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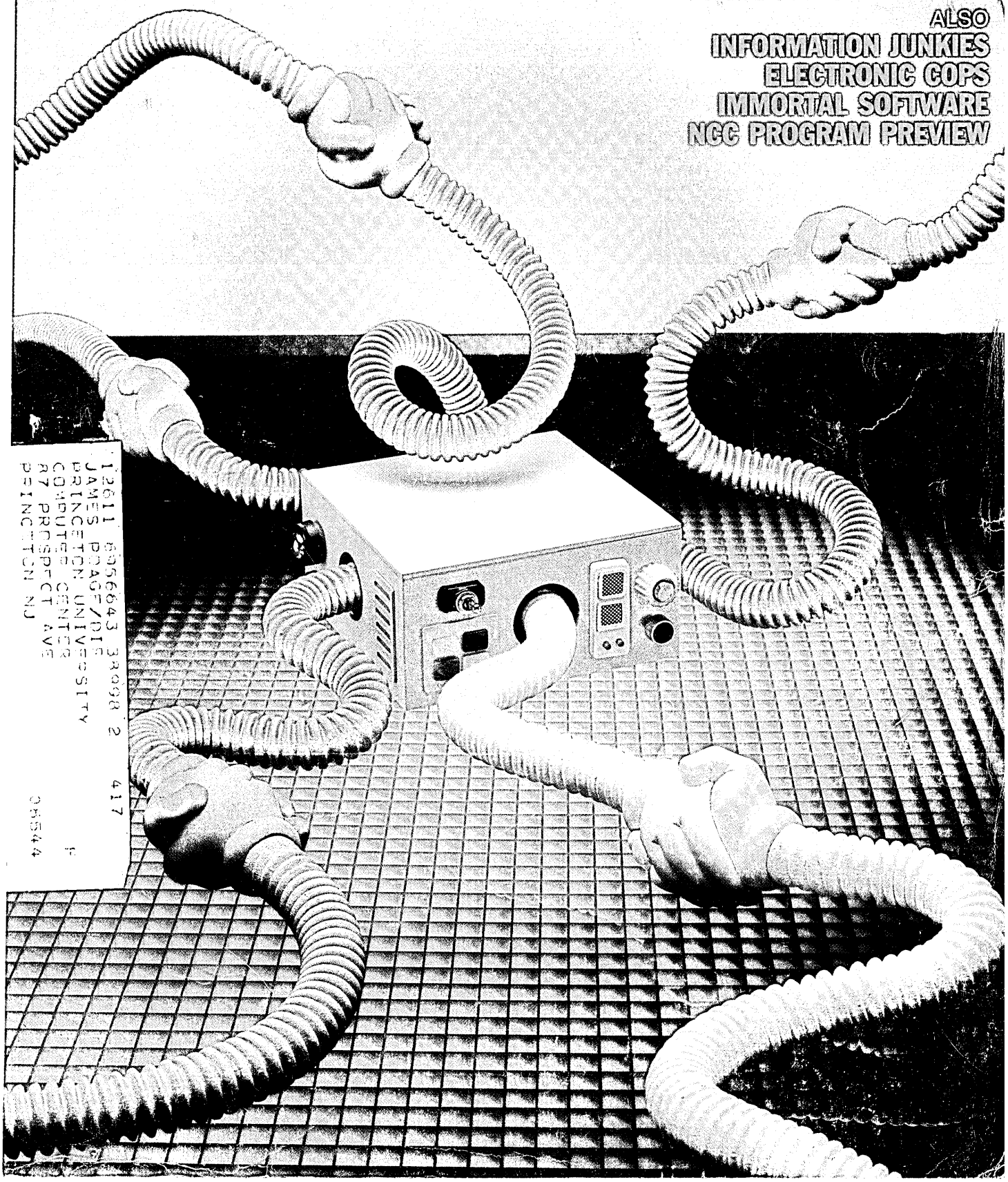

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The new model IBM System/36. The big news is that we made it smaller.

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This System/36 processor—the 5362—integrates data processing, text processing and color business graphics. It runs all the System/36 applications without recompiling. And the wide range of available proven software packages satisfy almost every user's needs.

The new 5362 processor has up to 512K of main memory and from 30MB to 120MB of disk storage. It can support up to 22 local work stations and up to 64 remote units, including the IBM Personal Computer and the PC/XT. And any System/36 communicates with a range of IBM small and large computers.

The new System/36 processor just plugs into any 110v outlet. Additional features or memory can be added by inserting plug-in modules. And its more than 2,000 "Help" screens will lead a user through any rough spots.

Another new System/36. A lot of computing power in a small package. But the best news isn't what's in the computer, it's also what's on the computer. IBM.

This new system is available from your IBM representative or from an IBM System/36 Value Added Remarketer. Or for more information, call 1 800 IBM-2468, ext. 449.

IBM®

CIRCLE 1 ON READER CARD

Our IBM Protocol Converter is not the same under the skin.

MICOM's new Micro7400 is very, very different. It not only provides a Gateway for dumb asynchronous terminals to access IBM mainframe applications, but goes far beyond the basic capabilities of IBM 3270s and other protocol converters. *It's even easy to use.*

Since MICOM is the world's largest volume manufacturer of data concentrators—thanks to its Micro800/2 "Orange Box" family—it's only natural that MICOM's protocol converter should include the same features and capabilities that made the data concentrators so popular. And fortunately for asynchronous terminal users wishing they could connect to IBM mainframes, and for mainframe DP managers looking for less expensive terminals, adding concentrator features to a converter makes for a surprisingly effective hybrid.

All Standard IBM 3270 Features

Functioning as an IBM 3274 Model 51C Cluster Controller using either Bisync or SNA/SDLC protocol, the Micro7400 allows ASCII terminals (or personal computers emulating terminals) to perform as 3270s. Display terminals emulate IBM 3278s, printers emulate IBM 3287s. And special software allows printer terminals to interact with full-screen programs originally developed for crts.

Plus Extra Functions

The Micro7400 also offers features not available in the IBM 3270 line, including dial-up access to the protocol converter, terminal-controlled diagnostics, and do-it-yourself channel configuration for setting terminal-related parameters like parity.

Support for IBM Personal Computers

IBM PCs connected to the Micro7400 can emulate IBM 3270 terminals, too, for communicating with mainframes. Diskette-based MICOM software makes it easy.

Switching Between Multiple Hosts

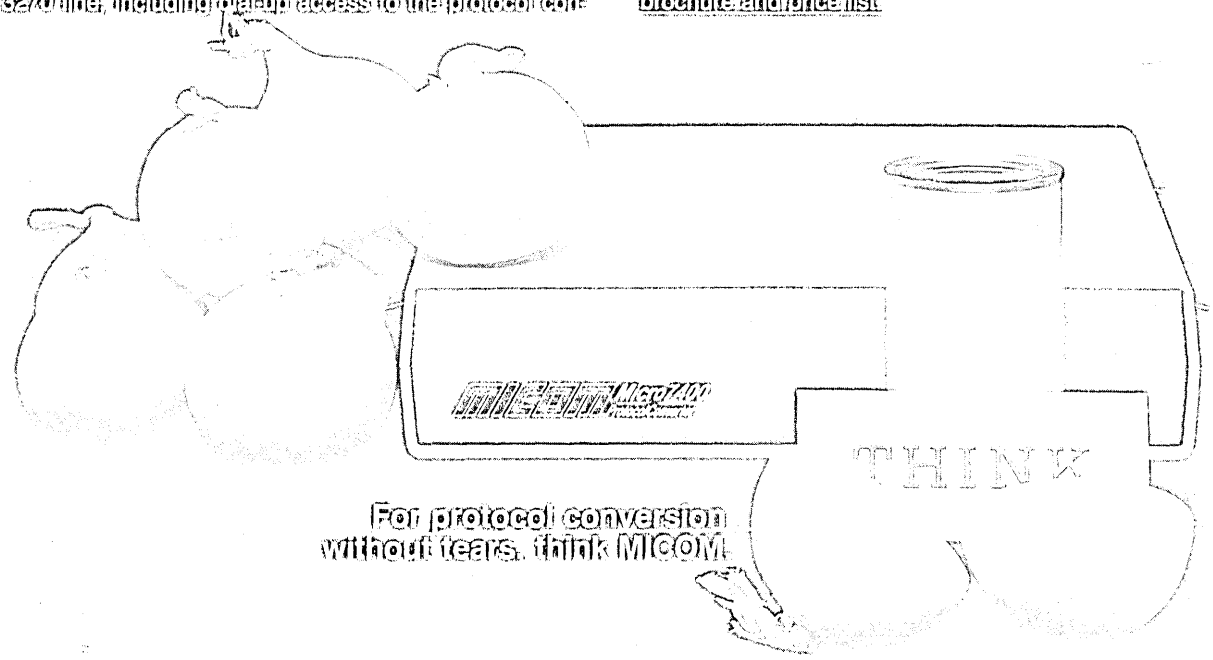
Users can switch between two IBM hosts, or between an IBM host and asynchronous ports on one or more minicomputers—completely under terminal control.

Command Port

Unique among protocol converters, the Micro7400's Command Port allows a network manager to dynamically alter operating parameters like priority assignment, as well as providing monitoring, diagnostic, and control facilities.

As Low As $400 Per Channel

Even the pricing is more like a concentrator. Standard models are available to support from two to 12 channels, at prices as low as $400 per channel. A budget-minded 2-channel "LTD" model is also offered, as are cost-saving versions with built-in modems. And there's much more. Call our toll-free (800) number below for a 12-page color brochure and price list.



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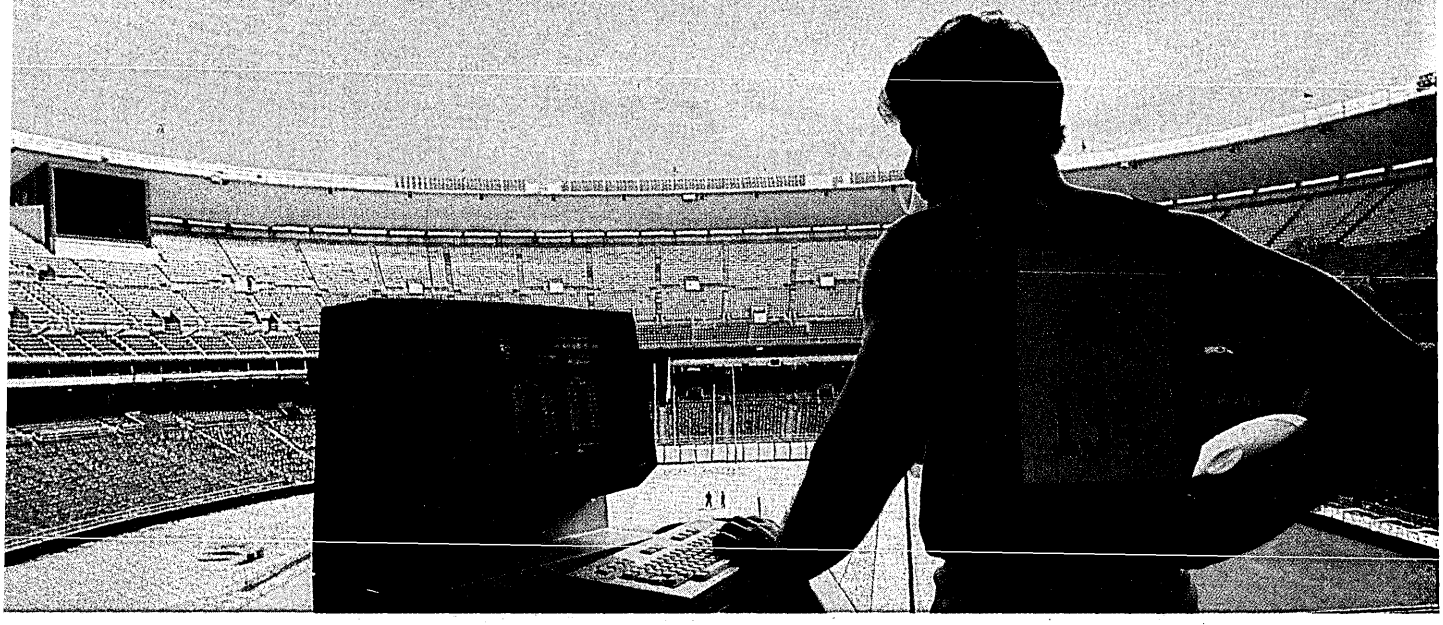

Behind the action, pageantry and spectacle of the 1984 Olympic Games is one of the most extensive data communications systems ever built.

The Electronic Messaging System—12 computers, 1,700 terminals, 300 printers—was created for the 1984 Olympics by AT&T. And tied together with Infotron networking equipment.

The EMS is designed to replace the old system of hand-carried reports in the world's first multi-site Olympics. It does everything from displaying event results, to supplying athlete biographies for reporters, to providing schedules, qualifying information and personal messages to the participants themselves.

The system's true complexity lies in the numbers of people it serves: the 50,000 officials and reporters, coaches and athletes of the Olympic family. But the demands placed on it are very much like the demands all Infotron customers place on their networks.

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This issue, 189,464 copies

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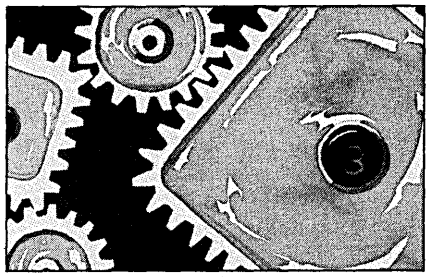

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COVER SCULPTURE BY KATHY JEFFERS/
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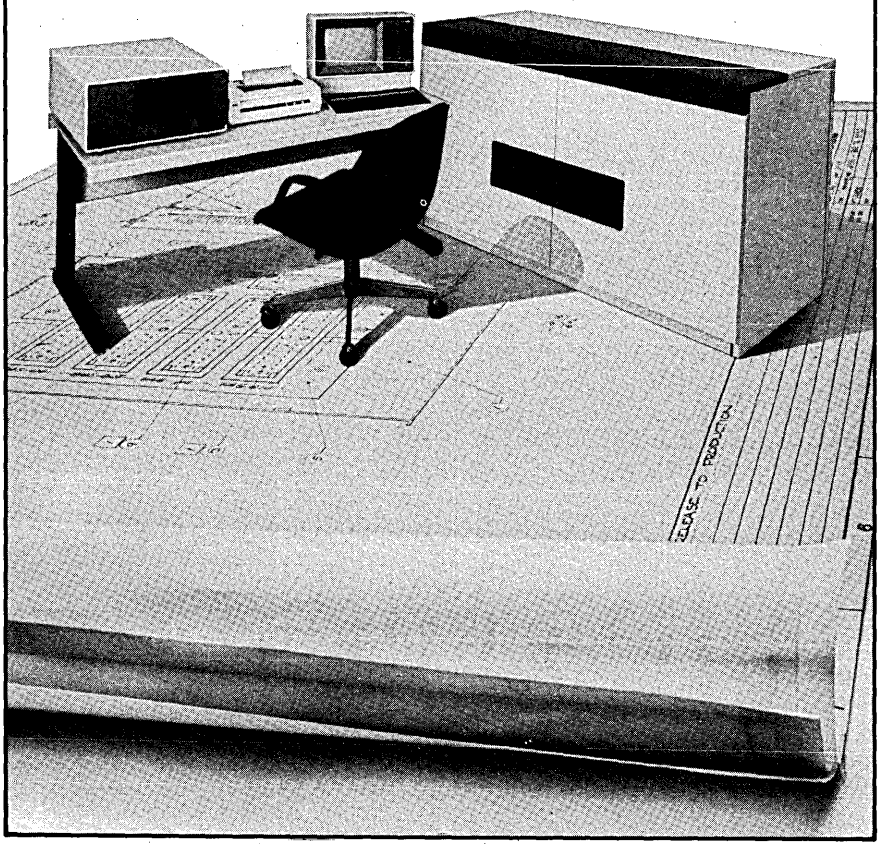

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Technical Publishing
a company of The Dun & Bradstreet Corporation

BPA Circulation audited by Business Publications Audit
ABP Member American Business Press, Inc.

DATAMATION (ISSN 0011-6963) Magazine is published twice monthly, on the 1st and 15th. Published by Technical Publishing, a company of The Dun and Bradstreet Corp., John K. Abely, President. Executive, advertising, editorial offices, and subscription departments, 875 Third Ave., New York, NY 10022. Published at Lincoln, Nebr. Annual subscription rates: U.S. and possessions: $50; Canada: $75; Japan, Australia, New Zealand: $100; Europe: $90 air freight, $155 air mail. All other countries: $90 surface, $155 air mail. Reduced rate for qualified U.S. students, public and school libraries: $30. Single copy: $3 in U.S. Special Datamation/Dataguide issue: $25. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England, (01)422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at New York, NY 10001 and at additional mailing office.

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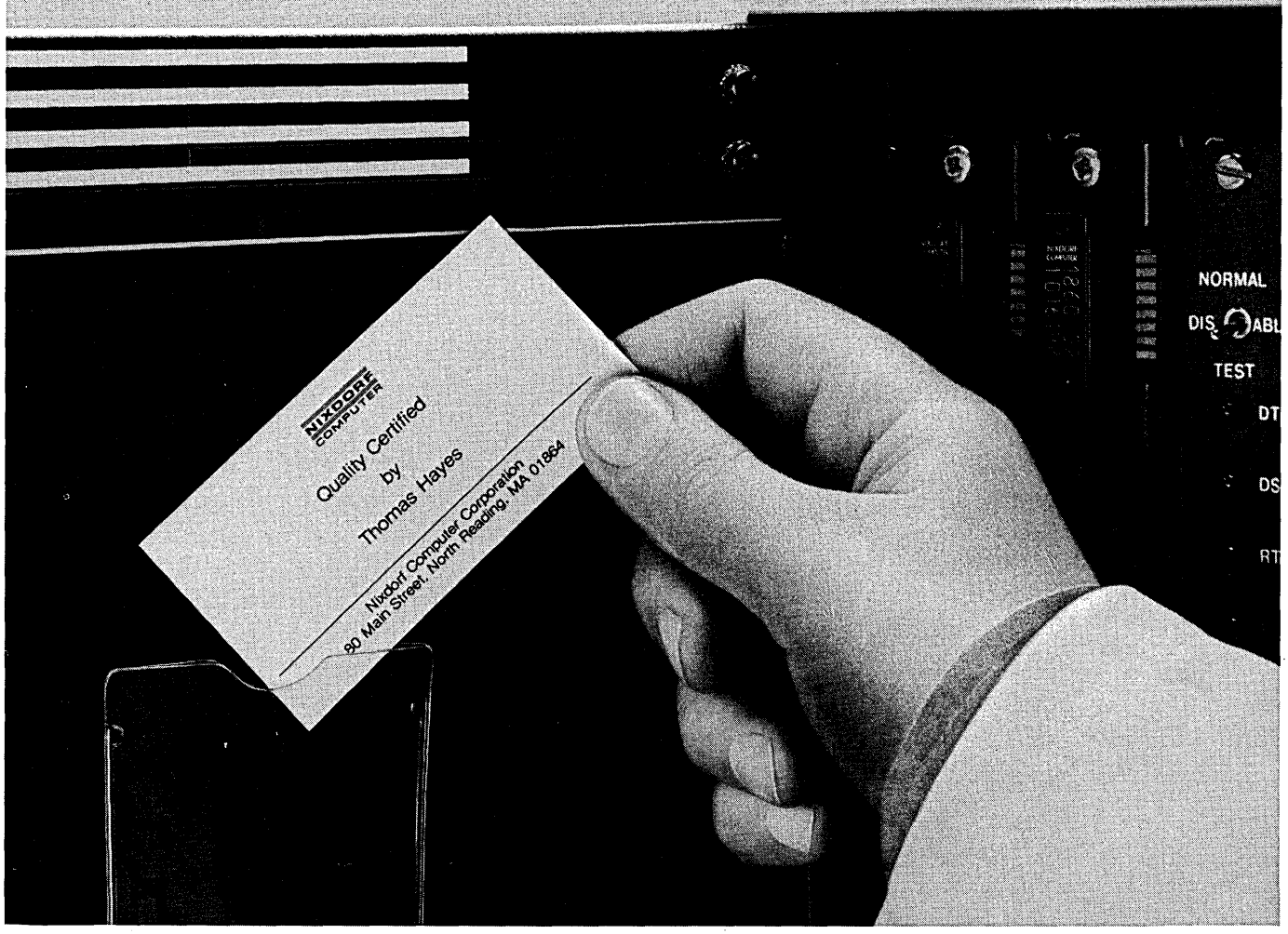

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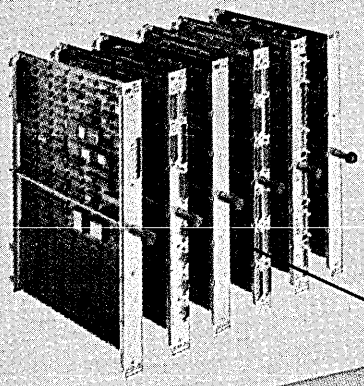
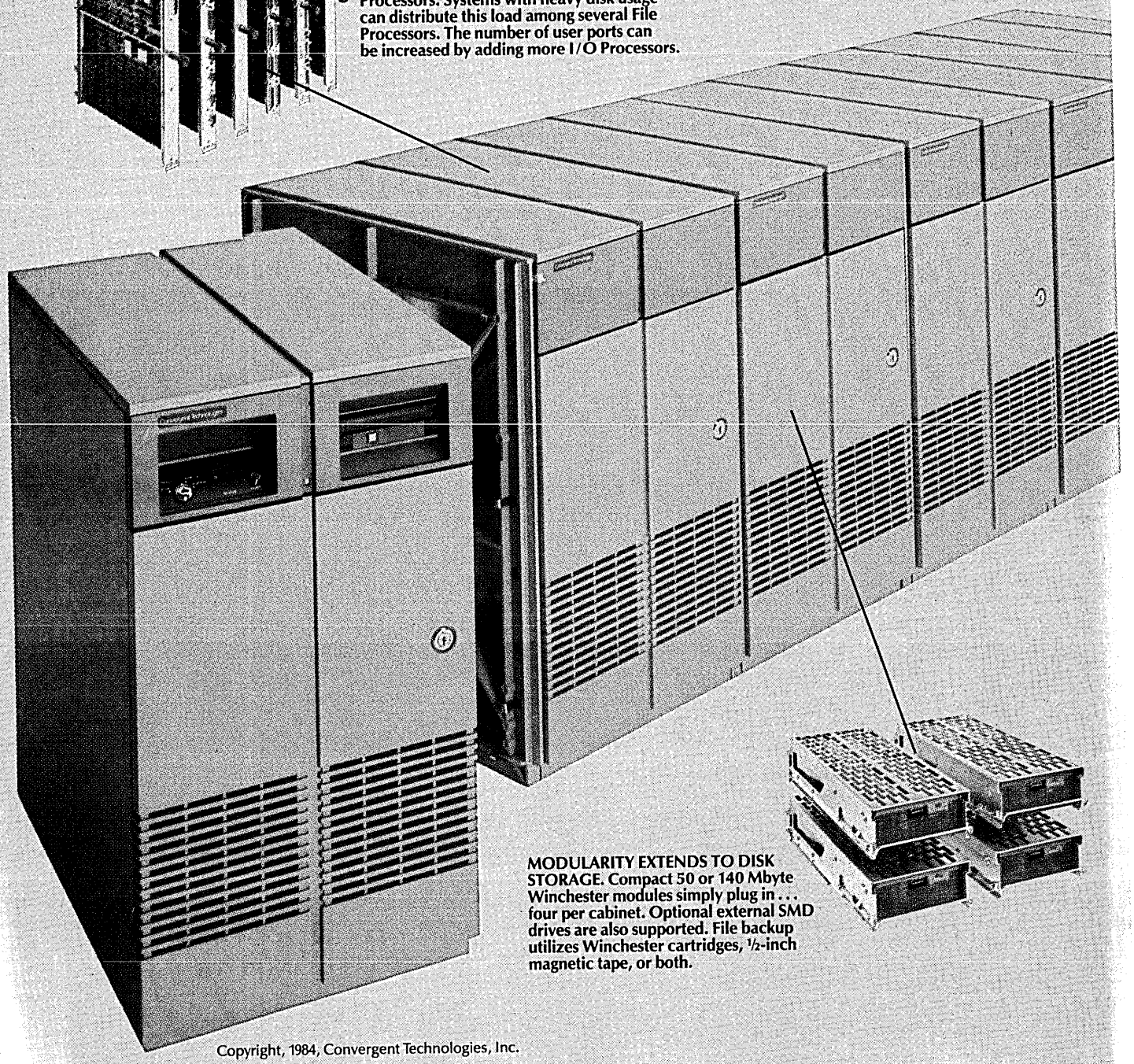


CONFIGURABLE ACCORDING TO USER NEEDS. As many as six processors can be installed in each enclosure. CPU-intensive jobs utilize multiple Applications Processors. Systems with heavy disk usage can distribute this load among several File Processors. The number of user ports can be increased by adding more I/O Processors.



MODULARITY EXTENDS TO DISK STORAGE. Compact 50 or 140 Mbyte Winchester modules simply plug in . . . four per cabinet. Optional external SMD drives are also supported. File backup utilizes Winchester cartridges, ½-inch magnetic tape, or both.

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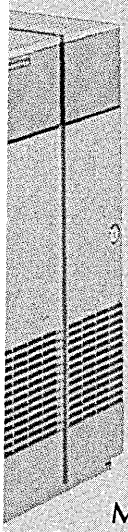
MegaFrame™. Now OEMs can offer a high-performance UNIX™-based system that can't run out of performance.

OEMS can now deal cost-effectively with the problems encountered when user applications produce computing demands that outstrip the capabilities of conventional systems.

Convergent Technologies' MegaFrame is a revolutionary new UNIX-based super-minicomputer—so innovative in its architecture that it represents the ultimate in multiuser systems design. It grows exponentially from a system offering minicomputer-level performance to an enormously powerful engine serving as many as 128 users with 36 parallel processors, 24 megabytes of RAM and gigabytes of disk storage.



No other system can match the MegaFrame's potential for field expansion. It enables manufacturers and systems builders to keep pace with today's requirements for more and more computing services . . . but *not* at the cost of discarding hardware or performing expensive CPU upgrades.

MegaFrame's architectural breakthrough. Dependence on traditional single-CPU shared-logic architecture is the root of systems bottlenecks.

Convergent's response: a novel system utilizing *multiple* specialized processors to distribute workloads for optimum performance—even if user needs are unpredictable or subject to rapid change.

MegaFrame's virtual memory Applications Processors each have a 32-bit CPU, up to 4 Mbytes of RAM and run a demand-paged version of UNIX System V. Up to 16 of them can operate in parallel.

The File Processors effectively function as back-end machines providing DBMS, ISAM and other disk-related services. Up to six File Processors each with four disks can operate in parallel.

Terminal and Cluster Processors can also be added—the latter serving front-end communications needs. They off-load communications from the other processors by running protocols such as SNA and X25 networks.

MegaFrame's daisy-chained cabinets offer total expansion potential of up to 36 slots. OEMs configure the system needed for specific applications simply by adding the correct number/combination of processors.

Flexibility in applications development. Inclusion of one or more Applications Processors allows running UNIX System V. All standard UNIX tools are provided, along with COBOL, FORTRAN-77, BASIC interpreter and compiler, plus Pascal.

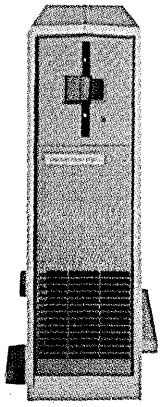
The "least-cost solution" to serving a wide range of UNIX-systems needs, MegaFrame has won acceptance from OEMs in the U.S. and abroad. The uniqueness of its modular design, its versatility in providing upgrade-path options and its price/performance advantages give it market-share potential of outstanding dimensions.

The system that will grow on you starts at a very attractive price: about $20,000 for a system that effectively supports 16 users. Send now for a comprehensive Information Package including reprints of magazine articles. It explains how MegaFrame's growth potential can impact favorably on your plans for growth in the UNIX market.

Convergent Technologies, Data Systems Division, 3055 Patrick Henry Drive, Santa Clara, CA 95050. Phone: 408/980-0850. Telex: 176-825.

MiniFrame™: the entry-level multiuser UNIX system.

Starting at under $5,000 for a single-user system, Convergent's MiniFrame offers outstanding capabilities for small to medium sized organizations running large UNIX-based applications. Utilizing an MC68010 microprocessor operating at 10Mhz, with no wait states, it provides impressive CPU speed—comparable to VAX™-11/750 running the AIM™ Benchmark. MiniFrame features virtual memory management, with demand-paged implementation of UNIX System V. It runs as many as eight terminals, with up to 50 Mbytes of integral mass storage. MiniFrame and MegaFrame are object-code compatible, allowing OEMs to offer a *complete family* of systems unrivaled in price/performance characteristics.



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CIRCLE 9 ON READER CARD

Twenty Years Ago/Ten Years Ago

LOOKING BACK

MAXIMUM BENEFIT

June 1964: Max Palevsky was in the money this month, as his company, Scientific Data Systems, became Wall Street's darling. SDS was scheduled to go public early in June, at about $25 a share, and Palevsky was the proud owner of 386,000 of those shares. Only 3,500 other shares were available for divvying up among 600 employees and other interested persons.

With the stock issued, Palevsky & Co. announced two new products: the SDS 925, (a stripped-down 930) and the SDS 92, a small control computer, which, priced at $29,000, promised to give the PDP-5 some stiff competition. The 925 was said to be twice as fast as the 920, five times the speed of the 910, and faster nonarithmetically than the 930. The 925 was available in 4K, 8K, and 16K memory sizes, had a 1.75 μsec cycle time, a 3.5 μsec add, and an $80,000 to $120,000 price tag. The 24-bit machine was also compatible with the 910.

JUST IN CASE. . .

While the company was dedicated to its System/360, IBM wasn't taking any chances on losing too many customers because of any unwillingness on its part to move to a new programming language.

DATAMATION reported that IBM was ready to accept the loss of 30 to 40 of its 7000 series installations to competitors should firms balk over the transition to the 360 and the new programming language. The company already had the specs for its 7095/6 machines just in case the "enemy raiding" got out of hand.

The 7095 was said to contain a fraction of the components of the 360/mod 70; the 96, with a slower memory than the 360/90, was supposed to be faster. The article said that "both look like paper tigers nobody will have to feed, unless IBM fails to come up with a good FORTRAN for the 360."

STATUS REPORT

June 1974: At the time, the organizational level and reporting relationship of the dp manager was a much debated topic within firms that had dp installations. In this issue, Robert J. Greene culled the Weber Salary Survey on Data Processing (which also provided the information for May's salary survey) for an answer to the question, "Who does the manager of dp report to in your firm?"

Of the 330 firms queried, 107 said their dp manager reported to a vice president and 38 claimed overall responsibility for dp lay in the chief executive officer's hands.

Greene also said the effect of installation size was not strikingly apparent, with the exception of the shift from controller to corporate director of MIS as installations became larger.

By type of industry, Greene noted a number of interesting trends:

Manufacturing: the controller had the responsibility in 25% of the firms, compared to a total sample figure of 14%.

Transportation: the president was the responsible executive in 37% of companies, compared to a total average of 10%.

Utilities: the corporate director-MIS position was cited most frequently, of all the industries queried.

Retail: the vp-operations was the overseer.

Finance, insurance, and real estate: 70% of the firms said dp was answerable to a position at the vp or higher level.

The services industry very closely approximated the total sample, except that the director of administration managed the dp function more frequently than in the sample average.

