to . . . permit the carriers if they so desire to propose new tariffs which will protect the telephone system against harmful devices and they may specify technical standards if they wish.

The "Carterphone Ruling" permitted unfettered, even if tariffed, electrons to pass freely through non-Bell devices such as pastel decorator phones, radiophones, and modems. The only restriction—that the signal interface with a Bell Data Access Arrangement (DAA)—was dropped in 1976. In short order the unitary world of AT&T was shattered into four: the common carriers (AT&T and its affiliates), the independent specialized common carriers, the satellite common carriers, and the value-added common carriers.

Imagine a perfectly functioning telephone system connecting a Swede and an Australian aborigine, and you understand the level of standardization yet to be accomplished.

Beginning in 1969 *specialized common carriers,* such as MCI and the now defunct DATRAN, built microwave systems. By beaming information between antenna dishes in major U.S. cities, these specialized carriers were not as costly as AT&T Long Lines and were more flexible in bandwidth.

The only bottleneck was local distribution. It was almost impossible to compete with the telephone companies in local signal distribution. After sending information through the air at the speed of light, most specialized carriers were forced to sign interconnect agreements with AT&T subsidiaries that passed the signal through earthbound copper-wire networks. The giant bandwidths open to microwave transmission were restricted by the low 2400-baud rates available to local telephone lines.

TCP/IP: AROUND THE HORN AND BACK

Transmission Control Protocol/Internet Protocol (TCP/IP) and associated application-level protocols such as the File Transfer Protocol (FTP) arose from the development over 10 years ago of ARPANET, the first large-scale packet-switched network. Besides being the most established, familiar, and debugged high-level protocol architecture available for peer-to-peer packet-switched networks, ARPANET protocols are the most fully defined. They have detailed specifications for complete communications, including a family of applications that are structurally independent of the type of host operating system—an important consideration for cross-machine compatibility.

Excelan's EXOS 8010 TCP/IP Protocol Package includes the TCP/IP Protocol Module, which runs on the EXOS 100 or 200 Series Ethernet front-end processors, and the Host Utilities and Integration Kit (application protocols and drivers), which runs on any Unix system host.

EXOS 8010 network utilities such as FTP use TCP as their communications path. TCP is a connection-oriented protocol, and therefore a client process such as FTP must first set up a virtual circuit with its counterpart process on another system before communication can be accomplished. TCP supports numerous such connections between different systems.

In order to multiplex connections, each process uses a unique address, or port ID, in addition to its network host address. Typically, one process, here an FTP daemon, requests TCP to accept a connection on a well-known port ID. The FTP utility completes the connection by supplying TCP with the network host address and port ID of the FTP daemon. In all subsequent communication, the FTP processes can send data to each other simply by supplying TCP with the data and this short ID.

TCP exchanges data with client processes according to a stream model—that is, it delivers data in the same order that it is sent and does not impose record boundaries. This model corresponds closely to the Unix system's FIFO-type file, or pipe. A sending process passes data to TCP in arbitrarily sized fragments. TCP decides how to block and transmit these data fragments from the host system's memory into on-board buffers, and at this point it becomes responsible for delivery. TCP then ages the data, and if the client process presents no more data, it proceeds to transmit it.

TCP translates between the stream model of communications and the datagram services that most lower-level networks provide. It cannot, however, actually package and send data from its client-side buffers until the other side of the connection has advertised that it has sufficient buffer space to receive it.

When a reasonable amount of receive buffering is available, TCP wraps a packet header around the data and passes the packet to the Internet Protocol (IP), along with an Internet destination address. The header includes sources and destination port IDs, data sequence information, and a checksum to ensure data integrity.

IP is a datagram protocol similar to Ethernet in that it does not guarantee delivery of packets at their destination. One principal service that IP adds to basic packet delivery is support for interconnected networks. It also allows for fragmentation and re-assembly of packets over links that support packet lengths shorter than those that a TCP connection uses.

Upon receiving a packet from TCP, IP prepares a header that contains source and destination Internet addresses, packet length, and an additional checksum. If necessary, it also adds fragment information and routing directions.

In the EXOS 8010 implementation, IP uses Ethernet as its link layer protocol. In most cases, fragmentation and multihop routing are not required. IP simply maps the Internet destination address to the appropriate Ethernet address, adds an Ethernet packet header, and transmits the packet on Ethernet. IP assumes that receive buffer space is available and does not perform acknowledgment.

Data reception using EXOS 8010 is a straightforward reversal of the process described above. Each succeeding protocol layer interprets its header, checks data integrity, and passes packet contents to the next, higher protocol. When TCP receives a packet from IP, it stores the data contents in a buffer corresponding to the process identified by the packet's port ID. If this process has made buffer space available in the host system's memory, then the data is moved off the board and delivered to the client process. Otherwise, it remains on the board until the client process makes sufficient buffer space available.

—Dale W. Way

Dale W. Way holds a B.S.E.E. from Michigan State University and has authored several articles on the evolution of distributed computing and LAN technology. He is currently vice-president of marketing at Excelan Inc., San Jose, Calif.

A subspecies of the specialized common carrier is the *satellite common carrier.* In 1962, TELSTAR, the first international communications satellite, presaged a new age. Although TELSTAR was designed by AT&T, U.S. regulations prevented the helpless giant from using space technology for domestic communications.

Canada changed all that in 1972 by launching ANIK—a domestic telecommunications satellite designed to unite Canada's sparsely populated outer reaches. America quickly took advantage of its neighbor's largesse. Antenna dishes sprang up like steel flowers in the wintry hills of nor-

KEEPING IN SYNC

Communication terminology is confusing—even to the point of hindering communication. In general, the buzzwords are divided amongst baud/bit rates, transmission types, communication modes, and synchronicity operations.

WHAT IS A BAUD?

The baud rate, named after the 19th century French inventor J.M.E. Baudot, measures the number of signal changes in a carrier wave per second. A bit is a unit of information. A 2400-baud line, the maximum that any telephone line can deliver, is not necessarily confined to 2400 bits/second. Using a variety of transmission types (see below), a modem can encode several bits into each signal change. Di-bit or tetra-bit encoding yields 4800 bits/second or 9600 bits/second on a 2400-baud line.

ASYNCHRONOUS VERSUS SYNCHRONOUS

Asynchronous operation sends characters at random intervals on a dedicated line. Each separate character is synchronized by its own start-stop bits. This allows the gap between characters and words to be indefinite without confusing the receiving device. The high duplication of overhead start-stop bit slows transmission considerably but allows intermittent traffic. This method is best for slow traffic, as from human operators.

Synchronous operation requires blocks of data to be preceded by at least two SYN (synchronizing) characters. Synchronous operation does not allow for pauses between characters within a block, but it is very quick. It is usually used between buffered machine memories.

Bisynchronous, or binary synchronous, protocol is built upon synchronous operation in that data is sent in synchronized blocks. The protocol requires the receiving device to send an acknowledgment to the sender before the sender will transmit the next message. If the block is not acknowledged, it is retransmitted until an acknowledgment is received. Although somewhat slower than standard synchronous communication, this protocol is essential when you must guarantee data integrity.

TRANSMISSION TYPES ON ANALOG COMMON CARRIERS

Modem is a portmanteau of *mo*dulator/*dem*odulator. The device is used to convert digital signals to analog and back again. This allows a digital computer to converse across analog telephone lines.

Amplitude Modulation (AM) increases and decreases the strength or "loudness" of a signal to emulate either a *1* or a *0.*

Frequency Shift Keying (FSK) varies the frequency or "pitch" of the signal to create a "high" *1* or "low" *0.*

Phase Shift Keying and *Dibit Phase Shift Keying* (PSK and DPSK) shift the phase of the signal waveform. A shift of phase indicates a change either from a *1* to a *0* or from a *0* to a *1.* (The network communicator only tracks changes from the initial bit.) No change within a set number of milliseconds indicates a repeat of the last bit. Because no phase change is required to duplicate a continuing bit, this is currently the most efficient and fastest form of modulation.

Multiple Modulation, combining two or more modulation methods, can encode up to four bits into a single signal.

COMMUNICATION MODES

Simplex transmission allows movement in one direction only. As with your car radio, your shouted comments will not be received at the other end.

Half Duplex allows transmission in both directions, but only one way at a time. This is similar to a CB radio that requires each transmission to begin with "breaker" or "Roger" and end with "over" to make sure that both parties don't transmit simultaneously.

Full Duplex is true simultaneous transmission in both directions.

—Anthony Adverse

thern New York. The FCC quickly moved to promote "free competition" with its Open Skies Policy.

In 1974, Western Union's WESTAR began competing with landlocked common carriers. Today, Western Union, RCA, Comstat, Telesat Canada, Comsat General, Satellite Business Systems (a joint venture of IBM and Aetna Insurance), and many European and Eastern bloc countries are busily turning the 23,000-mile geosynchronous-orbit shell into a parking lot filled with spider-web antennas and black-silicon solar panels.

VALUE-ADDED COMMON CARRIERS

A new wrinkle came in 1975. Packet Communications Inc. (PCI), the first proposed *value-added common carrier* (VACC), won a license from the FCC. A value-added carrier does not create new physical networks; it adds "value" to existing ones. This came through adding security procedures, linking resources (such as data banks), or by providing message delivery, broadcasting, message enhancement, word processing, bulletin boards, message storage, and message retrieval. Because the diverse services used the network to its maximum and because the development, maintenance, and operational costs were divided among subscribers, the new services delivered at a lower cost than traditional common carriers.

PCI had intended to offer packet-switched data communications, but the company folded before it could realize the plan. Graphnet became the first operational VACC in January 1975.

In those pioneering days, almost all VACCs were based on ARPANET (the Defense Department's Advanced Research Projects Agency Network). The Defense Department designed ARPANET in the 1960s to interweave all the data processing and information resources available to major universities working on defense research grants. Like its successors (the VACCs), ARPANET did not itself process the messages it carried. (That service would make a VACC a full-blown time-sharing network.)

For over 100 years, telecommunications, data processing, and space travel have been as tightly bound as twisted-wire cable.

However, what's past is but prologue. The AT&T divestiture has changed completely the telecomm and datacomm scene. The wall between the symbiotic data processing and communications industries has come tumbling down. American Bell, IBM, AT&T, MCI, and others are all now scrambling to compete in a deregulated market for communication lines and devices, as well as computers and peripherals.

Trendy books such as Naisbitt's *Megatrends* have put modern economics squarely on an information basis. It is clear that business depends heavily on two main streams of information: analog voice, in the form of face-to-face communication, and digital data processing. It is also clear that this is the high frontier in which the two superpowers of AT&T and IBM have chosen to do battle.

AT&T, the communications giant, has securely invaded the computer business with a full product line, strong marketing, and a huge direct sales force pulled from the ranks of its business phone retailers. One product in particular indicates the direction in which it is headed: the System 75, which integrates a digital private branch exchange (PBX) with a small office automation system.

Meanwhile, IBM has picked up AT&T's gauntlet by merging with Rolm, a communications specialist. What the end-user is likely to get out of this battle is a choice of cheap, reliable office machines that combine voice messaging and data processing.

In the U.S. at least, the Unix system and all its allied vendors can only gain. For almost a decade, the telephone system has been administered by large Unix systems. AT&T products such as Unix RTR, the real-time version of the Unix system for transaction processing, have grown out of this experience. If AT&T continues its current strategy of making improvements to the Unix system available to outside vendors, then system houses and software developers will get a free ride through this stormy competition as AT&T Information Systems makes available kernel updates that support the marriage of analog and digital information.

A NETWORK'S FOUR PARTS

All datacomm users should have an understanding of switched-network operations in order to make smart choices between systems and to use their chosen systems intelligently. Included in this understanding should be a grasp of the four parts that comprise any network: a transmission system, and switching, signaling, and terminal equipment.

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The transmission system is the track that electrons traverse, like so many trains, from one location to the next. There may be many transmission systems included in a single-message loop. Transmission media include the following: (1) two- and four-wire voice-grade lines, which are inexpensive but are restricted in bandwidth; (2) high-speed coaxial lines, which feature high bandwidth and moderate cost but relative inflexibility in changing structures; (3) microwave systems, which are inexpensive over long distances but inflexible; (4) fiber optics, which are expensive and difficult to modify but yield extremely high data rates; and (5) satellite connections, which are the most expensive and least flexible of all.

Terrestrial microwave lines require many repeater stations because line-of-sight to the earth's horizon is never more than 30 miles. In a satellite system there is a single repeater, the satellite itself, and line-of-sight is always more than 23,000 miles. Satellite transmission is superior for distances over 1,000 miles because there are fewer repeaters. Since the transmission beam to the satellite travels nearly vertically, it is less affected by the atmospheric layering that causes microwave fading for terrestrial links.

For almost a decade, the telephone system has been administered by large Unix systems.

Switching identifies and connects each transmission link so that there seems to be one continuous path to the user sending and the user receiving. The message itself simply steams straight ahead on the track or line, switched by the network to direct that energy. Most networks are controlled by single messages along the length of the message path and for the duration of the message. The sender is charged for distance and time. Like all long-distance phone calls, this can be a very expensive proposition.

For heavy data transmission, it may be less expensive to lease private lines from a common carrier. Leased lines cost a set fee per month no matter how many messages cross the wires. Note that "lines" do not equate with physical wire. A message may be multi-

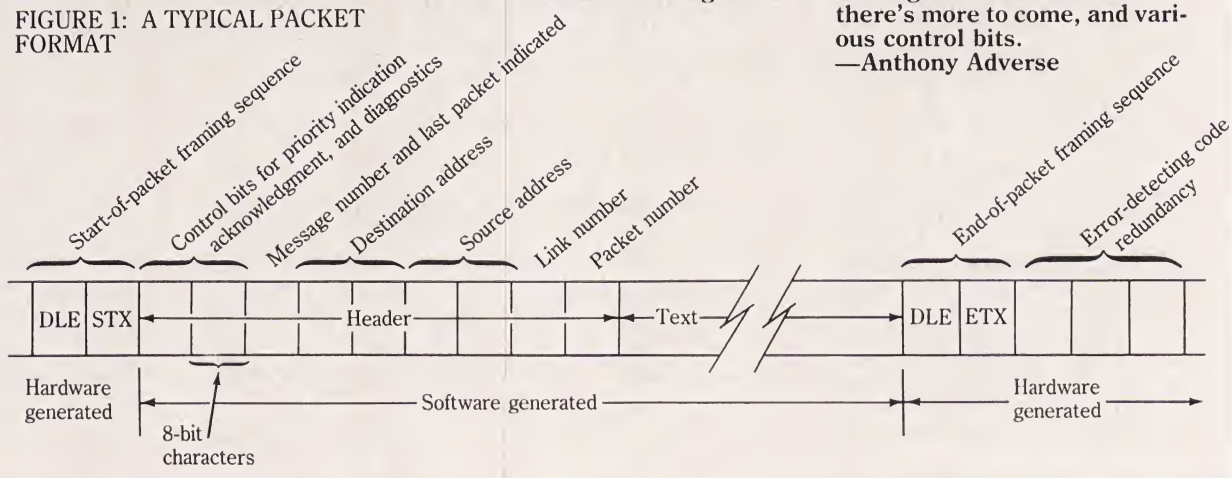
PACKET WRAPPING

Packets act as envelopes that contain data. Long messages are cut into many shorter messages that are reassembled at the destination. The transmission network must be kept from altering the packets; even more important, security must be maintained by safeguards that block human tampering.

Currently, there are no standards for packet size or contents. The ARPANET and Telenet packet configurations are shown in Figure 1. They have a maximum length of 1024 bits, including a start-of-message delimiter and a 24-bit error-detection module. The header contains the destination and source addresses, the current link number, the packet number that ensures that no packets are lost, a message bit that indicates if there's more to come, and various control bits.

—Anthony Adverse

FIGURE 1: A TYPICAL PACKET FORMAT



plexed with many other messages on a physical wire; it may also be rerouted over different wires many times a minute by the phone company to balance traffic load. But whether a "line" refers to a bandwidth or to a copper strand, a circuit-switched connection is using up a finite resource.

A more recent development is packet switching, a process that breaks lengthy messages into smaller pieces or packets—much like shipping a French castle to St. Louis and rebuilding it a block at a time. The packets have fixed maximum lengths and begin and end with predetermined codes. The discrete nature and the finite size of the packet, combined with the redundant codes that delimit the message, allow for highly reliable and relatively quick communications.

Many packets occupy a single line at one time (discrete packet bursts take up a fraction of a long line), and many customers ensure constant network use. The network computer charges individuals for the number of packets delivered—not the length of connect time. Message switching is best for time-shared human-to-human communications; packet switching is best for machine-to-machine communication.

Signaling semaphores the address and command signals to switching centers that direct the message. Network signaling identifies origin and destination stations, makes network connections, identifies line status, tracks billing information, and, finally, releases connections between sender and receiver.

The terminal equipment, which prepares the message for its final berth, is the interface to the destination network. Terminal equipment may be acoustic (for voices over telephones), digital (to connect to computers), or analog (to access telephone lines directly).

THE NETWORK HOOKUP

If the possibilities of private, leased, and common carrier lines seem complex, don't look for simplicity here. The simplest scheme is called point-to-point, which links each device in a network by a single, dedicated line. Using private line cable is inexpensive for short office distances, but it is too costly for most budgets if it requires stringing miles of wire across Wyoming. If

MESSAGE MASSAGE

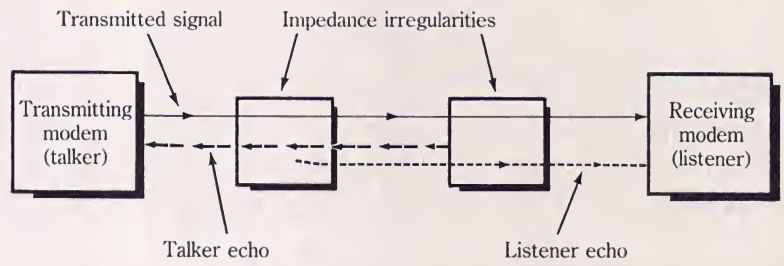
Impedance irregularities at each repeater and terminating station can bounce transmitted energy off the listener and back to the talker end. This is known as talker echo. If this echo itself encounters impedance irregularities, it can also be reflected toward the receiver as listener echo (see Figure 2). Layered phase distortion and feedback is irritating enough for voice transmission, but it is deadly for data.

Echo suppressors **block these reflections by selectively allowing strong signals and disallowing weak signals.** ***Echo cancelers*** **use a slightly different technique. Cancelers synthesize a replica of the echo 180 degrees out of phase: Destructive interference subtracts the original echo from the line. These devices are the reason your conversations overseas are choppy and one way at a time. While these two devices are useful for voice transmission, suppressing two-way communication eliminates full-duplex data communication and can make half-duplex communication slower. Most systems turn off echo suppression by emitting a pure tone of 2100 Hz and then ignoring low-power echoes.**

Listener echoes can interfere at the receiving end if the time delay is too long or the echoed signal too strong. In these cases, special echo suppressors are used selectively by the network (usually satellite networks). These special suppressors allow half- and full-duplex communications.

—Anthony Adverse

FIGURE 2: ECHO PATHS ON A TRANSMISSION LINE



telephone lines are used instead of cabling, point-to-point requires a dedicated line for each device, which also gets expensive.

Multipoint, or multidrop, networks use a single line, but data is passed linearly across several terminals. A message is addressed to a destination device, or drop-off point, and is passed from device to device until the message reaches its destination. While somewhat slower than the dedicated lines of point-to-point, multipoint systems are much less expensive.

A multiplexer is one device that can expand a single data line for use with multiple stations. Multiplexers receive data from a fixed number of input devices and direct it to a fixed number of output devices over a single line. A time-division multiplexer (TDM) transmits data in a set sequence determined by time slot. Device 1 gets data segment 1 in time slot 1, device 2 gets data segment 2 in time slot 2, and so forth.

If no data segment is output for device 3, a dummy character is inserted to maintain sequence. Each end-device knows automatically which message is intended for it because the sequence repeats ad infinitum in a set pattern. Each device receives data one-quarter of the time whether it needs it or not. If the output line operates at 4,800 bits per second (bps) and if there are four devices, each device operates at 1,200 bps.

The drawback of TDM is that if a device is not being used, a time slot is wasted. Statistical multiplexers (statmuxes) use output lines more efficiently. They transmit data only —without dummy characters. An address character is added to each input character to direct the data. Because statmuxes divide the workload according to demand, they allow an output line to operate at a higher baud rate than straight time division allows.

Message switching kept village gossips from listening in on salacious neighborhood tidbits.

Statmuxes have their own drawback, however. If all devices suddenly start operating at their maximum rates, the output line is unable to handle the data, and some data can be lost. Statmuxes are therefore provided with buffers that can outlast brief data surges. The cost of a statmux increases with memory-buffer size and flow control. System designers can't always know in advance if the statmux they buy has too little memory and will lose data, or if they have spent too much money on memory capacity that will never be used. Only a statistical study done after the system is up and running can answer these questions.

Note that at this time only the physical and logical connections between X.25-compatible systems have been defined—what they say to each other may be complete gibberish. The sending computer may deliver a clear, crisp set of *1*s and *0*s to the receiving computer—a series of bits that a user will trash as unintelligible. Imagine a perfectly functioning telephone system connecting a Swede and an Australian aborigine, and you understand the level of standardization yet to be accomplished. Message codes, character codes, start-and-stop delimiters, and so forth currently are not defined.

The future of the digital telecommunications industry is slated for explosive growth. What will control the electronic Tower of Babel is widespread adoption of international standards.

James Martin ends his book *Future Developments in Telecommunications* with potshots at unbridled change:

"In an era of great invention, the users need to be protected from the proliferation of new mechanisms.... Users ought to be demanding such protection, both nationally and internationally.... Manufacturers or designers, given appropriate virtual standards, can then be free to invent all manner of ingenious new mechanisms and organizations."

Amen. □

Anthony Adverse is the nom de plume of a well-known Bay Area playwright who is ashamed to admit that he supports himself by writing on a variety of technical subjects.

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USENET

SPANNING THE

Here are the ins and outs on how to use 'the net,' which now connects more than a thousand sites worldwide.

You've probably heard of USENET. Perhaps it was at one of the Unix system technical conferences that you recently attended, or it might have been mentioned in a magazine article you read. At some point, however, most Unix system users get word of *the net,* as it is often called.

USENET consists of all the sites that run the "netnews" software and that transmit netnews articles to each other. The UUCP network, upon which much of the USENET relies, differs in that UUCP is a point-to-point electronic mail and file-transfer network. [See the attached UUCP sidebar.] Because USENET is a broadcast network, there is no such thing as a "USENET address."

The idea for the original "netnews" software (generally referred to as "version A news") sprang from the minds of Tom R. Truscott and Stephen Daniel of Duke University, in North Carolina. The two men started the network in 1980 in the Duke area, and it has been growing ever since.

Around May 1980, it became clear to Mark Horton, at that time a UC Berkeley graduate student in computer science, that the version A news was having trouble handling the volume of traffic the network was generating and that a rewrite was necessary.

He found another student, Matt Glickman, to do the job on the only spare Unix system machine Berkeley had at the time—an Onyx C8002, known on the network as *ucbonyx*. What Matt finally produced is called "version B netnews," also called "readnews," after the program in the software that is the user interface.

OTHER INTERFACES AND SUBSYSTEMS

In addition to basic B netnews software, there are some other user interfaces and whole subsystems for netnews. Some current examples include the "notesfiles" system (written by Ray Essick, of the University of Illinois, and patterned after PLATO notesfiles); "vnews" by Kenneth Almquist, of Bell Labs; and, more recently, "rn" by Larry Wall, of Systems Development Corp. All of the netnews software is in the public domain and is distributed over the network itself.

In the last two years, the USENET has seen explosive growth. In April 1981, for example, after UC Berkeley and a few sites in Bell Telephone Laboratories in New Jersey joined the network, only 23 sites were on the network. Since then, however, the network has grown to include over 1000 systems, spanning the globe from Europe, the U.S., and Canada, to South Korea and Australia.

BY ERIK FAIR

GLOBE

The B netnews software is now at version number 2.10.2, which was released in early September. Also, consider the following figures, which I obtained by doing some counting on my site in June. The traffic is about 10,000 messages per month, and the average message length is 1600 bytes. Thus, total traffic is 16 megabytes per month.

A single message on USENET is called an *article,* and the messages are grouped together by topic in different *newsgroups.* Currently, there are 190 different newsgroups covering topics from "net.Unix-wizards," which contains technical information and esoterica about the Unix system culled by and for Unix system gurus, to the relatively mundane matters found in "net.cooks," which is for posting recipes and cooking questions.

Newsgroups come and go by general agreement of the network community. If a newsgroup is not being used, it is deleted after suitable debate. Conversely, if a new topic is flooding an existing newsgroup and if there is sufficient demand for it, then a new newsgroup can be created.

NO CENTRAL CONTROL

The reason that things are done by consensus is that the network has no central control. Recall that UUCP links are point-to-point and that the UUCP network exists by virtue of my machine talking to some machines that yours doesn't (and my stated position that my machine will pass on traffic from any one of them to any other).

Although all network members agree to send traffic to their network neighbors, there is really nothing anyone can do to coerce any particular system administrator to perform a specific action. All you can do is try to present a convincing argument for him to perform the action. If he agrees with you, then he will probably do as you ask.

USENET has seen explosive growth in the last two years.

Because of this structure, the USENET relies heavily on persuasion and education of the network community. It is particularly critical that the USENET administrator at all the network sites take time to put the documentation in accessible places and encourage users to read them before starting to post articles to the network.

USENET is noncommercial because everyone is paying a part of the cost to maintain it, and direct profit from network activities is frowned upon. In addition, because we all see so much physical junk mail, electronic junk mail and advertisements are things to be strongly discouraged.

Once, about a year ago, a computer company tried to set up a commercial customer service system through the USENET and UUCP net-

works. The reaction from the network community was so overwhelmingly negative that the site in question very nearly lost all its UUCP neighbors. On the other hand, simple and to the point commercial announcements—more along the lines of an announcement that something exists rather than a flashy advertisement-type of notice—are generally welcomed, if posted to the appropriate newsgroups.

THE UUCP NETWORK

This network consists of all computer sites that run the UUCP (Unix to Unix CoPy) communication software to talk to each other, mostly over the national and international direct-dial phone network at 1200 baud.

Because UUCP is a standard part of licensed Unix, this network potentially includes all of the Unix systems in the world. As of last count, there were some 3000 sites on this network worldwide.

Until the fairly recent release of System V Unix from AT&T and 4.2BSD from UC Berkeley, UUCP itself only understood about single-hop transfers from site *a* to site *b*. Other software was written to automatically get messages beyond the first hop from you to your neighbor. The only such software that comes with standard Unix is `/bin/mail`, and it is on this basis that the store and forward UUCP network has developed and grown.

For example, if you are a user of hypothetical site *a* and wish to send an electronic letter to your friend at site *c*, you would type:

```
% mail b!c!username
Hi Fred.
^D
```

and the `mail` program would use `uux` (one of the UUCP commands) to queue and subsequently send that electronic letter to site *b*.

At site *b*, the `/bin/rmail` program gets invoked (it's just a link to `/bin/mail` in Version 7 Unix systems). This program strips off the first site name in the path (the site the message is already on) and fires up `uux` to queue and send the message to site *c*.

At site *c*, the `rmail` program is once again invoked. It determines that the letter is for a local person and delivers it.

The point is this: In this model the intelligence resides in the upper-level software (`mail` and `rmail` in this example) and not so much in UUCP itself. The other thing to notice is that `mail` is re-invoked at every intervening site to pass on the message. While this mechanism may seem relatively simple, it actually has resulted in a powerful, yet very general, intercomputer communication system that currently passes large amounts of data throughout the world.

One nice part about the UUCP network is that the setup cost is very low. If you already have a Unix system, you just have to find another Unix system in your area (or not in your area if your phone bill is of less concern) that is willing to call you or be called by you to speak UUCP with your computer.

When you have set up that link, they become your link to the world and the world's link to you. For those who are not fortunate enough to have a real Unix system in their backyard, versions of UUCP for some other popular operating systems, such as MS-DOS, are in the works and may even be released by the time this article appears.

An annoyance with the current UUCP network is that you must use explicit paths from one place to another. The upshot is that if you want to get an electronic letter from site *a* to site *b*, you must know all the sites in between *a* and *b* that talk to each other, and you must specify that path when you mail the letter.

This raises the point that no one knows completely who is on the network. Because connection to the network involves an agreement between two sites (and a brief exchange of log-in information and phone numbers), the rest of the network has no idea that the new site is there unless the administrators of those systems find some way to announce the new site's existence.

The UUCP Project, with funding from the USENIX Association, is attempting to "map" the network in the sense of finding out who is on the network and to whom they all speak. If you're on the network and you haven't told us yet, please mail a letter to `cbosgd!uucpmap` announcing your presence and requesting a blank (electronic) site form for our database.

The development of this database represents an important first step toward eventually establishing more automated procedures for determining complex user/path routings through the UUCP network.

HOW USENET WORKS

In the generic case of a USENET site that uses UUCP to transmit and receive articles, USENET works as follows. A user has a question to ask the other people on the network. Because USENET articles appear in different newsgroups that are defined by different topics, it is important for the user to decide which newsgroup to post to.

A classic *faux pas* committed by new users is to ignore the question "which newsgroup is appropriate for my article?" and just post the question to "net.general," a newsgroup which, in theory, is read by everyone on the network. This will typically generate many heated replies to the effect that "this is not the right group and you should read the documentation before you post articles!"

The user then invokes the `postnews` command to post an original article to USENET. When the user has finished editing, checking spelling with spell(1), and otherwise preparing the submission for the network, the `inews` program is invoked by `postnews` to finish formatting the article and to queue it for transmission elsewhere.

The `inews` program will then add information to the article header, including things like a time stamp saying when the article was first posted, which site it came from, what version of netnews the site is running, the user's real name, and a unique message identifier. `inews` will then read the USENET `sys` file (distinct from UUCP's `L.sys` file). The `sys` file says which sites should be sent a copy of this article and how it should be transmitted to them. It also invokes the appropriate program to transmit the article to each neighboring USENET site.

Once the article is transmitted to the neighboring USENET sites, they, in turn, invoke the `rnews` command to process the article. Because some sites have more than one news "feed" from which they get their netnews, all incoming articles have their unique message ID checked against a history file to see if the site has already seen this article. If it has, the article is thrown away. If not, it is posted locally in the news directories and transmitted to the site's USENET neighbors, excluding the one the article came from.

A BROADCAST NETWORK

The USENET manages to be a broadcast network by this "pass it on" method. In fact, article propagation to all 1000 USENET sites typically takes three to four days. This is because most of the USENET sites transmit articles via UUCP over 1200-baud phone links.

Later, other users on other USENET sites will log in and start reading netnews. When they come upon the first user's question in the news, the other users are free to reply privately by electronic mail, or they can post a "follow-up" article if they feel their response is worthy of the entire network's attention.

Discussions on the USENET, much like cocktail party conversation, tend to wander somewhat, frequently until the subject listed in the header of the article is no longer related to the article's content. Some debates on controversial topics have been known to last for weeks.

As I noted earlier, traffic is fairly high for a 1200-baud network. Fortunately, other transmission methods are being worked on, including one that would intersperse articles over cable TV between the TV screen frames via satellite broadcasters. Computer systems would be connected to a special decoder box that would pick out the ASCII from the TV signal.

Lauren Weinstein, the gentleman who writes the *sync* column in the back of UNIX/WORLD, is working on this and hopes to have a test system going soon. The 2400-baud modem is getting cheaper, and the hope is that some of the major sites will get these as the seed sites and that the rest of the network will eventually follow. This should help somewhat reduce the loading problems in the short term.

How can you get your site on the USENET? Unfortunately, I can't just give the name of a single individual to call because that person would probably be swamped with calls once this article appeared. However, what I suggest is that you check with other companies or universities in your area. See if they have a Unix system and whether they're on the net. If they are, it is likely that they will be happy to help you get your site up. They will have a copy of the netnews source, and, because it is public domain software, you can have it whether you have a Unix source license or not.

Good luck, and I hope to see more new site announcements in "net.news.newsite." □

Erik Fair, a former UC Berkeley student, now works as a Unix system wizard for Dual Systems Corp., Berkeley, Calif. In his spare time, he works with the other members of the UUCP Project on future mailer and USENET software.

UUCP: {ucbvax, ihnp4, cbosgd, hplabs}!dual!fair

A TALE OF SOFTWARE WOODS

BY STEPHEN AUDITORE

Chapter 11 filings, layoffs, forced mergers, depressed earnings. What does this bad news have to do with the micro software business, hit records, Dolby sound, and Time magazine? Read on.

It was his first day on the job at Eve Software. "My God," he thought, "this is nothing like Gamble Foods. I'm going to create a little Cincinnati right here in Silicon Valley." This CEO is just what the venture capitalist ordered: a consumer-marketing-savvy chief executive. The local high-tech advertising agency was the first casualty of the new regime. This is my company now, and I'm going to get a REAL ad agency. I'm going to get Salt Water Thomas. They'll help me sort this mess out."

Six months after he hired Salt Water, the executive staff, buzzing in anticipation, was assembled in the boardroom. After months of researching and blue-skying, Salt Water Thomas was going to present the plan.

The overhead spotlights dimmed. Salt Water himself was going to make the presentation. With a voice that dripped like Karo syrup, Salt Water began: "Gentlemen, we have devoted the entire resources of our agency to researching your industry, your product, and your company. We have reached a startling conclusion: People use computers because computers help them get work done. And we have discovered the fundamental element that allows people to get work done."

"This is it," the CEO thought. "It could be a breakthrough of moment. They might make me chairman after this."

The room was silent. Bending forward, looking into each man's eyes, Salt Water whispered: "The secret is . . ."—heads started to tilt slightly forward, as if awaiting communion at Sunday Mass—". . .software."

TWO BUSINESS MODELS

The proliferation of computers, both single user and multiuser, has created a tremendous demand for useful software programs. These programs have usually been developed by independent publishers and developers. The success and failure of these software companies have depended almost entirely on the expansion of the installed base of computers. This link between computer market expansion and software publishing success has occurred be-


Time Mag
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Hit Records
Business Pl

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cause the publishers and developers have chosen one of two business models.

The most common business model for software publishers is the "hit record" business model. In this model, products are developed, markets are saturated, and new hit records (read: programs) are required to maintain the revenue stream.

Companies using the second business model sell software to computer hardware vendors. The software becomes an integral part of the computer system being sold, much like the "Dolby Labs" business model. Nearly every tape deck and many radios offer the Dolby technology.

If there were no computers, it is unlikely that there would be software, so it is not entirely possible to separate the expansion of the computer market and the success of the software publisher. However, with an understanding of why software publishers have adopted these business models and the formulation of an alternative business model, it is possible to manage the success/expansion relationship.

With the "hit record" model, software publishers set themselves up like Michael Jackson or the Rolling Stones, record new records (make new programs), and try to get people to buy the new record (program).

The strategic essence of this business model is to create a hit program, saturate the installed base of computers, then create another hit program and resaturate the installed base. Much of the strategic rationalization of this business model revolves around something called the "upgrade strategy." The theory is that once users have the hit program, they will want to upgrade it to the new, improved version of the program.

Crucial to executing a hit record business model is knowing what the market saturation point is and having a natural follow-on product ready when the product life cycle has run its course. Figure 1 shows the expected product life cycle of a hit business program.

The hit record business model is based on the assumption that making hit programs is similar to making hit records. Five steps to producing a record and program are detailed in Figure 2.

Within the record industry, the concept development is generally an artist-oriented function, with the performing artist playing the key role in determining what the record is going to be. The product definition stage of program development has a higher organizational orientation, with market research playing a crucial role.

Studio production time for a hit record is similar from artist to artist and from record to record. No doubt, the Rolling Stones spend more money on production than does the Chocolate Watchband or the 101 Strings, but in a global sense they are similar. Programming time devoted to hit programs varies dramatically, being based on the

FIGURE 1: PRODUCT LIFE CYCLE OF HIT SOFTWARE PROGRAMS

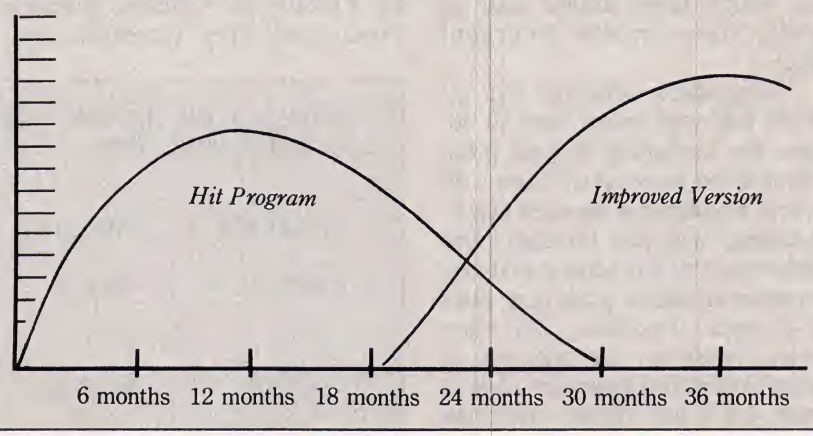

FIGURE 2: FIVE STEPS TO PRODUCE A RECORD AND PROGRAM

FOR RECORDS	FOR PROGRAMS
Concept development	Product definition
Studio production	Programming
Mixing	Debugging
Press records	Duplicate media
Sell	Sell

complexity of the program being implemented. The amount of programming time devoted to Lotus 1-2-3 easily exceeded the amount of programming time expended for Frogger.

CONSUMABLE SOFTWARE?

The fundamental difference between hit records and hit programs is in the pricing strategy. Pricing for hit records is based on the cost of the plastic disc plus royalties. Pricing for hit programs, however, is based on attaining a reasonable return on investment, with the investment being the development cost of the hit program. This explains why Frogger and Lotus 1-2-3, which have similar cost of goods, have widely divergent prices.

Companies adopting the hit record business model tend to address the marketing of their products as if the hit program were a hit record. Emphasis is on shelf space, packaging, and pull through. This marketing style has some validity for consumer-oriented programs such as Frogger, Pac-Man, and other games. However, the purchase of business-oriented programs such as Lotus 1-2-3 and dBase are predicated more on perceived requirements and the product's ability to meet requirements. It seems unlikely that many Fortune 1000 companies purchased Lotus 1-2-3 because they liked the box.

Within the hit record business model, the assumption that selling software is like selling records has created a corresponding assumption that consumer-oriented marketing techniques are required. Consumer marketing techniques applied to products with short life cycles ultimately cause that company to fall behind the product and technology curve. New product development gets stymied as the company explores line extension, market expansion, and new, improved packaging.

Emphasis on a consumer marketing orientation within companies adopting this business model has resulted in ill-defined marketing strategies, with the associated waste of capital. This has also led to just too many wine salesmen trying to keep up with a rapidly moving industry and product life cycles of less than two years.

If a software company adopts a hit record business model, it needs to remember that once a product is introduced, the primary focus of consumer marketing, as practiced by Proctor & Gamble, General Foods, and other successful companies, is to generate repeat business, not sell to new customers.

Many of the programs that have been popular during the past several years have turned out to be a company's single hit. Even for a company with a substantial revenue base, the ability to create a successful follow-on program has been a caveat to potential investors and customers. Figure 3 shows some examples of hit software companies and their products.

THE ONLY SECOND HIT

A more detailed examination of Figure 3 shows that the only true, nonpredatory second hit program is Symphony from Lotus. In the case of Ashton-Tate, dBase III is a replacement for dBase II, while the success of its Framework pro-

FIGURE 3: SOME HIT SOFTWARE COMPANIES AND THEIR PRODUCTS

COMPANY	FIRST HIT	SECOND HIT	THIRD HIT
Ashton-Tate	dBase II	dBase III	Framework
Lotus	1-2-3	Symphony	
MicroPro	WordStar	InfoStar ReportStar DataStar	ChartStar
VisiCorp	VisiCalc	VisiStuff	
Sorcim	SuperCalc	SuperCalc2 SuperWriter Spellguard	SuperCalc3
Lexisoft	Spellbinder		
Lifetree	Volkswriter		
Software Publishing	pfs:File	pfs:Report	pfs:Write

gram is still in question. VisiCorp has not only been unable to develop a follow-on hit program, but it has also been unable to move its hit program into the 16-bit arena.

Sorcim developed a hit program, SuperCalc, for the 8-bit CP/M field. When the installed base of computers moved to 16 bits, Sorcim attempted to move but ran head-on into Lotus. MicroPro has had little success in moving non-word-processing software, while Lexisoft, Select, and Lifetree have yet to attempt a second hit. Software Publishing is an interesting case in that it seems to have been able to generate several hit programs. The pfs: series has been a very successful group of programs, but the single function and low price of these products make them more analogous to a 45-rpm record than to a 33-rpm album.

Advances in computer technology and the entry into the market of new suppliers have provided the hit program publisher with new areas for market expansion. The biggest expansion of the market to date has been the introduction of the IBM PC and the subsequent proliferation of 16-bit PC clones. This new class of computers and users represented a major opportunity for the 8-bit CP/M software vendors to extend their product lines, while expanding their businesses. But what happened? Figures 4 and 5 show the dominant software companies for the 8-bit CP/M and 16-bit PC arenas.

The rapid penetration of 16-bit computers caught many software vendors by surprise. Software publishers expected the acceptance time for 16-bit computers to be as lengthy as it had been for the 8-bit microcomputer. There was only one minor difference: 8-bit microcomputers were pioneered by companies such as IMSAI, Exidy, Dynabyte, and Intertec, whereas 16-bit microcomputers were pioneered by IBM.

Without new hit records, continued success with a hit record business model requires a constant expansion of the installed base. This expansion can come in two forms: (1) more users of existing computer types; or (2) new users of new computers.

The second category is best represented by AT&T's entry into the computer arena and the associated growth of Unix system availability. The Unix system's functionality appeals to a customer different from the traditional personal computer user. However, users of this Unix functionality still need the personal productivity tools that have become the mainstay of personal computer software publishers. Thus, it is reasonable to expect that Lotus 1-2-3, Framework, and WordStar will become available for the Unix system.

"We've been running the Salt Water ads for six months now. We have a high frequency rate, our packaging has been redesigned, we seem to be getting shelf space. Why aren't we selling more?"

The days were long for the CEO. Failure was something he had never known. Things were being done just as they had been done at Gamble Foods, but something wasn't working. He thought about the advice from Salt Water: "People use computers because software makes them useful; you can't use the computer without software."

"That's it!" he cried. "Since software is the key, we'll sell our software to the computer manufacturers."

FIGURE 4: 8-BIT 'HIT RECORD' COMPANIES [AND THEIR HIT SINGLES]

Digital Research	CP/Mdstar
Sorcim	SuperCalc
VisiCorp	VisiStuff
MicroPro	WordStar
Lifeboat	Distribution

FIGURE 5: 16-BIT 'HIT RECORD' COMPANIES [AND THEIR HIT SINGLES]

Microsoft	MS-DOS
Lotus	1-2-3
Ashton-Tate	dBase
MultiMate	MultiMate
Softsel	Distribution

THE DOLBY LABS MODEL

The second business model that software vendors have adopted is the "Dolby Labs" model. With this model, publishers sell the software one time to hardware vendors who include the software on each computer sold. The publisher collects a small fee, or royalty, for each hardware unit that is shipped.

The Dolby Labs business model is used primarily by companies offering operating systems or systems tools. Some examples of this business model in the personal productivity or applications program area exist, and this inclusion of productivity and application software as part of the computer is referred to as *bundling*. Figure 6 shows companies that use or have used the Dolby Labs business model.

Although the Dolby Labs business model can provide a consistent revenue stream, it is susceptible to changes in technology and demand. For example, Perfect Software sold primarily to 8-bit systems suppliers. These systems suppliers bundled the Perfect Software programs into their product offerings, with Perfect

Software receiving a small royalty for each computer shipped.

When 16-bit computers emerged, Perfect Software's customers (the system suppliers) found themselves behind the technological curve and experienced a lessening of demand for their products. This ultimately found its way back to Perfect Software as a dramatic drop in sales. Perfect Software has subsequently filed for protection under Chapter 11.

It is operating system and system tool companies that have made the most effective use of the Dolby Labs business model. It is also the operating system companies that have found themselves most susceptible to advances in technology. The classic case is that of Digital Research (with CP/M) and Microsoft (with MS-DOS). Digital Research dominated the 8-bit arena with CP/M, but when 16-bit personal computers started to emerge, Microsoft gained the upper hand with MS-DOS.

What happened? Theodore Levitt, in his 1950s study "Marketing Myopia," foresaw what would happen to companies such as Digital Research. The gist of Levitt's study is that the railroads declined because they viewed themselves as being in the railroad business, not the transportation business.

Digital Research viewed itself as being in the CP/M business, not the operating systems business. When an advance in technology occurred, the firm tried to push its 8-bit-oriented CP/M onto a new technology. What was required, and what the customer wanted, was something different.

The key points of the Dolby Labs business model: (1) a revenue stream from products that are not managed by the vendor; (2) a susceptibility to changes in end-user demand and technology; and (3) a low-cost, targeted sales effort.

"We were doing OK until that new '90987' microprocessor came out. Damn! Those people at Pratel never make anything that's upwardly compatible."

His gang from Cincinnati had returned to the banks of the Ohio. Successive rounds of technological one-upmanship had catapulted the market beyond his company.

"What can I do? I've tried to sell it like records, I've tried to sell it like Dolby stereo. Is there a way to market software while not preying on your base or being vulnerable to technological advances? What if we sold software subscriptions like Time *magazine?"*

FIGURE 6: COMPANIES THAT USE OR HAVE USED THE 'DOLBY LABS' BUSINESS MODEL.

COMPANY	PRODUCT	COMPUTER
Microsoft	MBASIC	TRS-80, IBM AT&T, COMPAQ
Digital Research	CP/M, C-BASIC	Kaypro, Osborne
Lotus	1-2-3	HP Portable
MicroPro	WordStar	Eagle
Perfect	PerfectWriter PerfectCalc	Kaypro
AT&T	Unix	AT&T, IBM PC/AT

THE TIME MAGAZINE MODEL

Historical precedence and technical limitations have prevented software publishers from pursuing a third business model, the *Time* magazine model. The strategic essence of this model is to sell a program to a user for use over a specified period and then to resell the same or a newer version of the program to the same user for another length of time.

The historical precedents pushing against the *Time* magazine business model are unique to the microcomputer world and are based more on technical limitations than a reasoned marketing or business strategy. Traditionally, microcomputer software has been sold with an "unlimited, non-exclusive, worldwide use license."

This allows users to utilize the software for as long as they want and as long as they abide by the licensing agreement. Another strong element of this precedent is the licensing of a software product to a specific computer or system. If you think you really own the copy of Lotus 1-2-3 that you just gave someone $500 for, read the fine print.

The unlimited license and licensing to a specific system evolved because there was no way to limit the duration of the sale of the program. Because there was no way

to limit the use duration, software could only be sold (licensed) forever, not sold based on time or usage.

Primary advantages of the *Time* magazine business model include generation of an ongoing revenue stream, high market penetration because of lower pricing, knowing who the customer is and how to reach that customer, an identified market for an improved version of the product, and an identified market for ancillary products.

Marketing subscription software allows direct marketing to the consumer and allows a focus on generating repeat business. For subscription marketing of software to occur, a market segment that has not been tainted by the historical precedents of the personal computer needs to be identified.

This, then, is a major opportunity for Unix system software vendors to shed the weighty baggage of the past, if that is possible at all.

The parking lot of Eve Software was nearly empty as Mel Jockton, Godfather of the Silicon Valley venture capitalists, pulled up in his anthracite Ferrari 308. The parking lot has been nearly empty for several months now.

"I hate having to do this," Jockton muttered to himself. He zipped into the parking place next to the front door. The low-slung Spanish stucco looked appealing in the setting sun.