In the government, the director of finance was most often the official responsible for the dp function.

—Lauren D'Attilo

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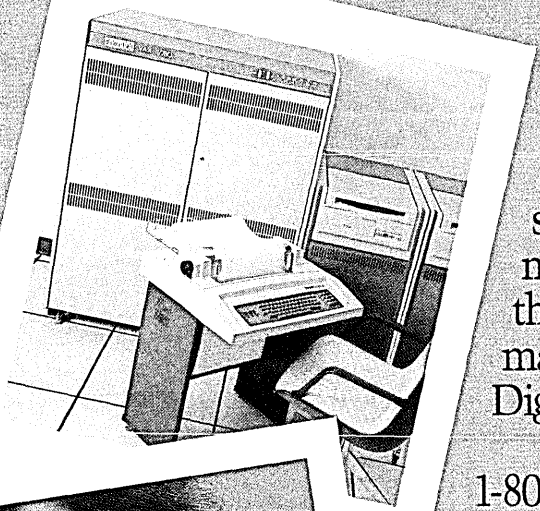
DM068

"Agriculture is an extremely dynamic marketplace," says Larry Wergin. "To service it you need a flexible, quick and highly responsive information system. With VAX™ computers, we're building such a system, and even better, doing it in stages."

"We're starting with RMS, forms management, and communications via DECnet,™" he explains. "We're putting all our batch operations on-line. As our needs and marketplace change, we'll keep adding to this library of services. We'll eventually build a model of our entire business based on Digital's information management products."

Larry believes that VAX information management software is integrated around the operating system better than any other vendor's. "It's a tremendous foundation to build on," he says. "It presents no limits on our ability to tailor services on an individual basis. This may very well be the key to our competitiveness in the future."



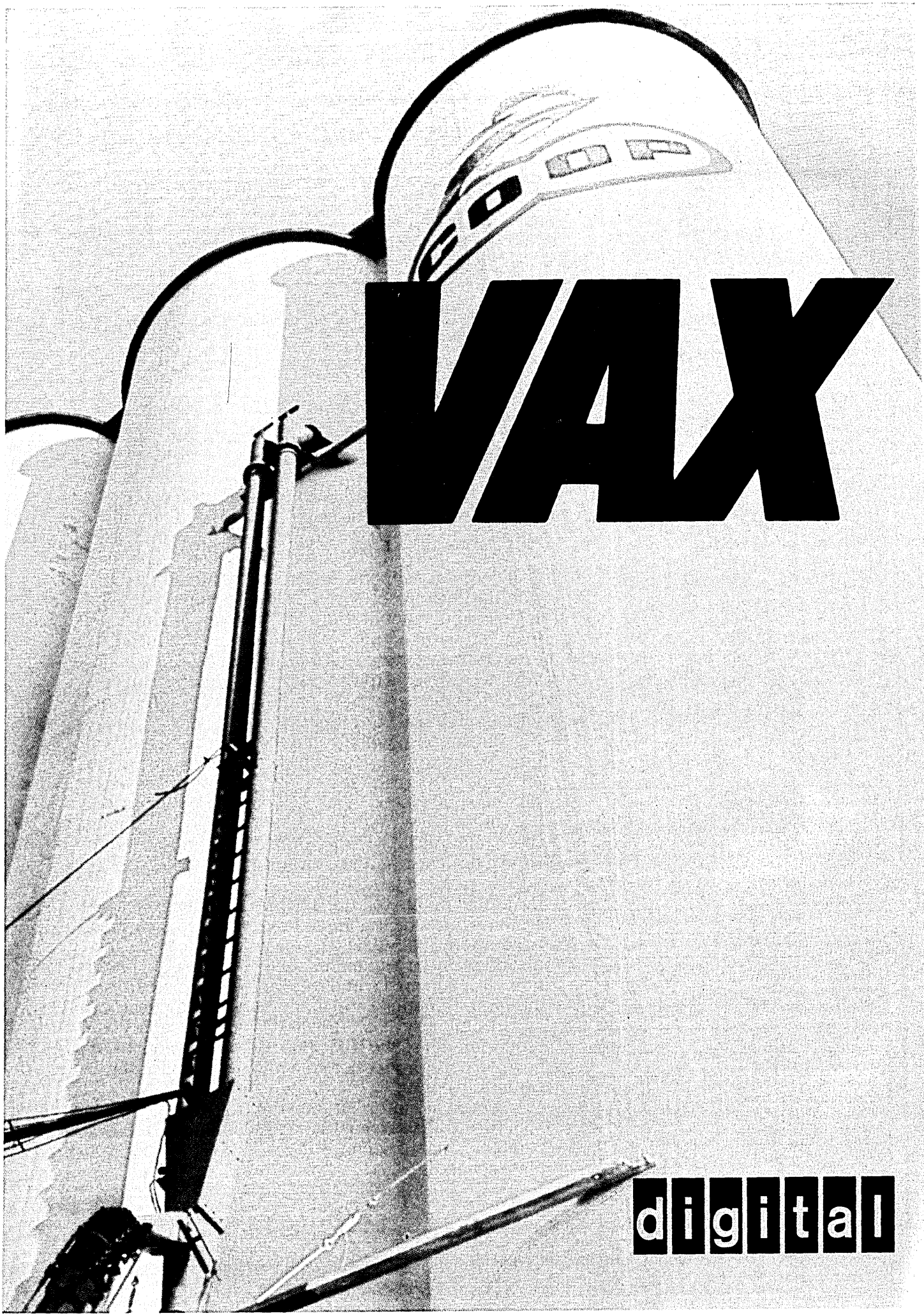
The nine Land Banks asked Digital to look into the future. "We tried to look ahead as far as twenty years," Larry recalls. "We imagined a day when this network could be used to offer farmers full financial services—right in their hometowns. We needed a vendor who would be there when that day came. I don't think there will be many. But with products like VAX, I'm sure Digital will be one of them."

To grow along with VAX, call toll-free: 1-800-DIGITAL, extension 200. Or write: Digital Equipment Corporation, 200 Baker Avenue, CF01/M94, West Concord, MA 01742.

"WITH OVER 450,000 FARM LOANS, WE PICKED VAX BECAUSE IT KEEPS ON GROWING."

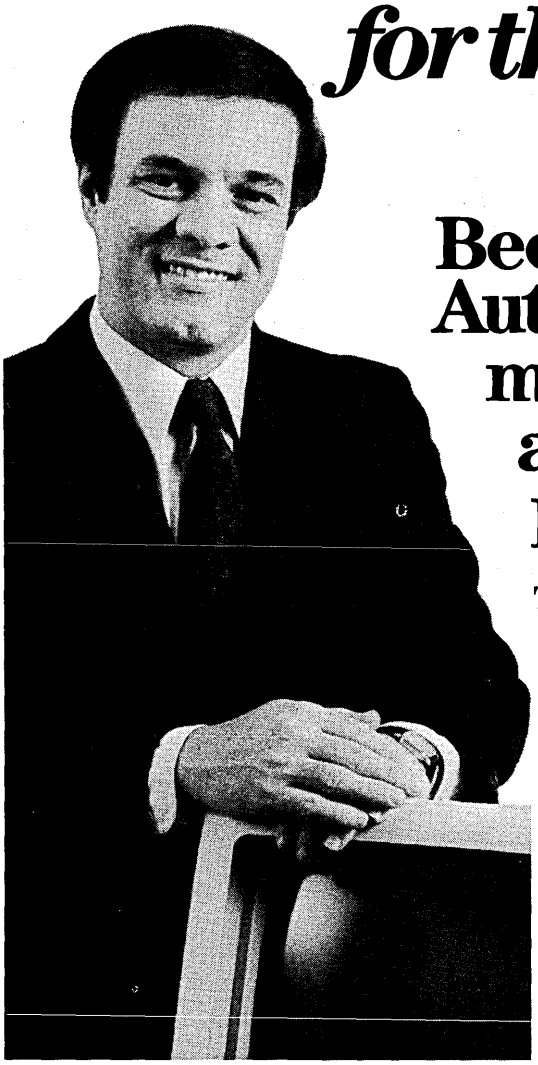
—Larry Wergin, Director, The Land Bank Data Processing Center

Nine of the regional Land Banks of the nation's largest agricultural real estate lender, the Farm Credit System, are building a VAX-11/780-based network to link up with their National Data Processing Center. The network's first task is to improve services to the borrower by providing up-to-date information to hundreds of associations across the country.


VAX
digital

"IDMS/R is the perfect DBMS for the IBM 4300 user."

Frank Chisholm*



Because IDMS/R, with its Automatic System Facility, makes your IBM 4300 as easy to use as a personal computer.

The Automatic System Facility (ASF) is so comprehensive and easy to use that all an IBM 4300 user need do to develop an application is to define a relational record. ASF then dynamically generates all necessary supporting structures including data definitions, screen formats, application processing logic, and documentation. In other words, the developer can witness the application being produced, literally, in seconds. This is what makes ASF a major advance over fourth generation languages. Thus IDMS/R is the perfect system for the IBM 4300 user with limited staff resources.

But suppose when you build a complex, high volume production application with IDMS/R, you desire outstanding performance. Typically, 5% of the data relationships (joins) in any application are accessed 95% of the time. With IDMS/R you can simply change these relationships to predefined joins and benefit from a dramatic boost in performance.

We call it Relational Fastpath. This is what makes IDMS/R a unique relational DBMS, and a perfect system with which to build production applications. In addition, IDMS/R has the most sophisticated back-up and recovery capability of any DBMS, a full integration with personal computers and a complete line of integrated financial and manufacturing applications.

In summary, IDMS/R was designed to satisfy the requirements of the IBM 4300 user who wants to develop both production and end user applications faster and easier.

For further information, attend a Cullinet Seminar. Mail the attached coupon or call Cullinet at 1-800-225-9930, (in Massachusetts 617-329-7700) for a complete schedule.

**Frank L. Chisholm is Cullinet's Executive Vice President. Frank has worked closely with Cullinet users and prospective users for more than six years. As a key member of Cullinet's management team, Frank has contributed heavily to Cullinet's database product development strategy.*

Computer _____

Name/Title _____

Name/Title _____

Company/Department _____

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DM 6/15

Database: Cullinet

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CIRCLE 9 ON READER CARD

LOOK AHEAD

IBM MELDING VM AND SNA	"IBM didn't like what we did," says a dp technician at Lockheed of the Burbank, Calif., aerospace concern's year-long corporate conversion to VM/370 and CMS running on distributed 4300s. That combination took the place of several MVS-based mainframes. The conversion isn't without its risks, however, for the current connection of VM into SNA is still a "kludge," the source says. The necessary IBM product, VCNA, is said to degrade performance at both ends of the link. Lockheed and others expect IBM to bring enough of MVS's control structure into VM to support the more robust VTAM package....
CMS TO MVS?	...Meanwhile, industry sources say IBM is working on native mode SNA support for VM, as well as the ability to run the increasingly popular interactive CMS system under MVS. Such enhancements may be introduced within the next two years, sources claim.
DSS GETS MORE OOMPH	Comshare of Ann Arbor, Mich., has begun testing a new version of its System W decision support software, which it comarkets with IBM. Said to run several times faster than the current version, the new software gains some speed from the applications of DBMS techniques supplied by Set-Theoretic Information Systems Inc., also of Ann Arbor. The latter, through a joint venture in Dallas, SMC Technology, is still seeking several million dollars in venture capital to build a back-end storage management computer that would improve DBMS functions in big IBM systems.
CHRISTMAS IN SUMMER?	Competitors are betting IBM will unveil its much-rumored Popcorn workstation this month or next. The desktop machine is expected to have an Intel 80286 engine and offer multi-user access under Unix; that means little compatibility with the original PC family but much more computing horsepower. Pricing is expected to be in the $10,000 and up range. Watch for Sytek Corp.-designed local network to be unveiled that will string Popcorns together.
COMPAQ GOES DESKTOP	Talk about a hard act to follow: Compaq Computer, Houston, this month will expand beyond the transportable pc market, where it sold over $100 million in 1983, its first year in business, into the heavily contested desktop computer arena. To be introduced is Deskpro, which, built around the Intel 8086, is designed to switch easily between

LOOK AHEAD

	720 x 350 monochrome and 640 x 200 color displays so as to maintain compatibility with popular software packages. Prices will range between $3,000 and $8,000, depending on peripherals attached. The introduction will be a tough measure of Compaq's marketing savvy, for although the company has thrived in the shadow of IBM's PC machine so far, observers wonder if last year's success was but a fluke caused by 1983's severe shortage of PCs from Big Blue.
HERE COMES THE BEEF	Look for a shakeout in the crowded micro software market where cutthroat competition is sure to take its toll in coming months. Observers say too many look-alike packages are being offered and that the climate for a huge VisiCalc market success is long gone. If nothing else, venture capital needed for marketing is hard to find these days. Moreover, IBM has signaled its intention to beef up its PC software drive instead of leaving so much of the lucrative business to independents. It recently entered into a joint marketing deal with Software Publishing Corp., Mountain View, Calif., vendor of the PFS series of business applications, and is expected to devote more of its own development resources to building PC packages that take advantage of propriety hardware hooks in upcoming PC products.
LISP FOR LESS	Symbolics Inc., Cambridge, Mass., will introduce a low-end Lisp computer at next month's NCC in Las Vegas. Designed as a "delivery vehicle" for run-time artificial intelligence applications, the machine will offer better price/performance than the company's successful machine. No performance specs have been released, but the machine is expected to weigh about 200 lbs.
MARTIN SEEKING VENTURE $$	Self-styled industry guru James Martin is looking for $10 million to fund development of a program generator that would automate the job of the systems analyst. Prototypes of the so-called Information Engineer are already running in the U.S. The product is claimed to be based on an encyclopedia of corporate information, using graphics to diagram dataflow, relationships, and structures in a way that is legible to the end user and analyst. The Bermuda-based Martin has so far been seeking funds from Texas Instruments and the U.K.'s Alvey National Research center.
RUMORS AND RAW RANDOM DATA	Intelligenetics, a Palo Alto, Calif., AI company, has changed its name to IntelliCorp., reflecting a shift to general-purpose products.

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CIRCLE 11 ON READER CARD

ADM 3A
ADM 24E
ADM 11

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This new generation of Lear Siegler video display terminals brings elegant High Touch™ style to our American Dream Machine (ADM™) tradition. The family features three new ergonomic terminals designed to meet the needs of OEMs and end users alike: the ADM 11, the ADM 12 and the ADM 24E.

Here is a whole new way for terminals to relate to people. Dozens of little touches add up to the convenience and comfort of High Touch.

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The monitor not only tilts and swivels, it stops positively in almost any position.

The clean, crisp display features a large character matrix on an easy-to-read green or amber non-glare screen – made even easier to read by the hooded bezel. Screens are available in 12" or 14" sizes.

You get the best in style and ergonomics, plus all the outstanding performance features you'd expect from Lear Siegler (see chart).

Lear Siegler High Touch terminals are backed by the broadest network of full service centers anywhere, serving 3000 cities nationwide. And they're made in America – designed, engineered, manufactured and shipped from Anaheim, California to provide you with the best local support.

Place your order today by calling your local Authorized Distributor or, for quantities in excess of 500 units, your Regional OEM Sales Office.

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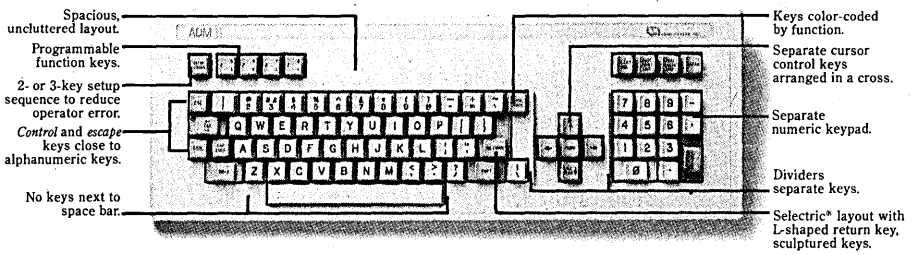

Low-profile, tapered, DIN-standard keyboards with Selectric layout feature logical key groupings and adjustable tilt for comfort and efficiency. ADM 11 shown above.

	ADM 11 Conversational	**ADM 12** Editing	**ADM 24E** Host Programmable
Programmable Function Keys	4 (Shiftable to 8)	16 (Shiftable to 32)	16 (Shiftable to 32)
Non-Volatile Function Keys	Optional	Standard	Standard
Function Key Legends on 25th Line	From Host	From Host	Standard Non-Volatile
No. of Pages of Display Memory	1	2	4
Display Memory Configurations (Plus 25th Message/Status Line)	24 Lines by 80 Characters	(2) 24 x 80 or (1) 48 x 80 or (1) 24 x 158	User Definable up to 96 x 80
Scrolling	Standard Scrolling	Smooth, Jump or Horizontal Scrolling Split Screen	Smooth or Jump Scroll Split Screen
Transmission Mode	Conversation Mode	Conversation or Block Mode	Conversation or Block Mode
Editing	Limited	Full Editing & Protected Fields	Full Editing & Protected Fields
Visual Attributes: Reduced Intensity, Blink, Blank and Reverse Video. Underline also on ADM 12 and ADM 24E	3 Embedded 1 Non-Embedded	4 Embedded, 1 Non-Embedded or All Non-Embedded, plus Full Screen Reverse Video	5 Embedded, 1 Non-Embedded or All Non-Embedded, plus Full Screen Reverse Video and Highlight
OEM Flexibility	Modifiable Set-Up Characteristics	Modifiable Set-Up Characteristics & Personality	Modifiable Set-Up Characteristics. Add to Program in ROM or Down-Line Load in RAM (56K ROM or RAM. Up to 22K Display Available) Room for additional Logic Boards.
Terminal Compatibility	ADM 3A, ADM 5. ADDS Viewpoint & Regent 25, Hazeltine 1400, 1420 & 1500, also available.	ADM 3A, ADM 5, ADM 31, ADM 32	ADM 3A, ADM 5, ADM 31, ADM, 32, ADM 42

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CALENDAR

JUNE

PERCOM '84—Second International Exhibition & Conference on Business and Personal Computers.
June 19-22, Hong Kong, contact: Adsale Exhibition Services, 20/F., Tung Sun Commercial Centre, 194-200 Lockhart Rd., Wanchai, Hong Kong, telex 63109 ADSAP HX.

The First International Conference on Computers and Applications.
June 20-22, Beijing (Peking), China, contact: The Institute of Electrical and Electronics Engineers Inc., P.O. Box 639, Silver Spring, MD 20901, (301) 589-8142.

PCExpo.
June 26-28, New York, N.Y., contact: PCExpo, 333 Sylvan Ave., Englewood Cliffs, NJ 07632, (201) 569-8542.

Second World Conference on Transborder Data Flow Policies.
June 26-29, Rome, Italy, contact: IBI, Department of Policies, P.O. Box 10253, 00144 Rome, Italy.

JULY

MICROTRADE 84.
July 4-6, London, England, contact: Microscope, c/o Montbuild Ltd., 11 Manchester Square, London W1M 5AB England.

1984 National Computer Conference (NCC'84).
July 9-12, Las Vegas, Nev., contact: Registration Dept., AFIPS, 1899 Preston White Dr., Reston, VA 22091, (703) 620-8900.

SYNTOPICAN XII.
July 17-21, Chicago, Ill., contact: Association of Information Systems Professionals, 1015 North York Rd., Willow Grove, PA 19090, (215) 657-6300.

SIGGRAPH'84, The 11th Annual Conference on Computer Graphics and Interactive Techniques.
July 23-27, Minneapolis, Minn., contact: SIGGRAPH'84 Conference Office, 111 East Wacker Dr., Chicago, IL 60601, (312) 644-6610.

AUGUST

Great Southern Computer Show.
Aug. 2-4, Charlotte, N.C., contact: Chris Paul, Great Southern Computer Show, P.O. Box 655, Jacksonville, FL 32201.

AAAI-84 (The National Conference on Artificial Intelligence).
Aug. 6-10, Austin, Texas, contact: Claudia C. Mazzetti, American Association for Artificial Intelligence, 445 Burgess Dr., Menlo Park, CA 94025, (415) 328-3123.

The 1984 International Computers in Engineering Conference and Exhibit.
Aug. 12-15, Las Vegas, Nev., contact: The American Society of Mechanical Engineers, Dept. C-438, 345 E. 47th St., New York, NY 10017, (212) 705-7795.

SEPTEMBER

Midcon/84 and Mini/Micro Southwest-84.
Sept. 11-13, Dallas, Texas, contact: Nancy Hogan, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, CA 90045, (213) 772-2965.

Eurographics '84.
Sept. 12-14, Copenhagen, Denmark, contact: Eurographics '84 secretariat, DIS Congress Service, Linde Alle 48, DK-2720 Vanlose, Denmark, tel. 45-1-712244.

Infodial Videotex '84.
Sept. 17-21, Paris, France, contact: Infodial-Videotex, 4, place de Valois, 75001 Paris, France, tel. (1) 261-52-42, telex 212597F.

The IBM System User Show.
Sept. 3-5, London, England, contact: Peter Walker Associates, 32 Fitzroy Sq., London W1P 5HH England, or call (44) 01-388-9871.

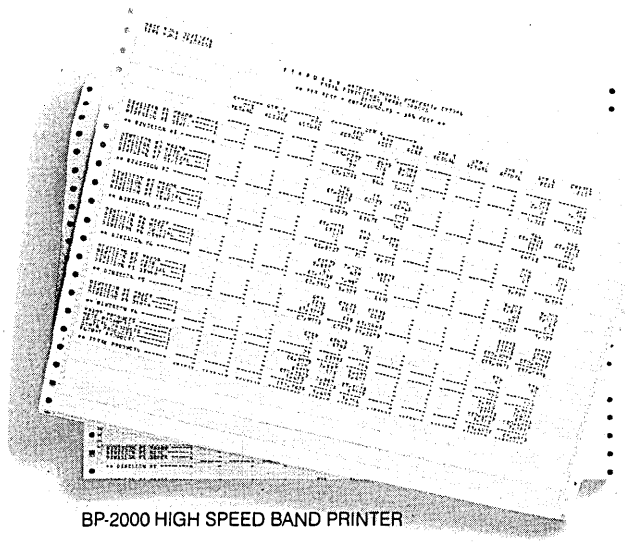
Electronic Imaging '84.
Sept. 11-13, Boston, Mass., contact: Electronic Imaging '84, Morgan-Grampian Expositions Group, 2 Park Avenue, New York, NY 10016-5667, or call (212) 340-9780.

Business Systems '84.
Sept. 17-22, Taipei, Taiwan, contact: American Institute in Taiwan, c/o CORDAG Associates Inc., 4405 East West Highway, Suite 401, Bethesda, MD 20814, or call (301) 652-6404.

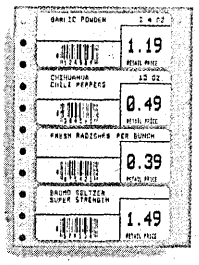
Federal Computer Conference.
Sept. 18-20, Washington, D.C., contact: Federal Computer Conference, P.O. Box 368, Wayland, MA 01778, or call (800) 225-5926 or (617) 358-5181.

Fiber Optic Communications and Local Area Networks Exposition (FOC/LAN 84).
Sept. 19-21, Las Vegas, Nev., contact: Information Gatekeepers Inc., 138 Brighton Ave., Boston, MA 02134, or call (617) 787-1779.

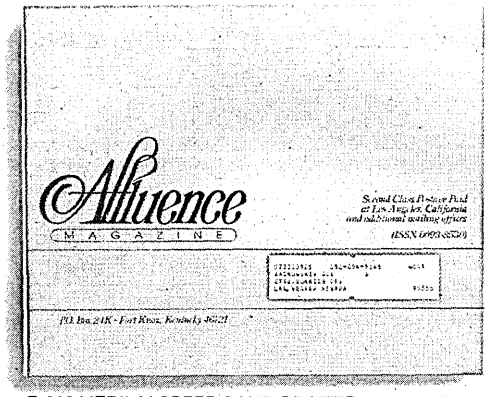
PCExpo.
Sept. 24-26, Anaheim, Calif., contact: PCExpo, 333 Sylvan Ave., Englewood Cliffs, NJ 07632, or call (201) 569-8542.



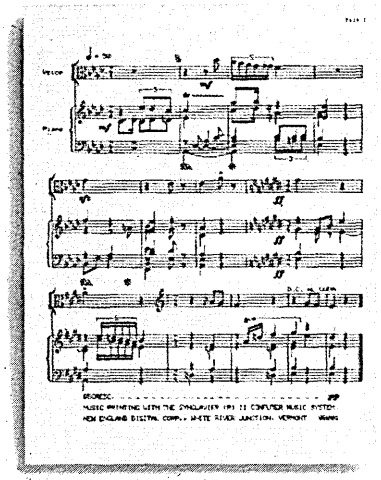
BP-2000 HIGH SPEED BAND PRINTER



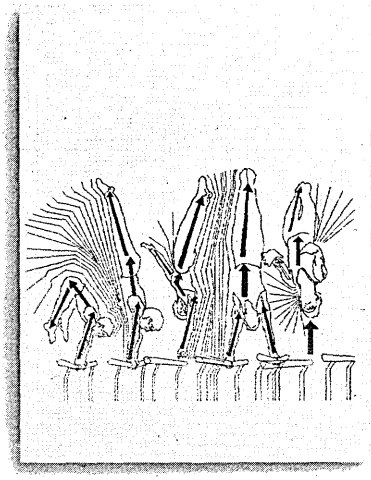
M-100L
MATRIX PRINTER



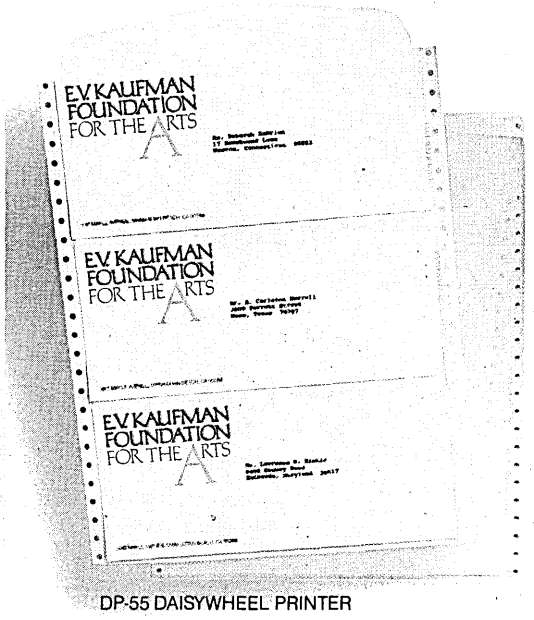
B-600 MEDIUM SPEED BAND PRINTER



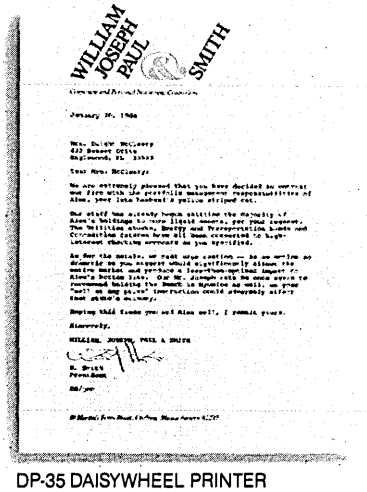
P-80 MATRIX PRINTER



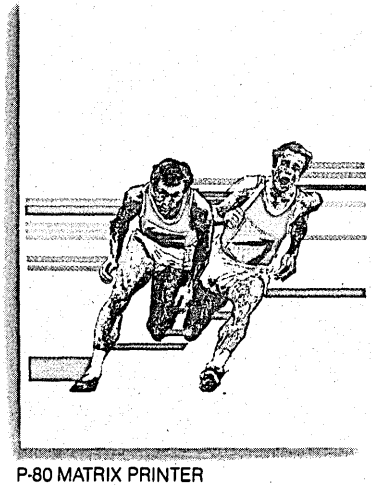
MODEL 480 MATRIX PRINTER



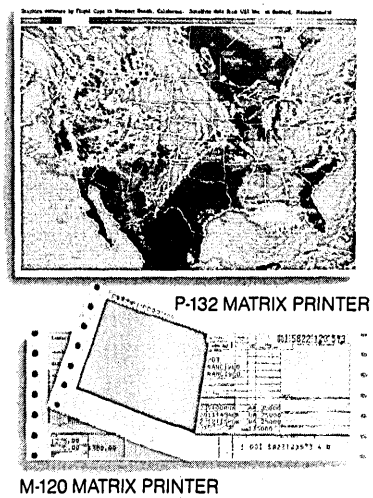
DP-55 DAISYWHEEL PRINTER



DP-35 DAISYWHEEL PRINTER



P-80 MATRIX PRINTER



P-132 MATRIX PRINTER

M-120 MATRIX PRINTER

...and so on.

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Nobody puts ideas on paper so many ways.

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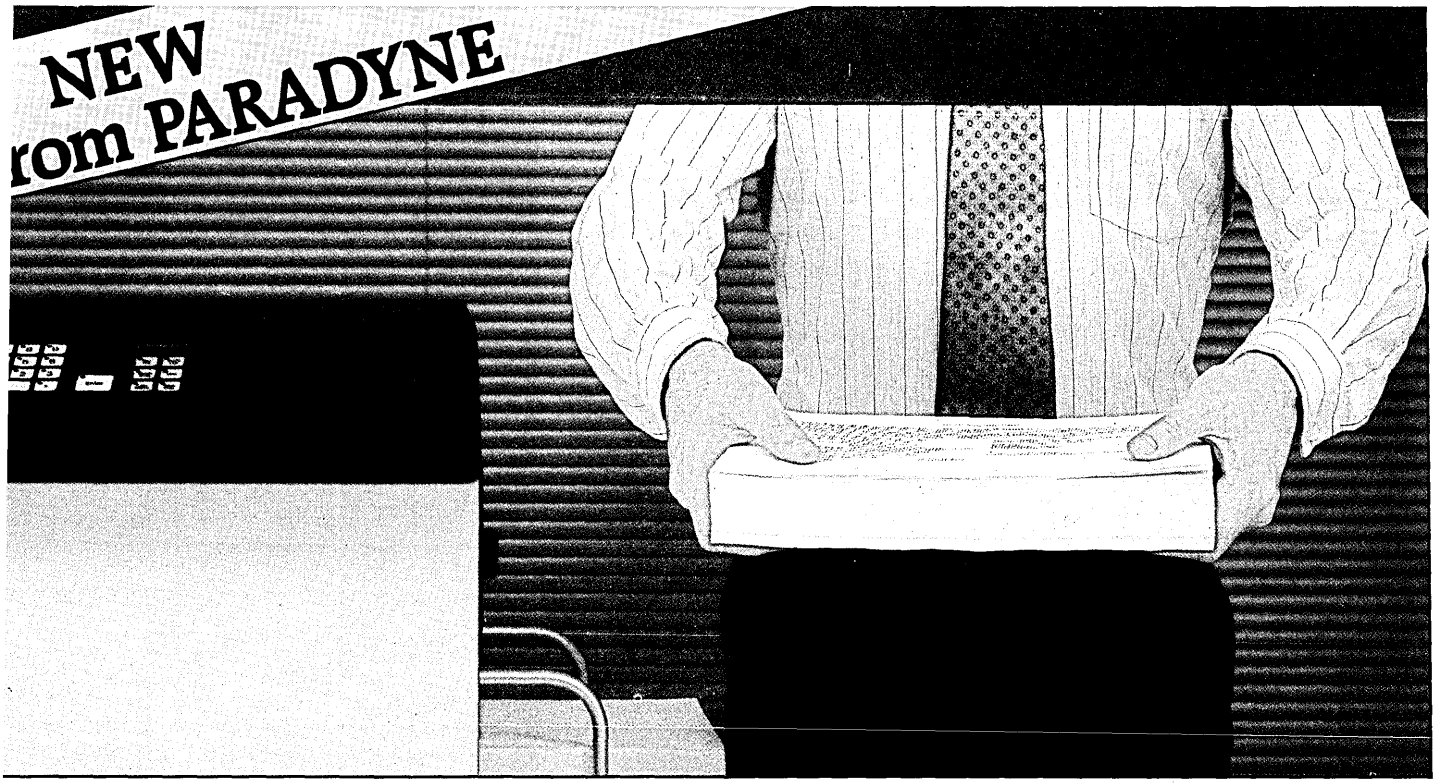
CIRCLE 13 ON READER CARD

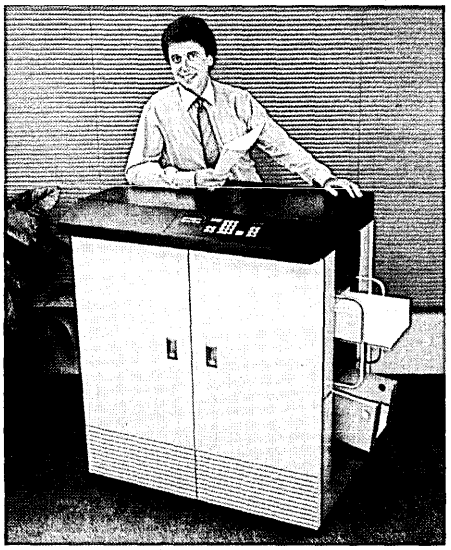


Can you print 300 pages of data at your Remote site...In 5 minutes?