The CEO sat alone in the boardroom. The lights were off. The mahogany table-top reflected the late autumn sun that snaked through the Veloblinds. The white presentation board was clean for the first time in months. □

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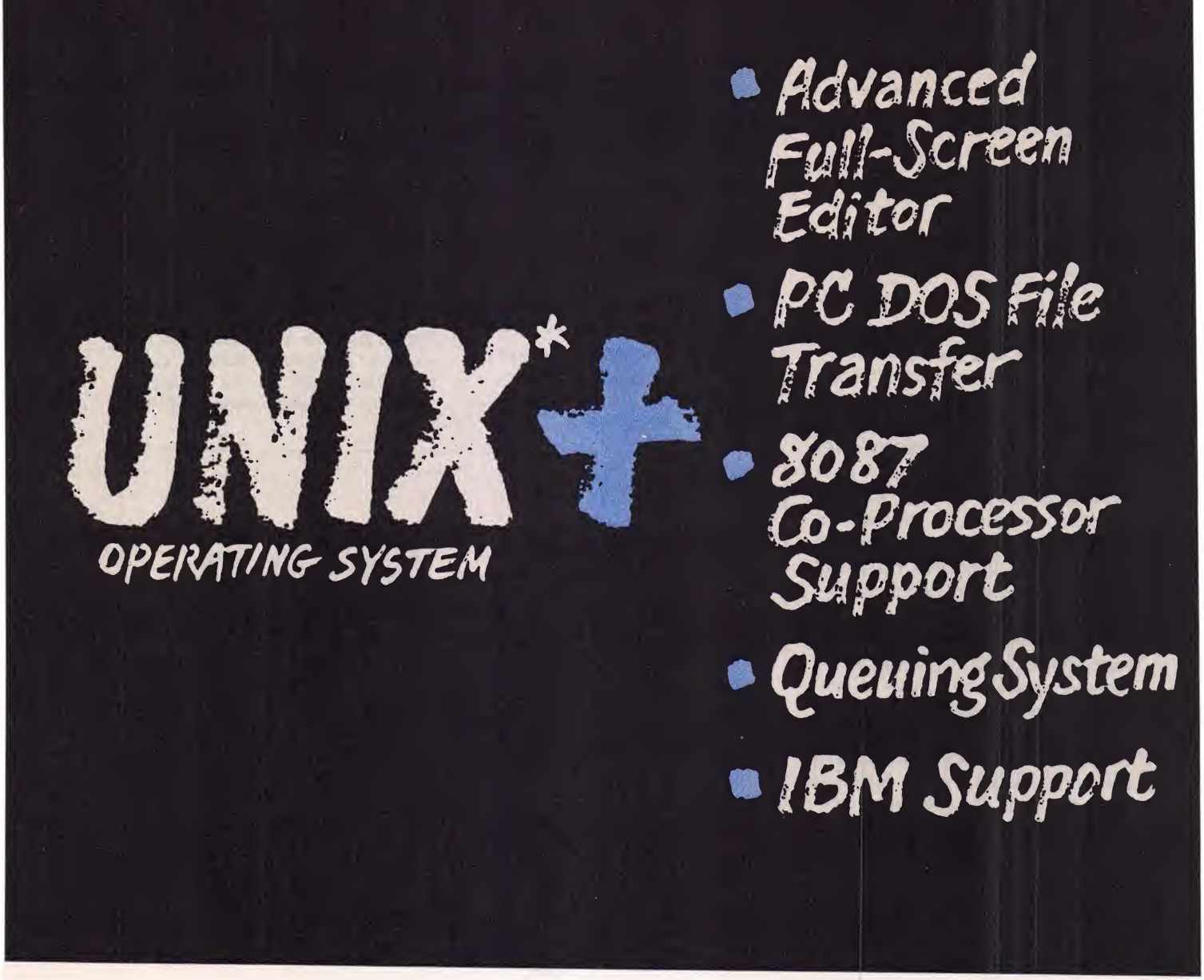

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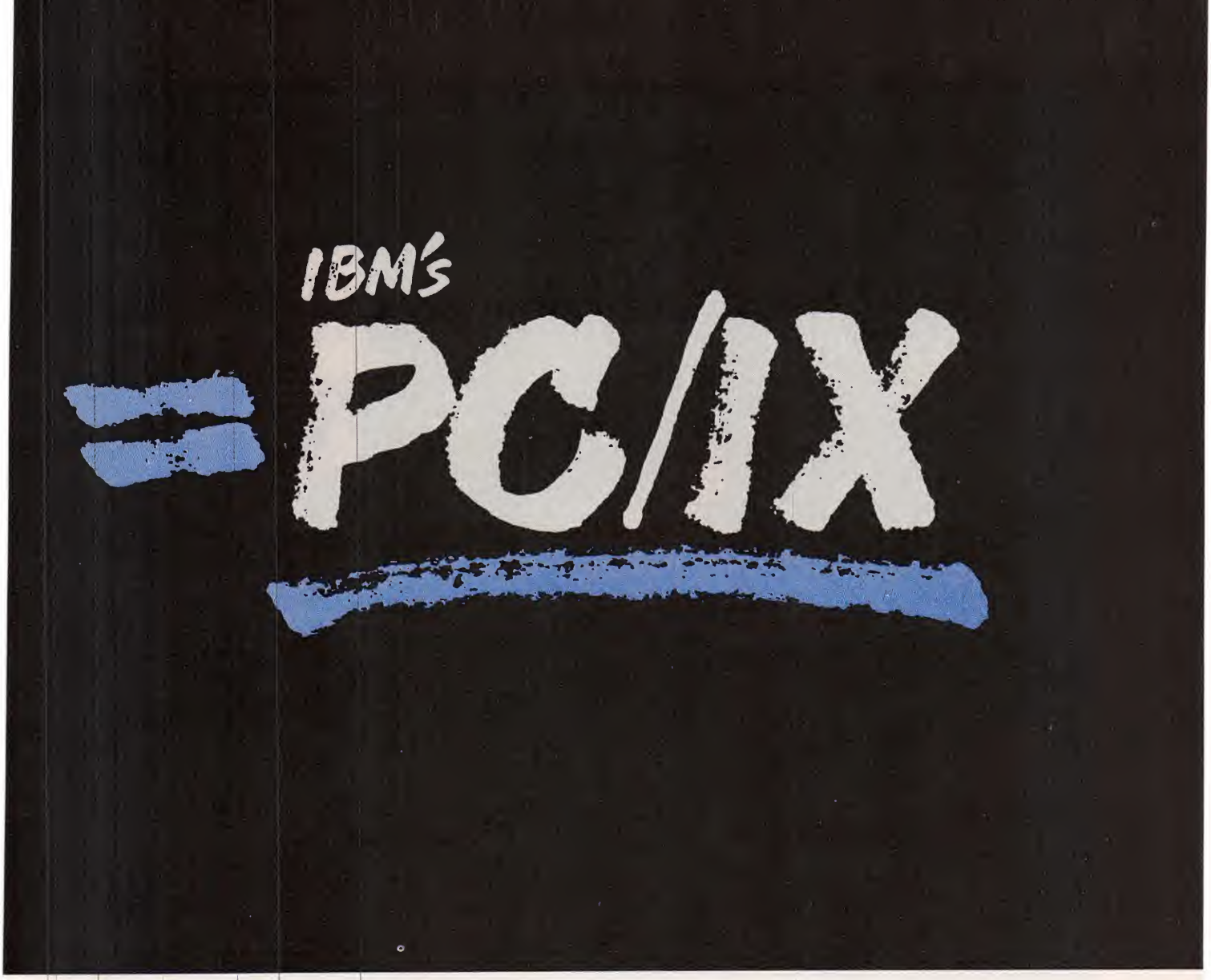

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You've heard stories about those big stock options, loose work rules, and big salaries. But what's the job market really like out there?

THE UNIX SYSTEM JOB MARKET

BY DAVID A. SMALL

There's a certain amount of euphoria associated with being a Unix system person. It is comforting to know that you are in a "hot" field and that your skills are in short supply. Like the petroleum engineer in the mid- to late-1970s, the Unix system professional is faced with opportunities that break all the rules. For example, we see 26-year-old engineering managers with $50,000 salaries, substantial equity positions, relaxed work rules, and jobs restructured to suit the whims of a key individual.

Even with such attractive opportunities, many of the jobs go unfilled for long periods. This is not just because of a talent shortage. The Unix system job market has some peculiar dynamics that tend to frustrate would-be employers.

This particular market is economically imperfect; that is, the best skills do not automatically flow

The greatest demand is for skills that the vendors need—system internals, communications, graphics, user interface, and marketing support.

to the highest bidder. One reason is that the Unix system community is made up of individuals who have priorities of their own. These individuals appear to fall into four camps (with some overlap):

(1) *The technical types.* These individuals want to work at the state of the art on the most challenging technical problems. They seek to associate with employers who offer the best teachers, the best tools, and the most advanced projects. For them, a certain status is associated with their affiliation to the most technically admired employer.

They consider themselves more a "member" of a profession than an "employee" of a company. They yearn for advanced education and for a work environment that encourages creativity and autonomy; they abhor bureaucracy and regimentation. Some feel that they must constantly move on to new challenges and avoid repetition. Some see themselves as pioneers working to roll back the frontiers of technology, thereby benefiting mankind. Some look down upon management and marketing types and prefer to withdraw into the laboratory.

At the moment, the technical types form a high percentage of the total Unix system population—many of the most experienced and talented individuals. In other words, this group has both breadth and depth.

DIFFICULT TO ATTRACT

Prospective employers find this group difficult to attract using conventional recruiting methods. These individuals look for a work environment that is consistent with their values as described above. They lean heavily on established employer reputations and word-of-mouth recommendations from their peers.

(2) *The strivers.* Although they do not all define success in the same way, they are driven to succeed. For some, success is making a lot of money. For others, it is advancement in terms of organizational power, responsibility, or recognition. For still others, it is career achievement, such as developing a successful product or becoming recognized in their field. Many are workaholics whose careers often take first priority over all else. They tend to be determined and thus very committed to projects and employers. As a result, their job mobility is lower than their ambition might otherwise suggest.

The best skills do not automatically flow to the highest bidder.

Companies like to recruit from this group. Strivers tend to fit right in with the short schedules, tight budgets, and big ambitions of most Unix system employers. Unfortunately for the companies, attracting the attention of the strivers is hard—they are too busy to think about changing jobs.

(3) *The lifestylers.* They see their careers as important but secondary parts of their lives. Living in the mountains or some other specific locale takes first priority, as may proximity to family, religious affiliation, or just about anything. They choose jobs on the basis of such factors as geographic location, job security, or working hours, and other benefits. In general, they respond to the enticements of an overheated job market only within the confines of their lifestyle considerations. To them, a job is just that —a job.

Many of these individuals would rather change occupations than compromise their lifestyle. They have to be lucky to find a good career opportunity within the typically narrow boundaries that they set for themselves. Companies find them unrecruitable outside their chosen area.

Pure lifestylers are usually pretty happy because they are living where they want to live or are doing what they want to do. It is the half-breed lifestyler/striver or lifestyler/technical type who is likely to be unhappy and have serious career problems.

(4) *The steady employees.* This is the working class—the normal, average, businesslike employees who seldom achieve greatness but who are consistently solid and reliable. They do what they are asked to do and no more. They hope to advance in their careers through steady dependability rather than spectacular achievement.

Because promotions in this group are rare, steady employees sometimes attempt to achieve advancement by changing jobs in a hot job market. They want to be successful, and they tend to perceive success as luck—being in the right place at the right time. They are the most likely group to be reading the classified ads.

RIGHT PLACE, RIGHT TIME

This group really stands to benefit from the crunch in the Unix system job market. They are liable to obtain positions and salary levels that they would not otherwise obtain. They really are in the right

place at the right time.

In addition to the difference among individuals and the shortage of talent, many good Unix system jobs go unfilled for other reasons. One major stumbling block is mobility.

Many smaller firms lure skilled employees with stock options that could be worth from $10,000 to $100,000.

In this economy, the homeowner enjoys a tax advantage, but the renter enjoys a potential career advantage. Many Unix system employers are located in areas with a high cost of living, areas where housing prices are prohibitive for both buyers and sellers. Sustained high interest rates further impede real estate transactions. The rise of two-career families also lessens mobility. In general, the technical population is decidedly less mobile than it was 10 years ago.

Second, many Unix professionals have preconceived ideas about the companies or categories of firms for which they would or would not want to work. They are conscious of the volatile nature of the field and often perceive this as a risk factor for all but the largest companies. They also fear making the wrong move by choosing an employer that is moving in the wrong technical direction. There are those who prefer micros to mainframes, scientific machines to business machines, or Berkeley to System V, and so on.

The Unix system job market is also imperfect because of a saturation phenomenon. That is, individuals entering the job market are quickly overcome by the variety of locations, companies, and jobs. As a result, they tend to restrict their search. It would be physically impossible for anyone to interview all possible employers. This often benefits "name" employers and those who respond the most quickly to incoming resumés. The individual may sidestep the problem and follow a friend to a new job rather than actively survey the market to determine his real market value.

At the moment, the Unix vendor community is in a state of full mobilization, while the user community is just awakening. As a result, the greatest demand is for skills that the vendors need—system internals, communications, graphics, user interface, and marketing support. In the future, as the market matures, there should be a tremendous increase in the demand for application programmers. To some extent, these new user employers will compete for currently trained programming talent, resulting in an increasing shortage of people who have Unix system experience.

THE EMPLOYER PERSPECTIVE

The Unix system employer must face the question of how to attract and hold key employees. This question depends to some degree on the local Unix system job market. In areas such as Silicon Valley or Boston, a large local labor pool and intense local competition exist. Employees enjoy high local mobility because they can change jobs without relocating. This leads to an active, fiercely competitive free market with wildly escalating salaries and high turnover rates. The results are often golden handcuffs (equity deals) and high salaries.

In an area such as New Jersey, on the other hand, AT&T and the many AT&T contract consultants have a near monopoly on the jobs for Unix systems programmers. There is no local competition from start-ups, and employees are dependent upon one company's wage and salary program for their rewards.

Strivers tend to fit right in with the short schedules, tight budgets, and big ambitions of most Unix system employers.

In emerging centers such as Portland, San Diego, Research Triangle Park, Austin, and Salt Lake City, the market is in transition from labor surplus to labor shortage. For years, more qualified individuals were always seeking employment in those locations than there were jobs available. Companies were able to hire engineers at low salary levels, and extra enticements were unnecessary.

In some cases, these companies now have entire engineering departments that are underpaid by national standards, though fairly paid by traditional local standards. As the local labor surplus dries up, these companies need to be able to recruit nationally. They are already finding it almost impossible to attract new hires within their existing salary structures; thus, they are faced with some particularly tough choices. For now, they try to limp along by looking for people who went to school in the area or are attracted to it for other reasons. As the shortage of Unix system talent intensifies, however, they will have to face up to their fundamental salary problems.

Large companies usually have formal wage and salary administration programs. They attempt to keep salaries in line throughout the corporation regardless of cost-of-living factors or specific skills. This

> **The technical types yearn for advanced education and a work environment that encourages creativity and autonomy.**

was illustrated when, at the peak of the petroleum engineer shortage, many larger companies experienced a significant exodus of critical skills (engineers and geologists) to smaller companies that were not constrained by wage and salary guidelines. On the other hand, larger companies were more able and prepared to offer house buyouts and lucrative mortgage differentials than were smaller companies.

In the Unix system field, some of the equity offers that smaller companies make are particularly attractive and therefore potentially troublesome for larger companies. For example, some small companies give employees an option to purchase a substantial amount of company stock at a token price. They can exercise the option when and if the company goes public and the stock has a greater market value than the option price. Most of the engineers who sign on with these companies hope to see a return in the range of $10,000-$100,000 from these options. No guarantees exist, of course; but employees get a free ride, and that is what makes the options attractive. It is a benefit that bigger companies just cannot match.

TRADE-OFFS FOR THE INDIVIDUAL

There are, and will continue to be, significant career opportunities in the Unix system market. For most individuals, alternatives must be weighed in terms of the following factors: (1) long-term potential gain, (2) short-term job satisfaction, and (3) personal sacrifice (risk, geographic location, and working hours). It is seldom possible to optimize all three of these factors in one job. A relatively high proportion of Unix system people tend to emphasize short-term job satisfaction.

Several "questionable beliefs" exist in the Unix system world concerning the job market, including the following:

(1) Large company equals job security. Wrong. Job security relates more to profitability than to company size.

(2) High-tech equals high personal marketability. Questionable. An individual who can write device drivers is more marketable that a system architect.

(3) Big-name employer equals enhanced marketability. Not necessarily. For marketability purposes, the type of experience is usually more important than the employer. Given current demand, it would be better to work on a Unix system port for any obscure company than to work on telecommunications switching applications for AT&T, Big Blue, or anyone else.

TOUGH DECISIONS

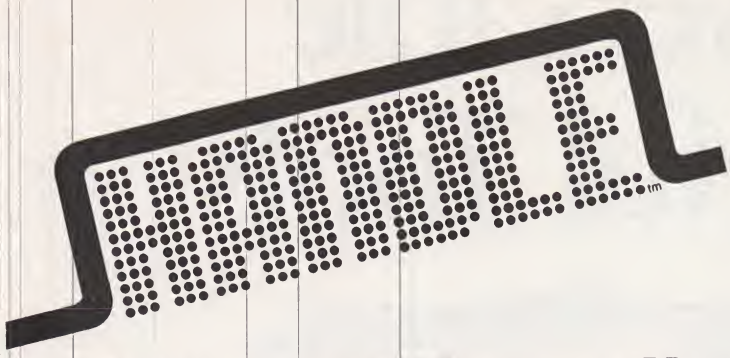
The crunch in the Unix system job market presents some tough decisions for both individuals and companies. In the future, there will not be enough technical talent to go around. Individual companies will prefer to hire an experienced person and let other companies worry about retraining employees or hiring rookies. Somebody will have to do the retraining, or each hire will simply create another vacancy somewhere else.

The small companies will continue to buy up expensive talent rather than to train their own. The big companies will cling to their wage and salary programs and will be forced to do even more of the industry's training. This is not all bad because there are many competent software people interested in the Unix system but not experienced with it. It is the larger companies, with greater personnel margins and softer budgets, that are most likely to give them a chance.

Individuals should be aware of the old maxim: Be careful what you want because you might get it. For example, if you make the lifestyle choice, you must accept the long-term consequences of possibly limited salary, career, and technical development. Career decisions made now are critical for the longer term. There is no benefit to simply having qualifications or credentials. You must put those qualifications together with a good job opportunity.

Many Unix system people will re-evaluate their priorities over the next few years as they see examples of fame and fortune achieved by others less talented than themselves. The trick is to be able to tell your grandchildren what it was that you did and not what it was that you should have done. □

Dave Small is president of Scientific Placement Inc., a Houston-based company that is a major placement firm for Unix system professionals.



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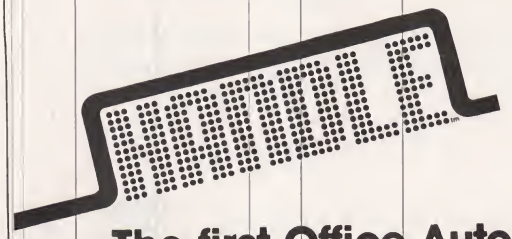

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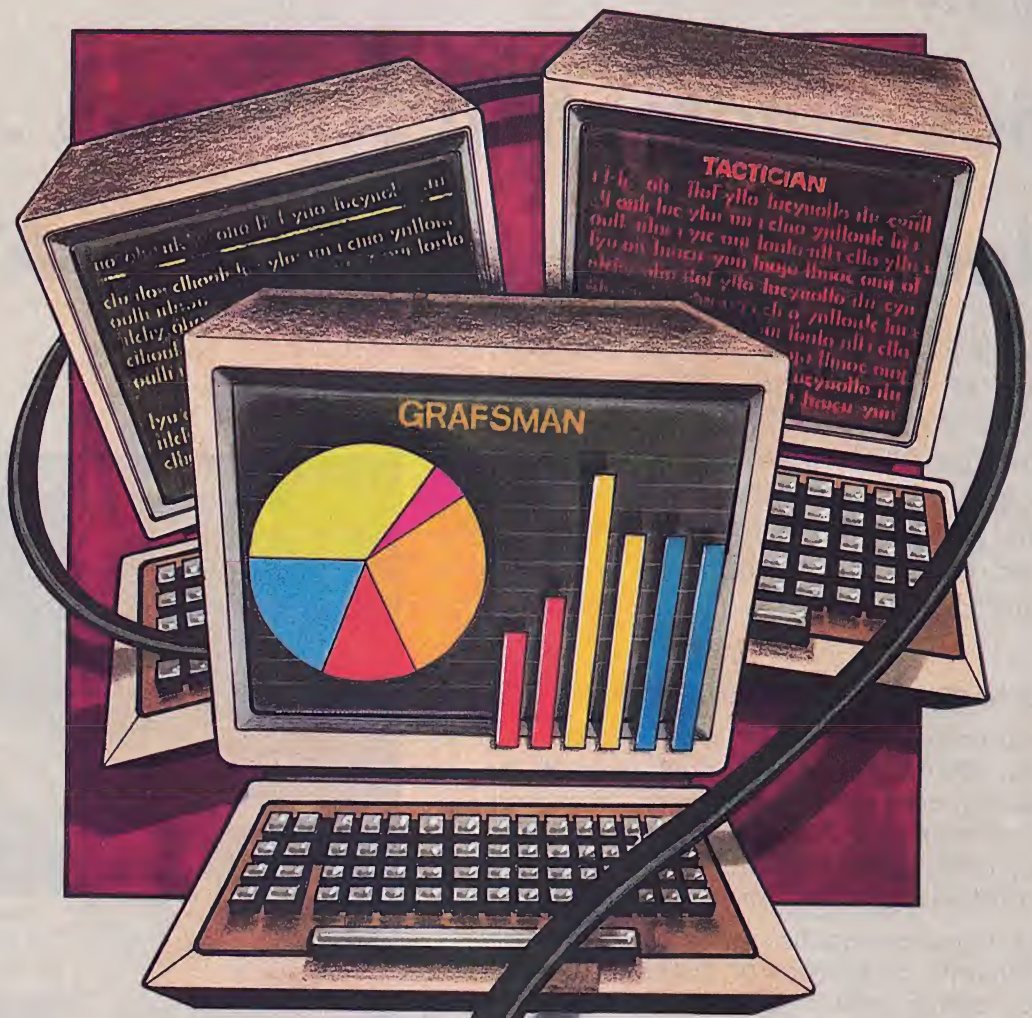

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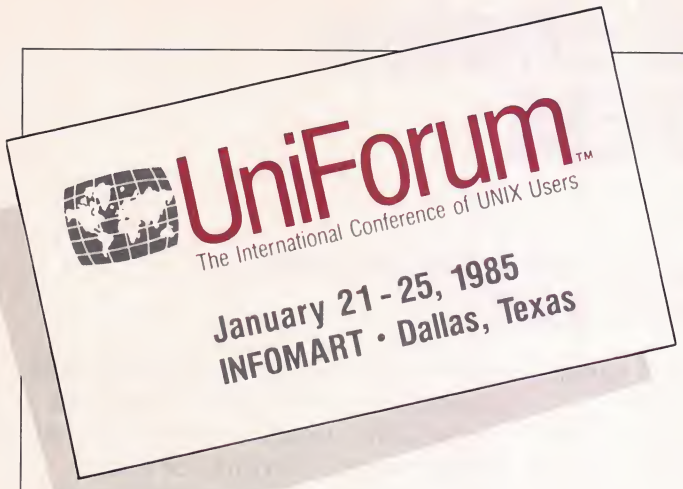

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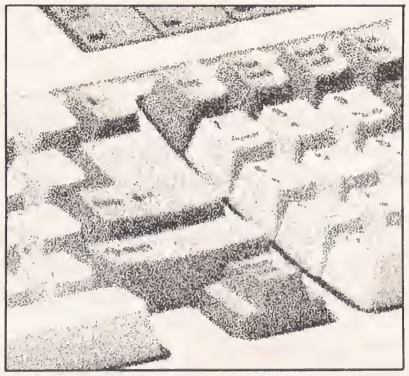
REVIEW OF THE ACUITY BUSINESS SOFTWARE PACKAGES

BY WILLIAM J. DONNELLY

The Acuity Software, originally developed by Irisystems, was first released in 1980 for use on a line of superminis. Now, however, it is being marketed by Computer Cognition, located in National City, Calif. Unix system implementations began in the first quarter of 1984. Most minicomputer sites use VAX VMS or Harris VOS, but among the compatible machines that use the Unix system are those from AT&T, Convergent Technologies (MegaFrame and MiniFrame), Motorola, NCR (Tower), Burroughs, Gould, Plexus, Charles River Data, and Digital Equipment Corp. (DEC VAX using Berkeley 4.2). Generally speaking, any M68000-based micro can run this software. It also requires the Ryan-McFarland run-time COBOL package, and it can be released for Version 7, System V, and System III.

The nine software modules currently available to run on the Unix system include (1) General Ledger, (2) Accounts Receivable, (3) Accounts Payable, (4) Inventory Management, (5) Customer Order Processing, (6) Bill of Materials Processor, (7) Purchase Order and Receiving, (8) Fixed Assets, and (9) Payroll. Modules one through three retail for $1000, and the remaining



Computer Cognition wisely advises new users to continue using their former systems until all problems have been ironed out.

modules cost $1500. Source code is also available for an extra $1000 per module. Project Cost Accounting, Labor/ODC Forecasting, and Work Breakdown modules, such as Shop Floor Control, are expected to be released soon.

All programs can operate on machines that have 256 Kbytes of main memory, and each system requires approximately 1/2 Mbyte of disk space, excluding data storage. Actual storage space obviously varies depending upon the amount of data that a company processes and upon its file-maintenance policies. To prevent system degradation, Computer Cognition recommends using more than one controller.

The programs are written to conform to the format of Moore Standard Business Forms, which helps to eliminate the long and sometimes tedious process of aligning forms before printing.

DOCUMENTATION AND USERS' MANUALS

Computer Cognition's manuals are easy to follow. The manual accompanying each module presents a brief introduction to related accounting topics and provides numerous examples of screen displays. Suggested step-by-step processes to follow in converting from a manual or other computer system are given for each module, and load sheets accompany each module to ease conversion.

In addition, Computer Cognition wisely advises new users to continue using their former systems until all problems have been ironed out. With rare exception, when users do not answer a program prompt, the programs default to the most logical assumption. This saves considerable time in data input because the operator is not required to answer a question and can move on to the next item.

Although the programs offer little flexibility for sorting or presenting data, they are sufficiently flexible to allow for users' future needs. In addition, users can offload data files to another system if they want to perform any additional data manipulation. A three-part method of user controls, program controls, and data file controls is written into the programs to provide computer security.

GENERAL LEDGER

The General Ledger module is based on four-digit main account numbers and three-digit subaccounts, which can be used to create profit or cost centers and accommodate multiple entities. Most users should be able to convert to this system easily. The General Ledger is very flexible. For example, it enables users to transfer data from other modules such as Accounts Receivable, Accounts Payable, or Payroll, eliminating the need to re-enter data. Depending on the user's needs, information can be entered on a summary or detail basis. Users can set up standard or recurring entries in which the transaction is either fixed or requires the entry of a new dollar amount for each accounting period. Automatic reversal of entries is also possible. Users can enter prior years' data, and budgeted data and historical data is easily transferred to the current year's files for comparison purposes.

The financial format is highly flexible—for example, any desired numbers can be singly or doubly underscored. In addition, up to 99 different texts are available for footnotes, headings, or opinions. Automatic allocations can be established and distributed to as many as 12 different accounts. You can express income-statement dollar amounts in percentages, and you can use up to 13 accounting periods. Current, budget, and historical data

can be printed for comparative analysis purposes.

A convenient feature that helps users prepare statements is an option to produce a general ledger worksheet. Users can easily produce a standard balance sheet and income statement, subsections of either in the form of supporting schedules, a statement of retained earnings, a statement of cash flow (sources and application of funds), and a statement of changes in financial position or changes in components of working capital.

I found only one weakness in the general ledger process: The system allows for the consolidation of multiple companies, but a general ledger worksheet cannot be prepared for this function. In sharp contrast to the rest of the users' manual, the section dealing with this portion of the module gives scant information about how it works. If your company has complex consolidation entries, I would suggest that you contact Computer Cognition for more details about this section of the module before you purchase it.

ACCOUNTS RECEIVABLE

Any accounts receivable module must enable users to enter invoices, apply cash receipts, compute finance and other charges, and enter debit and credit memos. With the Acuity system, you must buy the Customer Order Processing module if you don't want to generate invoices manually. This module lets you establish customer credit limits, and gives you a warning message if an invoice puts a customer's balance over his limit.

Master files by customer include ship and bill to addresses, phone numbers, individuals to contact, sales tax status, discount terms, shipping codes, payment terms, finance charge rates, and a salesperson code for later commission calculations. Cash receipts can be applied against an open account or specific invoice. One nice feature of this program is that a running balance of the amount of cash not yet applied is shown on the screen. This aids in applying the check to invoices. Open invoice work sheets can also be printed to simplify this task.

COMPUTER COGNITION REPLIES

In general, we find ourselves in agreement with the reviewer's comments. Accordingly, we thought it would be useful to supplement those remarks, in addition to replying to a few of the criticisms.

New modules. **In the next 60 days, we will be releasing the Project Cost Accounting module. The Acuity Payroll, A/P, A/R, and A/P Systems are integrated with Project Cost Accounting. A Work Breakdown Structure module is linked to the Project Cost module; this system is being improved and redesigned, and will be released during 1985. A major modification to Project Cost is underway that will provide commitments through the Purchasing and AP Systems.**

Also during 1985, Computer Cognition will be releasing Master Scheduling and Material Requirements Planning systems for the Unix system.

Interfaces. **At the recent West Coast UNIX Expo, Computer Cognition demonstrated a Unix system-PC link that allows for exchange of actuals, budgets, and comparatives from Acuity GL and Lotus 1-2-3. Spreadsheet interfaces will be released, where appropriate, for all Acuity systems. Also under development are a native-mode report writer and an interface to the relational database management system, Informix.**

Unix system implementation. **A great deal of care has gone into the Unix system implementation of Acuity. A proprietary file system overcomes all the limitations of Ryan-McFarland's V2.0 file system; system speed and integrity improvements are the result. The Unix system spooler is utilized; the printer may be locked out when special forms are being printed. A system log of all Acuity users is maintained. Background processing of longer jobs frees the terminal for other uses. Multiple companies are stored in multiple Unix system directories, so that site managers can effectively manage their disk space.**

Remarks. **1: A common use for the Bill of Materials Processor is to define a product structure so that the Customer Order Processing System can affect the inventory of multiple items based upon a single line item in an order; for instance, a set of bedroom furniture might consist of bed, dresser, mirror, carpet, etc. A customer might order just One deluxe bedroom set, and the system figures out all the pieces using BOMP.**

2: A new release of documentation for G/L Consolidation is being prepared.

3: Minicomputer pricing (for example, DEC VAX using Berkeley 4.2) is higher; contact Computer Cognition for details.

The Accounts Receivable module generates several useful reports, including customer listings, receivable open listing items, sales journals, cash receipts edit list and journals, finance charges journal, commissions due reports, general ledger distribution reports, sales tax reports, and sales analysis reports. Each of these reports can be by customer, customer type, sales volume, salesman, or state. When the project management system becomes available, users will also be able to produce reports by project.

Given today's emphasis on the timely collection of money, users will find the Accounts Receivable aging system a helpful tool. The system is flexible because users can determine the time periods used to age receivables. Users can also sort balances in several useful ways (including by salesperson) that can speed collection efforts.

ACCOUNTS PAYABLE

The Acuity system's Accounts Payable module can track the amounts owed to vendors and can aid management in making payments that maximize company cash flow. Accounts Payable tracks balances outstanding through the use of its accounts payable open item report and tracks agings by invoice dates or due dates. If users need information about a particular vendor, perhaps to answer a question raised in a phone call, they can make a vendor account inquiry and can call all the recent transactions with that vendor to the screen.

The program sets up payment due dates when vendor invoices are entered into the system. Prior to check preparation, a pre-check-writing report can be generated. Management can select those bills it wants to defer temporarily or permanently and can then run the check-writing program. Another useful report is the cash requirement report, which is particularly helpful to a company experiencing cash-flow problems. This report enables users to forecast expenditures, so they can modify payment dates or use the deferral feature mentioned above.

Users can offload data files to another system if they want to perform any additional data manipulation.

Another useful option is that users can set up recurring payments such as rent, insurance, or leases on a one-time basis and then include them in the Accounts Payable reports. This can save the considerable time and effort that it takes to prepare checks manually. Given the IRS' increased emphasis on the reporting of non-employee payments, you will be pleased to know that the system can print 1099 forms for those vendors you indicate are subject to such reporting. Again, this frees clerical personnel from an extremely time-consuming job.

INVENTORY MANAGEMENT SYSTEM

The Inventory Management module is set up primarily for distribution or closely related applications. In addition to multiple companies, it can also handle multiple inventory locations. Although users can enter the receipt of items directly into the system, Acuity recommends that the Purchase Order (PO) system be used for this function. Deletions from the system can also be entered directly, but the Customer Order Processing (COP) module is recommended.

If you purchase the PO and COP modules, you have an integrated system that can not only track inventory levels but can also become another management tool. If you don't purchase these two modules, you must determine if the time and effort necessary to enter additions and deletions manually is cost-effective and if it gives you sufficiently accurate inventory counts and dollar amounts.

The Inventory Management module has several useful features. For example, users can allocate available stock to specific orders. The program calculates safety stock and re-order points based on user-supplied information, but economic order quantity must be computed manually. One uncommon feature is a forecasting program that can be used to determine future needs. The user gives relative weightings to prior activity, and the program exponentially smoothes the data.

This module also includes an ABC analysis report, broken out by unit and dollar usage. It is not uncommon for 80 percent of sales to be generated from 20 percent of the items in inventory, and this run can aid management in categorizing its inventory into the three classes. This should help eliminate costly stock-out situations and indicate which items should be counted more frequently if cycle counting is performed. The module also allows users to prepare the tags necessary to perform cycle or year-end physical inventory counts.

When I entered receipts manually into this module, I did notice one weakness. If purchase cost is unknown at the time of receipt, the

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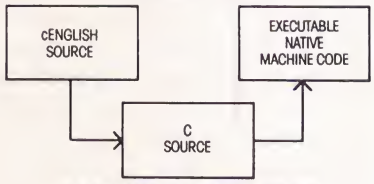

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SAMPLE cENGLISH PROGRAM

```
IDENTIFICATIONS
  MODULE:  Mininame
  AUTHOR:  bcs
  DATE:    8/29/84
  REMARKS: Sample cENGLISH program that adds first
           names to a file
END IDENTIFICATIONS

GLOBALS
  FIXED LENGTH 1 ans
  FIXED LENGTH 15 Fname
END GLOBALS

MAIN PROGRAM
  BEGIN
    CLEAR SCREEN
    SET ECHO OFF

    USE "NAMES"
    VIEW BY "ID_FNAME" ASCENDING

    AT 23,1 SAY "Add a record? Y or N"
    AT 23,25 ENTER ans USING "!"

    WHILE ans EQ "Y"
      CLEAR GETS
      AT 6,1 SAY "Enter first name"
      AT 6,20 GET Fname
      READ SCREEN

      INSERT
        Fname = Fname
      END INSERT

      AT 12,10 SAY "Welcome to cENGLISH," & Fname
      WAIT
      AT 14,10 SAY "HIT ANY KEY TO CONTINUE"
      STORE "                    " TO Fname
      STORE "  " TO ans
      AT 23,1 SAY "Add another record? Y or N"
      AT 23,30 ENTER ans USING "!"
      CLEAR ROW 1 THRU 23

    END WHILE

    AT 12,10 SAY "That's all for now!"
    UNUSE "NAMES"
    SET ECHO ON

END PROGRAM
```

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program defaults to the last price paid. This could cause problems in a standard cost system or if prices are constantly changing. A manual audit trail would have to be established to guard against such a misstatement of inventory and to ensure that files are changed once actual information becomes available.

CUSTOMER ORDER PROCESSING

The Customer Order Processing module covers customer orders from the order entry process through the billing cycle. This module is worth buying only if you have also purchased the Accounts Receivable and Inventory Management modules.

Regular and blanket orders are each entered through two different screens and invoices; credit memos are entered through a third screen. The program sets up 24 different fields for information pertaining to the order, and other fields exist for detailed line item and billing information. Given the number of available fields, this module should be adequate to handle most companies' requirements. Order acknowledgments can be printed once all information has been entered.

This module allows users to print picking tickets that can then be sent to the warehouse or stockroom and used as the source documents for pulling items to be shipped. When the tickets have been filled in, they can be sent back to the billing department, where they can become the source documents for preparing invoices.

The module also includes a consolidation program that enables orders to be consolidated so that one large order, rather than several small orders, can be sent. Users can review back orders periodically to see if they should be filled. Quantity discounts and pricing codes can be established based on customer, product type, or a combination of the two. Both can be changed easily, although, in my opinion, making such changes may be too easy. Using the security level codes discussed earlier could minimize this problem.

BILL OF MATERIAL PROCESSOR (BOMP)

This module generates lists of parts necessary to build higher-level assemblies or finished units. I made only a cursory examination of this program (noticing no significant problems, by the way) because every company establishes assembly levels and part numbers differently and because a Shop Floor Control program is not yet available for review. A program such as BOMP is only useful if it is fully integrated with an I/M and a Shop Floor Control program.

PURCHASE ORDER AND RECEIVING

This module covers the ordering and receiving of items that are necessary to conduct your business. It can be integrated with the General Ledger, Accounts Payable, and Inventory Management modules. The module can print purchase orders (POs) and can also handle the normal situation of ordering and receiving items in one complete transaction. It can also handle drop shipments against blanket POs. Change orders and cancellation of POs are included, and appropriate controls are present.

The receiving portion of the program allows for partial receipt, as well as the rejection, of received items. Data entry is streamlined: The PO being received against can be called to the screen, and the program defaults to the quantity received line.

Among the reports and options that this module generates are PO inquiry by vendor, PO edit lists, various purchase history reports, vendor performance analysis, a cash requirements projections report, scheduled receipt reports by vendor or item, and an audit trail report to track changes in master file records. As many as 999 line items can be put on one PO, which should be adequate for almost any situation.

FIXED ASSETS

The Fixed Assets module keeps a record of all office furniture and fixtures, equipment and machinery, buildings, leasehold improvements, and other similar assets. The program calculates depreciation on either the straight-line, 125-percent, 150-percent, or 200-percent declining balance, sum-of-the-year's-digits, units of production, or the Accelerated Cost Recovery System (ACRS) methods. The package includes bonus depreciation and the expensing provision that is currently allowed for federal purposes. You can also obtain projected depreciation to aid in budget preparation.

Although the Acuity package is superior to many in the marketplace, several items could be improved. Because most companies now keep different depreciation schedules for their books and for their tax returns, the Fixed Assets module establishes a file for each. However, in certain states, users may also require a state file. The Acuity package, though, does not contain this third file.

PAYROLL

In my experience, unless a company has approximately 100 or more employees, an in-house computerized payroll system is unlikely to be cost effective. One exception might be if the payroll system were well integrated with other financial modules. This is not true of the Acuity package: The Payroll module is currently integrated only to the General Ledger module.

Problems that will be encountered with an in-house payroll system include the need to make timely updates for federal and state changes in withholding amounts and in the dollar amounts subject to various taxes, security problems related to payroll files and checks while they are being printed, and the need to have checks ready on required dates.

When a payroll system contains a large number of employees, the costs associated with the previously mentioned problems are less significant. If this describes your situation, the Payroll module is a worthwhile purchase. The system can handle both salaried and hourly employee data; however, hourly input must break down hours into regular, overtime, or special—the program does not make such allocations.

Employee master files can contain over 100 different items, a useful feature when you have to answer any local, state, or federal inquiries about the makeup of your staff. The module sets up fields to cover the standard deductions for federal, state, and local withholdings. It also establishes other deductions, such as employees' share of medical, credit unions, savings bonds, garnishments, and so on. Extra fields have been provided for any

unusual deductions. Payroll checks can be printed once the operator is satisfied that all data is correct and that the checks have been aligned properly for printing.

CONCLUSIONS

Once you have sorted through the sales literature, salesperson's promises, users' manuals, and performed some hands-on work with the packages, the most critical question of all can be answered: Does the software work?

In my view, this Acuity package would perform well for a distribution company in the 40- to 500-employee range. A light manufacturing company might find the package useful if it can handle shop floor control (SFC) manually until the SFC module becomes available. For a service or heavy manufacturing company, I recommend that you buy another package, unless the company can wait for the release of Shop Floor Control.

If you are examining the modules individually, you should remember that the high degree of potential integration does not mean that you cannot start with one module and add others as you need them. Before you purchase any of the modules, though, you should ensure that a majority of the modules will suit your needs. □

William J. Donnelly, CPA, holds undergraduate and graduate degrees in accounting. He is currently a lecturer at San Jose State University and is a doctoral candidate at Golden Gate University. Before spending several years as the chief financial officer of a Silicon Valley electronics firm, he spent four years in public accounting with two Big Eight CPA firms.

This month our reviewer reveals a deep, dark secret.

UX-BASIC

BY BRUCE MACKINLAY

Why use BASIC on the Unix system? When you have C, the Bourne shell, `sed`, `yacc`, `lex`, and the host of other Unix system tools, why would anyone ever want to use BASIC on the Unix system? If your answer is that you have a program written in BASIC and you don't want to rewrite it, then you should check out UX-BASIC.

Because UX-BASIC is compatible with OASIS BASIC, you should be able to move from OASIS to the Unix system without translating your programs into C (as long as you wrote your applications in OASIS BASIC).

Furthermore, the UX Software people intend to write a whole series of BASIC translators for different BASICs. These programs will translate foreign BASIC into UX-BASIC, allowing people who have applications in IBM BASIC, DEC BASIC-PLUS, or even Microsoft BASIC to move to the Unix system with little effort.

There are other reasons to use BASIC under the Unix system. Thousands have learned to program in BASIC on inexpensive microcomputers, and most of these people will not learn a new language; they just don't have either the inclination or the time. Also, BASIC is great for ad hoc programming. You can whip out a BASIC program where other tools don't work.

And what about programming

FIGURE 1: BINARY SEARCH IN C

```
#define TABLESIZE 10
main();
{
  int Table[TABLESIZE] = {1,2,3,4,5,6,7,8,9,10};
...
  printf(''The index is %n
  (-1=fail)\n'',Binary(5,Table,TABLESIZE);
...
}


int Binary(Number, NumTable, Size) /* find the n'th work in
sorted table */
int Number;     /* the number to find */
int NumTable[]; /* the list of numbers to search in */
int Size;       /* and the size of the array */

{
  int Low = 0;
  int High = Size-1;
  int Mid;


  while(Low <= High)
    {
    Mid = High-Low/2;
    if (Number < NumTable[Mid])
      High = Mid - 1;
    else if (Number > NumTable[Mid])
      Low = Mid + 1;
    else
      return(Mid);
    }

  return(-1); /* -1 indicates failure to find a
match */

}
```

FIGURE 2: TRADITIONAL MINIMAL BASIC BINARY SEARCH

```
10 DIM T(10)
20 DATA 1,2,3,4,5,6,7,8,9,10
30 FOR I=1 TO 10
40 READ T(I)
50 NEXT I

...
1000 S=10
1010 N=5
1020 REM Call the binary search routine looking for N in S
elements
1030 GOSUB 9000
1040 PRINT ''The index is'';M;''(-1 = fail)''
1050 GOTO 9999

...
9000 REM Subroutine to search the first S elements of T[]
for
9001 REM the value N. If found leave the value in M,
otherwise
9002 REM make M=-1.
9003 REM
9010 LET L=1
9020 LET H=S
030 IF L>H THEN 9120
9040 LET M=INT((H-L)/2)
9050 IF N>=T(M) THEN 9080
9060 LET H=M-1
9070 GOTO 9030
9080 IF N=T(M) THEN 9130
9090 LET H=M+1
9100 GOTO 9030
9120 LET M=-1
9130 REM returning the side effect M=index value
9140 RETURN

...
9999 end
```

by nonprogrammers? You know, the people who haven't spent years studying programming, trying to become superprogrammers. For these people, BASIC is simple, direct, and understandable. So the answer is YES, there are good reasons for BASIC under the Unix system.

PROBLEMS WITH BASIC

Figures 1, 2, and 3 show examples of the same program fragment in C, in traditional BASIC, and in UX-BASIC. The fragment of traditional BASIC clearly demonstrates some of BASIC's problems, while the UX-BASIC fragment shows that UX-BASIC solves many of these problems. (The C fragment is there for comparison.) It is clear to most programmers that the C code is much easier to read and that it should be easier to maintain.

Traditional BASIC is very hard to read for a number of reasons. (In fact, after I wrote this fragment of BASIC code, I was not at all sure that it worked; I had to get out an old BASIC interpreter and test the code.) The one- or two-character variable names are not descriptive, and you cannot use white space to logically group the code into digestible pieces.

Also, the flow control structures are very limited; you have to use IF and GOTO *almost exclusively*, turning the BASIC program into a

rat's nest of branches. In addition, traditional BASIC does not have subprograms or functions. You have to use the GOSUB statement, passing all variables via global side effects. I used REMarks to document the function call, entry and exit. But even with the REMarks, the subroutine was very unclear.

Although UX-BASIC is easier to read than traditional BASIC, C is still much better. But UX-BASIC does allow programmers to use multicharacter descriptive variable names. You can even use the dot (".") character to allow white space in the variable name. In fact, the variable name can be any length, but only the first 32 characters are significant.

C allows variables to be any length, but only the first eight characters are significant. C also allows the variable name to be mixed uppercase and lowercase. Some C compilers limit you to seven significant characters, some to more than eight.

With UX-BASIC you still can't insert white space in your code to make it clearer, and it does not allow blank lines. Also, it places spaces in a code line according to its own rules. UX-BASIC has an INDENT command to indent the code, making the structure clear. In Figure 1, the C code indented the `if` statements to indicate an `if-case` structure. UX-BASIC indented it assuming a normal hierarchal `if`. The INDENT command is an improvement over traditional BASIC, but total control is still better.

READABILITY

UX-BASIC's readability could be improved in a number of ways. First, UX-BASIC could allow blank lines. You can see from the sample C fragment that blank lines greatly improve the readability. Also, the ability to place any number of spaces between words and symbols allows the programmer to group equations, again improving readability. Finally, there is no need for a statement number on every line. Some BASICs provide multiline statements.

Allowing the programmer to enter the text in mixed uppercase and lowercase would be a good move. You can see from the example that uppercase is very dense and that reading uppercase is tiring. The C code uses the mixed case to make it very easy to distinguish between variables, constants, and reserved words. Reserved words are in lowercase, variables are in capitals, and constants are in uppercase.

UX-BASIC has a wealth of flow control structures. (See Figure 4.) These structures, while not as flexible as C's flow control structures, make it possible for a programmer to avoid almost com-

UX Software intends to write a whole series of BASIC translators for different BASICs.

FIGURE 3: UX-BASIC VERSION OF BINARY SEARCH

```
10 DIM NUM.TABLE%(10)
20 DATA 1,2,3,4,5,6,7,8,9,10
30 MAT READ NUM.TABLE%

...
1000 PRINT''The index is'';FNSEARCH%(5,10);''(-1 = fail)''
1010 END

...
9000 DEF FNSEARCH%(NUMBER%,SIZE%)\REM Subroutine to search
the first SIZE%
9001 REM elements of NUM.TABLE%[] for the value NUMBER%. If
found
9002 REM return the index, if not return -1
9003 REM
9010 LET LOW% = 1
9020 LET HIGH% = SIZE%
9030 WHILE LOW%>HIGH%
9040    MID% = INT((HIGH%-LOW%)/2)
9050    IF NUMBER%<NUM.TABLE%(MID%)
9060      THEN HIGH% = MID%-1
9080      ELSE IF NUMBER%>NUM.TABLE%(MID%)
9090        THEN HIGH% = MID%+1
9100        ELSE FNSEARCH% = MID%
9110          GOTO SEARCH.EXIT
9120        IFEND
9130      IFEND
9140 WEND
9150 FNSEARCH% = -1
9160 SEARCH.EXIT: FNEND
```

pletely the goto statement. UX-BASIC also provides a way to document the branching using statement labels. In the UX-BASIC fragment, I used a GOTO statement to exit the function. By labeling the FNEND statement, I made it clear (at least as clear as the C code) what I intended. I could have used the SELECT–CASE statement to make the meaning even clearer. (To see what the UX-BASIC code would become, see Figure 5.)

I included the DEF SUBroutine and DEF FNunction statements in

FIGURE 4: FLOW CONTROL STATEMENTS IN UX-BASIC

```
CALL SUBname(argument-list)

DEF SUBname(argument-list)
  statements
SUBEND

DEF FNname(argument-list)
  statements
FNEND

FOR index TO limit [ STEP value ]
NEXT index

GOTO label      or   GO TO label
GOSUB label     or   GO SUB label

IF expression
THEN
  statements
ELSE
  statements
IFEND

ON expression GOTO label-list
ON expression GOSUB label-list

SELECT expression
CASE expression
  statements
OTHERWISE
  statements
CEND

WHILE expression
  statements
WEND
```

FIGURE 5: USING THE SELECT–CASE STATEMENT, THE UX-BASIC CODE BECOMES:

```
SELECT
 CASE NUMBER%<TABLE(MID%) \HIGH% = MID%-1
 CASE NUMBER%>TABLE(MID%) \LOW% = MID%+1
 OTHERWISE FNSEARCH% = MID%
   GOTO SEARCH.EXIT
CEND
```

FIGURE 6: 1 MILLION FOR- LOOP TIMER IN C

Source Program:

FOR1M—For 1 Million timer prog.

This is the classic nested for-loop timer program coined by Professor Fabry. There are several articles in UNIOPS' *Pipes & Filters*, and /usr/group *Comm-Unixcations* referencing this particular loop.

```
main()
{
    register int i,j,k;
    for (i=0;i<10000;i++)
      for(j=0;j<100;j++)
        k++;
}
```

Results: CPU time = 23.8 seconds

FIGURE 7: 1 MILLION FOR- LOOP TIMER IN UX-BASIC

Source Program:

```
10 FOR I% = 0 TO 10000 STEP 1
20    FOR J% = 0 TO 100 STEP 1
30       K% = K%+1
40    NEXT J%
50 NEXT I%
60 END
```

Results: CPU time = 462.6 seconds for integer variable
CPU time = 16832.7 seconds for floating-point variables

the list of flow control statements because this capability is very important in any attempt to structure code into useful, digestible chunks. Without the ability to define multiline subroutines with arguments, the program tends to become one large mass of seemingly unrelated statements.

The GOSUB statement is worse. Not only does it have all the same problems as the GOTO statement, but it also hides a subroutine's structure. Subroutines have clear entry and exit points; also, they use local variables and passed arguments. The GOSUB has none of these features. Using the traditional GOSUB statement tends to bury the subroutine within the bulk of the BASIC text, making it invisible. The UX-BASIC DEF SUBroutine statement makes the structure much clearer and defines the arguments passed to the subroutine; the only thing lacking is the ability to have local variables.

HOW SLOW IS BASIC?

Traditionally, BASIC has been very slow (at least when compared to either C or assembly language) because BASIC is an interpreted language. This means there is a program that reads the "source" BASIC text and immediately executes it, without any translation. With C and other compiled languages, the program is translated by the compiler into the native machine instructions, and the compiled instructions are run directly by the machine. The big difference is that there is this extra program (the interpreter) between the BASIC code and the native machine.

Programs written under BASIC are easier to write and debug. With UX-BASIC you load the interpreter and start entering statements. At any point you can test the program—running it from any point, stopping it at any point, and looking at the contents of any variable. There is certainly a great deal of freedom. With C, you are forced into a cycle of editing, compiling, running, and reviewing the results of the run.

Because compiling takes too long and because you can't easily stop a running program to look at a variable, it takes much longer to write a program. Some versions of BASIC also provide true compilers that translate the BASIC into native machine instructions. In theory, this should allow you to have both a nice development environment and fast production programs. UX-BASIC does provide a "compiler," but this program does not seem to improve the running speed of a compiled program.

Giving up a little performance to decrease programming expense makes a lot of sense, but the bad news is that many BASICs are very slow, some up to 100 times slower than C. To get a feel for how slow UX-BASIC is, I converted some of the Aim benchmarks into UX-BASIC. I discovered that a simple 1 million times for-loop (see Figures 6 and 7) ran 19 times slower in UX-BASIC than it did in C.