Yes, Paradyne's NEW 8360 Remote Page Printer Prints as fast as a Page a Second. Paradyne introduces high speed, non-impact remote printing — from one location to any other — at speeds up to 60 pages a minute, depending on line speed and data density.

No Host Remote Teleprocessing Software is Required. Communications requirements are handled through PIXNET®, Paradyne's communication system, and the page printer will operate without any changes to your existing applications programs.

With the 8360 your remote operators have the same functional capabilities as the data center operator. And the 8360 has the same capabilities as the system printer in your computer room.



Uses Standard 8½" x 11" copy paper.

Compact in Size, Highly Reliable and Easy to Use. The 8360 is easy to install and it runs cool — all day long. You'll have a high quality printer designed to blend into your office environment with an operation that's so quiet your operator may have to check to see if it's finished printing.

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CIRCLE 14 ON READER CARD

WE MADE IT POWERFUL. BUT WE KEPT IT SIMPLE.

Until now, IBM PC users looking for a data base manager had to make an unappetizing choice: Multifile systems so powerful they're difficult to use. Or single file systems so simple they can't be used to do much.

Until we cooked up Power-base.™

Power-base is the only multifile data base manager powerful enough to get the job done, yet simple enough to be mastered in one sitting. Even if you've never used a computer.

There are no languages to learn, no commands to memorize. To tell Power-base what you want, simply keep choosing from the menu which never goes away, yet never gets in the way. To make a change, simply make another choice. And the unique DataZOOM™ gives you the power to move rapidly from file to file, right to the piece of information you need.

Software Digest awarded Power-base the highest "overall evaluation" after testing twenty IBM PC data management programs for the March 1984 issue of *The Ratings Newsletter.*

It's hard to make a simpler choice than Power-base. Especially with a suggested retail price so easy to digest: $395.

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Get a taste of Power-base for yourself. For a demonstration copy, send us $10. It's refundable when you purchase Power-base at your local participating ComputerLand or other authorized dealer.

Powerbase Systems, Inc., (Dept. A), 12 West 37th St., N.Y., NY 10018. (212) 947-3590.

Requires 256K for either IBM PC with 2 drives or XT and compatibles.
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CIRCLE 15 ON READER CARD

WHAT'S THE BEST WAY TO SAVE PDN CONNECT CHARGES?

TAKE A T.I.P. FROM DCA.

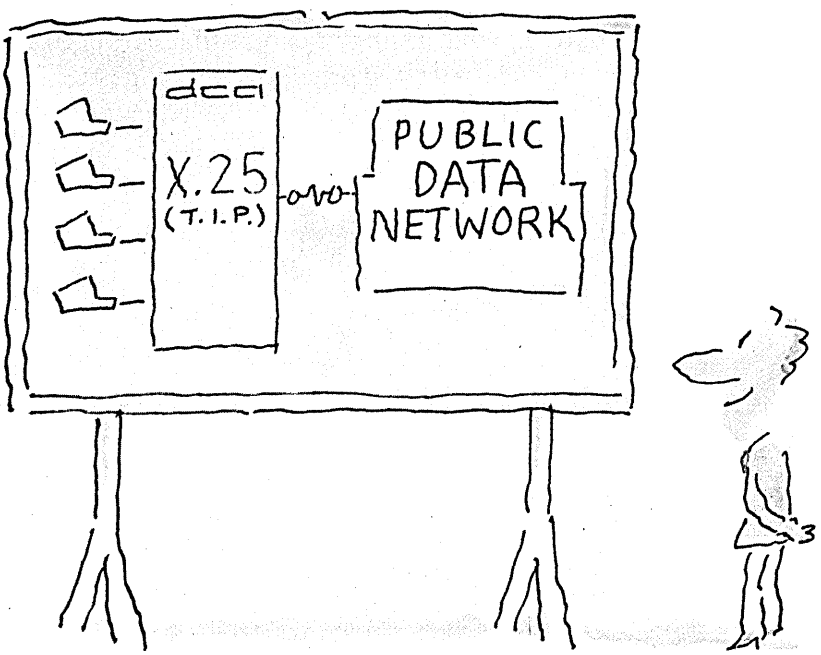
Our new Terminal Interface Processor can interface up to 32 asynchronous devices on a single X.25 connection. Reliably, quickly. And at substantial cost savings.

And, since it's built with our exclusive Integrated Network Architecture, it can be upgraded to a DCA Series 100 Statistical Multiplexor—easily and inexpensively—when a private-line network becomes more cost-effective.

Our T.I.P. operates in accordance with current CCITT standards of the X.25 family. It features full 18-parameter X.3 PAD support. And it connects directly to async ASCII terminals. Or via dial-up or leased-line modems.

If you're suffering high PDN connect charges, our T.I.P. is the best tip anyone can give you.

For more information, write: DCA, 303 Technology Park, Norcross, Georgia 30092. Or call toll-free: **1-800-241-5793.**



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CIRCLE 16 ON READER CARD

LETTERS

THREAT AGAINST HUMANS

Regarding DARPA's Strategic Computing program (February, News In Perspective, p. 48), thanks for informing us of this important project. I was very disappointed that most of the industry people you quoted seem to regard the plan as nothing more than a needed shot in the arm for artificial intelligence research. I have read the whole proposal and I am writing to tell you it is much more dangerous than that. Many of us have become so inured to exaggerated military claims in computer science funding proposals that we forget how bizarre they must appear to the average person. Who really thinks it would be a good idea to place "complete reliance" on computers with "humanlike, intelligent capabilities of planning and reasoning" to guide weapons "with little human intervention, or even with complete autonomy"?

I think the most important points about the Strategic Computing project are these: it proposes to build instruments for waging nuclear war, it recommends replacing human decision-makers with machines, and it suggests that a military project is an appropriate response to such commercial challenges as Japan's fifth generation computer effort.

First, it proposes to build instruments for waging nuclear war. The proposed integrated circuit technologies are supposed to be hardened to 50 million rads (Strategic Computing Proposal, p. 29). (By the way, the fatal dose to a human is about 500 rads). This is far more than needed for a spacecraft; the devices are clearly intended for use near nuclear explosions. The intention is explicitly spelled out: "Commanders remain particularly concerned about the role autonomous systems would play during the transition from peace to hostilities when rules of engagement may be altered quickly. An extremely stressing example is the projected defense against strategic nuclear missiles, where systems must react so rapidly that it is likely almost complete reliance will have to be placed on automated systems" (SCP, p. 4). This statement seems to allude to various ballistic missile defense proposals, but also endorses the same principal as "launch on warning." The implication is that these systems can eventually be made so reliable that we may entrust them with the ability to commit acts of war without human intervention. The underlying assumption seems to be that refinements and elaborations of the technology within warning and launch systems can replace human observers and decision-makers, whose judgment presently does not depend completely on the correctness and reliability of the technology. This is a fundamental misconception, potentially a mortally dangerous one.

The theme of replacing human decision-makers occurs in other contexts as well. In the context of military staff work (or "battle management" as the report terms it) there are worries that the speed and complexity of future conflicts will overwhelm staff people (SCP, pp. 4–5). In the context of the robot copilot (or pilot's associate), there is concern that the complexity of the modern cockpit can be overwhelming (in the words of the report, it "outpaces our skill at intelligently interfacing the pilot") (SCP, pp. 24–25). It is notable that in these examples, machines are envisioned as replacing the judgment of highly skilled people rather than automating routine tasks. The wisdom of this is certainly arguable, even from the point of view of traditional military values. The idea is almost a parody of the attitudes implied by the phrase "battle management."

These and other ideas reveal an underlying theme that is really quite repugnant: although warfare is becoming increasingly hazardous and impractical, the miracles of computer technology will enable us to continue to use it as a rational instrument of national policy.

Turning from the moral to the pragmatic, it is specious to suggest that a military project like this one is an appropriate response to such commercial challenges as the Japanese fifth generation computer effort. Instead, this plan is likely to retard our nation's contribution to this developing market. As the report admits, the project is intended to "pull" a sizable fraction of our national talent into a number of exotic military applications (SCP, pp. 14–16, 64, 69), thus displacing it from more practical and marketable projects where it would otherwise be occupied. Despite vague promises of spin-offs and technology transfer, performing this work in a military context will prevent much of it from becoming available for other applications; the military's recent penchant for retrospectively declaring its contractors' work to be classified or otherwise subject to export limitations is well known. Meanwhile, our competitors will not be waiting for spin-offs to provide what the market demands.

JONATHAN JACKY
Seattle, Washington

LETTERS

SECURITY SCRUTINIZED

Regarding your article on software piracy (April 15, News in Perspective, p. 49), the long-term solution does require the computer manufacturers to add a program-accessible serial number to each cpu, as you indicated, or use of a separate plug-in module. In the interim, however, there are methods of reducing the incidence of software piracy within current technology and adding a minimum burden to the authorized user.

Several diskette manufacturers or vendors have developed methods of imprinting diskettes with a fingerprint or signature that cannot be changed or counterfeited by the disk drives currently part of the most popular microcomputer systems, some of which were mentioned in your article. We have developed cryptographic procedures that bind the application package to the imprinted diskette, based on our patented method of using the Data Encryption Standard (DES). In addition, part of the application package and the routine that validates the diskette are enciphered to reduce the possibility of compromise by disassembly. This approach permits the authorized user to generate backup copies of the applications package using the copy utility that is distributed with the operating system with some of the vendor's diskettes. The backup copies, however, will not run; they can be used only to reinitialize the authentic version in case of accidental erasure or other problems.

Many spokespersons have complained that "software costs too much." One reason for the current pricing structure is that so many pirated copies have been made of the popular packages that the software developers or distributors have to rely on a substantial profit on each copy sold in order to recover their large development costs and to provide a profit. If the incidence of piracy was reduced by as little as 20% to 30%, then software prices would be reduced by the pressure of competition at the same time as profit and return on investment increased. Although no security procedure guarantees 100% security, with current technology this level of reduction in piracy can be achieved at an approximate incremental cost of 3% of the retail value of the application packages.

MARVIN SENDROW
Advanced Computer Security Concepts
Annadale, Virginia

I read with great interest your article in the April 15 issue on software piracy. Before I present my observations on the dilemma, I must emphatically state that I am totally opposed to the copying of copyrighted software for any use other than that specifically permitted by the copyright holder.

Here are my observations:

1. Traditional copyright law works basically because most people are "honest," and because the expense of copying an item is so close to acquiring an "original" from the publisher that there is no great temptation (copying a $7.95 cassette onto a reasonable quality blank cassette that cost $3.95, using dubious equipment, is only tempting to the unsophisticated and to the owners of indiscriminate ears!).

2. Pet rocks selling for $4.95 to $49.95, depending upon packaging, are obviously a better target for copying in that the ratio of retail cost divided by cost to copy is so great.

3. It may not be very profound, but if you take the retail cost of personal computer software and divide it by the cost of the magnetic media and computer time it takes to copy it, you will see that this software is much closer to pet rocks than to musical cassettes in the temptation ratio I have outlined.

My conclusion is that as long as the developers of personal computer software continue their mad dash toward market share, regardless of the channel of distribution or the development of a customer (read end-user) relationship, the problem will not only continue but will escalate.

ROBIN CONNELLY, CDP
Doorway to Memory
Pasadena, California

You have published several articles lately about software piracy, most recently in your April 15 issue. The usual themes were to employ more and better security features in software products, or to pass new legislation putting additional bite into deterence.

Neither of these actually attacks the root cause of software theft occurring in large corporations. To understand what actually causes software piracy in large corporations, you must take an insider's look at what happens and why.

All large corporations have established bureaucracies, with red tape and complex procedures, to control any purchase. Many times these entrenched bureaucracies develop procedures as protectionism for political purposes. This is especially true in companies where the old "MIS/EDP" type organizations have not been able to deal realistically with the coming of the microcomputer, and are still attempting to maintain some degree of control over their former empires. Instead of helping users with today's sophisticated microcomputers and developing networks and training facilities, they resist through procedures and red tape.

Even when microcomputers are not a threat to management, most companies have through the years instituted sufficient procedures and inefficiencies to seriously delay and deter purchasers of needed microcomputer software from obtaining it quickly and easily.

It's not as simple as a small businessperson just going to the local computer store, buying a needed software product, and bringing it back and using it. Corporate users of microcomputer software must follow all the rules and proper procedures to obtain permission to buy and approval of budget funds, and then have the needed product purchased for them by an organization that generally doesn't know the difference between a byte and a bolt. Many miscommunications result between the software end user and the software vendor because of all the middlemen. Obtaining the correct software product can take months.

Well, does this offer any insights on how to expedite the process of obtaining microprocessor software in a reasonable time frame without going through the corporate software purchasing wringer? In case it doesn't, here is what really happens. After a rejection or a demand for more justifications by some level in the bureaucracy to a purchase request for a needed software product, the end user simply copies the software and documentation from a friend who previously obtained it the hard way! This, of course, makes the copier indebted to the friend and requires the copier to reciprocate in kind with a similar software copy deal in the future. Of course, some people don't even bother to officially request a software purchase, they simply steal it in the first place.

A lot of the pirated copies of software are being used by people who cannot officially justify (to their management) their need to have a purchased copy of it. Once they become proficient in its use, however, they frequently become the purchasers of follow-on products from the same software vendors. This is because they can see (and thereby justify) ways to use it only after actually using and understanding it.

How, you ask, can normally honest people stoop to stealing software? Well, it has a lot to do with the long-standing habit of copying in-house software and documents that have been freely copied since the first computer was cycling its first instruction. In the old days it was a fellow worker's copy of a punched object deck; today it's a friend's floppy disk. Large corporations have an underground set of methodologies that are actually used to get the day-to-day work done in spite of the red tape; it's hard for a worker to see this as illegal.

So, the act of copying a vendor's microcomputer software product is still not perceived as theft of a valuable commodity, but instead, as a means of getting the job done. This mentality is also caused by the fact that the theft does not deprive the software owner (original purchaser) of its use, but instead may be affecting some distant third party who "will never know anyway."

Obviously, many people are at fault

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ACCELERATED AND ECONOMICAL APPLICATION DEVELOPMENT:

- Database concurrency, integrity and recovery are fully automated.
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APPLICATION AVAILABILITY AND INTEGRITY—BEYOND MERE HARDWARE FAULT TOLERANCE—FOR THIS UNPRECEDENTED INTEGRATION OF SYSTEM-WIDE FAULT TOLERANCE:

- Application software integrity and recovery are achieved without any required application programming.
- Because all system maintenance tasks may be performed while the system is in production, the application is available 24 hours per day, 7 days per week.
- SYNAPSE N+1™ architecture not only permits recovery from multiple processor failures, with no human intervention—but also lets all processors fully contribute to transaction throughput.
- Data integrity is the top system priority.

GRACEFUL GROWTH AND CONFIGURABLE PERFORMANCE:

- Performance increases linearly with the addition of processors online and under power, and yields the most transactions-per-second-per-dollar in the industry.
- The advanced Synapse multi-processor architecture expands system power linearly in low-cost increments, from supermini to largest mainframes, in one cabinet (42" wide).
- A unique software architecture automatically scales up with increasing database concurrency and growth.
- Relational database performance is achieved through access acceleration and an active, system-wide APPLICATION DICTIONARY™ facility.
- Hardware and software growth is transparent to application programs and requires no application redesign, complex tuning or load balancing.
- Integration of the Transaction Processing Manager into the operating system eliminates bottlenecks traditionally found in systems dependent upon the requester-server model.

SIMPLICITY AND EFFICIENCY OF OPERATIONS:

- The system may be in production 24 hours per day, 7 days per week, because the following may be securely and efficiently done during production:
  - Backups • Database reorganization
  - Reconfiguration and growth
  - Maintenance • Development • Batch processing
- Program modules can perform in either a batch or an online environment.
- Menu-driven system security is flexible and easy-to-implement.
- Batch processing is flexible and high- performance.

What Synapse has created is a truly unique option. Totally integrated online database transaction processing—from hardware to software to application. With an architecture that combines 3081 performance, System/38 simplicity, Tandem availability, and a painless-growth capability that's beyond anything else.

You can confirm all this for yourself in just a half day at one of our demonstration centers. You can walk in and build your own online database, screens and application unit. Then walk out with program listings and samples of output. Knowing that, while there's now an alternative to IBM and Tandem, there clearly isn't one to Synapse.

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CIRCLE 17 ON READER CARD

LETTERS

here—the corporations, their management, the employees, and even the microcomputer software vendors themselves.

So, what needs to be done to solve the software piracy problem in large corporations? Is it security? Is it new, tougher laws? No, it is a human problem with a simple, long-lasting human solution:

1. Microcomputer vendors need to reduce their software prices to a more realistic level.

2. Vendors must provide extremely liberal volume discounts to corporations.

3. The artificial barriers to purchasing software in corporations, such as in-house software stores and classes, must be eliminated.

4. The people using software must be educated as to its value, and the fact that loss of sales by copying is theft.

JAMES J. QUAIL
Universal Information Systems
Escondido, California

FEAR OF DIMINISHED DENOMINATORS

I am elated over seeing my "Hit the Slopes" contribution appear in so august a Forum as your April 15 Readers' (p. 169).

I am concerned, without undue pessimism, lest the ORQ typographical mutation from:

$$n = \sqrt{\frac{cost}{enuff}}$$

to:

$$n = \frac{cost}{\sqrt{enuff}}$$

may bring misadventure to the statistically unperceptive.

The severely diminished denominator may induce a Person Made of Lead (i.e., a non-Ironman) to undertake unsustainable heights of endeavor in a misguided pursuit of optimism.

A.J. CRAWFORD
Colgate Palmolive Co.
Fairfield, Connecticut

SWEET ON SARAH

In the article by Frank Sweet (April 15, "The Winchester House Syndrome," p.104), Sarah Winchester's name is misspelled as Sara and the article states that workers continued to add to the house for 36 years. According to the brochure distributed by the Winchester House in San Jose, the figure should read 38 years.

M.B. DANISH
Aberdeen Proving Ground, Maryland

WHAT'S IN STORE FOR '94?

Not surprisingly, both entries in your recent "Looking Back" column (April 15, p. 8) involve accomplishments by one man—Dr. Gene Amdahl.

First, there's the architecture planning for System 360 in 1964, and second, the founding of the plug-compatible mainframe industry in 1974. Had you looked back one more decade to 1954, you would have found that Dr. Amdahl's first machine for IBM, the 704, was announced in May.

Now in 1984, in his fourth decade of contribution, Dr. Amdahl continues to strive for innovation and excellence in electronics.

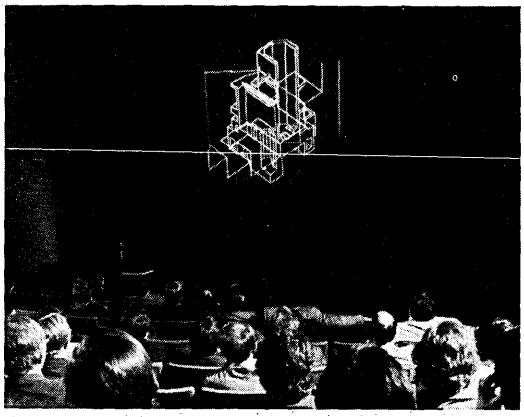
PAULA BELL
Trilogy Systems
Cupertino, California

ON GNASHING NASH

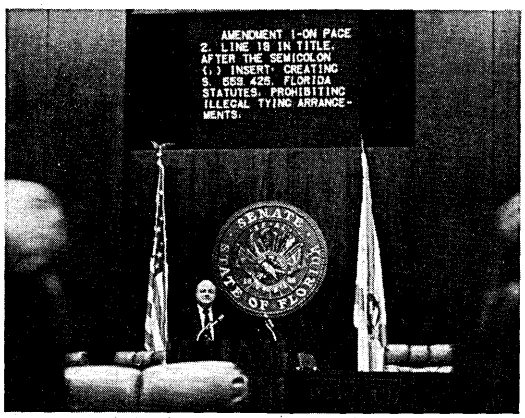
Lorraine King got it wrong (March, "The New Orient Express," Oem Edition, p. 225-3), and Ogden Nash is surely turning in his grave at 250cps. What he wrote was .

How courteous is the Japanese
He always says excuse it please,
(and went on saying, I think):
He climbs into his neighbor's garden
And smiles and says I beg your pardon;
He smiles and grins a friendly grin
And brings his hungry family in;
He grins and bows a friendly bow,
So sorry, this my garden now.
Yours scrutably,

E. MUHR
Escola De Administração De Emprèsas
São Paulo, Brazil



COMPUTER-AIDED DESIGN displayed by General Electric projector is viewed by Engineering Society of Detroit.



WORDS "PUNCHED UP" by clerk of Florida State Senate are inspected carefully before a vote.

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With General Electric's exclusive system for bright, sharp professional-quality pictures, up to 25 feet wide, General Electric Professional Large Screen Video Projectors are making presentations more dramatic, more productive, and more convenient.

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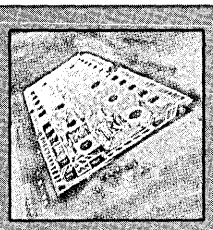
Portable and flexible, General Electric projectors are being used in a great variety of applications, including both rear and front projection. Ask our applications experts whether yours can be added to the growing list. Call or write: General Electric Company, Projection Display Products Operation, Electronics Park 6-206, Syracuse, NY 13221. Phone: (315) 456-2152. TWX710-541-0498.

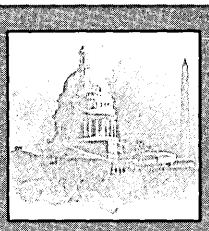
GENERAL ELECTRIC

CIRCLE 18 ON READER CARD

Isn't it about time for the next milestone in office information systems?



1970
Four-Phase announces the industry's first all-LSI Central Processing Unit to give you increased performance in a smaller computer system.



1973
Four-Phase wins the largest-ever contract with the Federal Government for a data entry system.

Motorola/Four-Phase introduces The 6000 Series–a new milestone.

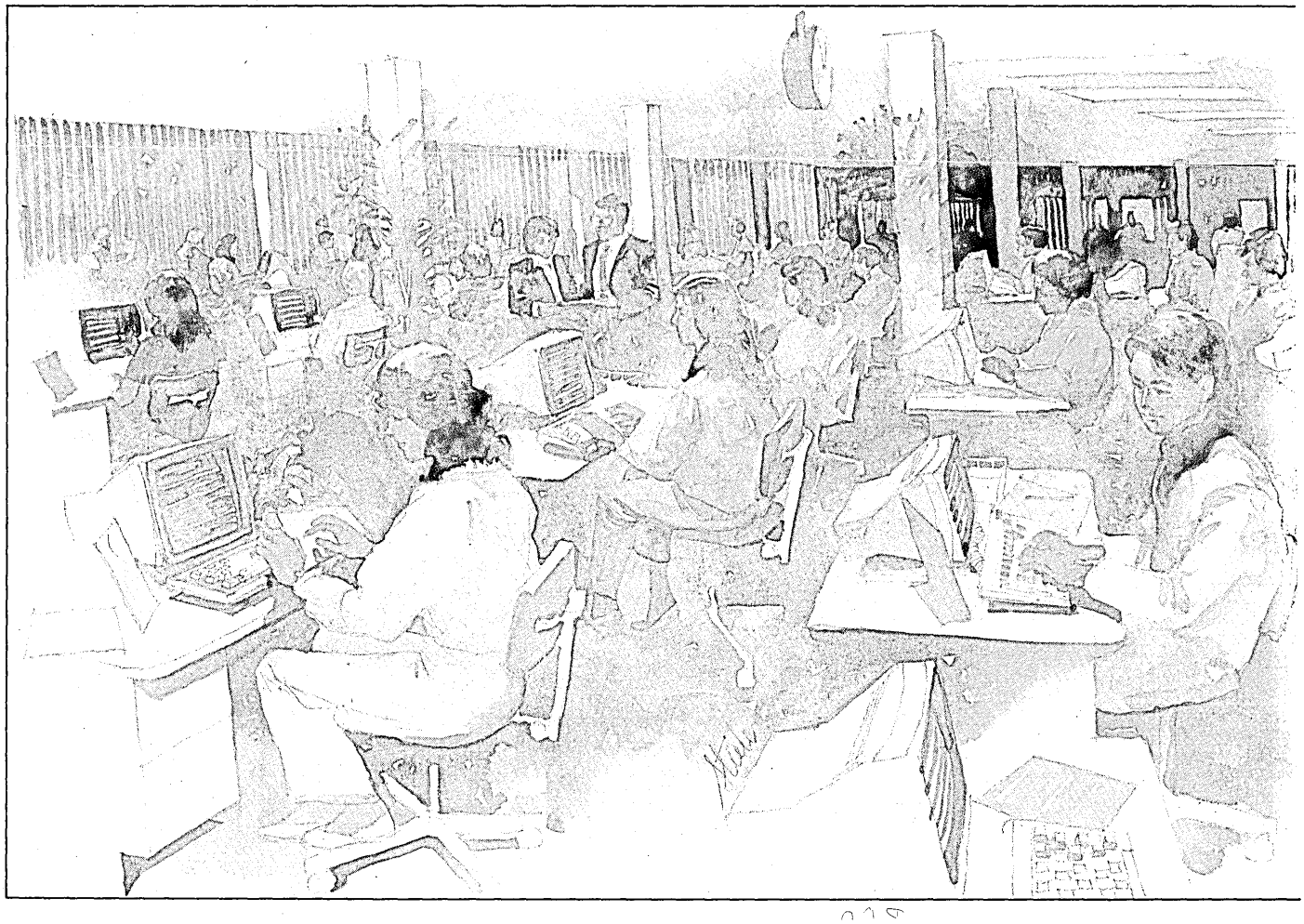
A milestone for new standards in office information systems from the company that started it all.

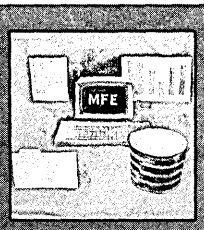
From the moment Four-Phase introduced the world's first all-LSI computer in 1970, we have consistently presented the industry with innovative hardware and software products to help make business more profitable and productive.

Today, as a member of the Motorola Information Systems Group, Four-Phase once again unveils another milestone in information processing—the new 6000 family of office information systems. Compact, powerful processing units and flexible, capable software have been fused together into a family of systems that deliver maximum results today, with substantial expansion capabilities for tomorrow.

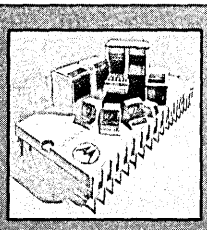
Technology for the real world.

Motorola/Four-Phase systems are tough enough and smart enough to deal with the real world—where speed, power, and reliability in a multi-user environment are prime considerations. The new 6000 systems feature the high-performance 32-bit Motorola 68010 CPU and an operating system derived from UNIX* System V under license from AT&T. We created





1978
Four-Phase announces The MULTIFUNCTION EXECUTIVE* (MFE), the first DDP operating system to allow multiple applications to run concurrently and independently.



1982
Four-Phase is acquired by Motorola Inc., combining our information processing expertise with one of the world's leading manufacturers of semiconductors and electronic equipment.

integrated system software that combines these two industry standards into a powerful, multi-user, multi-tasking environment that can stand up to practically any application.

There are two systems in the 6000 family. The 6300 supports 1-8 users, making it perfect for the smaller user or a remote office. The 6600 is a high-performance system designed to support up to 128 users. Both systems offer complete and integrated solutions—whether they're working in an operations-oriented environment where efficiency and precision are needed, or a results-oriented environment where flexibility and quality are key.

Service and support to match our technology.

At Motorola/Four-Phase, our commitment to you goes beyond providing quality, high-performance hardware and software. Support is just as important. Our award-winning Customer Support Operation is staffed with over 1,150 customer support specialists in over 175 cities across the nation. One phone call to our Operations Center will ensure prompt response from the nearest available specialist. And you can call the Center 24 hours a day, 365 days a year.

If you're a DP/MIS manager or OEM, find out what the latest milestone in office systems can mean to you. Contact Motorola/Four-Phase today at 1-800-528-6050, ext. 1599. In Arizona, call 1-800-352-0458, ext. 1599. Or write us at 10700 North De Anza Blvd., M/S 52-3B1, Dept. S., Cupertino, CA 95014.