I made this measurement using "compiled" UX-BASIC on the AT&T 3B2. I measured the time (with my stopwatch) for noncompiled BASIC and got almost identical results. The compiler only protects the BASIC code.

PROGRAMMING AND DEBUGGING

UX-BASIC provides even more development tools than does the typical BASIC interpreter. One of the most powerful features is the BREAK command, which lets you set breakpoints in the BASIC program. A breakpoint is a trap that causes the program to suspend (break) when the trap is triggered.

Although UX-BASIC is easier to read than traditional BASIC, C is still much better.

You can set the trap after a specific line or variable is used or changes. You can even request the breakpoint at the *n*th occurrence of a line or a variable, or even when a variable exceeds a specified range. Once the program suspends, you can look at or change any variable, enter more statements, and resume the program with a CONTINUE statement.

There is also a STEP command that allows you to single-step the program, executing a single statement at a time. This makes it even easier to diagnose a sick program and correct its problem. You never have to recompile, and you don't have to place debugging statements in the code. In addition a TRACE statement displays the statement number when the statement is executed.

One feature of BASIC that is often overlooked is the very specialized line-oriented editor. UX-BASIC has added features to the typical BASIC editor to make it easier to work on programs. One of my pet peeves with typical BASIC is the problem of making massive changes to the code. Typically, I want to change a variable name throughout the program to make it more descriptive. This would normally mean making the changes one state-

ment at a time or editing the BASIC text with a general-purpose editor (and leaving BASIC). With UX-BASIC, you can make this sort of change using a CHANGE command.

There are also a bunch of commands to edit single statements. There is a LOCATE command to find a string in the text, a MODIFY command to edit a single statement (so you don't have to type it back in), and commands to move around in and modify the text. With these commands you really don't need the power of vi. If you want to enter a shell command from the interpreter, you can simply use the CSH command, so you never have to leave the UX-BASIC interpreter.

Two more important commands make it easier to write and maintain UX-BASIC programs. The RENumber command lets you change the statement numbers in a BASIC program while preserving any references (via a GOTO or GOSUB statement). The other is an XREF command. This command prints a cross-reference showing the statement references (what line referenced what line) and a list of where and how every variable was used.

RANDOM FILES

One of the least standardized areas among different BASICs is that of file capabilities. UX-BASIC provides three file-access methods. The first is the typical sequential text file. You can INPUT from and PRINT to a file, but there is no way to move the file pointer and update a section of the file.

The other methods are random and Indexed Sequential Access Method (ISAM) files. Both of these types of files have fixed-length records, and you can INPUT and PRINT any record by supplying the

UX SOFTWARE REPLIES

Errors:

UX-BASIC does allow blank lines, provided that the first character is a blank space. This is mentioned twice, under the subheadings "Problems with BASIC" and "Readability."

UX-BASIC does allow multiline statements; however, each line must have a number. This is mentioned under the "Readability" subheading.

UX-BASIC does support local variables in DEF SUBroutines. As in FORTRAN, arguments are passed by reference. This is mentioned once under the "Readability" subheading.

Comments:

We are flattered that you have compared UX-BASIC to C, in addition to traditional BASIC. We will have released UX-BASIC+ by the time this article is in print. UX-BASIC+ was designed to be an alternative choice to C for application programming. UX-BASIC+ more than addresses the shortcomings you have indicated in your article.

With UX-BASIC+ users will have access to the full set of features C-ISAM provides, such as the ability to read files by the first, last, next, previous, and closest key, and, of course, a multikey access capability. Users will also have access to C-ISAM files generated by other languages and products, such as Micro Focus COBOL or Informix.

Users will have access to many Unix system calls as well as standard libraries, for example, plot(3X) graphic subroutines, including the low-level I/O that Mr. Mackinlay indicated was a must. In addition to our standard data types, BCD, integer, and string, all the other data types found in C will be implemented; short and long integer, float, double, character, and structures.

Mr. Mackinlay is correct in saying that the present compiler provides essentially a security feature; however, we will be releasing a new compiler and run-time module in the first quarter of 1985. The new run-time module will execute programs three to five times faster than the current interpreter. Incremental improvements in the interpreter will also be made.

Mr. Mackinlay mentions that strings are handled in two ways, when, in fact, there is a third way that is probably the most important. UX-BASIC allows for up to three levels of subfielding within strings and provides a series of functions for processing this ability. EXT$ returns, DEL$ deletes, INS$ inserts, and REP$ replaces a subfield within a given string.

With respect to your timing runs, our tests show that when using floating point variables, UX-BASIC executes 2.5 times faster (on the 3B2) than does an equivalent C program with float variables. This is due to our BCD floating-point arithmetic operating on 13-digit precision numbers.

Finally, an apology about the create command. This command was renamed uxcreate to prevent conflict with a utility of the same name and is documented in the installation manual. Unfortunately, we neglected to provide Mr. Mackinlay with this manual. The entire manual, however, is being updated for the UX-BASIC+ release, where this and other documentation problems will be resolved and corrected.

correct key. With random files the key is simply the record number; in ISAM files the key is an index into the file. For example, the ISAM key can be a name, and you can find the record based upon a name.

The only feature missing from the ISAM files is the ability to read backwards. With both of these methods, you must create the file using a `uxcreate` command before you can use them. The ISAM is implemented using RDS' C-ISAM package. In theory, you can use the same ISAM files with UX-BASIC and INFORMIX (RDS' database manager). In fact, UX-BASIC was designed to make it easier to add new access methods. It should be possible for UX-Software to add interfaces to many of the most popular database packages.

Missing from file-access methods is very low-level disk I/O. There is really no way to simulate low-level disk I/O using random files. Also, the other access methods are not very efficient; true low-level disk I/O would be very efficient.

Under the Unix system you should be able to seek to any byte and read or write any number of bytes. Having low-level disk I/O means that you could write routines that could read any file accessible by the Unix system. One of the Unix system's best features is the I/O system. But because UX-BASIC lacks low-level disk I/O, the UX-BASIC is kept from using the Unix system's full power. Even with the very nice ISAM and random files, UX-BASIC has some serious disk I/O problems.

Both random and ISAM files provide a form of record-locking. UX-BASIC locks the record when it is `INPUT` and unlocks it when the next operation is performed on the same file. This is a very important feature when you consider that many Unix systems do not provide any form of record-locking (mandatory for any multiuser business program).

BUSINESS FUNCTIONS

UX-BASIC provides a number of business functions and tools. The `PRINT USING` statement allows you to print using most of the common formats There are so many different ways to print a number that I can't reasonably list them. There are trailing debit and credit signs, angle bracket (">") for negative numbers, floating dollar signs, and many, many more.

There is a whole set of `DATE` and `TIME` functions to convert a numeric date/time into different printable forms. You can also do date and time arithmetic. There is even a way to retrieve the current system time and date. In addition, a set of general screen-handling functions allows you to write portable BASIC programs that can be used on many different terminals. You can create fairly complex screens, including protected fields (if your terminal supports them). And you can do this without having to send a single ESCAPE sequence to the terminal.

Strings are handled in two ways in different BASICs. The most common method is to use functions to manipulate strings. Commonly there are `MID$`, `RIGHT$`, and `LEFT$` functions to extract different parts of a string. The other camp uses a string range; for example, `A$[5:7]` is a string composed of the fifth through the seventh characters of `A$`. Since UX-BASIC does not want to offend either camp, it does both.

Personally, I like string ranges; they are more flexible than functions. If you have `DEF FN`unctions, then you can define the string functions using string ranges, but there is no way to simulate string ranges with functions. UX-BASIC also supplies a string concatenation operator (for example, `C$ = A$&B$`). Besides the common string functions, there are a whole bunch of useful string functions.

UX-BASIC provides a whole set of powerful array manipulation statements. There are also ways to ma-

COMPANY OVERVIEW

Company name:	**UX Software Inc.**
Public/private:	**Privately held**
In business:	**Since December 1983**
Headquarters:	**10 St. Mary Street, Suite 301 Toronto, Canada M4Y 1P9 416/964-6909**
CEO and President:	**Frank Shu**
Director of Marketing:	**Mark Burnstein**
Director of Sales:	**Birgit Vogelzang**
Major support centers:	**Toronto, Canada**
Major funding:	**$500,000 from founders and equity partners**

nipulate bits, including functions to shift and rotate integers. Along with functions to convert an integer to hex, octal, or binary, there are, of course, all the typical scientific and trigonometric functions.

DOCUMENTATION

The documentation comes in a loose-leaf binder the size of a PC manual. Most of it is a reference manual in which each command, statement, and function is listed separately in alphabetical order. The first 70 pages contain an overview of UX-BASIC, including sections on disk files and the `PRINT USING` statement. A lot of details are presented in this introduction, which should be read very carefully.

The manual assumes that the reader already knows BASIC and only wants the special features of UX-BASIC. Since there are so many excellent teach-yourself BASIC books available, I applaud UX-Software for not trying to be everything to everybody.

In the middle of the book are a number of short example programs that are a good demonstration of UX-BASIC's unique features. But I do have one complaint: In many places the manual refers to a `create` command, but I could not find any details about this command. Since the `create` command is used to create random and ISAM files, it was very hard to figure out how to make one. Luckily for me, I am fairly creative and like puzzles.

Oh, about that deep and dark personal secret....I cut my teeth as a programmer on an HP-2000 using BASIC (long, long ago on a distant planet). I also worked for two years as a systems programmer using BASIC-PLUS. Although I don't like to admit it, there are times when I long for the free and easy days under BASIC. (The only programming environment that I've liked better has been Franz LISP, which I used when doing some programming at UC Berkeley.) So what does all this prove? It proves that I will go to any length to get people to read my articles.

On the more serious side, if you want to use BASIC on the Unix system, then UX-BASIC is a good choice. As BASICs go, it is pretty good, but it does have room for improvement. The ability to take many different subroutine packages and weld them into BASIC will make it a very powerful addition to the already large arsenal of Unix system tools.

The extensions from traditional BASIC make it much better for application development, and the debugging tools for BASIC make it even easier to write programs. Finally, and most important, the ability to take your existing BASIC application and run it under BASIC without major rewriting makes this tool a winner. □

Bruce Mackinlay, a frequent UNIX/WORLD contributor, studied computer science, electrical engineering, and math at UC Berkeley. His most recent work for the magazine, a review of AT&T's 3B2, appeared in Vol.1, No.6.

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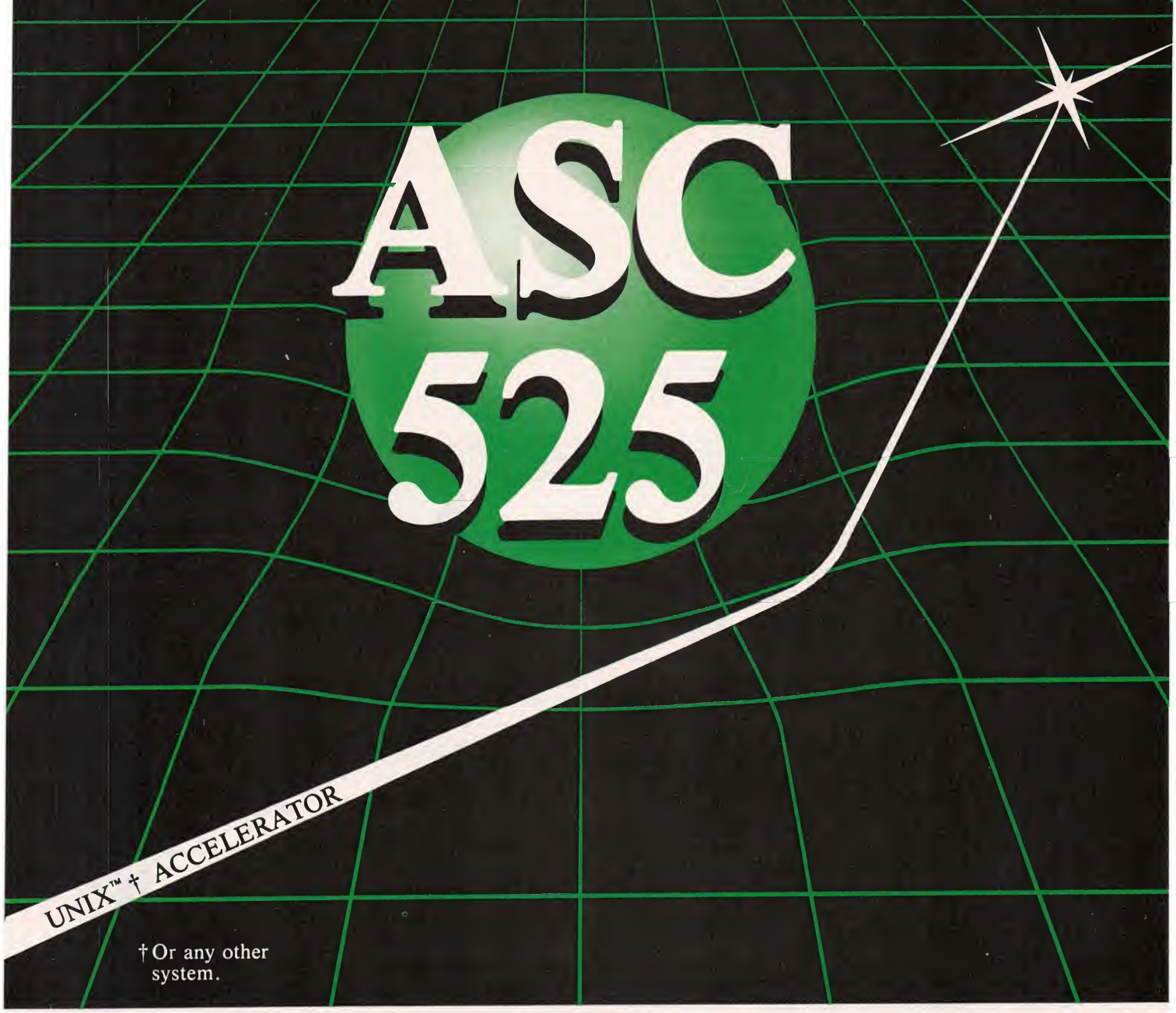

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PSEUDO-DEVICE PROVIDES SNA COMMUNICATIONS FOR THE UNIX SYSTEM

BY ROBERT A. HEATH

As the Unix operating system becomes more widespread in small-business systems, the need to add mainframe interconnection grows in importance. Where data communication in business requires IBM's Systems Network Architecture (SNA), overall coverage implies both interactive and batch-oriented capability. SNA is not part of the "standard" Unix distribution from AT&T Bell Labs, but once added, its applications play well with standard Unix system utilities. Integrating SNA within the Unix system requires a balance of application software and kernel pseudo-devices to accommodate both SNA layering concepts and the Unix system architecture.

Systems Network Architecture is one of a number of modern data communications architectures that depend on a concept of interdependent layers (see Figure 1). These architectures specify electrical interfaces at the lowest layers, up through applications at the highest levels, which are typically software or workstation users. Layering offers a better division of end-user, networking, and data link control functions over older bisynchronous protocols.

The Unix system, which does not readily accommodate SNA layering, is composed of three layers: the *shell* (a command interpreter), the *user processes* (loadable C language applications), and the *kernel* (resident scheduling and I/O primitives). The Unix system is more oriented to batch processing than to the real-time processing that data communication requires.

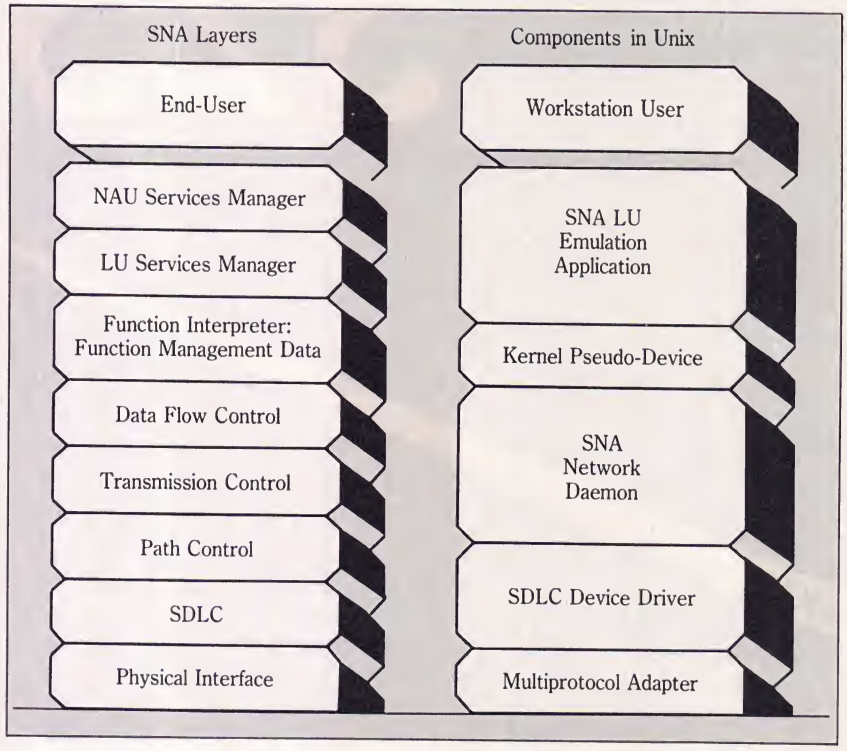

FIGURE 1: Interdependent SNA layers compare with Unix counterparts. Separate Unix applications embody highest SNA layers while Unix background process implements lower network layers.

One side effect is that the Unix system restricts interprocess communication. Serial byte streams called *pipes* are the chief interprocess communication paths for user processes that conform to a parent/child relationship. Because the data flow of various unrelated applications must converge for SNA networking, pipes are awkward. Thus, the problem is twofold: (1) how to distribute five layers of SNA within three layers of the Unix system and (2) how the layers can communicate.

Because the Unix system discourages true vertical software layering, creating the architecture for a pseudo-device within the kernel can bridge the path from the applications to the networking functions in a horizontal arrangement (see Figure 2). Within the Unix system, individual user-invoked applications embody the highest SNA layers—the NAU Services Manager, the LU Services Manager, and the Function Interpreter for Function Management Data.

A Unix system *daemon* (background application process) implements the lower SNA layers. These

are the Data Flow Control, the Transmission Control, and the Path Control. The foreground and background processes then communicate through the pseudo-device, relieving them from the restrictive parent/child relationship. When these components are shown in classic Unix system fashion, the data flow actually weaves in and out of the kernel when crossing SNA layers rather than following a uniformly upward or downward path.

DAEMON IN THE BACKGROUND

The pseudo-device buffers the multiple SNA applications from the SNA daemon. Presenting each application with its own device, known in SNA as a Logical Unit (or LU), it multiplexes data into a single data stream for the SNA daemon. Funneling the SNA application streams through the kernel, the pseudo-device's functions are minimal: SNA networking logic is deferred to the daemon. This approach reduces the size of the kernel, which is always core-resident. This shifts the memory required for SNA to the daemon, whose memory can be swapped out or even freed when not in use.

The SNA daemon is a background application that is brought up at start-of-day. It executes invisibly, whether or not workstation users are actively running the SNA applications. This allows it to reply to host requests on behalf of the applications, even if the applications have not been brought up.

The daemon implements the Transmission Control and Path Control Layers, which are the networking protocols of SNA. Data Flow Control regulates the order in which the host and the terminal send data; Transmission Control paces the arrival rate of data for a particular application; and Path Control merges the distinct data streams into a single stream for the data link control and combines segmented packets into larger data units.

The SNA daemon also embodies the characteristics of an SNA Physical Unit (PU) Type 2, the prevalent terminal node type in use nowadays. From the mainframe's point of view, it prescribes the variety of SNA protocols used. For instance, it dictates that the format of Path Information Unit (SNA packet) exchanged contains sequence numbers and abbreviated session addressing.

A PU Type 2 implies the presence of a Physical Unit, an entity with which the network management functions in the host can exchange messages aside from conversations with the main applications. Last, it provides for multiple, addressable Logical Units (SNA applications). Within the node, the SNA daemon exchanges SNA packets through the synchronous data-link control (SDLC) driver. In contrast, the user-loaded applications define the personality of the SNA Logical Unit.

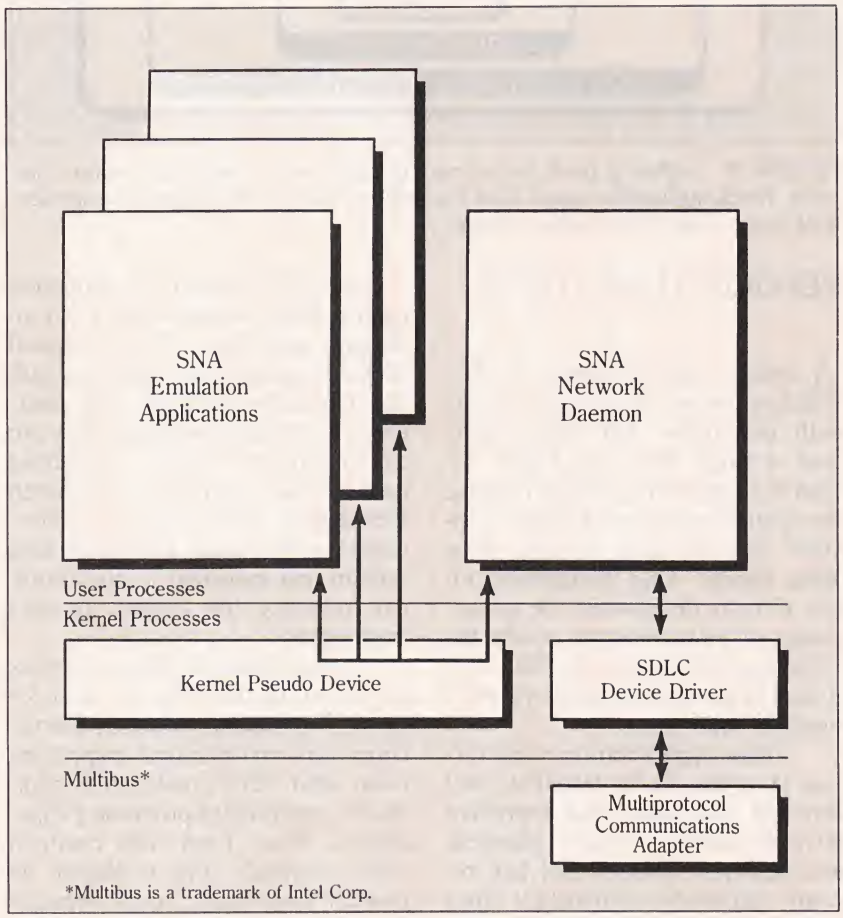

FIGURE 2: Pseudo-device bridges SNA layers in horizontal arrangement within Unix. Data flow actually weaves in and out of kernel when crossing SNA layers.

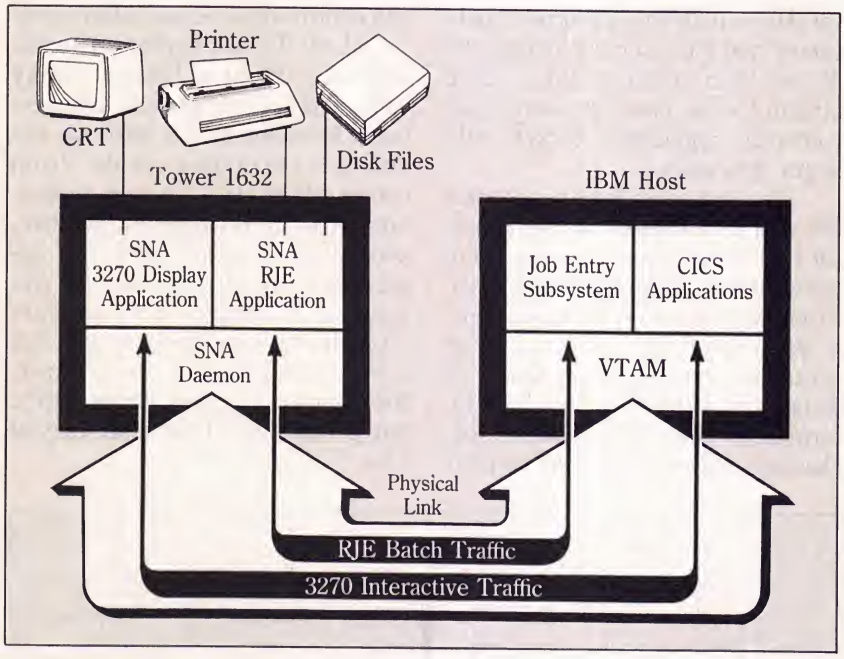

FIGURE 3: Combining batch and interactive traffic over a single line reduces line costs. Batch applications reuse Unix line-printer facilities while interactive applications reuse Unix video display software.

REDUCING LINE COSTS

Another improvement of SNA over bisync is that it can mix both interactive and batch traffic over a single line (see Figure 3). This is a major cost savings because the system owner must lease a separate line for each service when using bisync. This multiplexing effect directly determines the organization of SNA software within the Unix system because the data flow from independent applications must mesh at some point.

These applications emulate various LU types. In the traditional IBM terminal products, LUs represent devices such as displays, printers, and punches. Though IBM has recently introduced terminal LU types that represent programs, the simpler device LUs are easy to implement.