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Four-Phase Systems

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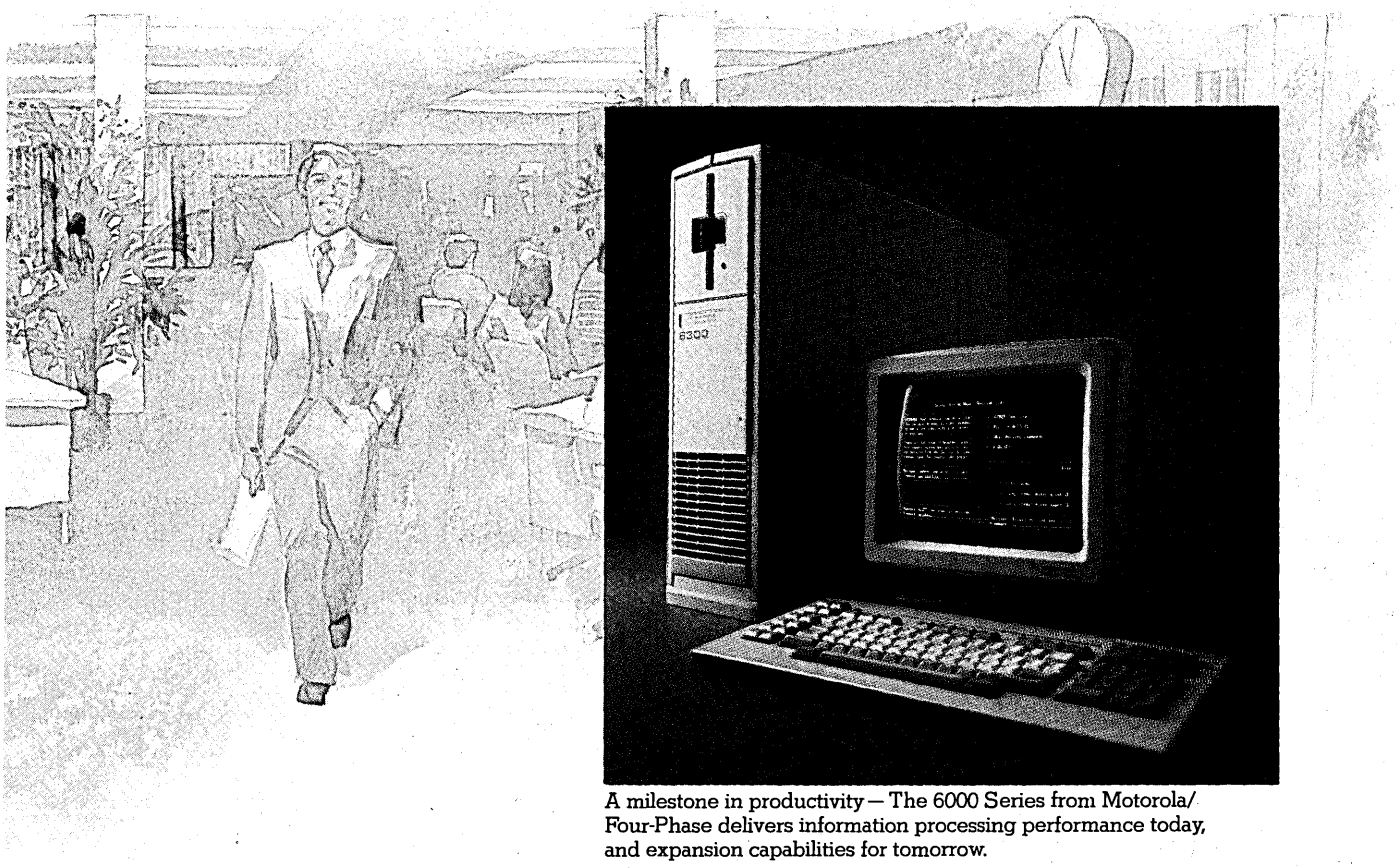

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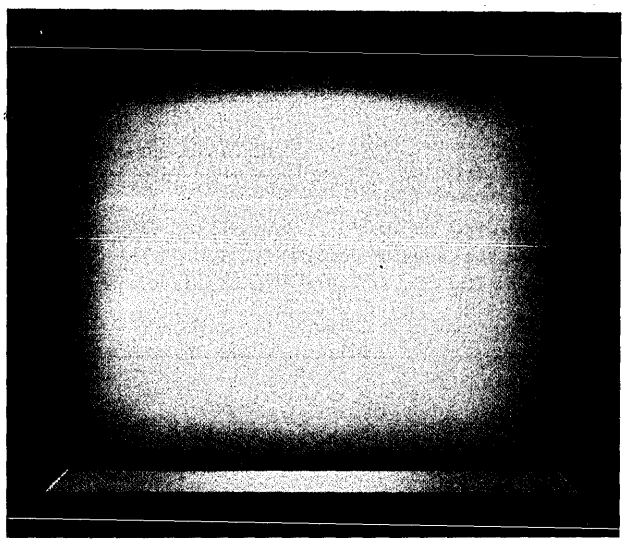

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CIRCLE 20 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

SHIFTING STANDARDS INTO HIGH GEAR

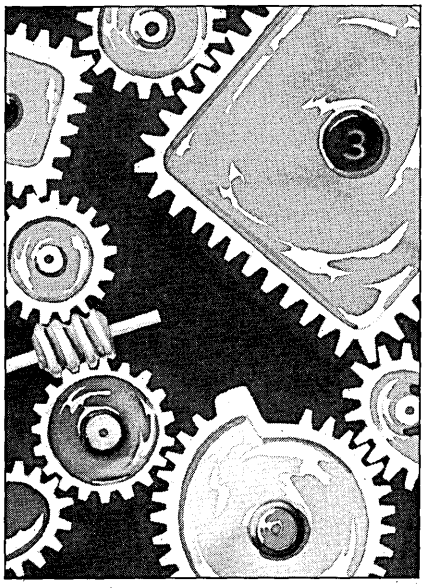

ILLUSTRATION BY DORIS ETTLINGER

Standards have been the subject of squabbles among vendors and users for years. Ignoring users' needs, industry manufacturers have tried to tie the hands of their customers, locking them into their products and protocols. Trying the hardest to untie those hands and unlock those closed systems has been the National Bureau of Standards (NBS) and the International Standards Organization (ISO). The struggle has not been easy and it's still far from over. Nevertheless, there are now signs that these laborious efforts will result in some truly meaningful standards—standards that will finally give users more freedom of choice and communications.

This progress on the standards front can be attributed largely to one powerful user—General Motors. GM recently inked an agreement with Boeing Computer Services, the Department of Commerce, and DOC's offshoot, NBS, that culminated a year-long government-industry effort to develop and implement key ISO networking standards. The agreed-upon protocols will allow host-to-host communications, something users like GM have been clamoring for to no avail for years.

This stamp of approval on ISO gives the international standards setting body added credibilty. It also means that ISO has indeed become international in scope, its presence now being felt on both sides of the Atlantic.

In Europe, similar moves are afoot to resolve compatibility concerns. In early March, 12 major European computer/communications vendors agreed to implement common open system interconnection (OSI) standards in their new products starting next year. This protocol package, based on ISO and CCITT standards, will enable equipment from the 12 vendors to communicate with each other—capabilities that are welcomed by users throughout Europe.

U.S. users can also rejoice over the headway made here at home. The ISO's OSI is no mere rejumbling of letters. The implementation of ISO will be a major breakthrough in the local area networks (LAN) realm. It will give users more freedom in how they choose to communicate with the computers of their choice.

This promised land does indeed look promising. No longer burdened by bothersome interface issues, users could hook up hardware that before the standard couldn't even handshake. Applications could be serviced faster, and presumably better. Productivity in the office and on the factory floor would pick up. Management would be pleased and purses would be fatter because of the cost savings involved in purchasing compatible wares.

The first glimpse of this promised LAN can be seen at next month's National Computer Conference in Las Vegas, where 14 computer/communication companies will host OSI demonstrations. These and other related experiments are valuable exercises that will hopefully lead to OSI standard implementation.

DATAMATION applauds these efforts. For too long the standards drive has been stymied by self-serving interests, which have done nothing to serve the user. Fueled by General Motors, that drive now seems to be picking up speed. Vendor support, like that shown in Europe, is now needed to shift that drive into high gear. ✱

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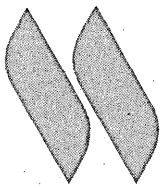

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Putting Information To Work

CIRCLE 31 ON READER CARD

IN FOCUS

THE INFO JUNKIES

Oblivious to everything from fires to their real jobs, many new end users are addicted to computerized information.

by Nancy Welles

Neil D. Lipson, founder of the Apple Users Group in Philadelphia, admits he's a reformed junkie. "I used to overuse the computer," he says. "I extracted more information than I needed. I created detailed models no one could understand. I overcomputed and didn't use common sense." Lipson didn't have to go cold turkey. After a year or so, he "wised up," he says. Now he only uses the computer "for what's needed and no more."

When they're in school, they're called hackers. When they get married, their spouses tend to be computer widows or widowers. And when they're at work, they're increasingly called junkies. Whatever the label, the main symptom they display is compulsive use of the computer. For some, there's something addictive in the power of the hardware or software; for others, the allure is the information the computer makes available. There's little difference between them except "the information freak is more normal than the computer nerd," observes a recent computer science graduate.

Like workaholics, electronic junkies use the machine to avoid something else: life itself, perhaps, or work that's hard or unpleasant. In extreme cases, compuholics resemble Bowery bums whose lives are also controlled by their habit. "They look as if they've slept in their clothes," notes an MIS executive in New York City who has worked with them. Days spent at the terminal is their kind of bender. Suffering from the same lack of self-esteem that plagues other addictive types, junkies can "have difficulty talking and dealing with other people," he adds.

To Carl Reynolds, vice president of communications and data processing at Hughes Aircraft in Los Angeles, info junkies are just a fact of life: "Some percentage of the population is in A.A., some is on drugs, and some is going to end up banging on computers all the time," he says.

These junkies display a common trait of the addictive personality: denial of the problem. Says Neil Lipson, an electrical engineer formerly employed by Betz Engineers, who switched to computer consulting as he learned to control his habit, "You have to see it externally before you can see it in yourself."

Curiously, some computer professionals deny the problem exists, almost as though they were hooked themselves. They may insist that the idea of electronic addiction is the product of a computerphobe's mind, a latter-day Luddite who can't deal with technological change. Bruce Brewster, for example, vice president of the Big Apple Users Group in New York, argues that people who are accused of being junkies are simply ahead of their time, beyond the understanding of more mundane minds. A person "may be a 'junkie' on the one hand, and 'misunderstood' on the other," he protests.

Denial takes other forms, too. Some concede that addiction occasionally happens but maintain that it takes a trained eye to discern. "There's a fine line between what's useful and what's obsession," says Jonathan Copulsky, business technology director at Time Inc., New York. Without addressing the question of whether he himself is a junkie, Copulsky says he no longer uses a paper and pencil, and admits he wouldn't like it if he had to work without a terminal. "I'd probably have withdrawal symptoms," he acknowledges.

The typical way to avoid the problem, however, is to maintain that "it doesn't happen here." A good many dp managers admit knowing employees who have wasted time computing, but they implausibly swear that these people only indulge their habits at night or on weekends, when the time spent reinventing the wheel is their own.

A few data processing veterans, by contrast, openly acknowledge acute awareness of the machine's addictive potential. "All of us know how involved you can get in a computer," says Reynolds at Hughes. "I stay away from it. I don't want to get that caught up. The absorption of hours is disproportionate to the results in many, many cases."

Real addiction shouldn't be confused with the enthusiasm of the computer novice. To learn the full potential of the machine, a period of compulsive use is necessary. When John Grimsley, microcomputer center manager at Coca-Cola in Atlanta, was a computer science student at Georgia Tech, some folks told him, "You aren't cut out for data processing unless you have 'terminal fever,' " which means, he says, "you're just always logged on."

One brokerage firm president found out about terminal fever the hard way, relates Allan D. Grody, computer consultant and partner with Coopers & Lybrand, a New York accounting firm. Alarmed that the number of reports published by his research department was steadily dwindling, the brokerage firm president visited the de-

ILLUSTRATION BY RICHARD ANDERSON

partment and found many security analysts totally engrossed with their new micros. Concerned that micros were supposed to bring productivity gains, not losses, he called in Grody to work up a blueprint for managing micros, with a trained adviser teaching the analysts how to use their machines most efficiently.

For the real junkie, however, this kind of micro support is like methadone maintenance: it helps the addict function without curing the real problem. "It's common to get caught up in the wonders of the micro at first. All but the hard core eventually come around," says Alan Francis, assistant vice president in charge of micro support for the analysts at the brokerage firm Merrill Lynch. The hard core junkie, on the other hand, gets "so caught up building bigger and better spreadsheets that they forget what they're here for." By wallpapering their offices with spreadsheets, they succumb to "paralysis by analysis," one observer notes.

Security analysts and others who have a lot of job autonomy may be the most likely to get hooked. The chief financial officer for a New York City-based industrial firm began using a micro for routine financial analysis, reports Margaret Levine, secretary of the Micro Managers Association in New York, but now he's keying in his own correspondence because he likes being on the machine so much. And he wants to break as many "protected" software packages as he can. "His delight springs from being able to do modeling he couldn't do before, but now he's verging on being a junkie," she says.

"Some percentage of the population is in A.A. and some is going to end up banging on computers all the time."

At Boston University some years back, a chemistry professor had a fatal overdose. After spending a couple of years in the school's computing center, his colleagues in chemistry "booted him out" because he hadn't published in his field, reports John H. Porter, center director.

People whose work is more closely supervised, by contrast, can't hide the problem for long. "Someone tried to download our entire database of 3 million policyholders into a file," says James Johnson, vice president of office technology at Equitable Life Assurance Society in New York, "but that person is no longer with us."

Similarly, two information junkies masquerading as stock brokers at a West Coast branch of a major brokerage firm didn't last long after ignoring warnings that they'd better kick the habit. They turned on by "punching up" the Dow Jones news wire on their quote machines, as the branch manager puts it. He detected their habit when he saw his information retrieval bills going through the roof.

Asking the vendor for an itemized bill, he realized the two junkies had racked up approximately half the charges. "They were checking the news almost on a minute-by-minute basis," he recalls. Their telephone calls to customers, on the other hand, were virtually nonexistent. "In the brokerage business," the manager points out, "salespeople make money by calling. You make no money punching machines."

Why do information junkies shoot up with news? "It's a cop-out. They don't want to do the job they've been hired to do. They'd rather stay in fantasyland, where they know everything that's happening," the branch manager concludes. At the brokerage firm Smith Barney, reports Alan Gross, technology planning specialist, this affliction has taken another form: Some brokers with micros have become "slaves to data entry," he says. "It's not that they are information junkies," he explains, "It's just that they haven't called their clients in six weeks."

It's harder to detect the junkie whose job consists of working with computers. "A person who comes in at nine, turns on the tube and starts typing away is a person who looks busy," observes Philip Druck, who recently left New York investment bankers Morgan Stanley to form his own software company, Druck Information Systems Corp., New York. However, he adds, "When the results produced are not commensurate with the time spent producing them, you have to ask yourself what's going on."

Outside timesharing and databases are the junkie's Acapulco gold.

Sure enough, like a wino getting a job as a wine taster, some of the most inveterate junkies are comfortably tucked away with the corporate computer, clever enough to get their employers to support their habits. "People who like writing code," observes an engineer at a high-tech firm on the West Coast, "will often be unable to step back and decide whether this is the most productive use of their time. They could analyze problems in a way that requires less programming and more thinking. Programming can be an escape from the hard stuff."

"I know a couple of people who try to automate everything," reports Kevin Clougherty, vice president at Morris Decision Systems, a computer dealer in lower Manhattan. "Obviously, there's a point of diminishing returns." One customer, he says, no longer wants to do anything that can't be done electronically; what's worse, "the guy even talks to his computer."

Outside timesharing and commercial databases are the junkie's Acapulco gold. Since just about anyone can find information tempting, companies often fight a losing battle to control these pricey sources of supply. Sounding a familiar theme, Time Inc.'s Copulsky says, "We did have a problem with outside timesharing. People didn't know how expensive it is. We had to cut back on use."

Information addiction is no doubt a major cause of high timesharing bills. "If a terminal is connected to external timesharing, it's easy to get excessive use," observes Andreas Kruse, director of client services at The Diebold Group, a New York consulting firm. However, he warns, the junkie will probably escape notice: "If a company's monthly timesharing bills go up 10% when they're already in the $60,000 to $100,000 range, abusive use may not be discovered."

Even when the minions have their timesharing bills closely monitored, senior executives sometimes have total freedom to indulge. At one New York company, a

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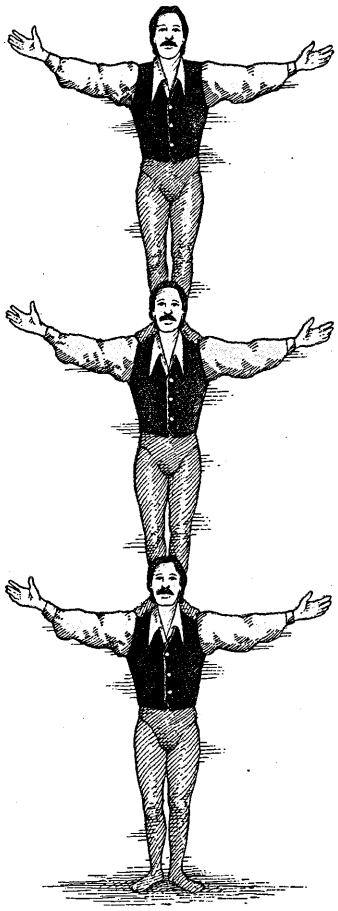

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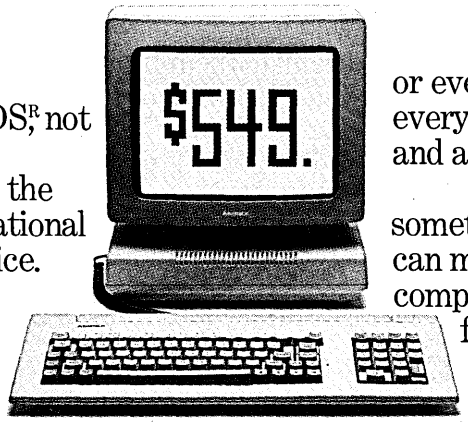

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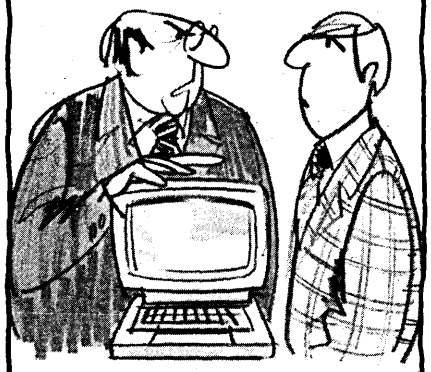

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IN FOCUS

high-level executive apparently got hooked, ordering up everything in sight—from Reuters, Dow Jones, and Nexis to tickets to the theater. His excesses became known only when the data processing department got his bills by mistake.

If the database door is open to everyone, information bills take off. "We have customers who have made it clear that money doesn't matter," says Tina Brouwer, information retrieval analyst at Dialog in Palo Alto. Of course, the database vendor has no particular interest in distinguishing between a reasonable request for information and one from a corporate junkie who's free-basing on data by taking volumes when a page or two would suffice.

In at least one instance, however, Geoff Sharp, director of database services at Dialog, knew a customer was going too far. An order came in from an oil-rich country in the Mideast for Dialog's entire database on U.S. exports. With two terminals running, it took nearly 24 hours to respond to the query. Total cost: "Well over $75,000," he reports. The customer, he notes, apparently didn't know that the Commerce Department sells the same information on computer tapes for considerably less.

Treatment of junkies varies a lot. Quite often, high-level people get no help at all until their job performance has deteriorated completely. Merrill's Francis explains the hands-off approach this way: "I provide computer support to the analysts. It's not my place to tell an analyst how to do his job. Management won't either. They are given a lot of leeway."

Managers of less lofty personnel, however, directly confront their "problem users"—a method that is standard in the treatment of alcohol and drug abuse, it should be noted. There will always be a few who "go overboard. Then you have to let them know the cost or explain that some things are better left manual," says Dorothy Kowalski, data systems supervisor at General Dynamics in San Diego, who generally feels that abusive use "is the least of our problems now."

Executives at a communications company in California, by contrast, decided its "problem users" posed a major threat to overall productivity, reports Gwen Meyers, a consultant with the JIA Management Group in Los Angeles. After realizing that an alarming number of its highly trained staff were writing code for their micros, a memo was sent around saying that anyone seen writing a program for a micro would be subject to immediate dismissal.

Raymond Giovannelli, vice president at Johnson & Johnson's management information group in Raritan, N.J., views the problem as a basic management control issue. It's handled, he says, "by walking around. You've got to watch what people are doing, and know what kind of resources they're using and the ultimate use of those resources." To him, abusive use of the computer is no different than that of the telephone or photocopy machine.

When the junkie is made aware of the problem, cure can be swift. As proof that he had kicked the habit, Neil Lipson says he started using a Rolodex card file to store names and telephone numbers, which can be accessed in a second or two. "It takes longer than that for my machine to warm up," he notes.

While most junkies are curable, a few are too far gone to care. Just as their colleagues on dope take to theft to support their habit, these junkies rob information and data. At one company in New York, a member of the elite group that was responsible for technology planning ran up a $30,000 timesharing bill while feeding his habit. When it was discovered that he was using that information in his private consulting practice, and that he hadn't produced any studies for the company, he was dismissed. It can be "a terminal disease," puns Stanley Richards, information services manager at the Cabot Corp., Boston.

Without treatment, letting addicted programmers stay at their terminals is like offering wine tasting jobs to winos.

While the isolated junkie may be a relatively easy management problem to handle, little can be done when information junkie-ism becomes institutionalized. Any organization that produces reports is susceptible; investment banking and consulting firms are especially high risks.

Institutionalized information junkie-ism causes people to produce reports that are several inches thick but contain only a few pages of useful information. "We generate a certain amount of paper. But some people like paper," confides an executive who fears that his *company* may have contracted the habit. An investment banker excuses the problem in the same way: "There are differing definitions of how you provide client service. Some don't think you've done your job unless you walk in with a four-inch thick presentation."

Indeed, rapid computerization is only making this problem worse. Insisting that the professionals who ask for the financial data on the Disclosure database don't ever ask for unnecessary information, Mark Bayer, who until quite recently was director of database services for the Bethesda, Md., concern, suggests, "They may become junkies overall."

Perhaps they already are. *

Nancy Welles is a free-lance writer specializing in business, finance, and technology, based in New York City.

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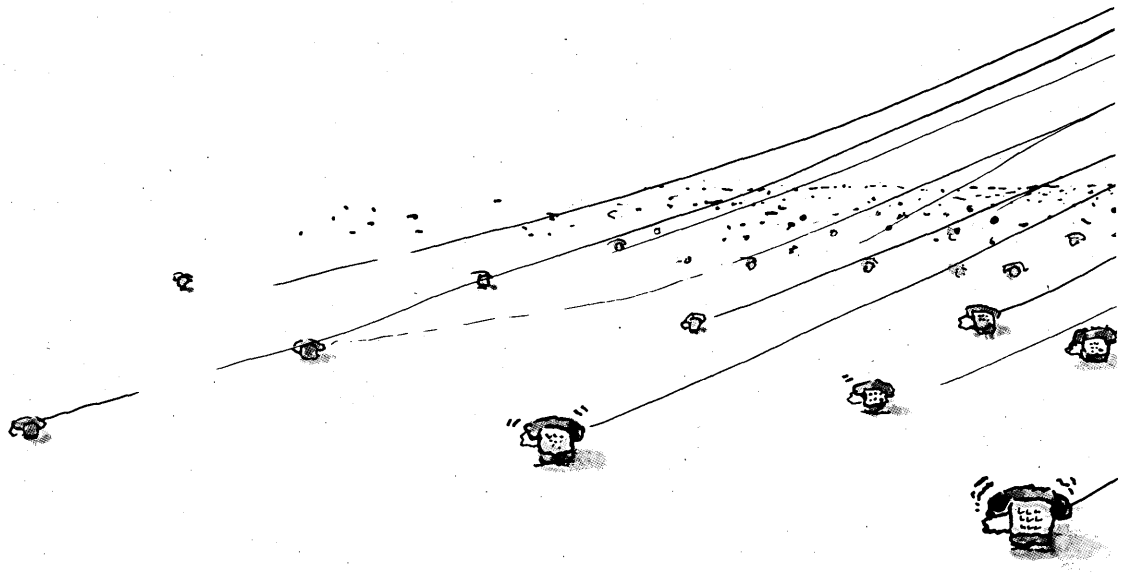

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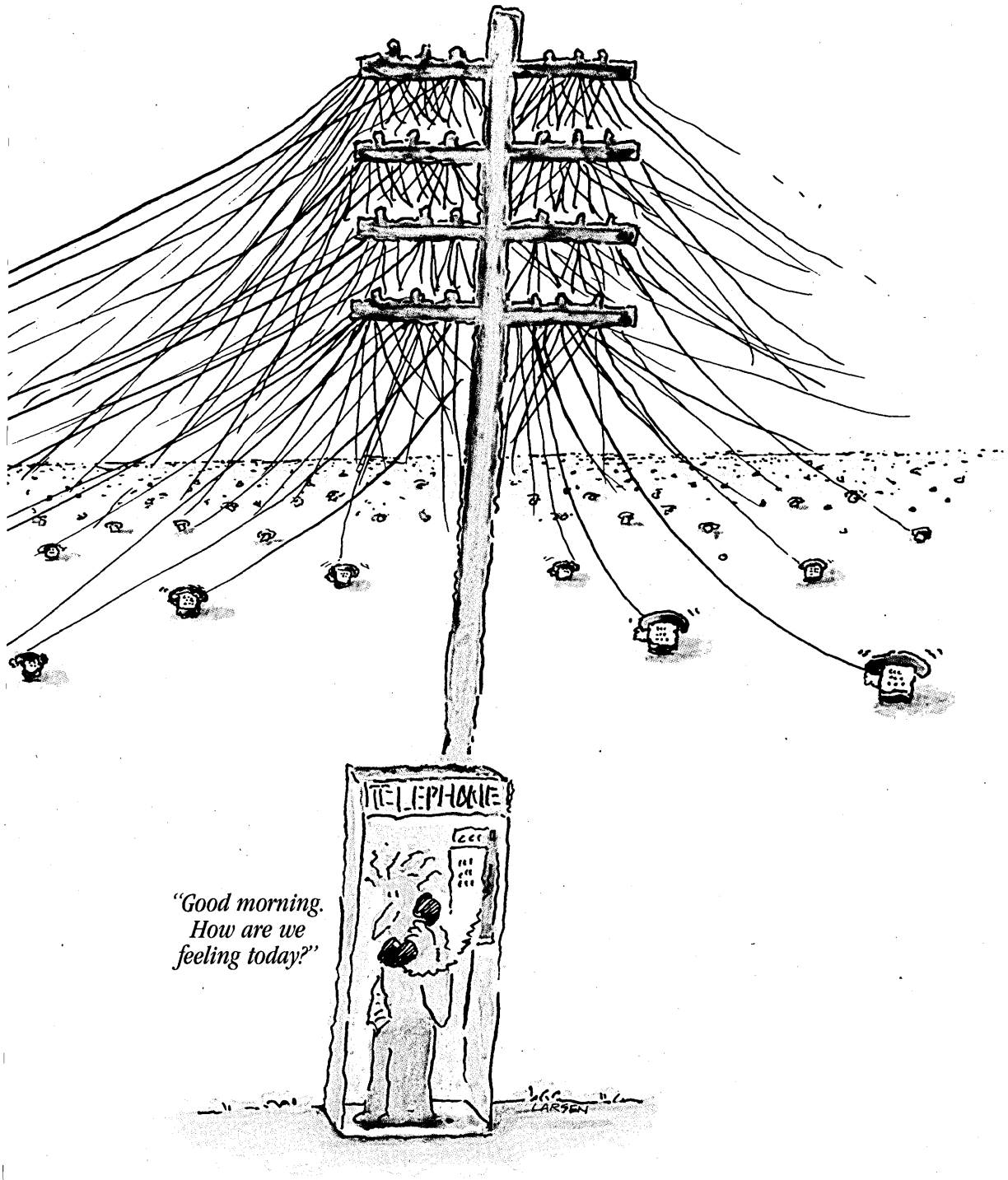

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NEWS IN PERSPECTIVE

OFFICE AUTOMATION

VIDEOTEX HITS THE OFFICE

The home market for information services still hasn't taken off.

by Jan Johnson

Remember videotex, that much heralded information technology that was to deliver banking, shopping, and electronic newspapers to the living room? It didn't quite work out, at least not just yet. Instead, following in the footsteps of the personal computer, videotex is being sold to the office.

Vendors such as DEC, IBM, and AT&T have found more immediate markets in the corporate world, where users apparently are prepared to pay the large up-front costs of installing videotex systems. Videotex may still catch on in the home, but so far the office looks like the more promising testing and profit-making arena.

"I wouldn't say there's been a shift in emphasis," says Sam Berkman, AT&T division manager responsible for national videotex sales and private systems development. "It's more an extension of the total videotex market."

Observes Bob Smith, executive director of the Videotex Industry Association, "The application of videotex to the business marketplace sprang out of the realization that information needs are not limited to the home. There is an even stronger need within the business community."

Semantics aside, home videotex smacked against the same wall that slowed home pc sales, only videotex hit harder. More had been promised by videotex, and technology got ahead of applications. In a word, people lost interest. Those companies providing information for public videotex systems talked a big story about the virtues of, say, home banking, and then produced only primitive systems with little value added. Field testing continues, being observed carefully by local telephone operating companies in particular, but private systems for a particular corporation seem to be where the money is now.

In the case of banking applications, the driving force behind videotex is not the public seeking a solution to a problem. Rather, it is the bank that stands to save money as soon as customers are weaned from paper checks to electronic funds transfer. It's a sure bet the changeover will be a slow and painful one.

For the short term, at least, "the smart money" is on closed-user target markets, such as on-premise shopping aids and internal videotex systems aimed at the business sector, "not on home systems," agrees Tom Thorne, president of Tom Thorne Associates, an Ontario, Canada, videotex consulting firm. By 1995 that smart money crowd may have a $7.7 billion corporate videotex pie to carve up, according to Brian Dugan, vice president and director of videotex for the Gartner Group, of Stamford, Conn.

Dugan correlates the growth of videotex against the growth of corporate workstations. He estimates professional workstations will number 5 million by year-end, growing to 17 million by the end of 1987 and 60 million in 1990. He predicts 40% of those 60 million corporate workstations in 1990 "will be used in a videotex environment."

Unlike the home market, the corporate market has some identifiable problems. Reasonable videotex solutions could benefit both parties: end users and the information provider. At DEC, for example, phone

Some observers expect 60 million corporate workstations to be installed by 1990, 40% of which will handle videotex applications.

clerks used to take orders from departments and field offices for corporate brochures. DEC transferred that task to a videotex system. "We put control of that function directly in the hands of those who wanted the information," explains Curt Anderson, DEC's videotex marketing programs manager at the communications marketing group, Merrimack, N.H.

"Now we don't need 14 clerks back at corporate answering telephones. Instead, a person hits a button that says videotex, and up comes a catalog of every available digital brochure, including those that just got published yesterday." That application "cost justified our first videotex effort," claims Anderson. "The product will pay for itself in five years."

The product? What is the product? Videotex is clouded with misconceptions and misunderstandings that need to be set straight. Even the seemingly simple question "What is videotex?" produces confusion. Few can muster a cogent answer. Among those who can is the Gartner Group's Dugan. "Videotex is a new name for the relatively old technology of electronic information distribution."

In plain dp terms, videotex is a timeshared page-based, data management application that offers a consistent, easy-to-operate user interface. Think of videotex as a tool for integrating a number of information sources, both internal and external, un-

ILLUSTRATION BY NORM BENDELL

der a menu-driven display method. In this way, users are protected from the culture shock of moving from one application to another, from one user interface to another, remarks Dugan.

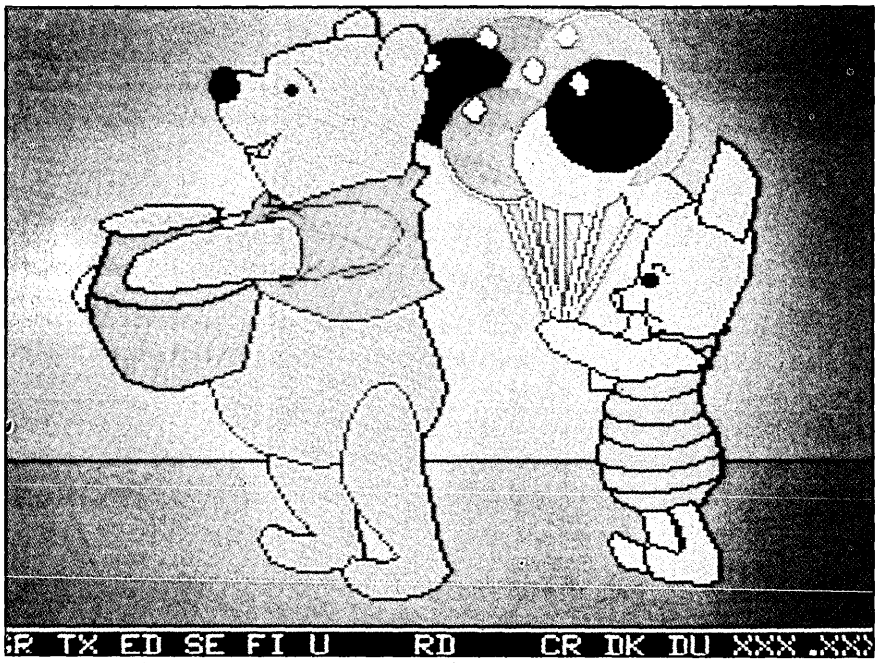
The basic components found in a standard videotex package include communications facilities, database software for managing the pages and billing users, and software for creating and maintaining pages. Scrutinize those areas for specific features and functions will undoubtedly vary from vendor to vendor.

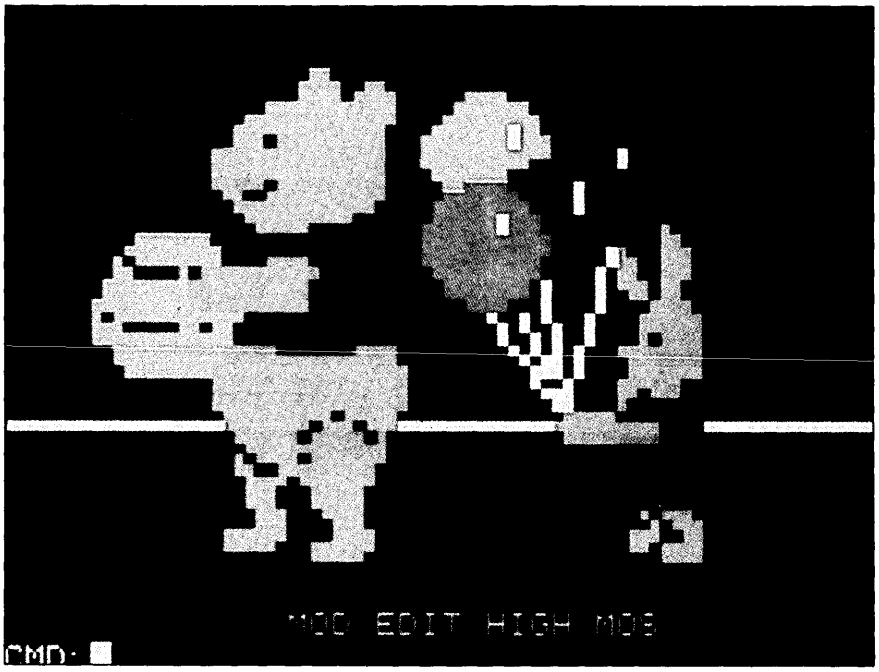
Some companies are positioning videotex as a turnkey application requiring minimal attention from dp and minimal end-user training. "Videotex has the opportunity to bypass the program development backlog," suggests William Seelinger, chairman of the Videotex Industry Association (VIA) and manager of videotex market development at IBM, White Plains, N.Y. VIA is a three-year-old U.S. industry organization with about 130 members.

Videotex with graphics without standards—that's a nightmare.

While dp involvement may be reduced, it will not be eliminated. Page creation and management tools embedded in some videotex packages should enable certain trained end users to build and maintain their own videotex pages. Dp's assistance will still be needed to make links to the production database and, in some cases, to corporate communication facilities.

One can ignore the loud chatter and screeching about color and graphics, Prestel versus NAPLPS (pronounced nap-lips, for North American Presentation Level Protocol Syntax), dedicated terminals, and big dollar, hi-tech page-creation stations complete with video cameras, electronic pens, and lots of knobs and buttons. Videotex doesn't have to be that complicated and expensive. A simple ASCII-based videotex application—just pages of text, no fancy graphics—can go a long way in solving many corporate communication problems, claims DEC.





WINNING PROTOCOLS: The North American Presentation Level Protocol Syntax (NAPLPS) screen (top) displays superior resolution but requires an intelligent terminal to expand compressed geometric data sent from the videotex host. Not to be pooh-poohed is the less costly but "chunkier" Prestel mosaic protocol, developed for a British videotex system. Some vendors expect to support each of these standards as well as other developed in Canada, Japan, and elsewhere. (Photos courtesy AT&T.)

DEC recently introduced an ASCII-based package, VAX VTX. It runs under VMS, sharing the VAX with other applications, and supports the VT100/200 terminals and DEC's personal computers. Deliveries begin this month with license fees of $25,000 per package. Word is DEC may add NAPLPS graphics capability next year.

The belief that videotex requires dedicated equipment is wrong. General purpose pcs and a shared host is the trend among those marketing to the corporate user. DEC's VTX application is an example. Special purpose requirements come into play when the high-resolution graphics protocol NAPLPS is being used. Instead of building special terminals, vendors, such as IBM and DEC, offer NAPLPS decoder software as an add-on feature to their personal computers. The add-on cost ranges between $250 for the IBM PC and XT, and $195 for DEC's Professional 300 series.

That's not to say all corporate applications require a full-blown pc. An unattended terminal in a lobby or lunchroom may warrant something cheaper. AT&T has a $600 to $900 NAPLPS-compatible unit called Sceptre that comes with no disk drive or monitor. But even AT&T revealed that its Sceptre, currently marketed as a videotex terminal, is actually a pc-in-waiting. All that's missing are the peripherals. In addition to its 8088 microprocessor, a built-in modem and NAPLPS capability, Sceptre has a black-and-white ASCII default mode and "twice as much ROM as the IBM PC," notes Berkman of AT&T. Those ROM chips are not sitting idle—they are filled with NAPLPS decoding instructions.

Some companies are positioning videotex as a turnkey application requiring minimal attention from dp and minimal end-user training.

Sceptre's shortfall is that it can't be locally loaded. It lacks a disk drive. "You can almost guess that future models will have that capability," hints Berkman. Suddenly AT&T's Sceptre looks like a classic Trojan horse strategy. Maybe AT&T is learning the marketing ropes faster than some think.

Another misconception about videotex is that vendors are locked in a protocol battle. Not true among DEC, IBM, and AT&T. Each says it will support multiple protocols. "The ideal terminal would be one that could go from ASCII to EBCDIC to NAPLPS to Prestel [the British videotex Protocol]," muses Berkman.

Says Anderson at DEC, "Let's get our mind set straight—don't worry about what is going down the pipe, whether its NAPLPS or Prestel. NAPLPS and Prestel are not by definition videotex. They are high-resolution graphics standards. What DEC is trying to say to its customers is 'Forget the technology for a moment. Look at the business problem.' Let's look for the right terminal and the right protocol for the database. Videotex is a functional thing. It is independent of the protocol."

It's protocol independent, that is, until someone wants to express graphics in a videotex page and make that page available corporatewide. Take the case of an in-house hotel reservation system. Select a town and a list of corporate-approved hotels appears. Now the trick is to locate the hotel selected. No problem, another videotex page shows a map of the town depicting the location of that hotel. Sales, marketing, and

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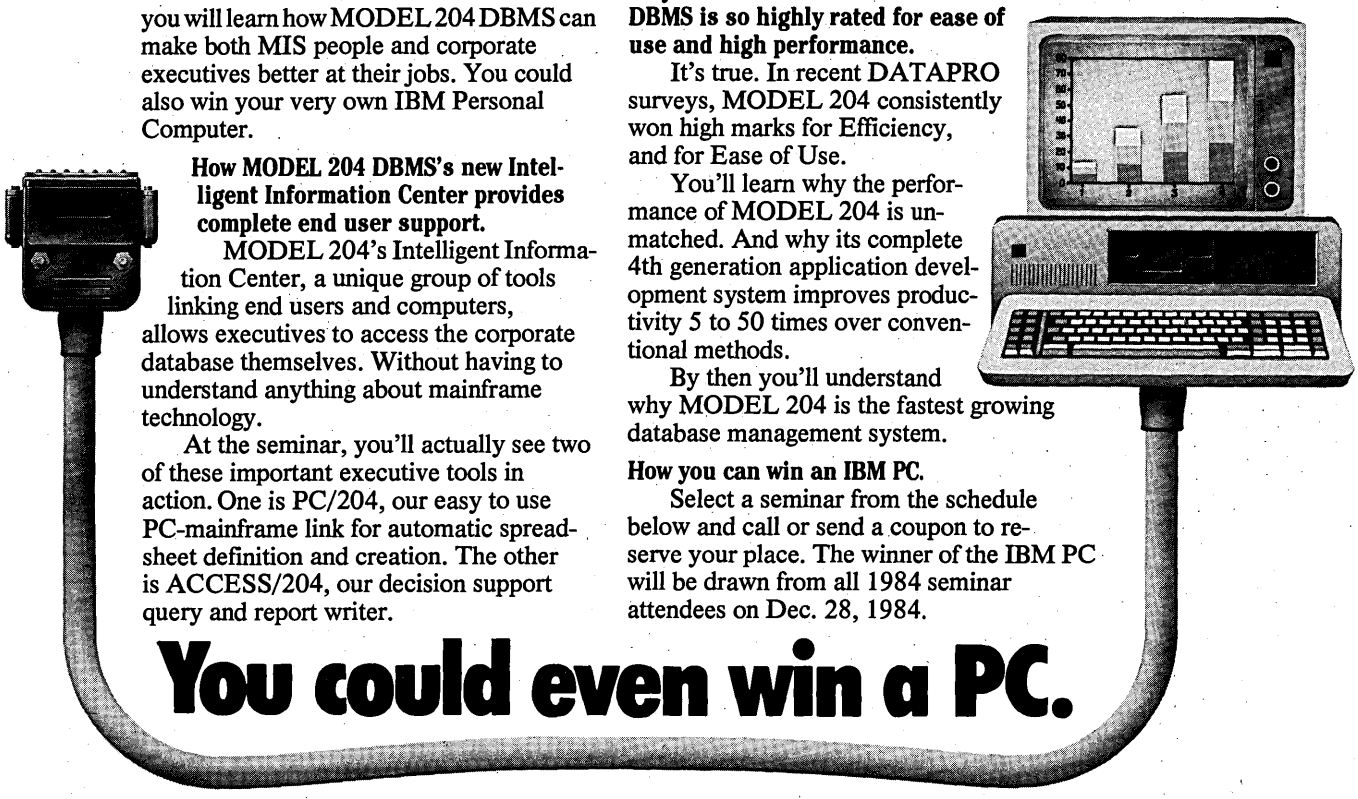

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CIRCLE 26 ON READER CARD

financial data are other prime candidates for graphics assistance. Without some kind of graphics presentation standard, a page of videotex with graphics could become yet another protocol conversion dp headache.

Enter that funny sounding acronym, NAPLPS. It grew up with the videotex industry in Canada and America. Meanwhile, Prestel emerged in the U.K. Antiope in France, and Captain in Japan. Like videotex, the presentation-level graphics protocols have a life of their own. They are, simply put, different ways of doing the same thing, representing color and graphics. Some protocols do it better, other do it cheaper.

To do it without standards is another issue entirely. Videotex without graphics is acceptable. Videotex with graphics is also acceptable. But videotex with graphics without standards—that's a nightmare. ANSI cleaned up that problem last November when it blessed NAPLPS as the U.S. presentation-level standard.

Prestel will always be a little cheaper than NAPLPS, but the gap is narrowing as the latter is embedded in silicon.

"That is a significant advancement in that for the first time the U.S. has a national standard for moving graphics and text," says Gary Holland, vice president, product development, for Videolog Communications, Norwalk, Conn. Videolog maintains a comprehensive on-line NAPLPS-based library of electronic components. It sells that database service to interested electronics engineers.

Once a standard hits the books, costs usually start falling as software is implemented in silicon. Within six months to a year, Holland expects to see a NAPLPS decoder on a chip and on the market.

"TI [Texas Instruments] appears to be first out with a single-chip video processor that supports NAPLPS. They call it the AVDP, the advanced video display processor," he says. It's currently available in test quantities only. Soon to follow will be National Semiconductor, Signetics, Motorola, and Rockwell, he speculates.

As the NAPLPS chips make their way into commercial products, watch for AT&T, IBM, and DEC to replace current NAPLPS decoders implemented in software with full-feature NAPLPS color boards. "We should see improvements in speed and capabilities, as well as lower cost," projects Holland. He suspects as much as $300 could be knocked off the cost of a Sceptre terminal when AT&T goes to NAPLPS chips.

Why NAPLPS? Compared to Prestel or traditional graphics protocols, such as Tektronix, NAPLPS is more data compact. "It takes up about one-third the space of a normal graphics file," notes industry consultant Thorne. NAPLPS can represent a rectangle of any size in seven bytes. Those bytes carry information relating to the color and type of primitive, and the x-y coordinates.

In contrast, the Tektronix protocol and Prestel, a subset of the European videotex standard, CEPT, store every point along the rectangle. "In Prestel, the amount of data that has to be sent is dependent upon the size of the rectangle," explains Holland. "If you only want a box as big as a single character, then it only sends one byte. If you want one as big as the screen, then it sends 800 characters [bytes]. For complex, high-quality graphics NAPLPS is more data efficient. For simple, blocky graphics Prestel can be more efficient."

The disadvantage is that NAPLPS, unlike Prestel, requires intelligence at the receiving end to reconstruct its compressed graphics. For that reason, Prestel will always be a little cheaper, admit industry sources. But the gap is narrowing as NAPLPS goes into silicon and the cost of chips comes down.

Think you might like to give videotex a try? Nothing big, maybe a handful of terminals, let people play with the system, and see what happens? A starter configuration from IBM costs an estimated $54,000, assuming a Series/1 is already on-site. That price includes one SVS/1 videotex software package for the Series/1, 10 IBM PCs with two disk drives each, a color monitor and a modem, and 10 PC Videotex packages that support NAPLPS. A basic dial-up link hooks the Series/1 and terminals together. The SVS/1 software will not be available until late summer or early fall.

A similar configuaration from DEC could run an estimated $96,000, assuming a VAX is on-site. That price includes one VAX VTX videotex package ($25,000), 10 DEC Professional pcs with two disk drives each, a color monitor and modem, and 10 PRO/NAPLPS packages. DEC's NAPLPS software for its pc, PRO/NAPLPS, sells for $195 per package. DEC claims all those products are available now. What should not be overlooked is that DEC has integrated VTX with its DNA and DECnet networking software. At the push of a button—making a selection off a menu—VTX can connect to a remote VAX, pull down the requested page, and present it to the user.

"The way VTX has been implemented with Digital's networking products, the customer doesn't have to write the code," says DEC's Anderson. "It's handled at the system manager level. I select the personnel file. All my computer has to know is where that personnel file is, say, node 16 in Merrimack. That's it, the link is established."

The third pillar in DEC's current product strategy is a standalone, single-user videotex system, the PRO/Videotex, which sells for $895. The software, designed for DEC by Genesys Group, Ottawa, Canada, includes a NAPLPS decoder and everything needed to manage a videotex database. There is no page creation capability. Instead, the database is updated on the weekend or late at night when communication costs are lowest. PRO/Videotex is targeted as a sales aid in distributor/dealer/retail locations, where owners could also run general applications on the same hardware.

For those who don't own a Series/1 or VAX, AT&T will offer its own starter kit in September. AT&T is actually marketing its product as a package deal, where DEC and IBM do not. The kit is priced at $140,000 and includes 10 Sceptre terminals, with keypads but no monitors, a separate frame creation unit, a microcomputer (made by Heuricon), and the VIS videotex software for the micro. Says AT&T's Berkman, "I'm trying to develop a package so that a customer can come to AT&T and get everything. I call it one-stop-shopping."

Berkman readily admits his system cannot be upgraded beyond 10 Sceptre terminals without upgrading the processor. Future configurations could include the larger AT&T 3B processor and host software, however.

Getting hands-on experience is essential, stresses IBM's Seelinger, for in three to five years corporations will be facing a major videotex decision. He cautions corporations not to leave that videotex decision to committee.

"Videotex is much too complicated and comprehensive a topic to put a few smart people in a room and let them try to figure out what to do with it. You've got to get hands-on experience, then use what you learn to answer that major question coming in a few years— 'What are we going to do about our whole company?' " ✱

ARTIFICIAL INTELLIGENCE

EASY DOES IT

Natural language query systems have gained new attention in recent months.

by Jan Johnson

Artificial Intelligence Corp. (AIC), Waltham, Mass., has since 1975 struggled along as the lone vendor of natural language query systems. Last year, however, the firm gained IBM as a marketing partner for its Intellect product and this year it will be joined by two, maybe three, competitors.

The nascent natural language systems market is expected to grow from only $10 million last year to as much as $100

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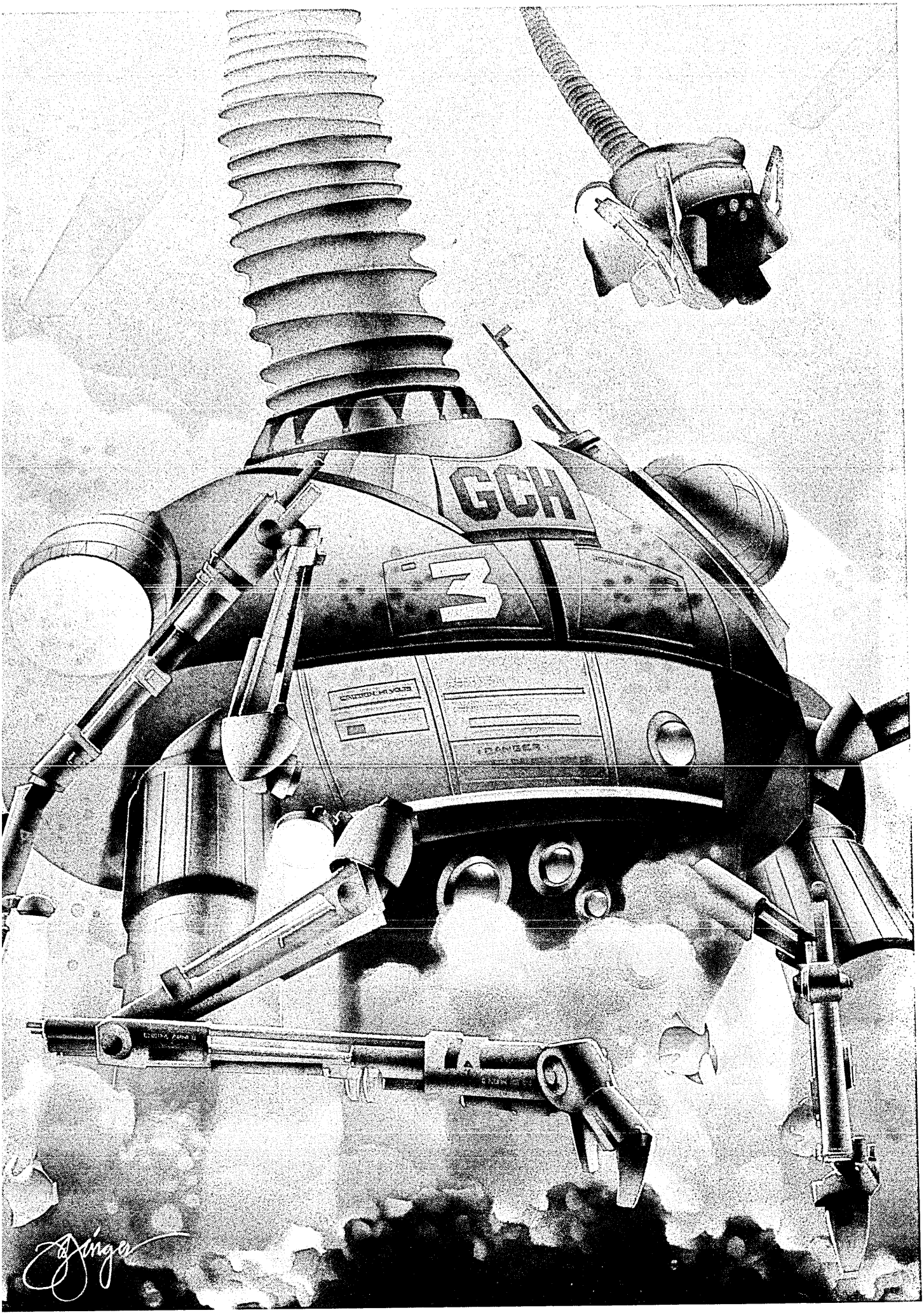
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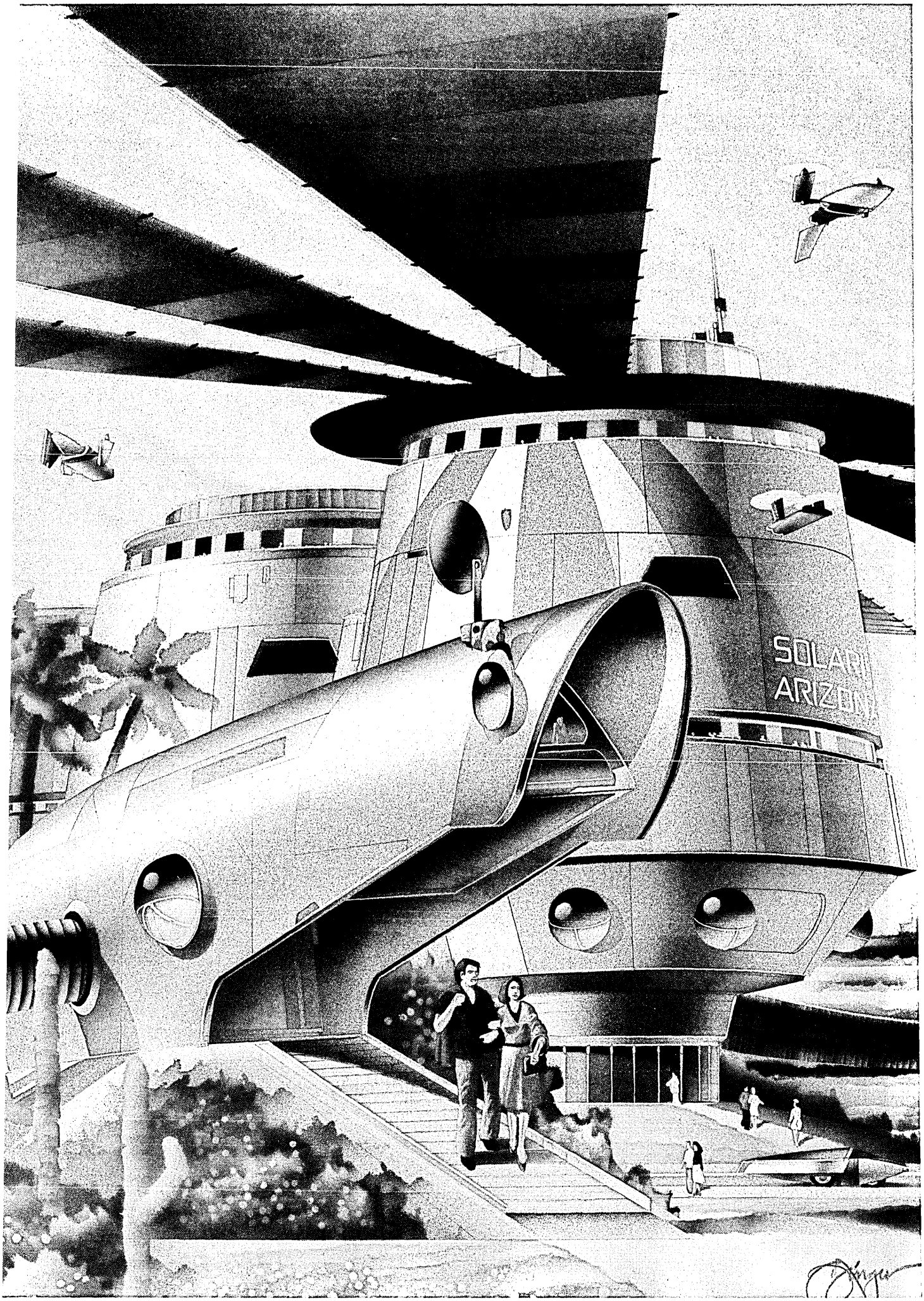
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million by 1987, according to industry observers. That kind of growth has attracted the attention of several startups and, most likely, the big computer manufacturers like IBM, Burroughs, and Fujitsu. With all this activity under way, the MIS manager had better get ready for a heavy barrage of marketing maneuvers.

Natural language systems are planned for virtually every class of machine, from micro to mainframe, and it will be hard to sort out fact from fiction. For a field that is hardly dry behind its technological ears, the move to mainstream marketing is coming swift and fast. IBM is already taking out full-page advertisements for Intellect, for instance.

Systems like AIC's Intellect and Mathematica Products' English, a front end to that firm's popular Ramis II query system, are supposed to make it easier for end users themselves to extract data from large databases. The "natural language" component handles just that—free-form queries that do not have to be phrased in a specific, procedural language. Well, almost. Besides appealing to the end user, however, natural language systems appeal to manufacturers because they use up many machine cycles in their processing of ad hoc queries. That means more hardware gets sold, which is a major driving force in the current rush to commercialize so-called artificial intelligence techniques.

While marketeers make claims for their products' technological prowess, discussing semantic/syntactic relationships, parsing routines, and dictionary lookup methods, the evaluation of this new software may best be approached by talking to users with the packages installed. The user base for even the most widely installed packages is relatively small, but is expected to grow substantially now that significant marketing muscle has come into play.

First among the newcomers to AIC's natural language game is Mathematica

Users' evaluations of the software become very valuable in such a new marketplace.

Products Group, Princeton, N.J., a unit of Martin Marietta, the aerospace firm. The first production of English, a $24,000 natural language option for Ramis II, was released on March 31. Mathematica claims to have eight field test sites and strong order interest from some 50 potential customers, "some of which are outside the Ramis II installed base." An estimated 1,200 Ramis installations have been made worldwide.

Ramis II English requires about 3 megabytes of virtual memory and a 370 instruction set, which puts IBM's XT/370 within reach. "We can run on anything that can run VM/CMS or MVS/TSO," claims Maria CeloCruz, product manager for English.

In contrast, Artificial Intelligence figures Intellect's installed base near the 200 mark. The product, which sells in the $70,000 range and runs under OS, DOS, VM, and MVS, requires 1 to 2 megabytes of memory, "or more depending on how many users there are and the size of the application," says Gary Schmidt, vice president of marketing.

By virtue of its marriage to Ramis II, English has direct access to a number of database systems and file structures, including IMS, IDMS, TOTAL, and ADABAS, as well as QSAM, ISAM, and VSAM, according to Mathematica. Intellect does not have direct access to the databases. An Intellect user gets entangled with the cumbersome task of generating special data retrieval files.

All the commercial natural language products claim to be data independent. In addition to Intellect and English, there are Themis, a minicomputer-based product from Frey Associates, Amherst, N.H., and an as yet unnamed and unintroduced microcomputer-based product from Symantec, Sunnyvale, Calif. Their syntactic and analytical schemes are general and not tied to a specific subject or set of data.

Their dictionaries, or lexicons, are another matter. A dictionary is closely tied to a specific application file, such as sales, financial, or shipping. It appears that all the new products headed for market will offer application-specific dictionaries, a shared resource that can be updated by any user with the proper clearance; and a user-specific dictionary, a nonshared resource that can override the shared dictionary when two definitions for the same word crop up.

Until last month, Intellect lacked many of the dictionary management features offered in the other packages. With release 2.0, AIC appears to have filled in those gaps, then taken the product a step beyond the others. Now end users can create their own dictionaries and make updates and additions to the shared dictionaries. In addition, they can create and update a database through Intellect.

Corporate product claims and demos are all very well, but what are the users saying? Some are choosing English over Intellect.

"We looked at Intellect and we looked at English and we decided that English looked better," says a systems analyst with a large transportation company. Costs and the opportunity for users to build their own lexicon were two of the features that turned the decision in English's favor, the analyst says.

Intellect's chief weaknesses can be summarized in two points: the need to build separate file structures and the need to index the data fields to enhance performance. The outcome is that Intellect eats up much storage space, agree users. Essentially, English is "superimposed" on the existing Ramis database. "You don't have to create more databases," says John Lafare, vice president of applications technology at Security Pacific National Bank, Los Angeles.

Lafare then suggests that that very feature can work against English. "There are fewer opportunities to improve English's performance because you are limited to the capabilities of the Ramis system." His criticism gained credence when another English user made the following observation: "Ramis appears to be less than graceful about sharing. It tends to use resources in a dramatic way."

The debate over system performance should become a hotbed of controversy and confusion. Over time, perhaps some standard benchmarks will emerge. Another area ripe for barbs and counterclaims will be a system's prowess in interpreting free-form sentences. On that count, Mathematica's English has some glaring shortfalls.

"There are few opportunities to improve English's performance because you are limited to the capabilities of the Ramis system," says one user.

English cannot deal with verbs, Mathematica admits to its customers. Indications are the company has not improved the situation in its current release. This weakness forces users into some clumsy sentence structures. One English user offers the following example: "Show me all the cars that went to Calif." is not acceptable to English, which requires, "Show me the cars with shipper state Penn. and destination state Calif."

"I have to rephrase my request to reflect the fields in the database," explains one English user. "Basically, they [Mathematica] told us not to deal with verbs. If we want to use them we have to define them in the dictionary."

If verbs aren't defined in the dictionary—and defining the concept behind a verb is no easy task—then the burden of understanding is back where it's always been—on the end users. To use English, they must remember how the database is structured and recall the names of the fields. Mathematica designers have tried to ease the pain by including help functions that make it easy to call the list of possible fields to the screen. While Intellect may require more of the computer's resources, it appears to require less of its users.

Meanwhile, the other natural language system vendors are farther back on the development track. Frey Associates is currently exercising Themis, its $24,000, DEC VAX-based package, at two unidentified beta sites. Symantec has none. "We

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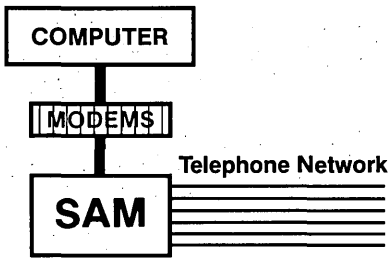

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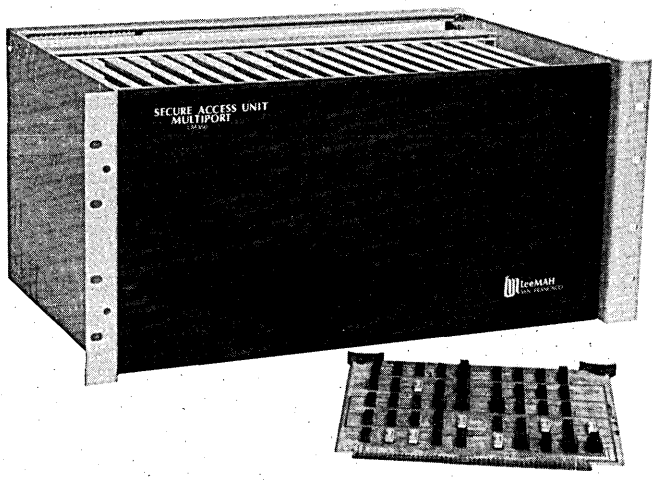

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CIRCLE 28 ON READER CARD

are still in the exploratory phase," explains Gary Hendrix, Symantec chairman and vice president of research.

Something seems to have slipped at Symantec, for the company was expected to make its product introduction at Softcom in February. It had reserved a booth, but didn't show. Hendrix wouldn't talk about delivery dates, price ranges, or product specifics. "We are trying to keep our powder dry until we are ready to announce," he said. The firm is known to be focusing its efforts on a product for the IBM PC market.