IBM 3270 interactive communications have become a de facto industry standard. The original product consists of a cluster controller, intelligent displays, and printers. The product's strong points are its intelligent displays, featuring field-oriented screens. Distributed formatting logic allows screen-control orders to be sent in the data stream and executed at the terminal, reducing the amount of data transmitted.

Local editing of display screens avoids interaction with the host for every keystroke. Modern microcomputers and personal computers often offer 3270 emulation in addition to general data-processing capabilities. When used with common ASCII terminals, this is known as *protocol conversion.* Some versions of the Unix system include utilities to simplify emulation of 3270 screen management.

Current ASCII terminals typically offer field-oriented screens with varying degrees of formatting and editing. Berkeley versions of the Unix system provide widespread software support for these common, readily available ASCII video terminals. This library of terminal capabilities, known as `termcap`, allows an intermixing of a manufacturer's terminals to attach to the Unix system.

Reusing both ASCII terminals and `termcap` support, an IBM 3270 Display Application on the Unix system emulates the screen formatting and keyboard functions of the IBM product. During 3270 emulation, the application, rather than the terminal, polices key-in privileges into protected and unprotected screen fields.

Because ASCII terminals seldom duplicate the 3270 key set, the emulation must map multiple ASCII terminal key sequences to achieve the richer 3270 keyboard repertoire. The display emulation is structured as a user-loadable application so that all workstations can freely enter and exit from this role without permanently dedicating the workstation as a 3270 display.

VALUE-ADDED FEATURES

The Unix system simplifies the addition of value-added features over the standard 3270 product. As with many interactive Unix system programs, workstation users can escape to and return from a shell during 3270 processing. Alternately, the user may send a printout of the displayed screen image to the local printer without requiring authorization from the host.

A 3270 Printer Application cooperates with the screen-oriented IBM 3270 display emulation. Clas-

sified as an SNA LU Type 3, because of its 3270 printer data stream, the program cycles as a background task, awaiting printouts from the host. By reusing the Unix line printer spooler, lpr, it readily merges host-originated printouts with local printing. Because printing within the Unix system is spooled to disk, the 3270 printer application always appears ready to accept another printout from the host.

An alternative to the 3270 printer is the LU Type 1 printer. This application differs in its use of the standard SNA Character Set rather than the 3270 character set. Other than this, it functions similarly, receiving printouts from the host.

For bulk data transfer between an IBM mainframe and terminals, IBM 3770 remote job entry has become a de facto standard. Remote job entry to IBM hosts is not new to the Unix system. The standard RJE utility in Unix System V relies on HASP multileaving bisync and a front-end processor known as the Virtual Protocol Machine (VPM) to communicate with a mainframe.

Replacing the System V RJE's protocol logic with an emulation of the IBM 3770 results in a new version known as SNA RJE. This approach preserves the familiar Unix system `send` and `gather` commands for their ability to consolidate job decks from component files. Like the standard Unix system RJE, SNA RJE spools user jobs bound for the host and alerts users on returning printouts via `mail` or `write` commands.

By running the SNA Remote Job Entry application, any Unix system user's workstation can emulate the console of an IBM 3770 terminal. Classified as an LU Type 1 in SNA, this program allows the user to send job decks to the host from a disk file as if they came from a card reader. In turn, the host can return an output listing to the user's terminal, a disk file, or the Unix system's line printer.

Similarly, punch data from the host is routed to a Unix system disk file rather than to an actual card punch. Because data transfer is spooled to disk files, the user's workstation is freed to run other applications in the meantime. In general, the Unix system's software development facilities make it an excellent satellite development system to a larger host when complemented by remote job entry.

SDLC DEVICE DRIVER

Figure 2 shows an SDLC device driver, which is a true device driver rather than a pseudo-device because it controls communications hardware. Like all device drivers, it resides within the kernel and supports the standard system calls: `open`, `close`, `read`, `write`, and I/O control (`ioctl`). The `ioctl` function permits device-specific I/O calls to be designed when new drivers are added to the Unix system. In this case it extends the standard system calls to include such operations as reconfiguration, diagnostics, session control, and statistics gathering.

The SDLC driver's role as a character device is a misnomer because its read and write functions actually transfer whole blocks of SDLC information rather than a character at a time. In SNA terminology, these data units are known as Basic Transmission Units or simply BTUs. Managing the SDLC functions for SNA, it generates and checks frame level sequence numbers, replies to polls from the host, and queues data to and from the SNA daemon.

Because most of the driver's processing is done at interrupt priority, it can respond to time-critical message processing. This is in contrast to the networking software, which has no time constraints at its level of protocol. The device driver's lower interface is to communication hardware.

In a small-business computer, the communication adapter requires an on-board microprocessor to offload time-critical operations from the parent processor. At this level, critical events such as buffering characters between USARTs and the parent processor memory are synchronized with the line bit rate and must be handled in real time.

Keeping up with SDLC's characteristic multiple contiguous frames also demands quick response. Likewise, under SDLC protocol the host continuously polls the terminal for data. For these reasons a separate communications processor optimally offloads this repetitive task, which would soon degrade the parent processor.

In the Unix system environment of the NCR Tower 1632 computer, layered communications are adapted by introducing special-purpose routing software as pseudo-devices and by partitioning layers into applications and daemons. This technique particularly suits SNA. However, other standard protocols such as X.25 (which likewise features layering and multiplexing) can be added in a similar fashion. As their popularity increases, intelligent communications processors can completely offload both lower SNA layers and data link control protocol functions, more closely imitating layering schemes in software. □

Robert Heath is a senior consulting analyst who has edited a number of NCR corporate engineering standards in data communications. Currently he architects and implements networking software for the NCR Tower 1632. In his spare time, Robert enjoys running, reading, chess, gardening, and relating to his personal computer.

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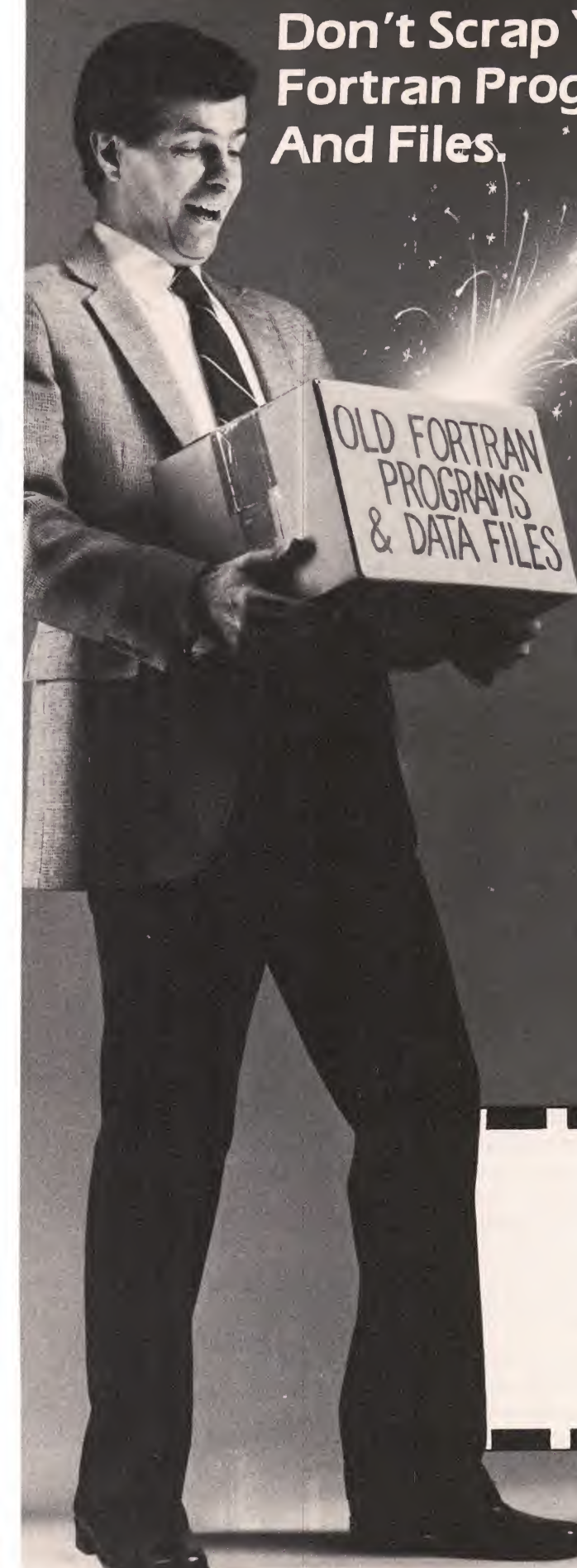

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Despite its shortcomings—and they are numerous —`troff`* offers a way to produce professional-looking documents while lowering typesetting costs.*

PLANNING FOR SUCCESS WITH

BY CAROLYN S. CLODFELTER

Why have many software companies decided to put their `troff` to use? Consider the following: the current availability of device-independent `troff`, the market pressures for typeset documentation, and the very high cost of out-of-house typesetting services. If arrangements are made for output, if deadlines are set for producing a manual, and if personnel are appointed to actually do the `troff` typesetting, the project is as good as done. . . or is it?

Underestimating the difficulty of a typesetting project is a frequent error that companies new to `troff` typesetting make. But anticipating the probable pitfalls and planning around them can help ensure the production of a successful, timely, low-cost, *and low-strain* documentation project.

Keeping a document's overall layout and design simple is the single most important thing a company can do to guarantee the success of a `troff typesetting project`. However, this tends to be easier said than done. A simple format contains only one or two levels of headings and paragraphs, few tables and illustrations, and uses a standard layout throughout.

A handful of macros, either from one of the standard macro packages such as `-ms` or from a customized package, will then suffice to process the document. Using the basic macros (which are bundled packages of commands) of either the `-ms` or `-mm` macro packages and manipulating the appropriate register values can create typeset documentation fairly easily.

A SPECIFIC FORMAT

But perhaps you have a specific format in mind? Frequently, a company will try to match the style of a previous manual that was typeset out-of-house. Or perhaps a graphic designer has been retained to design the overall layout of the manual. Does the graphic designer have any idea at all of the general

Troff

capabilities (and idiosyncrasies) of troff? Is the format of this previous manual so complex that it might be extremely difficult to match using troff? Why would there be any problem using troff to match a document previously typeset professionally? Most typesetting houses use equipment that is totally dedicated to typesetting.

A general understanding of some of the differences between troff and these conventional typesetting systems will help here. The typesetting systems produced by such companies as Compugraphic, Merganthaler, AM, and Itek have what is referred to as *counting systems*. That is, they provide the typesetting operator immediate and interactive feedback of such considerations as actual line endings, overset tabs, and headings.

troff, on the other hand, provides no feedback during the stage where commands and text are being entered and furnishes only minimal error messages during processing. Only after the file has been run through an output device can operators see what they have created. This tends to cause a lot of rerunning of files and, at times, endless tinkering with commands, point sizes, line lengths, and so on.

Despite its lack of interactive feedback, troff's macro capabilities can help compensate for this drawback. A macro can be created for each particular formatting situation: main and subheads, running headers and footers, initial paragraphs, subparagraphs, and so on. Well-constructed macros can reduce or even eliminate the problem of no interactive feedback because most of the decisions can be handled internally by troff.

However, each time the layout differs from the basic format (*special cases*), operators must tinker with the closest macro or use troff primitives and again hope that what they get is what they wanted. Obviously, the frequent use of such special cases in a document's format can significantly overburden the typesetting operator. Remember:

troff operators can see what they have created only after the file has been run through an output device.

The fewer the number of operator decisions required during typesetting, the faster the document will be produced.

HUMAN RESOURCES

Who will be doing the actual troff typesetting? Quite frequently, there is a programmer in-house who has had some experience with one of the macro packages (such as –ms or –mm) or perhaps even some nroff experience. By default, a typesetting project will then probably be assigned to this person's domain.

But take a hard look at the realities here. Has this person ever manipulated or "customized" any of the macro packages? Writing and debugging macros is no small task, often requiring tedious and seemingly endless testing and, frequently, a deep understanding of troff and how it works. And does this person have any facility with even the basic typesetting parameters such as point sizes, vertical spacing, and picas? Does this person have the time available to dedicate to a typesetting project, or will he or she be primarily involved in the last-minute research and development processes for the product?

Often, the actual typesetting is considered to be a task somewhat clerical in nature, and an available word-processing operator may be assigned to be trained by the above-mentioned programmer. A frequent solution is for the programmer to write a *setup file* containing all the necessary macros, strings, and registers.

The setup file can be designed to work in conjunction with –ms or –mm, or it may stand alone. The word-processing operator can then be trained in the application of troff, and this particular setup file may be sourced (or read in) at the beginning of each text file.

Remember, though, that using troff is not word processing and that typesetting is not clerical work! Typesetting involves successfully manipulating literally hundreds of parameters, and troff only complicates this process by its general "unfriendliness."

Word-processing operators can be shown how to create even highly complicated documentation, but doing this successfully requires a realistic assessment of time, resources, and support. It is quite possible that the person selected to actually do the troff typesetting has never seen nroff or troff, has never heard of a *pica* or an *en space,* and thinks that a buffer is something found in aspirin.

And remember, troff documentation is written in a way to make it almost totally inaccessible to nonprogrammers. If the person actually creating the troff files is not experienced in using troff, it is imperative that the document's format be kept simple.

TIME AND TRAINING TOOLS

Don't overburden your typesetting operator by placing an unreasonable due date on the documentation. Expect that it will take several weeks to learn the basics of troff well enough to have some idea of what to do when things go wrong. *And expect that things will go wrong!* Give adequate time for testing macros, and anticipate that files will need to be rerun to correct format peculiarities.

One of troff's advantages is that the automated pagination process allows for last-minute revisions of the documentation without upsetting the whole format. In the long run, troff can save a lot of time. But initially, troff can be slow going, and adequate time should be allotted both for the learning phase and for the actual text processing.

Be forewarned that troff documentation is almost totally incomprehensible to nonprogrammers.

Because the standard documentation that comes with troff is generally impenetrable by a nonprogrammer, training tools need to be secured from other sources. If there is no troff expert in your company, perhaps a consultant or trainer can be located for an in-house troff training seminar. Or perhaps the consultant can write a setup package for your documentation and can train personnel in its application.

Another approach is to consider using the software package AT&T has available (Documenter's Workbench), which is based on –mm and which offers much improved troff documentation as well as a comprehensive tutorial. Numerous good books are available that are helpful with training or as reference resources. A review of the books addressing the subject of Unix system text-formatting utilities is beyond this article's scope, but some good discussions of nroff and –ms are available.

Most of what applies to nroff will also apply to troff, although troff requires some additional understanding and commands that are unnecessary for nroff. (Unfortunately, there aren't any books available offering in-depth troff information that can be generally understood by nonprogrammers.) Of course, reading, digesting, and applying the ideas addressed in these texts would take a good deal of time, but reading specific sections can be very helpful in explaining the basics to a person unfamiliar with troff.

CONCEPTS

Beyond the basic typesetting concepts such as point size, fonts, character widths, and so on, there are certain concepts peculiar to troff that are essential to understand. One conceptual hurdle for people accustomed to word processing is the difference between what is on their screen and what is printed out. Unless troff is in no-fill mode, the "what you see is what you get" analogy does not apply.

troff processes text by collecting words from the input and by filling an output line with as many words as it can fit in that particular line length. When troff encounters a word too long to fit on that particular line, it decides whether or not to hyphenate. The words on that line are then adjusted for either justified or ragged margins, depending on what has been requested.

A break command (or a command that causes a break) will cause the printing of a partially filled output line, and subsequent text will appear on a new line. Unless troff encounters a break or a word too long to fit, it will continue to fill an output line. A murky understanding of breaks, filling, and adjusting is sure to cause the beginner a myriad of problems.

Defaults frequently cause much confusion for troff novices. The concept of a default is very basic, but don't assume a person intuitively knows that different commands may have different dimensions and values as defaults. Getting in the habit of always requesting specific values and dimensions is a good place to start. When output is not what was expected, check to see if a default value is still in effect.

Learning to typeset using –ms tends to be much easier for a beginner than learning –mm because –ms has far fewer strings and registers to be manipulated. Understanding how to use strings and registers is basic to using any macro package, however, and beginners frequently don't see the connection at first. For example: Why did –ms ignore the line length they specified by the troff primitive for line length? Why did the point size for the –ms paragraph change back to 10 point when they had used the troff command for point size 12 just before they did a ".PP"?

It is not always obvious to a new troff user that the –ms macros always return to either the default values or to the values specified by the appropriate strings or registers. Learning how to mix troff primitives and –ms macros is good training material and makes for a much more creative and flexible typesetting operator.

WHY USE troff?

Considering troff's shortcomings, one might legitimately wonder if a company should plan on using troff to typeset documentation unless the firm has a programmer available to dedicate most of his or her time to a typesetting project.

It is true that some support will be necessary, either from an in-house programmer or from a consultant or trainer. The various strings and registers for the specific style of pagination need to be defined, and this can become quite complex. Macros may need to be modified or created—not usually a job for a novice.

But much of this work can be done by a programmer, and once the setup for a job has been completed (if the layout is simple!), the actual text and commands can be easy to input. It is also true that, unless a realistic time schedule has been set, deadline after deadline may come and go before the documentation is available.

But there are many good reasons to develop the capacity for in-house troff typesetting capabilities, and it does not necessarily require dedicating all of one programmer's time to do so. It makes good economic sense to develop troff because if you have the Unix system, you have troff —and with it the opportunity to beat the high cost of professional typesetting. Considering the availability of low-cost laser output, even short-run publications can be typeset and can present the professional image the market is now demanding.

The person chosen to do the troff typesetting may think a buffer is something found in aspirin.

Furthermore, you retain control of the documentation process. Last-minute revisions are easier to handle, and the setup file you use for one manual can be used again or slightly modified to create later versions or new documentation following the same basic format.

Once you have in-house typesetting, you will find more and more uses for it. Brochures, addenda, even letters for which word processing used to be "good enough" can be professionally typeset. And, of course, the more your personnel use troff, the better they will become. Creative, cost-effective, and time-saving strategies will be developed, and more complicated projects can be undertaken. Take the time to get off on the right foot with troff, and you will find you get a lot of mileage for your initial investment. □

Carolyn Clodfelter is a freelance troff *consultant who lives with her husband and children in Portland, Oregon.*

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Quality is why Intel, DEC and Wang chose to distribute MWC86. These industry leaders looked and compared and found Mark Williams to be best.

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MWC86 is the easiest to use of all compilers. One command runs all phases from pre-processor to assembler and linker. MWC86 eliminates the need to search for error messages in the back of a manual. All error messages appear on the screen in English.

A recent review of MWC86 in *PC World*, June, 1984, summed it up:

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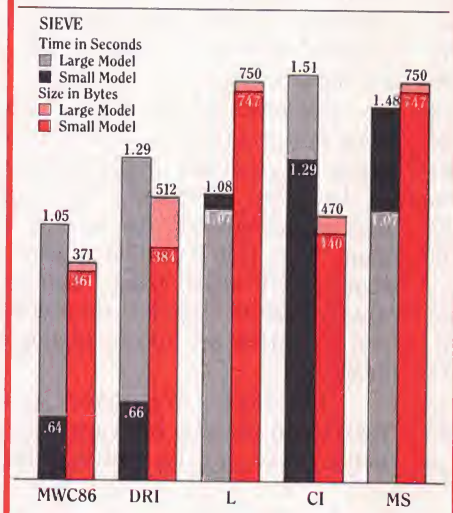

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THE CAPITOL SHELL ASSOCIATION

BY SUSAN DUGOFF

Capitol Shell's major aim is to organize the end-user community in the metropolitan Washington, D.C., area, which appears to include New Jersey, Boston, and New York. In addition, a number of people have joined because they might want to attend a meeting if they happen to be in the area.

Capitol Shell members have a broad range of interests in Unix system-inspired products. These interests include the concerns of end-users, vendors, technologists, government agencies, and technical OEMs. Just as member interests span the spectrum of concerns, so does the membership span existing user groups, including members of long standing from the Washington, D.C., Unix User's Group, USENIX, /usr/group, UNICORN, and Software Tools.

As the umbrella organization for disseminating information concerning Unix-inspired products, Capitol Shell has scheduled several monthly seminars, ranging from highly technical discussions concerning design strategies to practical comparisons and demonstrations of existing products.

The Capitol Shell Association is organized into several working groups, including a program working group, a facilities working group, a public relations working group, and a publications working group.

The program working group is further broken down into "special interest areas," which are designed to promote the flocking together of "birds of a feather." The first areas to be initiated: end-users, technical and OEMs, government, and industry and products.

The founding executive committee consists of the following people: Dennis Benson, National Library of Medicine; Susan DuGoff, Potomac Systems Resources (public relations committee chair); Neil Groundwater, Analytic Disciplines Facilities (working group committee chair); Bob Koski, Rising Sun Systems; Walt Lazear, MITRE (financial committee chair); Mike O'Dell, Group L (program working group committee chair); and Rick Wilder, CALCULON (publications working group committee chair.) □

Susan DuGoff is currently the vice president of Potomac Systems Resources Inc., a systems integrator to the federal marketplace. She is also a member of the board of directors of /usr/group and of Capitol Shell's executive committee.

APPLIX NEXT-GENERATION OFFICE SOFTWARE

Applix Inc. has introduced Alis, a next-generation office software system that combines the integrated PC applications with the information sharing benefits of communications-based office automation systems.

The new office software system runs on the Unix system and is targeted for resale by large OEMs in the computer and telecommunications industry. Alis features advanced applications that make extensive use of computer intelligence, sophisticated communications facilities for group support, a consistent multiwindow user interface, and a highly portable, open-system design.

Alis is based on a concept called active integration, which allows the user to combine different types of information such as text, drawings and business graphics, spreadsheets, and database information into a single document while retaining the ability to edit each kind of information in its original form.

Alis' use of computer intelligence increases the level of support provided to the user. For example, Alis' Intelligent Document Composer with multiple-font support provides continuous intelligent formatting assistance during text creation and editing. This capacity lets the user focus on the content instead of document formatting and, for the first time, makes multifont documents easy to create.

Another capability offered with Alis is universal graphics editing, or the ability to edit all graphics in a consistent graphical way at any time. The Universal Graphics Editor combines a freestyle drawing capability with the ability to draw standard business charts automatically and provides a consistent way to edit graphical information.

Alis' spreadsheet features in-

clude a built-in equation-solving capability, on-screen editable business graphics, and automatic interspreadsheet references.

The personal database application allows office users to create and manage office information such as lists, records, and reports. Databases can be defined and modified at any time.

Alis also offers integrated electronic mail and information sharing capabilities that enhance group communications. Its high-level networking applications exploit the advantages of the Unix system's multiprogramming facilities.

Another capability is Alis' Automatic Office Assistants, which transform office systems into active management aids. Alis monitors information within the office network. When a user-described condition is recognized by an Assistant, it carries out a user-defined task. For example, a user can specify that he wishes to be notified if a project specification in a shared filing cabinet is changed. This matter will then be handled automatically by Alis.

Alis offers a user interface consistent across all applications. It provides sophisticated facilities to the user of bit-mapped workstations while also supporting character-oriented terminals. The bit-mapped workstation user is provided with multiple, overlapping windows that can be user-sized and positioned.

Alis also provides a high degree of redundancy in the user interface between the use of mouse- and keyboard-based operations. As a result, users can easily use the interface most suitable to a particular function.

Alis is written in C and initially runs on the Unix operating system. It can support a wide variety of hardware, including Unix system-based bit-mapped workstations or PCs and multiuser Unix systems supporting users at terminals.

Alis is priced at $1,350 per user for bit-mapped workstations and $900 per user for terminal-based users. Quantity discounts are available. The product was scheduled to become available to OEMs in mid-November.

For more information, contact Applix Inc., 302 Turnpike Rd., Southboro, MA 01772, 617/481-4721.

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MOSAIC DEBUTS HIGH-PERFORMANCE GRAPHICS COMPUTERS

Mosaic Technologies Inc., a 15-month-old startup, has unveiled its first product offering: a complete line of 32-bit graphics computer systems for individual users in the CAD/CAM, CAE, CAP geophysics and other technical applications markets.

The products Mosaic introduced are the SVS 100 series, a desktop configuration comprising four models, and the SVS 200 series, which is a deskside version, again with four models. Both series offer two black-and-white and two color monitor options.

The deskside 200 series supports larger ECC memory and disk drive capacities.

The 100 and 200 series share a consistent architecture based on Mosaic's proprietary 32-bit system memory interconnect (SMI). The SMI is designed to optimize the integration of Mosaic's CPU, graphics processor, memory/video, and peripheral controllers.

Mosaic's architecture supports system performance with separate read and write buses with a sustained 48-Mbit-per-second aggregate bandwidth.

As the heart of Mosaic's open architecture, the SMI is the common interface for all major Shared Vision System components, allowing for easy system upgrading, expansion, and user-specific applications customization.

All Mosaic systems feature the new NS32032 microprocessor, whose symmetric instruction set delivers faster execution time for applications written in high-level languages. The complementary NS32082 demand-paged memory management unit and NS32081 floating-point processor further enhance systems performance.

In addition to the CPU, Shared Vision Systems include a proprietary graphics processor (GPU) based on the Advanced Micro Devices 29116 bit-slice microprocessor.

Other industry-standard hardware components common to all Mosaic systems include Ethernet, Multibus, and RS-232 interconnects.

All of the systems come standard with the CPU, 16 Kbytes of high-speed cache, the GPU, 1 or 2 megabytes of error correcting code random-access memory, an 85-Mbyte Winchester disk drive, a 45-Mbyte streamer tape, a 106-key keyboard, and either a black-and-white or color display monitor. Options include ECC memory expansion to 8 Mbytes, expansion to four 85-Mbyte disk drives, a 1-Mbyte flexible disk, an optical mouse, and a data tablet.

The software for the Mosaic family of products is based on the Mosaix operating system, a licensed derivative of AT&T Bell Laboratories' Unix system. The adaptations found in Mosiax include optimization for virtual memory and support for the /usr/group interface.

Another user-oriented feature is the Mosaic window manager, which allows simultaneous display of several independent applications. The system also includes a menu utility for easy composition and manipulation of user menus.

Mosaic systems also support C, FORTRAN-77, Pascal, CCA-EMA editor, and Fusion network software.

Mosaic said it began shipping the Shared Vision Systems in Au-

gust to beta sites. Single system end-user pricing for the eight workstations has been established, with a price range from $25,900 to $42,900. Volume OEM base system prices start at $18,300. The products were to become available for general delivery in October.

For more information, contact Mosaic Technologies Inc., 47 Manning Road, Billerica, MA 08121, 617/667-2383.

Please circle Reader Service Number 2.

SYNTACTICS UNVEILS DOCUMENT MANAGEMENT SYSTEM

Syntactics Corp. has announced a comprehensive, Unix system-based document management system that provides easy-to-use document creation and retrieval capabilities for the multiuser office environment.

The new office productivity software package—called CrystalSeries, the Document Management System—will enable business users of Unix system-based micros and minicomputers to perform a variety of sophisticated document-creation functions—e.g., word processing, calculations, and generation of business forms—within a consistent, friendly environment. The package will also allow rapid access to documents, wherever they reside in the system.

The package's ease-of-use stems from its "object-based" design. The system identifies the "object" the user is working on, whether it be a type of document (a report, presentation, manual, letter, memo, form, etc.) or a particular structure within a document (a sentence, paragraph, block quote, list, return address, table, etc.). Users can also define their own objects, and, with only a few keystrokes, they can insert objects from within a document into other documents.

CrystalSeries also provides an office with a "document database" supporting a broad range of sophisticated document-handling facilities. These facilities include (1) a word processor based on Syntactics' recently released CrystalWriter program; (2) TextMerge, a feature for merging text and mailing addresses; (3) a spelling corrector; (4) an outline organizer that generates multilevel outlines from randomly entered notes; and (5) a list manager that permits lists in either personal or general directories to be augmented and modified.

The CrystalSeries also includes a user-friendly "business shell" interface that provides on-screen help at all times; easy forms creation, permitting users to tailor forms; ActiveForms, a feature enabling OEMs, value-added resellers, and end-users to build on-line help and special soft function keys into forms; open architecture, permitting users and applications developers to integrate CrystalSeries with application programs of their own choosing; easy access to a Unix system-based relational database management system and application programs; and computational capability, allowing spreadsheet data to be incorporated into a document and calculations to be performed within the document.

The initial release of CrystalSeries, the Document Management System, will run on the most popular Unix-based systems, including computers from Altos, AT&T, Callan Data Systems, Codata Systems, Convergent Technologies, Cyb Systems, Data Systems Design, DEC, Dual Systems, NCR, Pacific Microcomputers, Plexus, and Pyramid Technology.

CrystalSeries will be available second quarter 1985 and will be priced at $2,500 for microcomputer systems supporting from 3 to 16 users. Current users of the CrystalWriter word processor can upgrade to CrystalSeries for $1,500. Quantity discounts are available, and pricing for other systems will vary. Syntactics will continue to support CrystalWriter.

For more information, contact Syntactics Corp., 3333 Bowers Ave., Suite 145, Santa Clara, CA 95054, 408/727-6400; outside Calif. 800/626-6400.

Please circle Reader Service Number 3.

NIS PROJECT MANAGEMENT FOR FORTUNE

National Information Systems has announced the VUE computerized project management system for the Fortune 32:16 system.

VUE project management offers an interactive system that provides a convenient tool to plan and manage single or multiple projects. VUE allows either precedence or I-J notation and uses the critical path method of scheduling. VUE is an easy-to-use, menu-driven system that project managers can use to generate "what if" scenarios, modify information to get different perspectives on their projects, and respond to unexpected developments with new schedules and strategies.

VUE reports show the impact of changes in timing, cost, and resources on activities and on the project as a whole. These reports can be generated on CRTs, printers, or plotters with the plotter graphics option. Other options available for VUE are multiproject capability, time-scaled network diagram, and custom report generator.

The system has been installed at over 100 sites and now runs on Fortune, Unix, IBM VM/CMS, DEC 10/20, VAX (VMS and Unix), PDP-11, HP 3000, Perkin Elmer 3200, and Honeywell DPS-6 and DPS-8. VUE is available for perpetual license at prices ranging from $5,000 to $26,000, lease or time-sharing, and can be evaluated for 30 days on your own computer.

For more information, contact National Information Systems, 20370 Town Center Lane, Cupertino, CA 95014, 408/257-7700.

Please circle Reader Service Number 4.

UNIX UTILITIES FOR CIE SYSTEMS 680 BUSINESS MICROS

CIE Systems has introduced a set of software system tools that provide a number of functions in addition to the standard Regulus utilities on the 680 family of multiuser business computer systems.

The CNIX utilities are derived from the original Unix System III and System V source code, and they provide additional functions not available with Regulus. These include a full-screen editor, called `vi`, the Source Code Control System (SCCS), Unix-to-Unix copy (`uucp`), and the Bourne shell.

For more information, contact CIE Systems, 2515 McCabe Way, P.O. Box 16579, Irvine, CA 92713, 714/660-1800.

Please circle Reader Service Number 5.

DSSP TELEMARKETING CONNECTION

Donald Sheldon Systems Products has introduced a new Unix system-based management program designed for telemarketing professionals.

The interactive DS/TMS allows phone personnel to automatically dial and record data in an "electronic notepad." This database can contain such information as reminders of customer conversations, notes on follow-ups, and orders. The systems also automatically sends follow-up letters via the U.S Postal Service's next-day E-COM mail service.

DS/TMS stores names and phone numbers in an electronic file that can be scanned, updated, and managed from any terminal in the system. Programmed to be used with simple one- or two-key commands, the system requires no previous computer experience or expensive training sessions. All instructions are clearly displayed on the screen, along with phone lists, note files, follow-up "tickler" files, reference materials, and more.

The system also connects the telemarketing operation to the phone company's extended services with a built-in PBX. Without additional equipment, DS/TMS makes interoffice calls, connects third parties to calls, and can transfer calls to other extensions or phone numbers. Calls are dialed by touching a single key on the computer keyboard and can be redialed by touching another key.

For more information, contact DSMS Inc., 11777 San Vicente Blvd., Suite 502, Los Angeles, CA 90049, 213/207-1600.

Please circle Reader Service Number 6.

TWO NEW DATA TERMINAL DEVICES FROM TRS

Tandy Corp./Radio Shack has announced the DT-100, an ANSI 3.64-compatible display terminal, and a 9600-baud serial-to-parallel converter.

The DT-100 offers a full range of user features, has a compact ergonomic design, and is fully software-compatible with the DEC VT-100. Thus, it will work correctly with the vast majority of DEC- or Unix-based software systems. Also included is a built-in serial printer port with programmable baud rate.

The 9600-baud serial-to-parallel converter allows Radio Shack's broad line of parallel printers to be used with the DT-100's serial printer port.

The DT-100 includes a 14-inch screen with a high-resolution character set for improved user satisfaction. The low profile sculpted keyboard features a redesigned cursor key layout and VT-220-compatible editing keys along with 16 programmable function keys.

The full 128-character ASCII character set and single embedded video attribute (underline, reverse, or dim) further enhance the DT-100's capabilities. The DT-100 supports 80- or 132-column by 24-row displays that make previewing 132-column reports before they are printed an easy task.

Included with the DT-100 is a TRS-XENIX-compatible diskette that includes an `/etc/termcap` entry to allow effective utilization of the DT-100 with the TRS Model 16 computer operating with TRS-XENIX. (TRS-XENIX is TRS' Unix system-based multiuser operating system.)

The DT-100 retails for $795, and the 9600 baud serial-to-parallel converter retails for $99 at Radio Shack Computer Centers, Radio Shack stores, and participating Radio Shack dealers.

For more information, contact Tandy Corp./Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102, 817/390-3835.

Please circle Reader Service Number 7.

PYRAMID'S NEW CPU PERFORMANCE OPTIONS

Pyramid Technology Corp. has introduced new data cache and floating-point units that can double the performance of its 32-bit, Unix system-based 90x supermini computer for specific applications. With the new floating-point unit, Pyramid becomes the first supermini computer to adopt the IEEE-754 standard for floating-point representation.

The new 4110 model data cache unit speeds up accesses to memory resident data structures. The 4110 provides 32 Kbytes of fast memory within the Pyramid 90x central processing unit in addition to

the standard 4-Kbyte instruction cache.

Although the effect of the data cache unit is highly application dependent, performance is typically improved by 20 to 30 percent or more for applications that frequently access large memory resident data structures, such as arrays. Installation of the data cache unit is transparent to user programs.

The new model 4110 floating-point unit may be added to any 90x central processing unit with data cache to improve the speed of floating-point intensive applications by a factor of two or more.

The data cache unit is priced at $14,500 and the floating-point unit at $8,500. Both are available 30 days ARO.

For more information, contact Pyramid Technology Corp., 1295 Charleston Rd., Mountain View, CA 94043, 415/965-7200.

Please circle Reader Service Number 8.

DI-3000 AND GK-2000 GRAPHICS SOFTWARE FOR RIDGE 32 COMPUTERS

Ridge Computers has announced that the DI-3000 and GK-2000 graphics software tools from Precision Visuals are now available for use on the Ridge 32 family of 32-bit personal mainframe computers.

DI-3000 is a device- and machine-independent subroutine system providing the tools needed for virtually any graphics application, including full color, two-dimension or three-dimension primitives and viewing, shaded and patterned areas, graphics data structure, full graphics input, and real-time image manipulation.

The new GK-2000 graphics package is compatible with the full complement of Precision Visuals' device intelligence drivers. This capability enables GK-2000 to support more than 80 graphics peripherals. The package's capabilities meet and exceed GKS specifications, including such features as exact image sizing, attribute bundling, and cell arrays.

Precision Visuals has added several productivity enhancements to GK-2000 that go beyond the GKS standard and that make it a usable

working tool. These enhancements include extended error processing, on-line debugging, and file name control.

The Ridge 32 is a 32-bit personal mainframe computer for engineering and scientific applications. Running under an implementation of the Unix system, both the multiuser 32C and single-user 32S offer virtual memory, floating-point hardware, and bit-mapped graphics.

For more information, contact Ridge Computers, 2451 Mission College Blvd., Santa Clara, CA 95054, 408/986-8500.

Please circle Reader Service Number 9.

ASCII COMMUNICATIONS UTILITY FOR UNIX SYSTEMS

Holos Corp. has released CW/Call Whomever communications utility, a general-purpose software package that allows communications between Unix-based systems and any remote device with an ASCII RS-232 transmission capability.

CW features include the following: use any TTY or ACU bidirectional port regardless of ownership or log-in status, or use the same port used by CU of UUCP; communicate with remote devices ranging from PROM programmers and Telnet facilities to large IBM, DEC, and CDC mainframes; run in conversational mode so Unix system terminals appear to be attached directly to remote devices, allowing users to transfer files or log entire sessions on remote devices; transfer ASCII files to and from any ASCII device and, when compiling and running programs on remote systems, transfer binary files; and perform data acquisition and data logging functions from non-Unix system devices when set up to run continuously or under CRON.

CW is currently ported to the Tektronix 8560, 8561, and the NCR Tower. Single purchase price for multiuser systems is $2,000.

For more information, contact Original Program Marketing, 100 Colony Square, Suite 200, Atlanta, GA 30361, 404/876-1031.

Please circle Reader Service Number 10.

ZILOG UNVEILS SERIES TWO CPUS

Zilog's Systems Division has introduced its System 8000 Series Two family of Unix system-based supermicro computers, featuring a new high-performance 11.1 MHz chip and support for up to 40 users.

The System 8000 Series Two includes the Models 32, 22, and 12, each featuring the new high-performance processor with cache memory, a Unix system license for up to eight users, cartridge tape, and single disk. Configuration, users, memory, and size of disks differ, depending on the model.

The Model 32, available immediately at a base price of $29,950, includes ½-Mbyte memory (expandable to 4 Mbytes), a Unix system license for 8 users, cartridge tape, and an 8-inch Storage Module Disk drive (SMD) with a capacity of 168 Mbytes. The Model 32 can accommodate a total of four drives, for total storage of 672 Mbytes.

The Model 22, available at a base price of $23,950, also features ½-Mbyte memory (expandable to 4 Mbytes), cartridge tape, and a 5¼-inch Winchester disk drive with 52 Mbytes unformatted capacity, expandable to four drives, for total capacity of 208 Mbytes.

Both the Models 32 and 22 offer as options up to 40-user capacity, industry-standard nine-track tape drive, and IEEE floating-point processor. The nine-track drive is the first commercially available to stream in multiuser mode under the Unix operating system, offering a sustained rate of 100 inches per second.

The Model 12, scheduled to become available in October, has a base price of $19,950, features ½-Mbyte of memory (expandable to 2 Mbytes), and a 5¼-inch Winchester drive with 52 Mbytes. The Model 12 can service as many as 16 users.

All System 8000 family models feature full software compatibility, including the Unix operating system, standard languages, application tools, and standard communications options.

For more information, contact Zilog's Systems Division at 1315 Dell Ave., Campbell, CA 95008, 408/370-8000.

Please circle Reader Service Number 11.

DIGITAL'S ULTRIX-32M FOR MICROVAX I

Digital Equipment Corp. has announced Ultrix-32m, a version of the Unix operating system for its MicroVAX I microcomputer system. Ultrix-32m is the newest member of Digital's family of Ultrix products, which currently run on larger VAX 32-bit computers and on PDP-11 16-bit computers.

The new operating system brings the Ultrix-32 operating system to a microcomputer environment, enabling users with larger systems to expand programming operations to the low-cost MicroVAX I computer system. Additionally, Ultrix-32m is compatible with Version 4.2 of Berkeley 4BSD, Ultrix-11 Version 2.0, and AT&T Unix System V. Ultrix-32m is fully syntax-compatible with the Bourne shell script on Ultrix-32 and Ultrix-11 systems.

Ultrix-32m includes a set of intersystem facilities for communication with and networking of multiple systems, including the TCP/IP network protocol for Ethernet support.

Version 2.0 of Ultrix-11 was announced concurrently with Ultrix-

32m. The new version has been improved to provide hardware support for the recently announced MicroPDP-11/73 computer system as well as other PDP-11 computers. The new version, coupled with Ultrix-32, provides users with an Ultrix environment ranging from MicroPDP-11 computer systems to VAX-11/785 systems.

Digital also announced Version 1.0 of DEC/Shell, a command line interpreter that provides users with an interface very similar to the interface on a Unix Version 7 operating system but running under the VAX/VMS operating system. To a user, the DEC/Shell environment appears like the Version 7 Bourne shell.

Ultrix-32m is priced from $750 for a single-user license. Ultrix-11 Version 2.0 is priced from $800 for a 16-user license on microcomputers. DEC/Shell is priced from $4,750 for a 16-user single-use license. All products will be available this fall.

Minimum configuration for Ultrix-32m consists of a MicroVAX I system with 1 Mbyte of memory, a 10-Mbyte RD51 5¼-inch mini Winchester-technology disk, an 800-Kbyte RX50 5¼-inch diskette drive, and a console terminal. Both single-user and multiuser versions of Ultrix-32m systems are available.

For more information, contact Digital Equipment Corp., Continental Blvd., Merrimac, NH, 603/884-5111.

Please circle Reader Service Number 12.

PYRAMID'S GRAPHICS TOOLS FOR 90X SUPERMINI

Pyramid has also introduced a new set of graphics tools to enable the use of graphics applications on its 32-bit, Unix system-based 90x supermini computer. The tools are designed for both business graphics and engineering applications.

These new products include a Graphics Kernel System (GKS) software library for developing graphics applications. Pyramid's GKS can be used with standard Unix system graphics utilities and provides a device-independent applications development environment.

The other graphics products are a serial interface package (RS-232C compatible) for medium-speed applications, a parallel interface package (DR11W-compatible) for high-speed applications, and the appropriate 90x host software to support Raster Technologies' Model ONE family of medium- and high-resolution color display systems.

The price of Pyramid's new GKS is $5,000. The model 4200 parallel interface package costs $4,000, and the model 4210 interface package is priced at $1,000. All graphics tools are available 60 days ARO.

For more information, contact Pyramid Technology Corp., 1295 Charleston Rd., Mountain View, CA 94043, 415/965-7200.

Please circle Reader Service Number 13.

PLEXUS ENHANCES P/35 UNIX SUPERMICRO FOR INCREASED PRODUCTIVITY

Plexus Computers has introduced an optional memory package that provides the P/35 with an additional 145 Mbytes, offering users of the Unix system-based supermicro more than twice the available storage memory and greater flexibility.

The additional memory, on a Winchester disk drive, effectively doubles the maximum storage capacity of the P/35 to 435 Mbytes.

The maximum amount of memory is achieved by using an optional Storage Expansion Module (SEM) that holds two 145-Mbyte drives. The new 145-Mbyte Winchester disk drive is available to P/35 owners as either an expansion of the current 72-Mbyte system or as an option in an existing P/35.

A P/35 system with the new 145-Mbyte Winchester drive, 60-Mbyte streaming cartridge tape, 512-Kbyte error correction code, eight user ports, and a 12.5-MHz M68000 central processing unit costs $27,950.

For more information, contact Plexus Computers Inc., 2230 Martin Ave., Santa Clara, CA 95050, 408/988-1755.

Please circle Reader Service Number 14.

DG TO SELL EMACS TEXT EDITOR

Data General Corp. and CCA Uniworks Inc. have announced that Data General has been licensed to market the CCA EMACS text editing system for use on Data General computers.

CCA EMACS, a programmer productivity tool, is now licensed for use on Data General's Eclipse MV/Family of 32-bit superminicomputers and on the Distributed Systems DS/Family of workstations. CCA EMACS operates with Data General's proprietary AOS/VS operating system, MV/UX (an implementation of the Unix system that works in association with AOS/VS), and Data General's stand-alone Unix operating system called DG/UX.

CCA EMACS is also available with Data General's recently announced Common LISP Programming Environment.

The editor features nearly 400 built-in commands that allow virtually any editing task to be done with a few simple keystrokes. In addition to the commands, CCA EMACS features more than 60 predefined variables that allow users to customize the editor for specific application needs or user styles.

The initial license for CCA EMACS on the Eclipse MV/Family of

superminicomputers is $2,400. The initial license for CCA EMACS on the DS/Family of workstations is $475. Data General will provide complete customer support and training. Volume discounts are available for each, with shipments starting in January 1985. CCA EMACS includes complete on-line documentation.

For more information, contact Data General Corp.'s Technical Products Division at 4400 Computer Dr., Westboro, MA 01580, 617/366-8911.

Please circle Reader Service Number 15.

INGRES CAPABILITIES EXPANDED FOR VAX/UNIX

Relational Technology Inc. (RTI) has announced the release of Ingres Version 2.1 for VAX/Unix. Ingres Version 2.1 features significant enhancements to the Ingres relational DBMS, including substantial improvements to both RTI's database system and Visual Programming tools.

Transaction processing has also been improved to allow several queries and updates to be treated as a single transaction so that either all or none of them are completed. In the case of hardware or software failure, any changes made to records will automatically be backed up. This feature helps to preserve the consistency of a database at all times.

Ingres Version 2.1 provides improved concurrency control as well, with page-level locking that automatically escalates to relation-level locking when it is more efficient. Version 2.1 also detects deadlocks when they occur and aborts one or more transactions in progress.

The Ingres Visual Programming tools have been enhanced as well. Version 2.1 allows users to create forms featuring "table fields" that display several rows of a table within a form on the screen.

Version 2.1 for Unix systems introduces a text data type that allows character strings of up to 2,000 characters to be stored in a data field. These features expand Ingres' capacity to support office automation applications that involve textual databases.

Version 2.1 provides users with several new display enhancements such as blinking, bold, underlined, etc. These display enhancements allow users to emphasize desired form components on-line.

The Report Writer has been enhanced to provide an extensive formatting facility that lets users specify various formats for printing date data types.

Additionally, with the release of Ingres Version 2.1, the arrow and function keys of the VT100 terminal have been activated, allowing users to define characters to invoke functions (e.g., using the cursor keys and the VT100 keypad to select menu operations).

Version 2.1, as with all RTI updates, will be distributed free of charge to Ingres VAX/Unix customers. A bundling support license for Ingres costs from $20,000 to $40,000, depending on VAX CPU size.

For more information, contact Relational Technology at 2855 Telegraph Ave., Berkeley, CA 94705, 415/845-1700.

Please circle Reader Service Number 16.

NEW VERSION OF FUSION FROM NETWORK RESEARCH

Network Research Corp. is releasing a new version of Fusion network software, Fusion Version 3.0. The new version further expands Fusion's interoperability among diverse communications elements with the inclusion of the VMS operating system and TCP/IP protocols. Additional modifications have increased Fusion's data transfer speed and have improved efficiency.

Fusion 3.0 supports both the Excelan and CMC intelligent boards. Throughput on Communication Machinery Corp.'s (CMC) new intelligent board is 700 Kbps for virtual circuits and 1.8 Mbps for datagram service.

Fusion supports both the XNS and TCP/IP protocols. Major revisions to the XNS flow control now provide for faster and more efficient packet passing. Fusion Version 3.0 is supporting DEC's current version of VMS, VMS 3.5, and will support VMS 4.0 when released.

For more information, contact Network Research Corp. at 1101 Colorado Ave., Santa Monica, CA 90401, 213/394-7200. □

Please circle Reader Service Number 17.

How To Make Profitable UNIX* Systems Connections

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Corporate Managers DP/MIS

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NEWS FROM AT&T

AT&T-IS TAPS UNIX SYSTEM PORT FOR PC 6300

Unisource Software Corp. of Cambridge, Mass., has signed an agreement to sell to AT&T Information Systems (AT&T-IS) the first copies of its new Venix/Encore for AT&T's PC 6300 personal computer. Venix/Encore is an update of Venix/86, the first licensed implementation of AT&T's Unix operating system for the IBM PC/XT (and its compatibles) and for the DEC Professional/350. Venix/86 and Venix/Encore were developed by VenturCom Inc. the pioneer of the Unix system on microcomputers, also of Cambridge, Mass.

Venix/Encore retails for $800, is delivered with a System V Unix license, and is also available for the IBM PC/XT, Compaq Plus and DeskPro, Eagle Turbo, MAD 1, and the Leading Edge PC. Venix/Pro for the DEC Professional/350 is also marketed by Unisource.

"We're very proud to have AT&T Information Systems as our first customer for Venix/Encore on the PC6300," said Clay Clatur, Unisource's executive vice-president for sales and marketing. "We feel that AT&T's choice of Venix for their own computers reflects their continued confidence in our ability to deliver quality Unix software."

The first shipment of this multiple order was delivered to AT&T in mid-September.

Among the initial applications of Venix/Encore on the AT&T 6300 will be training and networking for 3B2 computers. "The goal is to give our people actual experience using Venix on an inexpensive personal computer and also to communicate with our 3B2s using Unix system utilities," said Wallace Carroll, staff manager at AT&T Information Systems of Englewood, Colo.

Unisource Software Corp. is a publisher and distributor of Unix system software for the professional and system development markets. Its products consist of Venix, a licensed implementation of the AT&T Unix operating system, personal productivity tools, business applications, and program development tools for desktop microcomputers.

DUCOMMUN PICKED AS NATIONAL VALUE-ADDED SYSTEMS DISTRIBUTOR

Ducommun Data Systems and AT&T have announced a distribution agreement that names the new firm as the first master value-added systems distributor for the AT&T 3B computer family (based on Unix System V and the AT&T Personal Computer.)

Under terms of the agreement, Ducommun Data Systems, a new division of Ducommun Inc., will act as a master value-added reseller (VAR) for the AT&T computers. It will provide hardware and software products, sales and technical support, training, and service to more than 15,000 VARs and systems integrators nationwide.

Acting as an extension of AT&T, this newly formed division will be in a prime position to provide dedicated, high-quality support and service to VARs and systems integrators on a local level. AT&T will provide full support to the master systems distributor in this new venture. The agreement became effective on Oct. 1, 1984.

Ducommun Data Systems said it will serve the needs of the VARs and systems integrators by offering quick, off-the-shelf product delivery and full assistance in customizing vertical market hardware and software systems. By year end, field offices will be opened in nine regional areas to provide support on a local basis.

As an independent division, Ducommun Data Systems joins Kierulff Electronics and MTI Systems as part of the electronic distribution organization of Ducommun Inc. The newly formed computer systems distributor will be headquartered in Cypress, Calif., (located near Long Beach).