Les Dole, director of marketing for Frey, is less reserved in promoting Themis. Like English and the new release of Intellect, Themis supports user-specific dictionaries and other similar dictionary-related features. Unlike the other two, Themis has a built-in spelling checker and corrector. "If you misspell a word, Intelect stops you cold and tells you it does not recognize that word," says Dole.

Targeted for the DEC VMS operating system, Themis goes against Record Management Systems (RMS) files and generates Datatrieve and Oracle queries. It requires a total of 4 megabytes of memory, says Dole, but only 2 megabytes of main memory. The company figures it has invested about three years and a total of 20 man-years in product development.

Frey went public last July at $12 a share, to raise $5 million to finance the Themis marketing plan.

The company appears to be shepherding Themis down many of the same paths AIC has taken Intellect. Plans are to use Themis as a bridge to other applications. Graphics and a report writer facility are high on the list, Dole indicates. Plans also call for moving over to the IBM market. Dole confirmed the company is currently working on a version of Lisp for the 4300 to aid that effort.

"We are trying to keep our powder dry until we are ready to announce," says Gary Hendrix at Symantec.

Both Frey and AIC plan to address micros, although Frey was less specific about when. "We are planning to move to more advanced micros. The new 32-bit micros from AT&T, the DEC microVAX, and IBM's advanced workstation look interesting," he muses.

Schmidt confirms that AIC has a team of eight people working toward a fourth-quarter announcement of an IBM XT version of Intellect. He expects the price to fall within "standard" pc package ranges. In the interim, AIC announced a package at Softcon that will permit PCs to link to Intellect on a mainframe. The PC software sells for $250 a copy, while the required mainframe option costs $15,000.

Grand as the market projections and product plans sound, reality has not kept pace with expectations. (AIC once predicted it would have an installed base of 400 by 1983. Only recently did it hit the 200 mark.) Frey is predicting it will sell 150 to 250 Themis packages by the end of 1984.

Unlike AIC, Frey Associates is not a pure-play natural language company. It has sold database, computer security, and CAD/CAM applications into the military, banking, and manufacturing communities. While there is some opportunity for leveraging previous customer contacts, Frey is a small Frey, doing only $5 million in sales last year.

There are indications that Frey would like to strike a marketing deal with Digital Equipment similar to the one AIC has with IBM. The bridges are at least in place. Frey's recently hired president, Irwin Jacobs, logged 18 years with DEC, while Dole is a 13-year DEC veteran.

The company in the strongest marketing position is Mathematica. It will probably emerge as the unit sales leader for 1984. That 1,200-strong Ramis base makes the sales job a lot easier.

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Producing a natural language query system is only a start for most of these companies. The interesting years lie ahead. AIC says its goal is to create an environment of Intellect products from micro to mainframe. The idea is that someday Intellect will be the primary interface to most popular end-user applications. It will bridge to graphics, forecasting, statistics, and author aid applications. It will be the link from the worker to the corporate database of useful information. All an end user will have to do is phrase a request in free-form English, according to AIC officals.

Frey is moving in a similar direction, toward micros, bridging to multiple applications, but with less directed attention. It seems Frey's first love is adding voice recognition to Themis. Dole hinted the company is advancing quickly on that goal.

Mathematica is tackling some heavy theoretical issues that could have a profound impact on the integrated automated factory, a concern near and dear to the heart of its parent, Martin Marietta.

"We are working on a universal representation of meaning at Mathematica," says the company's CeloCruz. "The question is how do you represent knowledge? The trick in natural language processing is to come to some sort of semantic representation that is general enough that it can be used in vision processing, voice recognition, robot programming, or in representing knowledge in expert systems.

"Ideally someday you will be able to tell a robot doing one task to do something else. An expert system would take that command and engage in reprogramming that robot. If meaning representation could be generalized enough to be the same across the board, it could save us all a lot of time." Is that a first call for a standards committee? ✻

ALVEY IS ON ITS WAY

Britain's answer to Japan's fifth generation project has established its first two research programs.

by John Lamb

The U.K.'s government-backed fifth generation research project, known as the Alvey Program, is up and running with the announcement of the first two research contracts, together worth over $15 million. Playing to what the British see as their traditional strength, both research projects are concerned with software.

The Alvey Program, named after its chairman, telecom expert John Alvey, was set up a year ago in response to the now legendary Japanese proposals. It involves government expenditure of $300 million over the next five years, plus $225 million from industry. The money will be channeled into four main areas of research: VLSI, expert systems, software engineering, and the interface of man to machine. Some projects, called demonstrators, will combine work in several of these areas, serving as showcases for new technology.

The program, which includes universities, calls for cooperation unheard-of in Britain. Applicants for contracts under the scheme are expected to form research consortia similar to those set up in the U.S. (see "America Answers Back," May 15, p. 40).

The first group to win Alvey approval includes six industrial and academic partners headed by software house SDL. The consortium will spend at least three years producing new integrated software engineering tools. The second group, which will be working on expert systems software that would handle rules governing welfare payments and similar legal systems, contains five members headed by manufacturer ICL.

Alvey director Brian Oakley, an experienced administrator of government-funded research, admits that getting such consortia together has not been easy. "I am dissatisfied at the rate at which we have been able to approve projects and get them out of the door," Oakley says, adding that there have been delays in going from initial proposals to firmer ones that can form the basis of research work.

So far, there has been no shortage of applicants for funds from the Alvey Directorate, which runs the scheme. The directorate has received 200 applications and expects to have committed a third of its budget by the end of the year.

Although these are early days for Alvey, the program is not without its critics. Smaller companies with bright ideas but lacking the cash and research facilities of larger firms like ICL and GEC (no relation to U.S. firm GE), fear they will be left out of the program. Director Oakley has promised they will get a fair crack of the whip.

There is also some concern among academics that they will be railroaded into industrial research with commercial partners at the expense of long-term fundamental research. The Alvey directorate now controls over half the funds available for computer science research in Britain. "It's very worrying," says one university vice chancellor.

Perhaps the most telling criticism of Alvey is its lack of user involvement. The committee that recommended the program took evidence from only three users outside research organizations and the electronics industry. Few organizations that might be expected to buy the products resulting from the Alvey effort are represented on the Directorate. Frank Land, professor of systems analysis at the London School of Economics questions the Alvey approach.

"There is little evidence that a pure technology push approach can work in a situation where market needs are uncertain and undefined," says Land. "The alternative approach is to look to the user to define his needs, and then to engineer products to meet that need. The success of that approach was illustrated by the American space program, and both the Japanese and French attempts to develop their information technology industries rely heavily on assessments of what the user of the future may require."

There is some disquiet among academics that they will be railroaded into industrial research with commercial partners at the expense of long-term fundamental research.

The main aim of the Alvey Program, however, is to beef up the British information technology industry by giving it a technical lead over foreign rivals. The program was instigated against a background of declining competitiveness on the part of the U.K. computer industry. One survey predicted Britain would have a trade deficit of $1.5 billion in information technology by 1990 if things went on as they were. The answer, according to Alvey, is to build a strong technical base that does not rely on foreign know-how. To this end, American firms are excluded from the Alvey Program unless they can convince the directorate that the results of research work will be exploited in Britain first. Even IBM, it is said, has been turned away.

Despite the Little Englander approach, the Alvey directorate and its followers have opted to standardize on some key American products, particularly in the software field. Unix, for instance, is the program's standard operating system and there has been some dismay in the Alvey camp at the possibility that American tightening of export controls will prevent researchers from getting access to some products. Versions of Unix and Interlisp, for instance, have been hard to obtain in Britain. David Talbot, Alvey software director, complained more recently of an export ban on a validation program called Gipsey.

"We have a fallback position on Unix," explains Talbot, "we would make an operating system ourselves if it was necessary."

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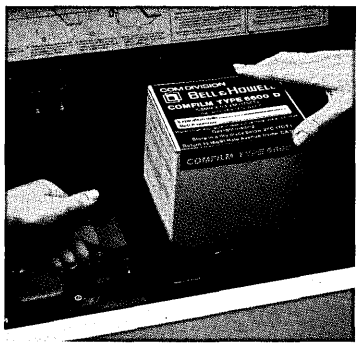

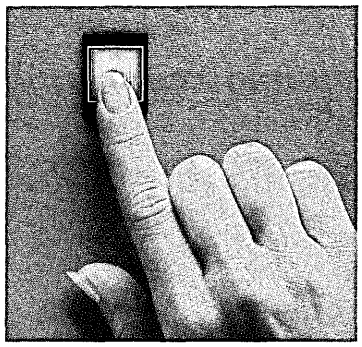

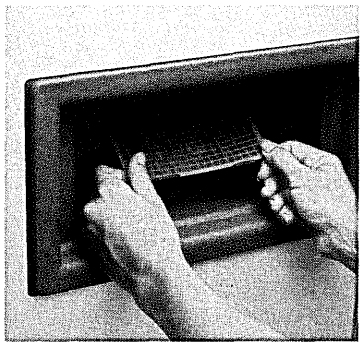

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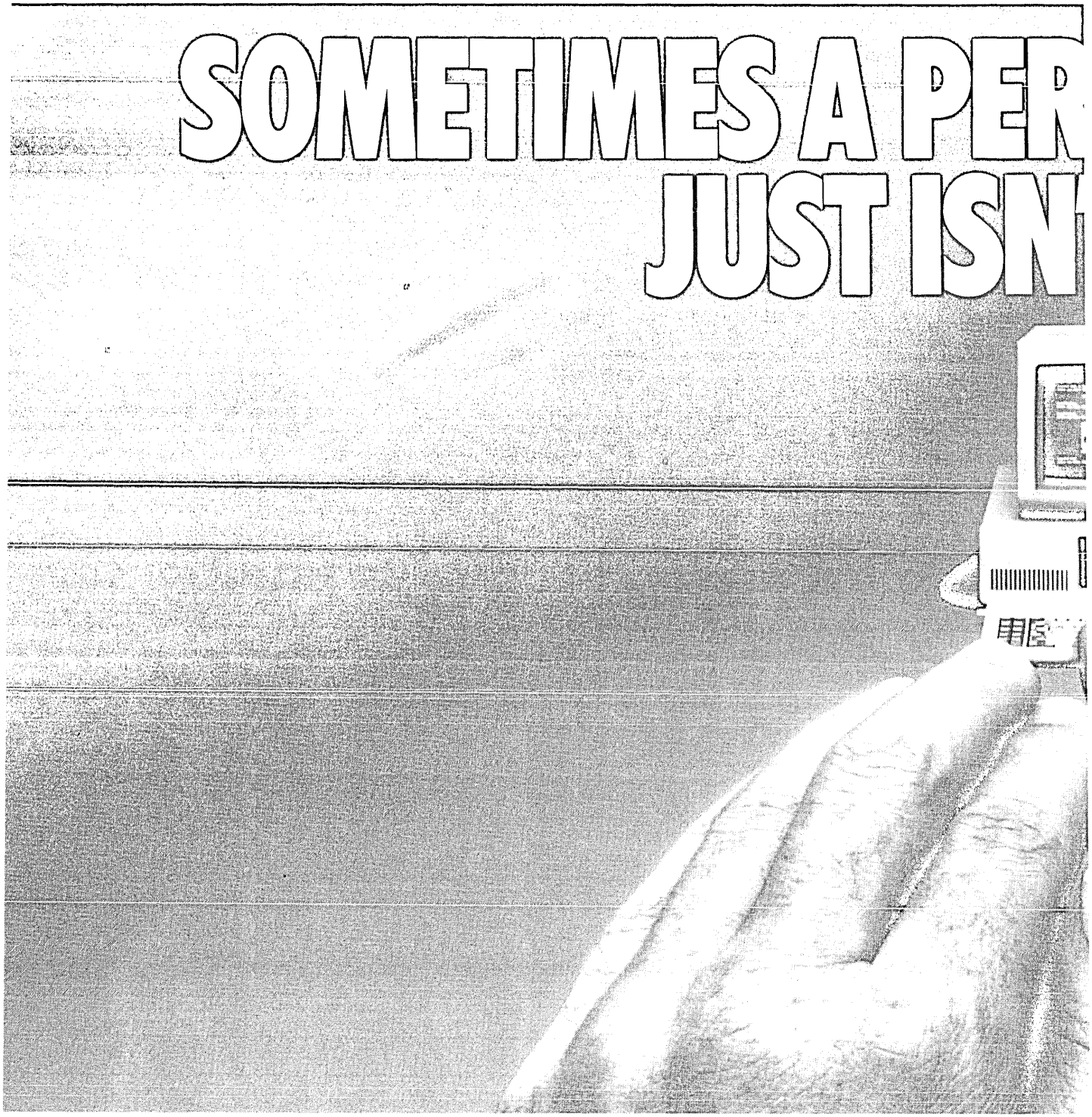

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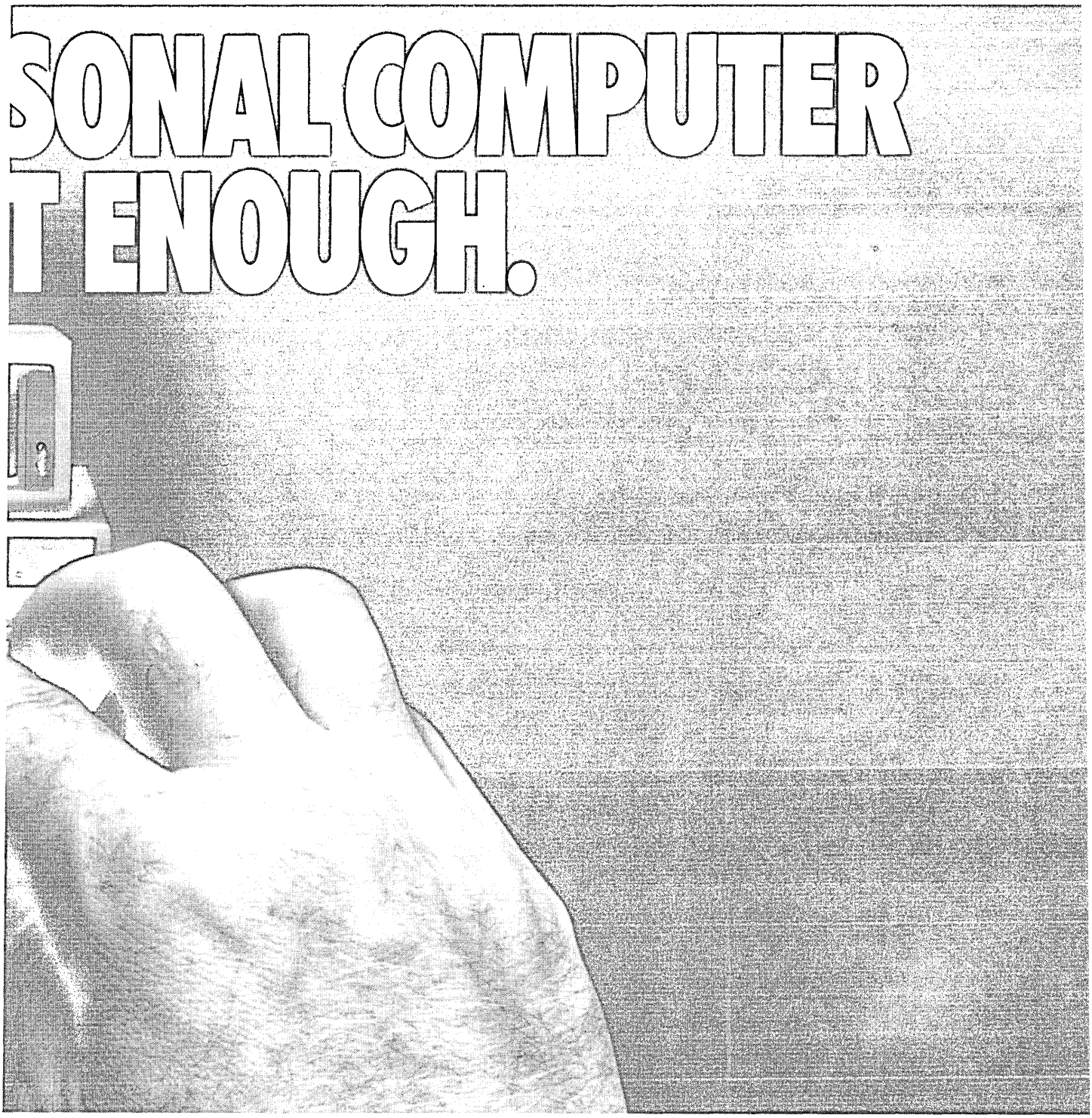

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Ada, too, will feature strongly in the British research, but again there is some concern that the U.S. Department of Defense may restrict its use. In the meantime the software engineering group headed by SDL is pressing ahead with tools to support Ada, as well as C and Pascal. The project, called Aspect, is designed to improve the quality of real-time programming as well as its speed.

"There is little evidence that a pure technology push approach can work in a situation where market needs are uncertain and undefined," says Frank Land.

Britain spends an estimated $3 billion each year on cutting code and the Alvey directorate believes that even relatively minor productivity improvements could mean big savings. Software man David Talbot says surveys have shown that 60% of large projects run into serious problems before they are successfully completed. He maintains software engineering could cut programming costs by 10%.

Measuring productivity, however, is not an easy matter and one of the first tasks of the Aspect team will be to devise ways of gauging the effectiveness of the system in cutting back on design time. "Our aim is to turn software production from a craft into an engineering discipline," says director Oakley.

With a total budget of $5.4 million, the Aspect project will cover all aspects of software production including requirements, specificiation, design, programming, testing, and maintenance. Work will be toward an integrated project support environment (IPSE), and will center on producing a database of tools accessed over networks from ICL Perq workstations. U.K. airplane maker British Aerospace will be the first user of Aspect.

The second Alvey project, the expert system for interpreting rules, is a demonstrator project with a budget of $9.8 million spread over five years. The British welfare system is so complicated that many people entitled to welfare do not claim it.

The aim of the demonstrator project is to build a system that can be used by claimants, desk staff, and policymakers to thread their way through the minefield of regulations. "The Department of Health and Social Security [DHSS] manuals are huge," says Myer Solomon, ICL project manager. "Building an intelligent knowledge base system of the complexity that will be required has never been attempted before."

The project will involve building terminals that claimants can use to identify their entitlements. For desk clerks, the system would provide answers to knottier discretionary payments, while policymakers would be able to use the system to trim existing regulations and ensure that new legislation does not conflict with existing rules.

The DHSS, which is involved in the research, is under no obligation to make use of the work. Solomon explains that the DHSS system will be used as a model for a more general system that could be applied to interpret a number of different sets of rules.

Like all Alvey projects, the first two are expected to result in profitable products. Whether they do or not depends on how well the partners work together and more important, how committed the top management of the companies concerned are to the Alvey idea. After all, the program relies for commercial success on the same firms who let the British computer trade deficit develop in the first place. ❋

MOVING BEYOND LISP

Lisp Machine Inc. has branched into the worlds of Prolog and Unix.

by Edith Myers

Lisp Machine Inc., Los Angeles, is no longer banking exclusively on the Lisp language to move artificial intelligence computing into the commercial world. Instead, the small company is hoping to join a powerful Lisp processor with a Unix engine to produce a flexible, versatile workstation at which software engineers can take advantage of two of the most popular system development environments.

Founded in 1980 with a license to build the CADR machine, a Lisp processor developed by Massachusetts Institute of Technology, LMI competes with Symbolics Inc., Cambridge, Mass., and Xerox Corp. in selling specialized Lisp processors to the budding artificial intelligence/symbolic computing industry. MIT licensed CADR to Symbolics and to Racal Ltd. in England.

LMI chairman and ceo F. Stephen Wyle says the firm shipped 25 CADR machines, which run only Lisp and which were of an older hardware technology than the current product, the Lambda.

Lambda, a refined version of CADR, began shipments last September. It combines a CADR-type Lisp processor and a Unix processor based on the Motorola 68010 chip. The two processors can communicate with each other and with peripherals over a high-speed bus.

"We realize there is a tremendous investment in other languages," points out Mache Creeger, LMI manager of product marketing. "Unix tends to encompass a lot." A Lisp-Unix Lambda offers the user the ability to add "intelligence" to an existing traditional software package operating in Unix by placing it under the supervision of an evolving Lisp program, Creeger explains.

The combination also adds the high-speed data acquisition and numeric processing capabilities of the 68010 to the symbolic processing abilities of the Lisp cpu, he adds.

Last January, LMI was named exclusive worldwide distributor of LM-Prolog, a version of the logic programming language that has gained a strong AI following abroad (see "Prolog vs. Lisp," January, p. 50). The majority of U.S. AI work has been done in Lisp, which was developed in the late '50s as a list processing language. But LMI sees a strong potential market for Prolog, especially since the Japanese fifth generation computer project has chosen it as the main language for research.

Prolog, developed at the University of Marseilles in the early '70s, is a declarative language whose design includes a relational database. LM Prolog was developed by researchers at the University of Upsala, Sweden, using an LMI Series III CADR machine. It is integrated into the Lisp programming environment.

"It's implemented in Lisp with microcode," says Creeger. "We offer it as an extra cost software package." LMI started delivering Prolog in late March.

Wyle says LMI had shipped 47 Lambdas in late April. The Lambdas are based on Texas Instruments' Nu Machine, which was originally designed at Western Digital. TI has an 11% ownership in LMI.

Last month, the company began shipping the Lambda S, a smaller version of the Lambda, designed for office environments. The S has a 169-megabyte disk and the same processor as the larger version. "It can be used as a target or delivery system for an expert system or it can be a workstation, hooked up either to a bigger Lambda or a VAX via Ethernet," notes Creeger.

With quantity discounts, the price per user goes to $44,000.

Next month, LMI will ship its Lambda 2×2, which the company said is the first two-user, dedicated Lisp machine. Also available is the 2×2 Plus, which offers Lisp plus Unix.

Wyle says 75% of the company's backlog is from "for-profit companies"

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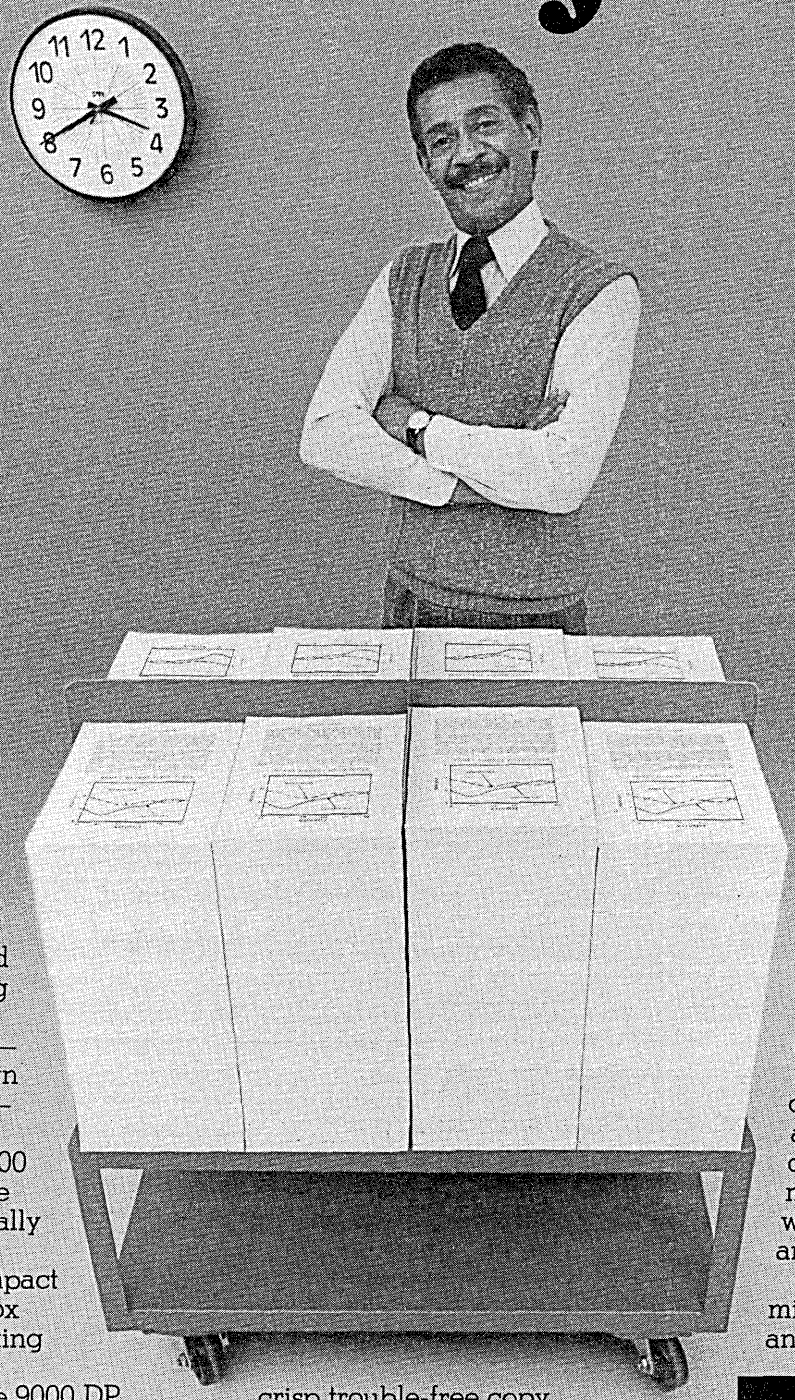

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and the remaining 25% is "mostly for expert systems" in nonprofit organizations.

Frank Spitznogle, who joined LMI as president and chief operating officer in May after 16 years with Texas Instruments, sees the 2×2 as "smashing the price barrier to increased use of Lisp machines." With quantity discounts, the price per user goes to $44,000.

One Alvey project will apply expert systems technology to interpreting British welfare payment rules.

Spitznogle says LMI is beginning to go after vertical market segments by creating divisions headed by experts in those markets. The first, Process Control, is headed by Robert Moore, "whose whole career was in the process control industry." The division is staffed by individuals who have more than 50 years combined experience in the process industries and in knowledge engineering and will try to penetrate the process control industry with specialized hardware and software that fit "over" the standard Lisp products, Spitznogle explains.

He said other vertical markets were under consideration, but declined to specify which ones.

And though they've embraced other languages, the powers that be at LMI still love Lisp the most. Wyle points with pride to a CAD/CAM package developed with Lisp for the company's work on the Lambda. "We built a schematic and did it in two man-years and it was usable in two man-months, actively making drawings for Lambda." ✲

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STANDARDS

GM, NBS PUSH ISO PLAN

With an eye on future CAD/CAM applications, the auto maker is taking an aggressive role in setting networking standards.

by Willie Schatz

Now hear this, all you DECs and IBMs and Honeywells and Univacs sharing the same office floor. Get to know your neighbor. You may become best friends sooner than you think.

At least that's what the National Bureau of Standards (NBS), General Motors, Boeing Computer Services, and the Department of Commerce (DOC) promise. The quartet recently signed an agreement culminating a year-long industry–government effort to develop and implement selected International Standards Organization (ISO) networking standards.

How far along they are to reaching that promised land will be revealed for all the world to see at NCC, where 14 computer and communications companies plan to demonstrate their wares under the auspices of GM, Boeing, and NBS.

"This is a major step in the development of local area networks," says Bob Blanc, director of the Center for Computer Systems Engineering at NBS's Institute for Computer Science and Technology (ICST). The major difficulty in the past has been getting computers to communicate with each other. We've been able to get terminals to communicate with a host, but we've never had host-to-host communications.

"Now we've agreed upon protocols that every manufacturer can put into its ma-

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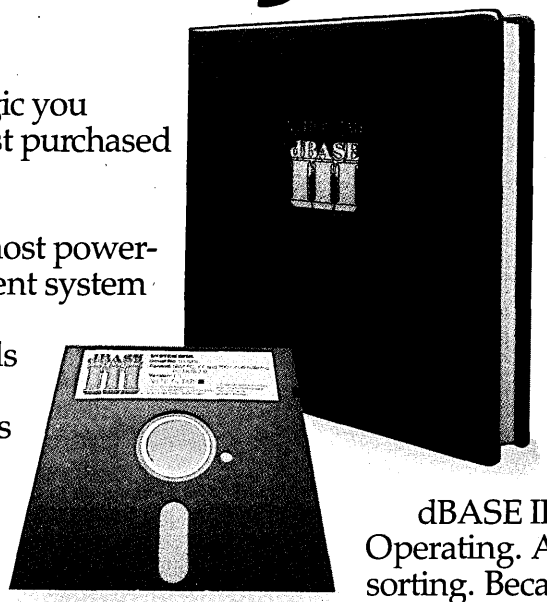

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chines. There's still a lot of software to be developed. But that software will be structured in such a way that it will support computer-to-computer communications."

Two types of networks are being tested. The nine companies in the NBS/Boeing demonstrations, including DEC, Hewlett-Packard, Honeywell, and NCR, are looking at a carrier sense multiple access with collision detection (CSMA/CD), which is supposed to show that international standards for computer compatibility will work in the business environment. The seven firms following GM's lead, including IBM and Motorola, are checking out the token bus, slated for use in factory computer systems.

Both networks are derived from the Open System Interconnection (OSI) Reference Model developed by ISO. The model divides a network's dp communications functions into seven layers, starting with the physical connection and finishing with the application. As the numbers ascend, so does the degree of difficulty. The NCC demonstration will show the fourth, or transport, layer working with the two networks.

What the demonstration won't show is the degree of control GM has had over this whole affair.

"GM rammed this down its suppliers' throats," says Bob Fleming of the Garner Group. "That includes IBM and DEC. It essentially told them, 'We're developing this standard. Anyone who expects to sell to us will interface with this—or else.' "

IBM's enthusiasm for this entire affair was apparent from its statement of participation. Big Blue admitted it recognizes

"It's really important that IBM has decided to go along with it," says Yankee Group director Dale Kutnick.

the need for the adoption of common standards to accommodate communications among multivendor intelligent devices in an industrial environment. As evidence, it cited its support of the GM multivendor IEEE 802.4 broadband token bus demonstration at NCC.

But just to set the record straight, IBM reminded everyone that its LAN activities will "continue to be directed toward the IEEE 802.5 baseband token ring approach for office and campus communications requirements." In other words, we're only going as far in this one as we have to go to keep GM's business.

"It's really important that IBM has decided to go along with it," says Dale Kutnick, director of the Yankee Group. "The fact that IBM has reached outside its publicly proclaimed token ring to support a token bus is very significant. You've got a user-driven standard that the major computer vendors will support. It's even more significant that IBM will support the transport layer. It doesn't preclude IBM from pursuing its future plans with the token ring."

GM, which rightly considers itself a leader in computer aided design/computer aided manufacturing (CAD/CAM), will still have a multivendor environment. There's no way it could have anything else. But if

Vendors can hardly ignore GM's multibillion dollar R&D budget, not to mention what it spends on plant automation itself.

these standards become the standard, the machines will be able to communicate, making it that much easier to talk on the factory floor and within the company. And thanks to 1983 expenditures of $1.9 billion on capital improvement and $2.6 billion on research and development, when GM talks, vendors listen.

What they'll be hearing about is GM's Manufacturing Automation Protocol (MAP). That's a specification that selects existing or emerging standards for multivendor communication in a manufacturing environment. If the standard required by GM isn't currently available, the company has developed an interim specification. The MAP specification has been published by a task force representing 15 GM operating divisions. If that's not getting it straight from the horse's mouth, what is?

"No one has said every GM plant has to do this," GM spokesman Mark Cocroft concedes. "But a plant and vendors would be foolish not to. We're not going to rip out anything we have now. But as new equipment is brought in, it must be MAP-compatible.

"If the equipment's not MAP-compatible, it better be so good at doing what it does that we can't find it anywhere else in the world."

So far GM has apparently liked what it's found. Despite being plagued by what it calls "islands of automation" in its factories, the company is only 15 months away from implementing what may be the first computer integrated manufacturing (CIM) plant in the country. CIM combines both CAD and CAM, and will appear in GM's Saginaw Steering Gear Division.

But this doesn't mean that vendors will necessarily be tripping over themselves to get inside the plant.

"GM is the only customer with enough muscle to force something like this down vendors' throats," says John West, president of CADLINC, a leading CIM firm. "It's typical of them to try the global solution and be all things to all people. They're clearly the leader just on the basis of volume purchased. GM can sway the direction of the standards by the sheer magnitude of its buying power.

"But this is no panacea. Vendors will give it a lot of lip service, but when it gets down to implementing it, they may not give it their heart and soul. No vendor wants to open its system. Once they get a customer locked into their protocols, they want to keep you there."

But customers don't want to stay there. No company wants to put all its cpus in one basket. Customers are getting smarter. They are no longer taking what their seller tells them as gospel. The trend is clearly toward open architecture. That's why NBS, GM, and Boeing are making such a big deal about this.

It may not, in fact, be that big a deal. Nothing will happen until the chips are ready, and that probably won't be for at least another 15 months. There is still a great deal of complicated software to be developed before implementation. The hardware isn't ready, either.

Other companies throwing their support behind the MAP effort are Gould, Condord Data Systems, Allen-Bradley, Motorola, Advanced Computer Communi-

"GM is the only customer with enough muscle to force something like this down vendors' throats," says John West, president of CADLINC.

cations, Charles River Data Systems, ICL, and Intel.

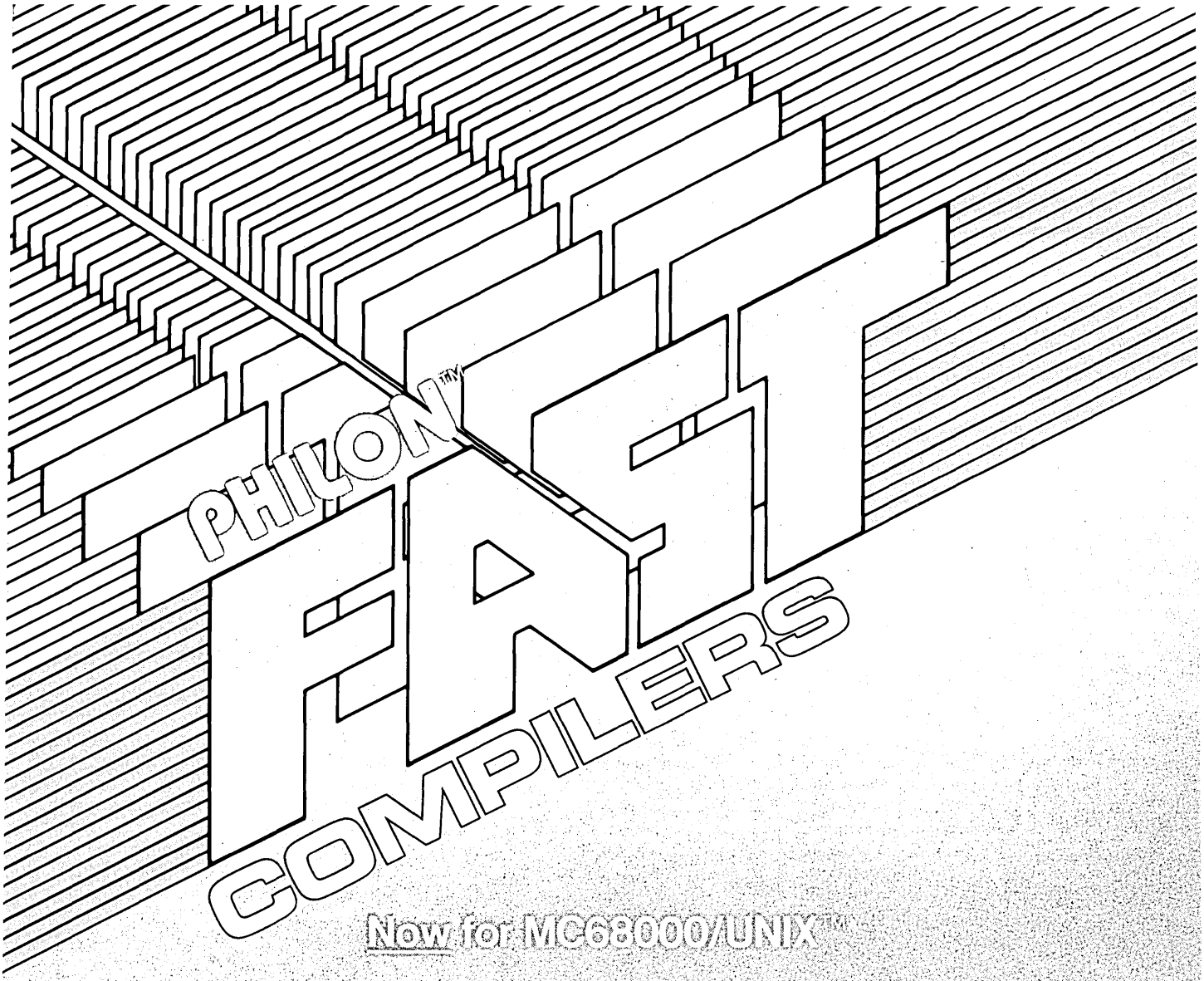
"What's really important is whether the manufacturers implement the protocols," says Sheldon Blauman, director of Boeing's Advanced Technical Applications Division. "I'm sure they will. There's no pressure on any of the participating companies to announce products. But none of us has any doubt that these things will become products.

According to Blauman, third parties like Intel could have something to show as soon as this summer. It's more likely to be the third quarter of this year.

"If the vendors support this, it will be a terrific boon for users," West says. "But there's this great myth of total transparency—that you'll be able to sit down at any workstation and talk to another as if you were right next to it. That's not going to happen without a lot more work."

"This isn't very thrilling or exciting," says Howard Frank, president of Contel Systems, a network consulting company. "It's not the kind of thing I'd run home and tell my wife about. And an experiment like this isn't going to change the world."

It may not change the world, but the push by GM and NBS could bring significant changes to the office and the factory. What's good for General Motors may be good for the rest of the country's dp shops. ✱



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EXPORT CONTROL

BUGGING THE INDUSTRY

That's what the Customs Service wants to do, in more ways than one.

by Willie Schatz

Pity the poor high-technology exporters. Already drowning in a sea of government papers, they are about to be bugged again. Literally.

The latest plan to catch the thieves of U.S. high tech comes courtesy of the Customs Service, which wants to track sensitive exports all over the world, no matter where they go. If this gets off Customs' drawing board, where it has been residing for the past six months, the computers may become hostages of their own technology.

Customs' plan is called Project Rampart. It would be an adjunct to Operation Exodus, the Service's current method of trying to plug alleged technology leaks to Eastern Bloc countries and other undesirable locations. Under H.R. 5188, Customs' export enforcement funds for fiscal year 1985 are limited to $11 million. That encompasses Exodus, Rampart, and any other means Customs dreams up to justify its ends.

The Senate bill, which was pending at press time, has no such cap. The $11 million is significantly reduced from the $31 million authorized for FY '84, but is only $5 million less than the Reagan administration requested. And the purse strings may not be so tight after all. The Department of Defense is reportedly helping pay the Rampart freight.

Don't ask Customs about it, or any other questions for that matter. Other than confirming the existence of the project, the agency just isn't talking. "It's secret, it's classified, and we can't talk about it," says spokeswoman Chris Fraser.

Others can and do. Based on information gathered from reliable sources, it is apparent that Project Rampart, although still very experimental, amounts to high-tech bugging. And even though Customs isn't sure the project will even get off the paper on which it's printed, the agency is $2 million in the hole and isn't about to give up.

Plans call for Customs to place some sort of bug, almost surely a computer chip, into sensitive computer products and semiconductor manufacturing equipment as they are produced. The bug would identify the product's manufacturer, describe the product, and give it an individual identification number, When the producer applied for an export license, the name of the consignee and its individual identification number would be embedded in the product. Upon arriving at its final destination, a computer stationed at that airport or shipping center could compare the original consignee with the receiving consignee. If they didn't match, Customs would know immediately.

Theoretically, the bugs would eventually replace the tortuous and voluminous paper trail through which U.S. exporters must now pass. If the bugs located a product that was being diverted, it would be much easier to trace the manufacturer and the distributor than it is now. No more waiting six months and suddenly realizing the product has already escaped to a country where it doesn't belong.

"Everybody is all for stopping stuff that needs to be stopped," says a government relations executive at a major computer company. "No one wants to judge this prematurely. There are an awful lot of details we don't know. Will a chip avoid licensing and exporting delays for those who don't deserve them? If the chip is set up to alert Customs to items on Commerce's control list, what does that mean? A 30-day delay?

"There is a general apprehensiveness about this. No one's making a real big stink about it yet because we're too burnt out from the DOD-DOC export license battles. But we have to remember that Customs is under a regime that is pretty extreme in its views. We know what they can do to us if they want to. This is as if we'll have the CIA out all over the world."

Customs may be employing the ancient carrot-and-stick technique. In return for industy's cooperation in Project Rampart, the agency would then ease up on the requirements for obtaining an export license. There is significant skepticism within industry that Customs would keep its part of that bargain, though, since licensing falls under DOC's jurisdiction.

"It's secret, it's classified, and we can't talk about it," says a Customs spokeswoman.

There are also the political realities of exporting. While DOD and DOC are waging war over who sees what exports when, and the House and Senate are wrangling in conference over almost every word in a new Export Administration Act (EAA), Customs seems to be the forgotten agency. It wants a slice of the export pie, too, and the bigger the better.

"I think this is a power grab," says Clark McFadden, a leading export attorney in Washington and the counsel for the Semiconductor Industries Association. "That's the reason Customs has admitted Operation Rampart now. It's premature—there's more smoke than fire there. But that's not to say they can't do it and it isn't something to worry about.

"Customs isn't afraid of getting shut out by DOC and DOD. That's not going to happen, although it remains to be seen how much it gets out of the EAA. But it's upset that it's not expanding to the extent it wants to. Customs is really after taking over completely."

That isn't about to occur. If the bug comes alive, though, Customs would be omnipotent in high-tech manufacturing. Every time something sensitive is produced, the bug would accompany it. And everywhere that product went, Customs would be sure to go.

Whether it in fact will get there is doubtful. Right now Rampart, even with so few details available, is on the ramparts against industry. There are many more questions than answers.

"No one's making a real big stink about it yet because we're too burnt out from the DOD-DOC export license battles."

For starters, is this technologically feasible? Probably. There's little doubt that a tracking bug can be manufactured with little difficulty. But no one knows whether it will work across the ocean. It's equally unclear whether the chip will stay in the product forever, or only until Customs finds what it wants to know.

Then there's the issue of going through Customs. The highest high tech may be nullified by what may be considered lowly methods. Odds are that as soon as the chip is put in the product, those who want to avoid detection will have figured out a way to do it.

Who's going to foot the bill? Right now the government is supposed to pay for most of it. Fair enough. Industry certainly doesn't want to cough up money to make its life harder.

What happens when the product leaves the U.S.? Are our allies supposed to make way for U.S. Customs officers at their airports and ports? That would surely appear as another attempt by the U.S. to practice extraterritoriality, which the allies despise.

"I can't really believe the U.S. would want to do something like this," says a source close to Cable and Wireless, a British firm which has had great difficulty with U.S. export restrictions (see "A Noisy Turf Battle," May 1, p. 38). "The U.S. is trying to turn back the tide with a bucket."

Without European participation, the system would surely be doomed. Industry also contends that most sensitive equipment

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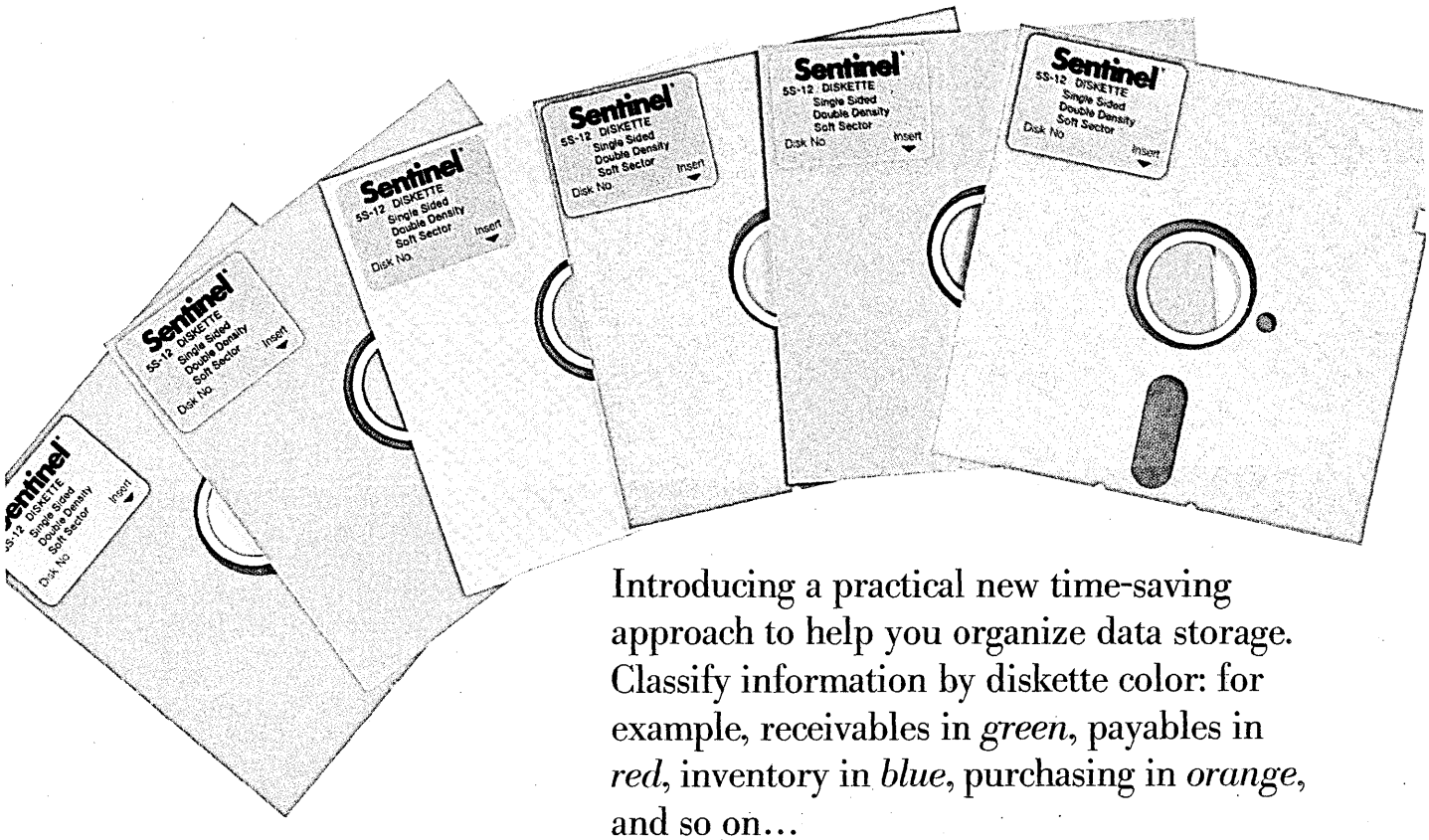

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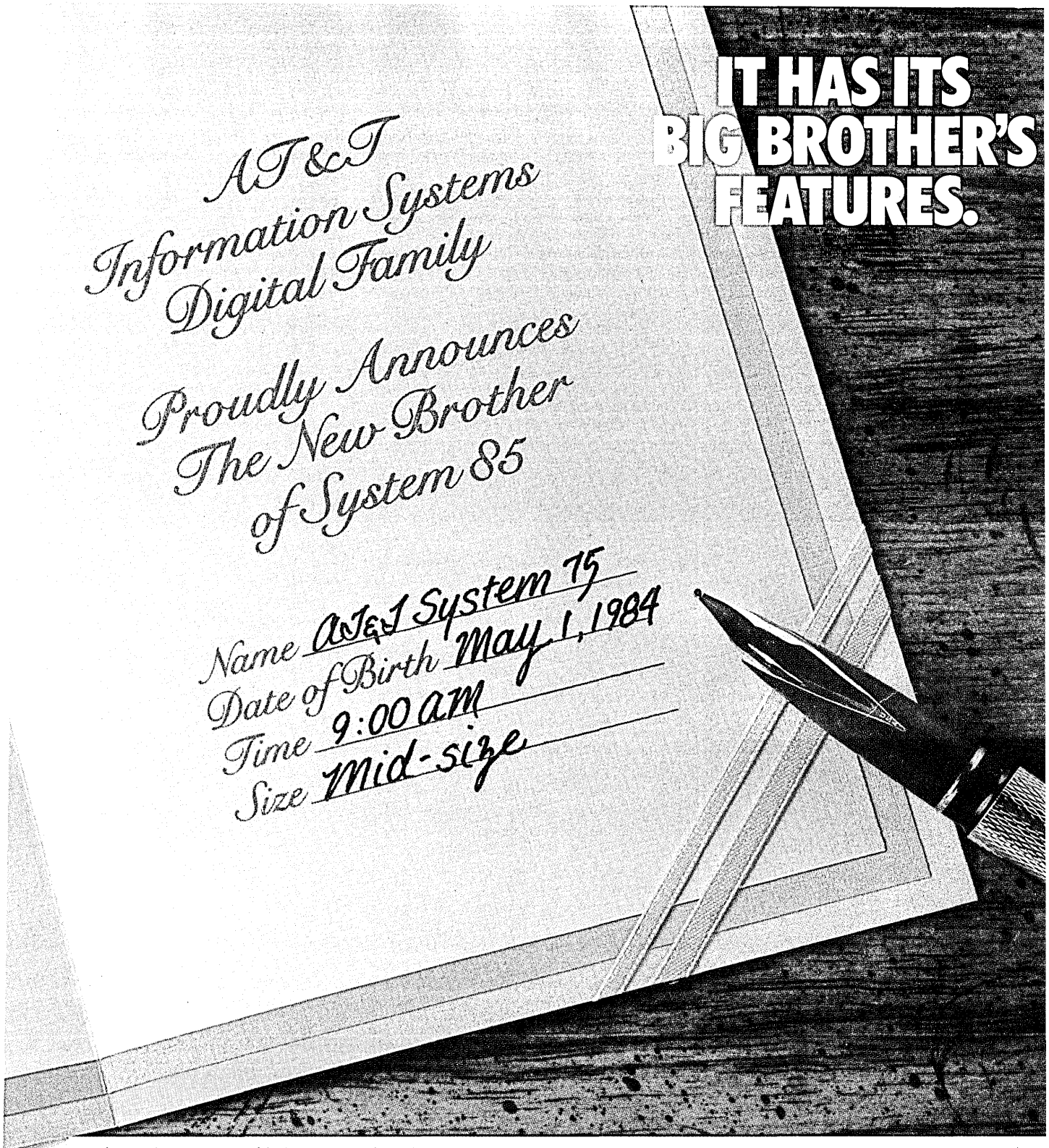

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heading for Western countries leaves the U.S. legitimately. It's when they reach foreign shores that the trouble starts. Thus if Project Rampart seems to be just another corridor in the bureaucratic maze, industry isn't likely to walk down it no matter what kind of deal Customs offers.

"The whole thing is very distressing," McFadden says. "Customs doesn't understand the licensing procedure. This would mean an enormous disruption that's totally misdirected. The diversion doesn't occur at the U.S. border. This is not a fruitful way to proceed."

Nevertheless, Customs marches on. The agency hasn't gotten any industry input on the technological and operational feasibility of Project Rampart. That may be because it hasn't asked for any. And it's not about to until the final details are released. Even if those hit the pages of the Federal Register within the next few months, which sources consider very unlikely, implementation won't start until 1985.

"The idea is valid," admits Hugh Donaghue, vice president of government programs and international trade relations at Control Data. "But no one knows if it's practical. No one knows how it will affect our allies. And no one knows whether another agency—namely DOD, which has helped fund this project—will be involved.

"All we can do now is wait. Our next step is to build awareness that something like this is coming down the road."

Time will tell if it's a runaway truck or a tricycle. ✲

MICROCOMPUTING

BREAKING AWAY IN OA

A spinout from Data General has developed a CEO-like office automation package based on Unix.

by R. Emmett Carlyle

What could easily have been the second generation of the CEO office automation software family will appear shortly—but not under Data General's name.

By the same token, a group of knowledge-based programs for the IBM PC will emerge next spring, but not under the banner of the Lotus Development Corporation, as expected. Lotus's Advanced Developments Group recently broke away to form Prelude Development Corp., Stow, Mass. and it is under that name that the software will appear.

This trend of software labs forming startups is an accelerating one, and is troubling to the mature companies that are hemorrhaging talent to make it possible. As Stratus Computers, Natick, Mass., president Bill Foster puts it, "Today's employee is often tomorrow's competitor." Foster should know. He left Data General in 1979 to form Stratus. His company is now maturing and facing the prospect of losing some of its own key personnel.

The breakaway trend is fueled by step function leaps in technology, increased standardization and portability of software and a near fivefold increase in venture capital funding since 1977 (see box). These factors have combined to dramatically reduce product development cycles. "Today you are either quick or dead," says Stephen Gaal, a former Data General software development head and since 1981 the founder and head of Chatham Ventures Corp., Lexington, Mass. "Shortening product cycles work for the startups and against the established companies who have to worry about compatibility with their existing software base."

Adds Gaal, "With the growth of portable standards such as the C language and Unix, the startup at least has the comfort of knowing there will be plenty of new applications from the independent software companies. That and the short cycles minimize his risks."

Data General's new generation of CEO, for example, has no such guarantees. The product's enhancements are focused on integrating back into DG's proprietary systems, and is thus less attractive to third-party software developers.

Applix, a breakaway formed by four key figures in CEO's development, has no such concern, and during the past 18 months has created a new CEO-like family of office automation programs that are portable. the Southboro, Mass.-based venture will shortly unveil communications, relational DBMS software, and office applications that run across all three currently favored versions of Unix: AT&T's Unix 3 and 5, and Berkeley 4.2, and all "generic" hardware, including the IBM PC. Portability has been achieved by writing all code in the high-level, structured programming language C.

Data general eventually will have to produce an Applix product to enhance CEO and to enable it to tap the emerging pool of third-party applications. "A C compiler was developed a few years ago for just this purpose," a former employee points out—but Data General will have to do it without much of the driving force that made CEO a reality after its development was commenced in 1978. Jit Saxena, the man who brought together the CEO team and controlled all software developments at Data General's software lab in Westboro, Mass., became the president and founder of Applix. With him as cofounders are CEO's principal architect and leader of its implementation group, Paul Dale; John Butler, who headed the marketing organization principally responsible for bringing CEO to market; and Data General's former manager of OA development, Robert O'Donoghue.

"Data General is probably the best company there is at forming entrepreneurial units in-house," states Saxena, "but they are still not as well placed as a startup for getting the most innovative people."

Says Gaal, "During the '70s, DG was a magnet for high-energy people, whom it motivated with stock options. But as it begins to mature in the 1980s it can no longer offer the same incentives and has begun to attract a different class of person.

"Data General is probably the best company there is at forming entrepreneurial units in-house," says Saxena.

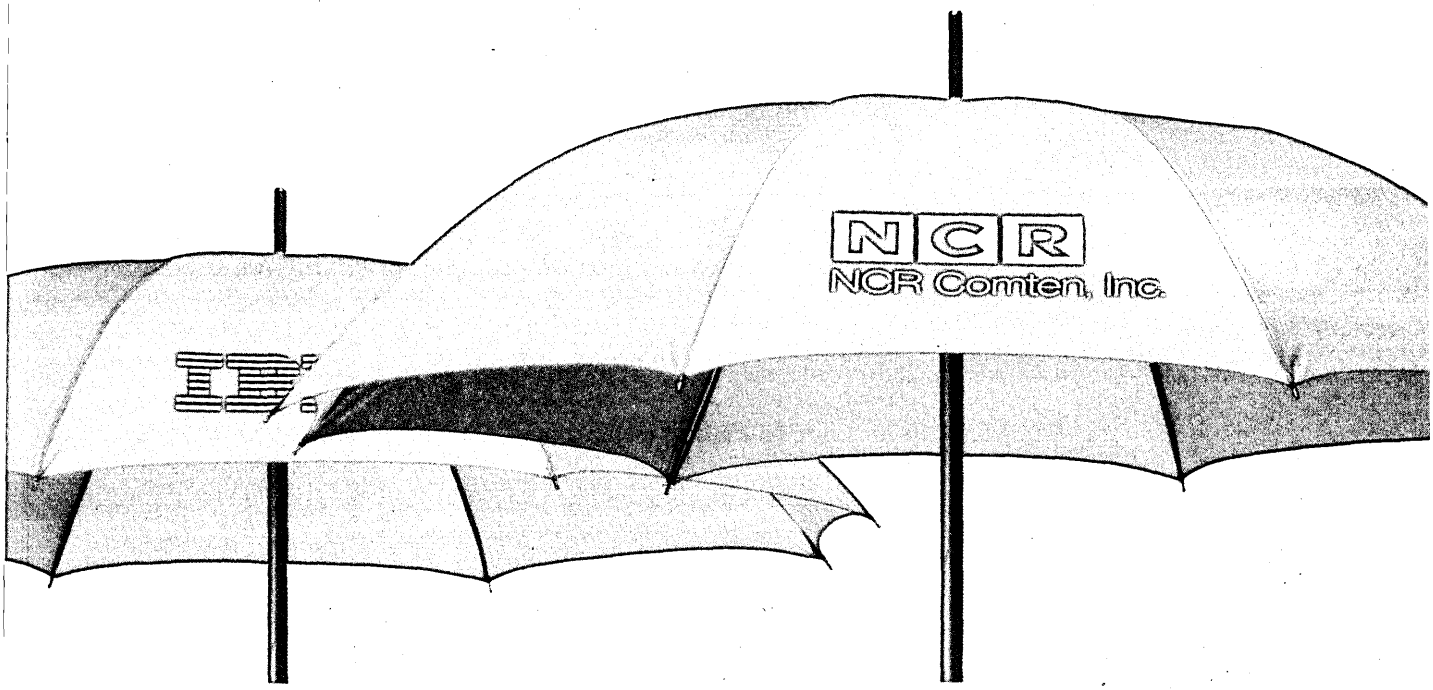
"Most of the people I knew," says Gaal wistfully, "have left." The floodgates opened between 1979 and 1982, and such companies as Solvation, 3R, Synapse, Stratus, and now Applix were created. "Jit [Saxena] is the last of them," says Gaal, who didn't waste any time in buying a piece of his former colleagues's new venture.

Applix is in the middle of a new phenomenon that Gaal refers to as transference. "The old mainframe companies like Burroughs and NCR grew from the fruits of their own R&D, product development, and manufacturing. But as product cycles get shorter, these functions are increasingly being transferred on an oem basis to new young ventures so that the mainframer can wage a campaign against IBM in the marketing, distribution, and service sectors."

Gaal believes, along with other leading venture capitalists, that as mini makers such as DEC, HP, DG, Wang, and Prime mature they will be forced to do the same thing, thus creating new opportunities for oems with niche products.

Stanley Pratt, publisher of the venture industry's bible, the *Venture Capital Journal*, and one of its most respected names, is quick to differentiate between a "good, solid niche" and a "hype." "Venture people now give a wide berth to what we call Jaws investing [for Just Another Workstation, or Winchester] and are seeking products that add substantial and lasting value."

"Give me six months and I'll reassemble the 170th Unix 68000 workstation or IBM PC clone," says C. Gordon Bell, designer of DEC's VAX line and cofounder of Encore Inc., Wellesley Hills, Mass., taking up the theme. "What's needed is passion



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NEWS IN PERSPECTIVE

VENTURE CAPITAL COOLING

After boiling over for much of the past decade, the superheated public issues market for computer stocks has cooled. Venture capitalists looking to cash out or return to liquidity are being forced to take the more traditional routes of acquisition and merger, say observers.

The ever-shortening cycle from idea to product and the emerging generic nature of the computer industry has drawn in venture money looking for a quick killing in the public market.

"Many people have invested unwisely in the 'copycat' or 'hit record' areas of IBM PC clones, integrated software packages, windows, and 68000 workstations," says Stanley Pratt, publisher of the *Venture Capital Journal*.

"They've created what are known as bridge funds in anticipation of early public offerings," adds Pratt, "but now the market has slumped badly and they are left nursing their seedlings." Because the copycat products all tend to look alike, and because they are the fruits of a short product cycle, these ventures are burning money to differentiate themselves from the pack—usually by slick marketing.

"Their problem," says Stephen Gaal, founder of Chatham Ventures Corp., Lexington, Mass, "is that they are not attracting the later (what are known as mezzanine) rounds of financing, particularly from big institutional investors. The money is there in abundance, but they are looking for software solutions to problems in specific vertical markets.

"Their response to yet another windows package, for example, is, why reinvent the wheel if somebody has already made it round?" says Gaal.

"What we've witnessed because of a hot public issues market are a lot of companies going through the venture process very quickly, and this has created a misleading impression," says Pratt. "We are now returning to a more normal period of venture companies working with their portfolios, often for the full traditional cycle of 10 years."

Pratt predicts that there could be a bloodbath for some of the copycat companies. "In general, software companies fail soft; hardware equivalents fail hard. Often a software package can at least be acquired by a mature mainframe or minicomputer company that wants to compete in generic markets."

Now that much of the heat has left the public issues market, there is the impression in some quarters of the computer industry that venture capital sources are drying up.

"Nothing could be further from the truth," Pratt insists. "The total pool under venture capital control has grown almost fivefold since 1977. Then it exceeded $2.5 billion, and today it's well over $12 billion. Venture capital is not going to go away. It'll just be invested with a little more care for the next few years."

—R.E.C.

and new ideas well executed." Bell adds that whatever a new idea entails, it must take into account the emerging portable software environment, "which is driving everything."

Saxena says that early in the 1980s at Data General the emerging standards trend was visible. "What wasn't clear was how fast it would develop. I took the gamble that it would arrive soon and formed Applix," he continued. "I was comforted by the fact that if a trend is very clear it is already too late!"

Saxena and his colleagues, now 25 strong, claim they have created an office automation "software environment" for Unix. "OA is nothing more than a set of good applications: document composition, graphics, time management, etc. Our software allows us to transfer, file, and address objects in office networks. It works in a combination of file server micros and workstations of at least the full PC XT class.

The company's "new idea well executed" is to stay close to the Unix and C standards and to stay away from optimization around any hardware or operating system. "If optimization is required by any of our customers our strategy is to throw extra hardware at the problem, not veer from the software standard," Saxena says.

The company's philosophy is to embrace new software standards as they emerge. "But if they don't we have to create our own for the interim," says Saxena, referring to the new relational DBMS and windowing software included in the company's upcoming offering.

Saxena says that the company's office software was completed in around 18 months—"We would have been much quicker if relational and windowing standards had already existed." He believes that the makers of minicomputer will be hard-pressed to match this performance.

"Some will manage it from time to time," he adds, "but there will be enough who don't at the mainframe and minicomputer end to want to buy and support our product."

Each of Applix's potential customers from among the BUNCH mainframers, the mini makers, and the PBX manufacturers specifically, knows it has the seeds of revolution growing within its software labs.

"So rather than suing the hell out of them, they'll probably just wish them well and try to maintain a close and mutually beneficial relationship with them after they leave," suggests Pratt.