SONECOR INKS VAR AGREEMENT WITH AT&T TECHNOLOGIES

The Sonecor Systems Division of Southern New England Telephone (Snetco) has signed on as a value-added reseller (VAR) for the full line of AT&T Technologies Inc. 3B minicomputers and the AT&T PC Model 6300 Personal Computer.

Sonecor intends to target telecommunications and office automation applications as well as specialized vertical market packages for the new AT&T gear.

Sonecor has signed 14 pacts for products used in voice and data systems integration. Other agreements have been reached with Wang Laboratories Inc. for personal computers and office automation systems; NEC Information Systems for personal computers; and General DataComm Industries Inc. for modems and multiplexers.

Snetco, the parent of Sonecor Systems, is one of the two remaining local operating companies that is still partially owned by AT&T. □

STRETCHING THE ETHERNET

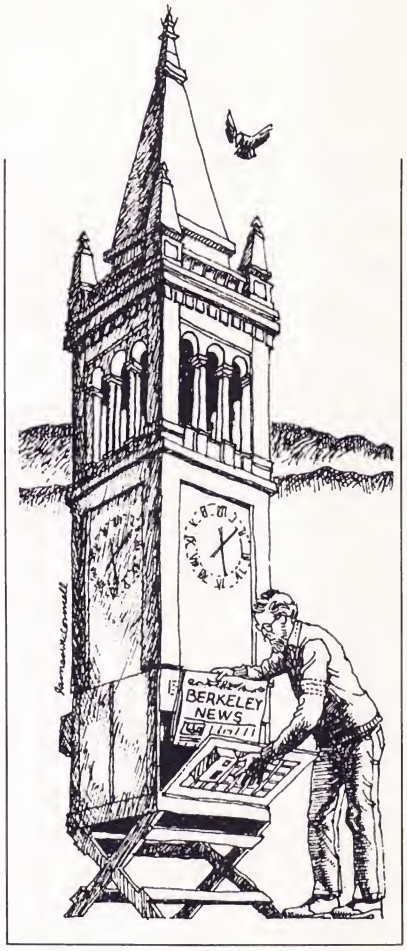
BY ALAN TOBEY

One of the most awaited abilities of the 4.2 Berkeley Software Distribution release was its generalized networking support. Unlike many proprietary networking implementations, which are limited to particular protocols or processors, the 4.2BSD approach allows great flexibility in the way networks can be put together.

The 4.2BSD networking scheme is built around the idea of "sockets," which are best conceived of as end-points or destinations to which communications can be sent. These communications can be just raw data streams or more controlled packages of information tailored by the governing software. The sockets are fairly flexible in what they are able to receive. It's important to see that the underlying socket mechanism is at base control-independent; any number of network protocols can be made to work.

This generalized networking power has been somewhat obscure in the year since 4.2's release. This is because the only network scheme actually implemented was the TCP/IP Ethernet protocol favored by the Defense Advanced Projects Administration (DARPA), which paid for the work at Berkeley. Because of this, 4.2 has gotten a reputation as providing "the TCP/IP network."

As the word about 4.2's networking capabilities gets out, however, more and more developers are beginning to implement interesting and creative network ideas. Here are a few of the first to reach the market:



Ethernet. 3Com Corp., of Mountain View, Calif., has developed a strong focus on providing Ethernet capabilities for IBM PCs. As one step in this emphasis, 3Com's Ethershare product allows PCs the ability to use Digital Equipment Corp.'s VAX computers over Ethernet lines as a file server and electronic mail hub. PCs running MS-DOS can use a VAX running 4.2 as a collection of virtual PC discs and can send mail to each other via the VAX.

This is a somewhat limited capability—the PC files are not accessible to Unix system users on the VAX, for example—but it points toward one solution for mixed-vendor networking. Regrettable is 3Com's recent decision to discontinue production of its VAX Unibus Ethernet controller board, which means that now its Ethernet software can run only on hardware from rivals DEC and Interlan.

B-Net. Berkeley's UniSoft Corp. has introduced B-Net as an available option in its UniPlus+ kernel. UniSoft has ported AT&T's Unix Systems III and V to nearly a hundred M68000-based machines and has recently announced its readiness to port UniPlus+ to Intel 80286-based computers as well.

B-Net is the Berkeley networking implementation brought into the AT&T environment. All the Berkeley functionality is included—remote log-in, remote file transfer, remote file copy, network mail, and net statistics. This means that VAXen and other traditional Berkeley Unix system machines now have full network access to dozens of different microcomputers, including the Sun and other high-end workstations.

B-Net is an excellent demonstration of how the 4.2 networking scheme is portable across different flavors of the Unix system and different scales of machine.

Fusion. Taking yet another approach is Network Research Corp., of Los Angeles, which is extending 4.2-based networking across Ethernet protocol boundaries as well as across operating systems. Besides Unix system implementations, Fusion provides access to VAX/VMS and MS-DOS systems and communications gateways to other Ethernets, X-25 protocol-based networks, and mid-level ISO standard network protocols. □

Alan Tobey is the marketing director of Mt. Xinu, a Berkeley, Calif.-based company that specializes in Unix systems software.

TIPS AND TECHNIQUES FROM AN UPCOMING BOOK

Here is a selection of some tips and techniques from an upcoming book by Nancy Blachman of Resonex Inc. (Sunnyvale, Calif.). This work is still in progress and will be a compendium of hints on using the Unix system from her as well as from other Unix system wizards around the world. In fact, if anyone reading this column would like to submit ideas directly to Nancy, please feel free to do so. We will be publishing further excepts from her book in future columns.

In this installment, Nancy shows you how to be notified when a process is done, decrease the amount of information presented when you log-in, access files with strange names, use Unix shell filename-matching capabilities from within `vi`, pipe or direct data to standard output and standard error separately, as well as two implementations of `pushd` and `popd` for C shells without these built-in functions.

To start out, here is a tip that lets you know when that long compilation you placed in the background has completed. As you probably know, a control-G rings the terminal bell, if it's available. In Figure 1, Nancy reminds you how to ring the bell when your compilation is done.

Are you tired of always having to read the system information immediately after you log on? Nancy tells us that you can suppress the messages that tell you when you last logged in, any messages of the day, and if you have mail with 4.2BSD. Simply place a file named `.hushlogin` in your home directory. The contents of this file are unimportant—in fact, it can be empty. Then, after you log on, only messages generated by your shell startup files, `.cshrc` and `.login` (for C shell) or `.profile` (for Bourne shell), will be displayed.

If you've ever encountered a file whose name begins with a dash (-), you've probably had trouble working with it. Why? Because if you begin a command line argument with a dash, most Unix system commands assume that you are specifying an option for the command. If you specify a file argument whose name begins with a dash, most Unix system commands misinterpret your file argument to be an option string, so they don't work as desired. Nancy reminds us of a simple yet elegant solution to this dilemma. Specify the file name as *./–filename* from the current directory or reference the file from another directory.

Here's a trick for using the Unix shell's filename-matching abilities when specifying the name of a file whose contents you wish read into the `vi` edit buffer. If you use the standard `:r` *filename* command, you can't use the filename-matching capabilities when specifying the absolute or relative pathname to the desired file. However, if you enter `!!cat` *filename* from visual mode, the current line will be replaced by the contents of *filename*.

The first `!` forces `vi` to execute the command that follows, which is in effect `.!cat` *filename*. Thus, the contents of the current line (implied dot) will be replaced by the output of the shell command, `cat` *filename* in this case. Be careful that the current line is not valuable because it will be overwritten by the output of the Unix system command. Note that with this approach you may specify *any* Unix system command line, and its output will replace the current line.

[*Doctor's note:* I find this technique especially helpful when using the C shell. For instance, when working in my personal subtree, I can always conveniently specify a file relative to my home directory using the tilde (~) metacharacter.]

Figure 2 shows how to redirect or pipe a program's standard output and standard error to different places. The "tricky" part for the C shell is to add the parentheses to

FIGURE 1: HOW TO RING A BELL AFTER BACKGROUND COMMAND IS DONE

```
$ (cc longcompile.c ; echo ^G)&
$ []
```

create a subshell. In the first case shown, redirection captures the `stdout` from *program* into *file1*, leaving `stderr` to be redirected into *file2*. In the second example for the C shell, `stdout` of *program* is piped through *prog1*; however, any `stdout` or `stderr` from *prog1* as well as `stderr` from *program* will be piped into *prog2*.

USENET TIDBITS

Nancy has been watching USENET for tidbits. Here are two examples she has selected from over the net.

Gordon Moffett of Amdahl (Sunnyvale, Calif.) writes: "It was beginning to frustrate me that the `csh alias` command accepted only one-line definitions; it is impossible to have an alias that uses 'if-then-else.' My solution to this problem was using a combination of `source` and `alias` to allow possibly lengthy `alias`-type commands using more complex `csh` constructions. This is particularly applicable in the following examples. Many UniSoft ports do not support the `pushd` and `popd` commands of `csh`, so I have implemented them thus:"

[*Doctor's note:* See Figure 3 for listings.]

"The advantages of this method are: more sophisticated (multiline) `csh` constructs are allowed, operates on the current shell (as does `chdir`), and no overhead for reading `.cshrc` (as with an executable script).

"The disadvantages are: Argv probably should be saved somewhere and restored, no 'exit' from 'if' statements (other than -- ech -- 'goto'), requires a file access.

"These scripts were derived from someone else's implementation of `pushd/popd` for `csh`'s lacking them; I don't recall who that was, but thank you anyway."

[*Doctor's note:* Yes, thank you whomever. Since comments and discussion were encouraged, Nancy found the following reply from Mats Wichmann of Dual Systems (Berkeley, Calif.)]

"Re: Gordon's neato implementation of `pushd/popd` for `csh`'s that don't have them....I am not trying to criticize the intent of this article, which was to show a method

FIGURE 2: WRITING TO `stdout` AND `stderr`

```
a. Using the C shell:

% (program > file1) >& file2
% (program | prog1) |& prog2
% []

b. Using the Bourne shell:

$ program > file1 2> file2
$ []

Note that pipe only affects stdout on the Bourne shell;
1 indicates stdout and 2 stderr.
```

FIGURE 3: MULTIPLE-LINE `alias` DEFINITIONS FOR `pushd` AND `popd`

```
% cat .cshrc
alias  popd    'set argv = (\!*) ; source ~/csh/popd'
alias  pushd   'set argv = (\!*) ; source ~/csh/pushd'
% cat ~/csh/pushd
if ($#argv != 1) then
     echo "pushd: Arg count."
else
     if (! $?_dirstack) set _dirstack = ()
     set _dirstack = (`pwd` $_dirstack)
     chdir $argv
     echo $argv $_dirstack
endif
% cat ~/csh/popd
if (! $?_dirstack || $#_dirstack < 1) then
     echo "popd: Directory stack empty."
else
     chdir $_dirstack[1]
     echo $_dirstack
     shift _dirstack
endif
% []
```

FIGURE 4: SINGLE-LINE `alias` DEFINITIONS FOR `pushd` AND `popd`

```
% cat .cshrc
if (! $?_d) set _d = ()
alias  pushd   set _d = \(\`pwd\` \$_d\) \; cd \!\*
alias  popd    cd \$_d\[1\] \; echo \$_d\[1\] : \; shift _d
% []
```

for fudging more complex `alias` commands. However, the specific example used can be done more quickly, although it is not as complete an emulation.

"Try this (all in your `.cshrc`)."

[*Doctor's note:* See Figure 4 for this shorter version.]

"This approach avoids opening an extra file each time for the source, although it has a less elegant error recovery."

Wizard's Grabbag is a regular feature of UNIX/WORLD, 444 Castro St., Suite 1220, Mountain View, CA 94041. Authors of published entries receive $25 for questions, $50 for shell scripts, `awk` scripts, `sed` scripts, `lex`, `yacc`, and C programs, or tips.

Guidelines for reader contributions: Write your shell scripts, C programs, and other code so it is portable across different versions of the Unix system. If possible, it should run without change on Bell Version 7, Systems III and V, and Berkeley 4.x. Thus, you should use "universal" Unix utilities, such as `who am i` (all systems) in lieu of `whoami` (Berkeley only), and the Bourne shell, if possible, when coding shell scripts. However, C shell scripts are also welcome because most of our readers now have access to this popular command interpreter. Use the standard I/O library when writing C code.

Also 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. □

REAL WORLD UNIX

Real World Unix
by John D. Halamka

PUBLISHED BY SYBEX, 208 PAGES, $16.95

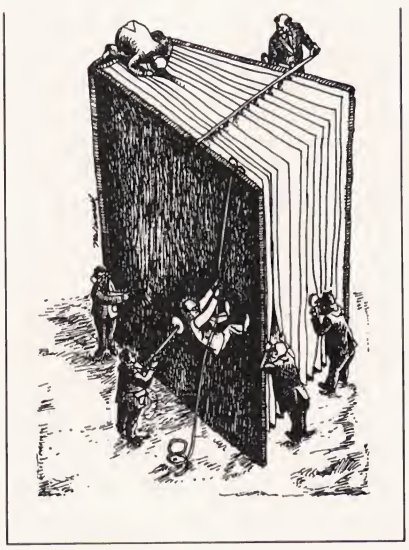
REVIEWED BY KEITH R. PRIOR

Before *Real World Unix* appeared, over a dozen paperback books were available on the Unix operating system. This apparent surfeit of Unix system books causes me to wonder why this particular book exists. Does the author have some new or different information for Unix system users? Does *Real World Unix* present a new approach to Unix system instruction? Unfortunately, the answer to these questions is no.

Two principal functions of a book on a computer operating system are to provide the following: (1) instruction in the use of the operating system and (2) reference materials on the utilities and commands of the operating system. Some books do both.

Instructions on how an operating system works can be provided through a series of tutorials or exercises or by a process-oriented text that leads the reader to an understanding of the operating system. Several books on the market do a good job of providing such material. But all readers forget a large part of what they read, even though the knowledge is reinforced by direct experience through tutorial and exercises. That is why the better books on operating systems also include a reference section or comprehensive indexing.

In its own peculiar way, *Real World Unix* tries to provide both instruction and reference. It just doesn't do an acceptable job of either.



ORGANIZATION

The book's first major flaw is its organization. The introduction and first two chapters attempt to introduce the user/reader to what an operating system is and what it does. The introduction, for example, tries to answer the question "What is Unix?" But we must wait until Chapter 7 to find out the history of the Unix system (oddly enough under the heading "The Future of Unix").

To complement the book's instructional portion, a glossary is provided as an appendix, but its usefulness is limited for two reasons. Many of its definitions merely repeat the content of the instruction section. The most critical problem, though, is that the glossary doesn't refer the reader to either the index or to the text, and the text does not refer to the glossary.

Two sections of the book —"Real World Hardware and Software" and "Unix Resources" —present extremely limited listings of the hardware, software, and publications available under the Unix system banner.

INSTRUCTION

The instructional content is found in the chapters "Unix Concepts," "Using the Unix Shell," "System Administration," and "Shell Programming." Compared to other such material on the Unix system, this book is both too brief for the beginning user and too rudimentary for the experienced user. For whom, then, is the instructional portion written? My guess is that the book is designed to provide an overview of how the Unix system works for people who will not be using the system.

In some cases the descriptions of utilities are simply erroneous. For instance, the author suggests that `$mail < letter`is an example of the Unix system's redirection facility. My experience with a variety of Unix versions suggests that this command, as presented in Mr. Halamka's book, will get the reader/user absolutely nowhere. The author neglects to show that this command, used in this way, must include a user code indicating to whom the letter is being mailed.

My real disappointment with the book, though, comes from the sheer lack of volume in the instructional area. The book attempts to cover 58 Unix system commands in the 128 pages that could be categorized as comprising the instruction section. Everyone who has used the Unix system knows that many commands have options. *Real World Unix* deals with the options to commands in an extremely haphazard way, when it deals with them at all. Although some options appear in examples, the range of options relative to the commands is never discussed.

REFERENCE

Reference material in *Real World Unix* consists of a 22-page sec-

tion called "One-Minute Unix" and the index. "One-Minute Unix" is nearly useless as a reference. Its format is:

COMMAND

Use: a one-sentence description of the command's use

Syntax:

```
$command argument
```

Example:

```
$command sampleargument
```

In all command references, the author gives the command short shrift.

Though the back cover of the book asserts that "You'll find specific instructions on using the Unix command structure for... word processing," the reference entries do no such thing. For example, `ed`, the Unix line-oriented text editor, is presented as follows:

```
ed
```

Use: text editor supplied with Unix. Use a word processor instead.

Nowhere is there a mention of the text editors `ex` or `vi`. Throughout the book the reader is implored to buy a word processor instead of making use of the Unix system text editors. While this may be good advice, nothing in the book even comes close to providing instruction on word processing—for any word processor. The back cover grossly misrepresents the contents. (By the way, this misrepresentation extends to the lack of "specific instructions for...database management" as well.)

OTHER PROBLEMS

The book is illustrated, as the Sybex press release states, with "five figures showing aspects of the hierarchic file and directory structure of Unix, and two simple diagrams of network structures." As graphic blandishment goes, this book is thin.

Consider the book's cover. On it is a painting of Atlas hoisting the world on his shoulder. The world is cracked open at the top and inside is a computer terminal. This illustration is *not* the stuff of the real world. I wonder about the notion of representing a computer terminal as a burden.

Finally, the book's preparation shows haste and a lack of care. In several places, the typesetting failed to align the margins. As a result, the hanging labels at the left-hand margin of the right-hand page fall farther into the binding margin, making the label hard to see in scanning. This negates the principle of hanging labels for quick reference.

Real World Unix is not a useful or logically prepared book. Its instruction is too rudimentary or inappropriate, its reference too brief, and its content, in general, poor. Of the 12 books on the Unix system I have read and reviewed, this is among the 3 worst because of its flaws in both content and form. Even if you have to write directly to the publisher to order another Unix system book, you would be better off with *A User Guide to the Unix System, The Business Guide to the Unix System, The Unix Primer Plus,* or *Introducing the Unix System.* □

Keith Prior is an analyst in student affairs administration at UC Davis. He has been a technical writer for 20 years and is interested in how people learn from written materials.

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December 5-7

"Using Advanced Unix Commands," Los Angeles, Calif. (See calendar key #4, CTG, for contact details.)

December 5-7

"Comprehensive Overview of Unix Operating System," Santa Monica, Calif. (See calendar key #10, DEC, for contact details.)

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"Unix," Somerset, N.J. (See calendar key #7, CAPE, for contact details.)

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"Unix Internals," Los Angeles, Calif. (See calendar key #4, CTG, for contact details.)

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USENIX

1985 Winter Technical Conference
Fairmont Hotel, Dallas, Texas
January 23 - 25, 1985

The 1985 Winter USENIX Technical Conference,

sponsored by the USENIX Association, is designed to promote the exchange of technical information and ideas among the UNIX* Community.

Technical Sessions

The technical sessions will cover: Networking, Distributed Systems, Software Tools and Applications, Languages, Environments, USENET and Future Directions, and other topics. Current research and development within the UNIX Community will be presented. Birds of a Feather sessions will be structured to provide a forum for technical exchange.

Tutorials

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- UNIX Systems Administration

Also ...

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For more information ...

If you have not received the pre-registration packet and wish additional conference information, please contact:

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P.O. Box 385
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Continued from page 128

tion. At the same time that some educators are strongly promoting the use of computers all the way back to the earliest primary grades, there are others who are now strongly denouncing such use, claiming that we'll be bringing up a generation of technological "zombies" who will be incapable of dealing with people and society at large.

This is another case where we need to try take a balanced viewpoint. It's very difficult to deny that computers can be of significant benefit in certain aspects of education, particularly when dealing with children who have learning problems of various sorts, but also when used with children in general.

Will all these children turn into social misfits? It seems extremely unlikely. Many of the persons arguing against the use of this technology in schools seem to be afraid that these youngsters will all turn into the sort of archetypical "computer nerds" that television and films have been so fond of portraying lately. Perhaps this fear is exacerbated by the fact that today's children often seem to accept computers much more readily than do their parents.

Once again, a reasonable way to approach this issue is not to proclaim loudly that computers in education are evil, but rather that we must be careful to not let the computer-based aspects of education overpower the many other crucial facets of schooling. I'm not claiming that this is an easy task, but it is a very necessary one.

Being aware of problems caused by or relating to technology is one thing. Letting the fear of such problems freeze us into fatalistic inaction is something entirely different. While the former choice of action has the potential of solving problems, the latter course will usually result in allowing a bad situation to become steadily worse.

As we've seen, the fears of computers (and of technology in general) are partially rooted in actual reality. We who spend our working lives creating and expanding these technologies should make an effort to help ensure that society at large has as full and as realistic an understanding of technology as possible.

We also cannot assume that somebody else will take the responsibility for integrating actual technology successfully with our society—we all should consider that task to ultimately be our own. Let's try to wipe out technophobia and the real problems that have resulted in technophobia, in our lifetimes! □

—Lauren—

UUCP: {decvax, ihnp4, seismo, clyde, allegra}!vortex!lauren

Lauren Weinstein is a computer/telecommunications consultant based in Los Angeles. He has been involved in a wide range of projects ranging from the mundane to the bizarre. He has particular expertise in the fields of computer networking, the Unix system, microcomputer technology, and telecommunications systems.

THE TRAUMA OF TECHNOPHOBIA

BY LAUREN WEINSTEIN

Having a widely known network mailing address can have both advantages and disadvantages. On one hand, it's usually pretty interesting to get up each day, wander over to the console, and see what sorts of goodies have flowed in while I was asleep. Outside of messages from persons I already know, I get a fair volume of "unsolicited" messages that are frequently quite interesting, informative, or at the very least amusing. I'd probably rapidly become bored without them, and I usually appreciate them greatly.

There can be a darker side to some messages, however. A message I received quite recently triggered some concerns I've had for quite a few years concerning our society's perception of, and reaction to, advanced technologies.

The message in question was sent by an individual from whom I had never before received mail, and it started out innocently enough with a polite introduction. A little ways farther down, however, the author got to his main points. He informed me that he was a very religious person and that he had concerns about the development of global computer/communications networks/technology and their possible relationship to Biblical prophecies.

He included a number of Biblical quotations as part of his discussion. The gist of his argument appeared to be that (in his opinion) the rise of such telecommunications networks was predicted by the Bible and was related to the rise of Satan. He also made a reference to the "number of the beast" (666) and pointed out the importance of that particular number in the Unix system for people to be able to read and write information.

Now, there have been jokes around the Unix system community for years about "666" and its religious "connotations." But I am convinced, as are others to whom I've shown the message, that these particular thoughts reflect genuine beliefs on the part of the individual concerned.

There are obviously a number of somewhat humorous reactions possible to such a message. For example, "Did you hear about the new movie coming out? It's called: 'Omen IV: The Rise of Unix.' " Or how about, "666? Gee, I didn't know that the Bible was written in Octal...."

THE SERIOUS SIDE

However, there is also a serious side to concepts such as the ones put forth in that message, and I'm *not* referring to the religious issues. As far as the religious aspect is concerned, I'll only say that if that's what some people want to believe, it's certainly their right to do so. I have no intention of getting into an argument concerning religious beliefs, and I don't intend to address that aspect further here.

But there is an underlying element to such fears and concerns that should be addressed since it seems to be expanding to pervade a significant portion of our culture. It's what I refer to as "technophobia." I define this to be simply "the fear of technology." It's nothing new, to be sure. Throughout human history, various people have feared or distrusted even comparatively simple technologies, for a variety of reasons.

Sometimes there is a legitimate reason for some concern. Unbridled technology, without consideration of the human aspects that relate to that technology, may indeed cause problems. The recurring specter of possible massive unemployment due to automation (both during the original Industrial Revolution and once again today) is certainly real enough. In today's world, we're faced with large blocks of workers whose industrial-age jobs are being rendered obsolete by advanced automation, most of which is computer-based and some of which is now an outgrowth of academic research into artificial intelligence and robotics.

It is unclear to what extent many of these workers can be effectively retrained and found jobs for in the "service-oriented" economy that we are told is now emerging in this country. I personally have my doubts that the number of "new" jobs will expand fast enough to avoid major unemployment problems down the road.

Still, these are problems that we should be able to solve, even if we need to make major shifts in our views regarding working schedules and the sorts of work that people are performing. Certainly the problems will not be solved simply by throwing up our hands and running around yelling that the sky is falling. However, neither can we just sit back smugly and pretend that the problems will somehow "automatically" take care of themselves in "the course of things"—because it's very unlikely that we're going to be that lucky.

COMPUTERS IN EDUCATION

Another area where technophobia seems to be present concerns the use of computers in educa-

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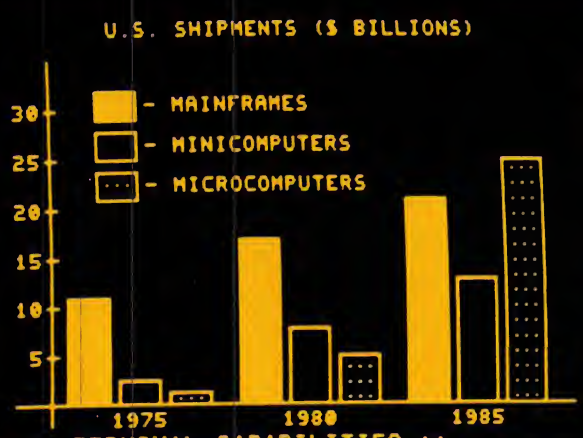
A Picture's Worth:



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