This is what Lotus chief Mitch Kapor did with Prelude; it's probably the example that the industry at large will follow.

One day Saxena will be in a similar position. "Let's just say we'll cross that bridge when we come to it," he says with a smile. "After all, it's flattering when it happens—it means we're successful." ✱

DATA COMMUNICATION

MISSING LINKS EMERGE

There are many different types of micro-to-mainframe links hitting the market, but not all of them deliver true integration.

by Jan Johnson

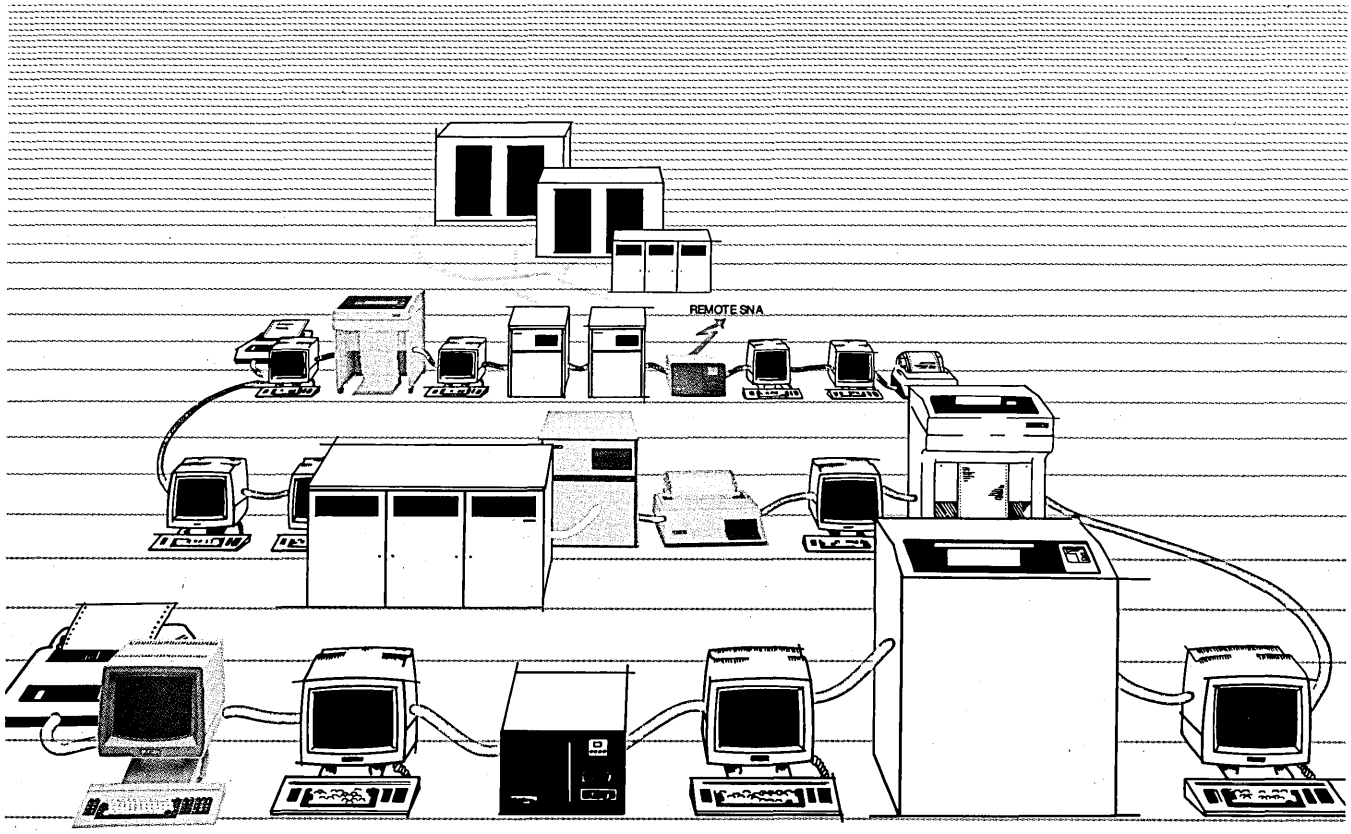
A year ago micro-to-mainframe links were an oddity. Today, there are more than 70 such products offered by U.S. companies, with more to follow. "I am constantly hearing of another company that has introduced some kind of micro-to-mainframe facility," comments one industry researcher who is studying this exploding market niche.

Having a micro-to-mainframe facility has become an unavoidable necessity in the standard software or hardware product line. Now the big question is, "Where along the evolutionary scale is a vendor?"

At the low end of the scale, and not counted among the 70 more evolved links, are passive hardware devices that provide a basic path between the personal computer and a host. Modems, concentrators of various kinds, and multiplexors fall into this Neanderthal category.

Instead of sending a sentence to be processed on the host, the micro could process the sentence and send up a standard query.

Then come terminal emulators and smart communications facilities. Among the better known names in this category are the Irma board from Digital Communications Associates, Atlanta; Forte Data's Forte PC, Santa Clara, Calif.; PCOX from CXI, Cupertino, Calif; and BLAST from Communications Research Group, Baton Rouge. Prices range from $250 to $2,000 per pc. Little to no advances have been made in simplifying the user interface to host-based applications and databases.



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USING VIDEOTEX AS A MICRO-MAINFRAME LINK

The use of videotex promises to facilitate the micro-to-mainframe connection for some vendors. Several are proposing systems in which the videotex processor—the machine that stores and manages the videotex pages (screens)—sits between the end user and the database. A user presses a button or two and up comes a videotex page with a menu containing several general report categories.

Suppose "sales" is chosen. A second menu pops up, this time listing several parameters, such as "state," "region," "salesperson," "quota," "month," "year," and so on. One or more can be selected. The user has just composed a query that, when combined with some additional embedded routines, is sent off to the host. The desired data is pulled out of the production database, sent back to the videotex processor where it may be further processed, then arranged into a predetermined format and presented to the user.

Without question, videotex would go a long way toward solving the user interface problem and concurrently reducing user training. It also may take some of the load off the corporate mainframe system. But it requires an immense amount of up-front attention from MIS. Someone has to build the videotex pages, embed the necessary routines, and build the bridges between the videotex and the corporate database systems.

Digital Equipment and IBM are both getting into videotex in a big way. Both companies have announced videotex software for their host machines—DEC's VAX and IBM's Series/1 and 4300—and for their pcs.

Honeywell recently rolled out a novel marketing strategy. It's offering a relatively inexpensive experimental package to the cautious and the curious. A customer buys several dedicated $650 terminals from Honeywell, and Honeywell provides the rest free. That includes the videotex software, processor, and frame creation service. "It's a way for us to help educate users and gain experience with live systems, and for users to become familiar with Honeywell's videotex equipment," says Raymond Oschger, Honeywell videotex program manager, Schiller Park, Ill. **—JJ.**

Not to be forgotten is IBM and its 3270 PC and XT/370. The XT/370 is in a class by itself. It hardly qualifies as a link-type product, being more of a full-blown VM mainframe stuffed into a desktop box. Where IBM will take that remains to be seen. At the terminal emulation level, IBM has been slow to move beyond the 3270 emulation products. So Visicorp jumped at the opportunity to extend the pc link into IBM's IMS database handler.

Still, these are seemingly Cro-Magnon advances at best, little more than bit-mover links with some attention to higher level protocols but none to applications. Overworked MIS programmers face more work building special files, and interface routines to mainframe applications before these facilities become useful.

The ideal micro-to-mainframe link would be a turnkey solution. It would require at most a single log-on procedure. When necessary, the pc would automatically and transparently link to the host database system or application and pull down needed information. One simple, consistent user interface would be presented, even when building a request destined for a host application. Ideally it would provide all that with little tweaking or training on the part of MIS. Of course, this will not happen any time soon, but the industry is moving in that direction.

Natural languages appear to be one key to solving the end-user access problem. Artificial Intelligence Corp. (AIC), Waltham, Mass., for instance, recently announced its intentions to deliver a micro-to-mainframe link for its Intellect query language. AIC also announced a new Intellect facility that will allow databases to be updated through Intellect. Nonetheless, natural languages do have their drawbacks. While they significantly reduce training they still consume hefty amounts of computing resources and require some tweaking on dp's part.

In the future, possibly by the end of this year, AIC plans to announce a micro-based version of Intellect. Other natural language vendors are planning micro-based products as well (see April 1, 1984, p. 60). That advance may help solve the host-hog problem. Instead of sending a sentence to be processed on the host, the micro would process the sentence and send up a standard query. The language processing could be offloaded to the micro.

Links from Cullinet and Computer Associates started with Knowledge Manager, relational DBMS.

Another trend to watch is videotex. Although it solves the single, simple user interface problem, bringing up a videotex system is MIS-intensive. In the past year, the emphasis on that technology has shifted from the home to the office and from dedicated videotex terminals to pcs (see box). Videotex could be seen as a new species in the micro-to-mainframe world, and a promising one at that. Its simple, single-user interface across multiple applications has caught the attention of many, most notably IBM and DEC. Much of its evolutionary process will probably focus on simpler screen creation techniques and less MIS intervention.

Meanwhile, the traditional micro-to-mainframe lineage continues to evolve as well. The most advanced products fall under the heading of "intelligent" or "integrated links." The facility is integrated directly or indirectly into a production database or application. Tools are provided for creating simple user interfaces or for offloading some of the work from the host computer. MIS assistance is still required but the growing number of "productivity" tools is making life easier.

Now the cost structure gets tricky. Most vendors charge from several hundred to several thousand dollars for the micro side, and several thousand to tens of thousands of dollars for the mainframe package. According to one researcher who has spent several months digging into the micro-to-mainframe products, only three companies have shipped production versions to more than a dozen clients.

They are On-line Software International, McCormack & Dodge, and Management Science America. "That situation is rapidly changing," he acknowledges.

All three companies offer a micro link to a mainframe application. On the micro side, all allow data to be moved into Lotus 1-2-3 and other micro-based applications. Only one, MSA, provides a generic micro-side database handler, dBASE II. Each provides tools to MIS for building simple user commands with which to extract data from the mainframe application.

The other group offering intelligent integrated links are the database vendors. Soon-to-be-delivered products from International fall into that category. CA Executive from Computer Associates, Jericho, N.Y., is due out next month and Cullinet, Westwood, Mass., is aiming for an August delivery of Golden Gate. Currently, both are in beta tests at several unnamed sites, claim company sources.

Though later to market, the micro-side of the newcomers' products appear to be more fully integrated, offering the usual communications fare, word processing, spreadsheet, graphics, and help—but with a more powerful database manager at the core. More intriguing, they both started with Knowledge Manager (Kman), a micro-based relational database management system purchased from MDBS Inc., Lafayette, Ind.

The two companies claim they have "substantially" rewritten most of the code. "We probably only have 2% to 3% of the original Kman code in our product," says Jack Armstrong, product manager for pc software, Cullinet. So why bother with Kman? "We wanted to develop our own software, but the timing was such there was no way to develop a full database capability and still get out in a year. So we bought the

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software that links

source code [from MDBS] to get us up the learning curve. What you will see in our product looks nothing like Kman. We improved its performance too. We run about twice as fast as Kman."

Kman is not a trivial product, though it has its share of flaws. It incorporates many of the features found in dBASE II and Lotus 1-2-3 then goes a measure beyond to offer data encryption and user password features, an unlimited number of tables open concurrently (dBASE II allows for two, 1-2-3 for one), automatic edit and integrity check during data entry, table sorting based on expressions involving multiple fields, a wider variety of cell definition formulas when used as a spreadsheet (including nested cell references), user-configuarable control keys, nesting of user-definable macro functions, and an unlimited number of characters permitted in macro text.

The query language put before Golden Gate users appears to be more friendly than CA's offering, but it still requires knowledge of syntax and procedure.

On the downside, Kman has taken the roughest beating for its unfriendly user interface, and SQL-like query language. The company claims it will be addressing that shortfall in future releases. Word is that MDBS plans to introduce a set of Lisa-like icons.

Computer Associates, like Cullinet, bought Kman and rewrote it, turning it into its micro-side database system CA DBMS. Because a common database underpins most of the CA applications on the pc side, a simple keystroke allows the user to move among applications. CA Executive also offers windowing and multitasking. A user can jump from application to application without closing out one task and opening another. The exception is the window that runs PC/DOS programs, which is not fully integrated with the other CA micro-based applications. Linking up CA DBMS with mainframe applications involves using a string of complex procedures that must be remembered. Most of those problems can be resolved by building macro commands using CA Editor.

"Basically, you can create a file in the pc that contains a series of commands," explains Arnold Mazur, senior vice president of marketing for Computer Associates. Once such a file is created, it can be executed by typing one word. "Automatically" a connection is made using the CA Link facility, the query is run, results are collected and sent back to the pc. Once the data are on a pc disk they can be read into the DBMS or other applications and manipulated, Mazur says.

CA Executive also has a "forms" application on the pc. Assisted by a menu prompt, users can create their own forms, Mazur says. Once a form is created, it can be invoked by typing in a file name. With a little help from dp, this feature, if coupled with CA Link and Computer Associates' mainframe, CA Universe DBMS, could be structured to generate queries or to collect data for making updates to the mainframe database.

CA's approach to database queries is, critics say, unfriendly. The company chose to stick with CA Universe's query language, a procedural language. CA DBMS, the micro-side database system, mirrors CA Universe's functions and command set and can talk directly to CA Universe. "We are working on a fourth generation [query] language for CA Universe," Mazur says.

If anything, Computer Associates has compounded the dp backlog problem. It's well established that even fourth generation languages, while solving a lot of problems for dp, solve few problems for the uninitiated user. Unless customers place CA Executive in front of seasoned CA Universe users, exclusively, the umbilical cord to dp has not been cut. It has instead been extended to every micro-based CA Executive user who wants to query a personal or corporate database. DP's only hope is that the menu-driven forms facility will "offload" some of the pressure. If that proves too complicated for basic pc users, dp may face a lot of macro writing—a simple task, as dp problems go, but potentially overwhelming in number.

Cullinet, in contrast, has tried to make life easier on the pc user. Prompts and menu-type features appear at the bottom of the screen and guide users through the query construction process. Cullinet created the Information Data Base (IDB) facility to sit between the micro user and IDMS//R, Cullinet's mainframe DBMS. The IDM receives the micro request, interprets it, then passes it on the IDMS/R. Likewise, the IDB receives the requested data from IDMS/R, formats it, and sends it down to the micro.

In addition, Cullinet appears to be managing data on the micro-side in a more user-friendly fashion than CA. Cullinet uses a hierarchical menu format that guides users to their destination. It also uses colors to describe where the data resides—one color for local data, another for mainframe data.

While the query language put before Golden Gate users appears to be more friendly than CA's offering, it still requires of users some knowledge of the data and attention to syntax and procedure. The more complex the query, the more likely a user is to turn to dp for help. Like CA, Cullinet offers several macro building tools. It's probably a sure bet that Cullinet dp customers will also experience a flood of requests for macro facilities from micro users.

Without getting into technical detail, from an end-user perspective CA Executive and Golden Gate do have some similarities. They offer the same basic complement of application packages and integrate them under one database system, and users can easily "toggle" between applications. They both provide macro building tools and a communication facility.

Among the features present in CA Executive and lacking in Golden Gate are forms creation and multitasking capabilities. "That's coming," Cullinet's Armstrong says, perhaps in the next production release (which may not be out until this time next year).

Cullinet nonetheless appears to be farthest along in addressing the end-user interface problem. Cullinet, like some micro software houses, is pondering natural languages. Says Armstrong: "I think where we might go in the future is more toward application development tools offered in a language that an end user can use, like Logo. Something as close to a natural language as possible." Armstrong says he has been watching developments at Artificial Intelligence and its micro-based versions of Intellect "with interest."

When it comes to cost and market coverage, CA appears to have the advantage over Cullinet. CA Executive sells for $1,295 per copy, whether it runs on the micro or mainframe, says Mazur. In contrast, Cullinet charges $995 for the pc software and $295 for the link package. That much is competitive with CA. It's the additional $75,000 charge for the Information Data Base facility that may throw Golden Gate out of the reach of medium to small-size companies. Computer Associates is also more widely used, claiming 15,000 customers using 29,000 products compared to Cullinet's claim of 2,117 sites and an installed base of 10,069 products.

Intel's Data Pipeline "is a database machine that serves as an interposing switch between the micro and the mainframe."

Not all products fall neatly into the above described categories. One product that does not is Data Pipeline from Intel. It falls somewhere between the intelligent integrated link and the less "evolved" smart communications facility. Data Pipeline is intelligent—a processor and a database machine reside between the micro and the mainframe application—but it's not integrated with an application or machine at either end.

"With Data Pipeline, Intel has come up with a whole new concept," says Bud Mathaisel, a principal at Temple Barker & Sloane, a Lexington, Mass., information management and systems consulting

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group. "It's a database machine that serves as an interposing switch between the micro and the mainframe." Intel is charging $22,000 for the product.

The processor takes care of the software conversion problem between micro and mainframe applications, interpreting commands from one side to the other. The database machine takes care of the management and security functions associated with collecting, holding, and handing out the data passing between the micro and the mainframe. Essentially, that duty, which is performed on the mainframe by other intelligent links, can now be offloaded to the Data Pipeline.

"You gain two things with this concept," advises Mathaisel. "You gain universal connectivity to most any micro or mainframe. And you have a separate holding area for data available to micros." Mathaisel believes Intel's idea is an especially "appealing solution for those who have mainframe database vendors that are not currently providing a full micro-mainframe partnership." It also appears to be an ideal oem product that software and hardware vendors might consider when building their own integrated micro-to-mainframe packages.

Who or what will survive? The application and database software vendors that offer micro-mainframe links to their installed bases will survive, speculates one industry researcher. In addition, he sees "every incentive for major (hardware) computer companies to make themselves actively communicate with the IBM-installed base."

Vendors will start building IBM mainframe compatibility directly into their pc products, one researcher suggests.

In the near term, he expects to see more vendors following Apple's and Sperry's lead of building IBM mainframe compatibility directly into the pc product. The links may appear first as software, he suggests, moving into firmware over time.

Vulnerable to virtually overnight extinction are the pure hardware communication link providers that were welcomed only a year ago, the modems and Irma-board class of participants. Their days are numbered, the researcher believes. "Communication products, unlike the application-based products, have no huge investments behind them. Therefore it's easy to pull out one and push in another as soon as better communication technologies come along."

In any case, it is clear that the linking of microcomputers to mainframes will draw a great deal of attention from vendors and users alike. The only guideline is match the solution to the application. ✲

EBCDIC MEET ASCII

Pcs in bisynchronous environments have caused a boom in the protocol conversion marketplace.

by Edith Myers

It used to be that 3270 was 3270 and ASCII was ASCII, and ne'er the twain did meet. That's changing rapidly, with the result that the market for devices to connect the two has blossomed.

"IBM, through a series of product announcements over the past two years, such as the 3270 PC, has changed 3270 from a product line to a communications protocol," says a spokesman for Datastream Communications Corp., a Santa Clara, Calif., firm gunning for a piece of the market for protocol converters. Advanced Resource Development, a market research firm, has pegged that market at $187 million in 1984.

"They all look at the 3270 numbers and go after it," says David Misunas, assistant vice president for protocol conversion products at Micom Systems Inc., Chatsworth, Calif.

Yet there is no clear consensus as to what protocol conversion really is. "I was into it back in 1960 when I tried to make a Teletype look like a TWX," says Ralph E. DeMent, manager of strategic planning and distributed systems engineering at Digital Equipment Corp. DeMent, who chaired a session on protocol conversion at Interface in March, notes that "it wasn't until the advent of microprocessors that it really began to move. It can range from pure, simple code conversion to intelligent gateways. No one can define it."

It's equally difficult to assess the numbers of companies in protocol conversion. "When you include the metal benders there could be as many as 60," says Richard Swarz, president of Protocol Computers Inc. (PCI) in Woodland Hills, Calif. "I think, though, that we have fewer than 20 real competitors." Swarz's company grew by 300% in the last year, and while he doesn't expect to maintain this rate, "I expect we'll continue to grow substantially."

In addition to PCI, Datastream, and Micom, other active participants include Icot Corp., Mountain View, Calif.; Renex, Springfield, Va.; Local Data, Torrance, Calif.; and Timeplex Inc., Woodcliff Lake, N.J. All are growing. Datastream says its sales have doubled each year since Charles Ascanas, president and chairman, joined the firm in 1980. Sales are projected to be approximately $9 million at the end of fiscal '84 (June 30), and the company expects to achieve sales in excess of $100 million in 1988.

Companies are getting into the market in a variety of ways. Micom entered through the acquisition, begun last July and completed in November, of Industrial Computer Controls Inc. (ICCI), a Cambridge, Mass., manufacturer of protocol converters.

Misunas, who founded ICCI and assumed his present job at Micom with the acquisition, said, "We married two worlds together. We [ICCI] had the IBM side and Micom knew the asynchronous world."

He sees that marriage as indicative of a change taking place in the protocol conversion market. "Before, it was a matter of knowing what a 3274 or a 3276 does and doing the same thing cheaper with asynchronous tubes. Now we're seeing that there are things done in the asynchronous world that aren't possible with bisync. We're bringing added value to the 3270 networks with things like banner messages and broadcast messages, the sort of things synchronous mini and micro users are used to."

Timeplex got into the protocol conversion market last November with a license from Local Data to manufacture some of its products. Timeplex also acquired partial ownership of Local Data. "It came out of our systems integration business," a Timeplex spokesman says. Timeplex puts together integrated systems for customers and tests them in its facility in Largo, Fla., before installing them on customer premises. "There was a great demand among our customers for protocol converters, and this was a way to get into it quick." Initially, Local Data is supplying the converters until Timeplex gets its own production geared up.

"We're seeing that there are things done in the asynchronous world that aren't possible with bisync, like banner and broadcast messages."

PCI in March announced an agreement with Ungermann-Bass for joint development of protocol conversion products to operate on UB's general purpose local area network, Net/One. "Everybody wants the added value of protocol conversion, of one desk, one terminal," says Jim Jordan, vice president and general manager of Ungerman-Bass, in Santa Clara, Calif. "We looked around and saw that others had done it and decided not to reinvent the wheel."

Teltone Corp., a 16-year-old Kirkland, Wash., telecommunications company, has been in the data communications

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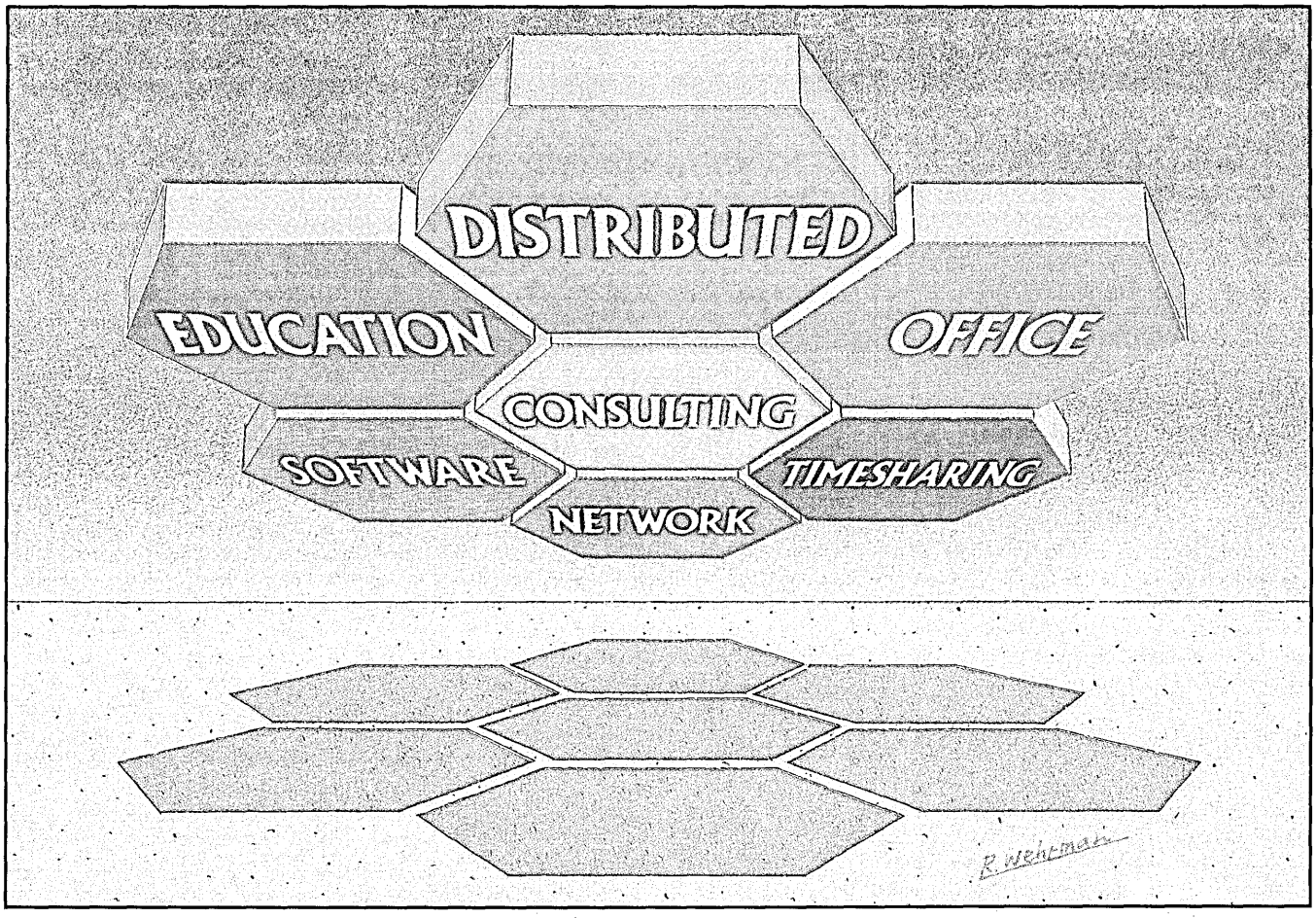

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business for the last five years. It sees a protocol converter it developed as simply part of its package of offerings, "to help customers transport data from one point to another," says vp Dale E. Johnson.

Why are people buying protocol converters? R. David Guthrie, vice president of sales at Local Data, lists five reasons: micro to mainframe links, configuration flexibility, specialized needs like talking terminals for the blind or bar code terminals in supermarkets, migration (e.g., DEC to IBM), and cost savings. "Cost savings is not what we're selling, though. It's primarily flexibility."

Timeplex says protocol converters became hot items in 1983 for two reasons: "They can reduce the cost of a network by substituting standard, asynchronous ASCII terminals, especially printers, for more expensive EBCDIC devices; and their bridging and switching functions allow one communications network to interconnect different types of computers and to serve both with only one terminal or processor."

Protocol converters are "definite memory hogs that eventually will become asynchronous front ends."

Ray Guinn, president of Renex, says cost savings of 10 to 1 can be achieved with use of protocol converting products. But, like others in the marketplace, he admits the cost savings come with security concerns. "There is a problem with security for dial-up, and security for disconnect."

"Security is a major problem with protocol converters," agrees Scott Brear, director of protocol conversion products for Micom. He says his company has built password protection into its "command port" concept. Standard models of Micom's Micro7400 feature a separate command port which provides access to a menu-driven set of configuration and control functions, permitting selections of desired parameters. Security options, including password access, can be selected or modified via this port. "We've put a lot of work into security features," says Micom's Misunas, "things like automatic log-off disconnect and password access to the protocol converter."

Dan Zatyko, president of Zatyko Associates, Tustin, Calif., doesn't think the security measures offered by the existing protocol converter manufacturers are good enough. "Protocol converters don't always work," he says. Early protocol converters didn't work because they addressed only the lowest levels of the ISO seven-layer protocol model and assumed levels of service that didn't exist in the higher levels.

"Now, in today's world," Zatyko continues, "there are all those pcs running through protocol converters in dial-up networks and they don't work either. They assume security. They assume they can clear the queues. In the IBM world you queue up before the 3270, you queue up before the Network Control Program [NCP] software, you queue up inside VTAM and IMS. When there are any connections they're LU [Logical Unit] to LU. The LU in the host is software."

If a system has an average three second response time, he explains, that means 95% of the users are getting a response time of nine seconds or better and 5% of them are getting response times greater than nine seconds. "Where are the data stored during that time?" Zatyko asks. "In the queues. And with pcs on-line doing file transfer, it's forcing the queues to be extremely large."

Zatyko worries about the vulnerability of data in the queues. "You're on a dial-up line. What if the phone company disconnects you? The information in the queues remains there for the next user. Output comes out on whatever terminal is there." He sees this as causing misdirected checks in electronic banking and misdirected airline tickets. He tells of an insurance company which had an experience where a part of one policy was printed on another. "If someone pays $10,000 for a policy and gets one worth a million dollars, what's the legal exposure? The problem is serious but it doesn't show up when the people who build protocol converters test them. They test by hooking into a line that is empty."

Zatyko says commands on line disconnection to clear IMS or to cancel passwords are not acceptable since they are inconsistent with the IBM host environment in which security is resident in the host. "It's inconsistent architecture," he states.

On the flip side, Digital Pathways Inc., Palo Alto, Calif., has added a protocol converter to its Defender II computer security and management system designed to protect large computers from unauthorized access. The Defender II is a central-site modem management system that provides dial-in/call-back protection against unauthorized telephone access. Its new protocol converter supports 100 types of asynchronous terminals.

Then there's what Guthrie of Local Data calls "a form of deconversion." Local Data has introduced a device, the VersaLynx TM 3278, which permits IBM and plug-compatible 3178/3278 display stations to interface to RS323C asynchronous ports and thus emulate a variety of ASCII terminals.

Swarz of PCI calls such a scheme "turning the key the other way and unlocking the ASCII world for IBM terminals." PCI's 74D protocol deconverter enables IBM 3270 terminals to access DEC hosts and other ASCII computers and network systems.

Both Guthrie of Local Data and Misunas of Micom talk of companies finding special protocol conversion niches. One such is Innovative Electronics Inc., Miami, whose Netmaster provides IBM SNA conversion to NCR or Burroughs Poll/Select. It functions as a remote in-store processor in a credit card authorization/data entry network system.

Many of the protocol converter suppliers talk of helping customers access the value-added networks. Tymnet has its own async-to-3270 service, which it says eliminates the need for protocol converter hardware and redundant lines. "It's all in the software," says Tymnet's Joe Lee.

Guinn of Renex says protocol converters are "definite memory hogs." For the future, he sees protocol converters bypassing front ends, "going directly into the users' world. They'll become asynchronous front ends."

Zatyko sees the best hope for a solution to the async-to-IBM communications problem in IBM's recently announced SNI (SNA Network Interconnect) and two of its subproducts, GW-NCP (Gateway Network Control Program) and GW-VTAM (Gateway Virtual Telecommunications Access Method), both of which are in beta sites now and will be available in the fourth quarter of this year. "These will allow you to build multiple networks and transfer data one to another with security checks at network borders," says Zatyko.

He feels protocol converters will remain around as "a low-cost entry. But they have to be used with care. It's like with cigarettes. First we were told they may be hazardous, and now we know they have been determined to be hazardous. With protocol converters there is no maybe." *

BANKING SYSTEMS

MAKING A NAME FOR ITSELF

A company called XRT is gaining a strong reputation in the commercial paper processing business.

by Michael Tyler

For a small, unknown company, there are two paths to success. One is to raise enormous amounts of venture capital for marketing, hoping the product will live up to its costly billing. That route has been taken by many microcomputer hardware and software vendors, with varying results.

The other way is to latch onto a famous name or two and hope that endorse-

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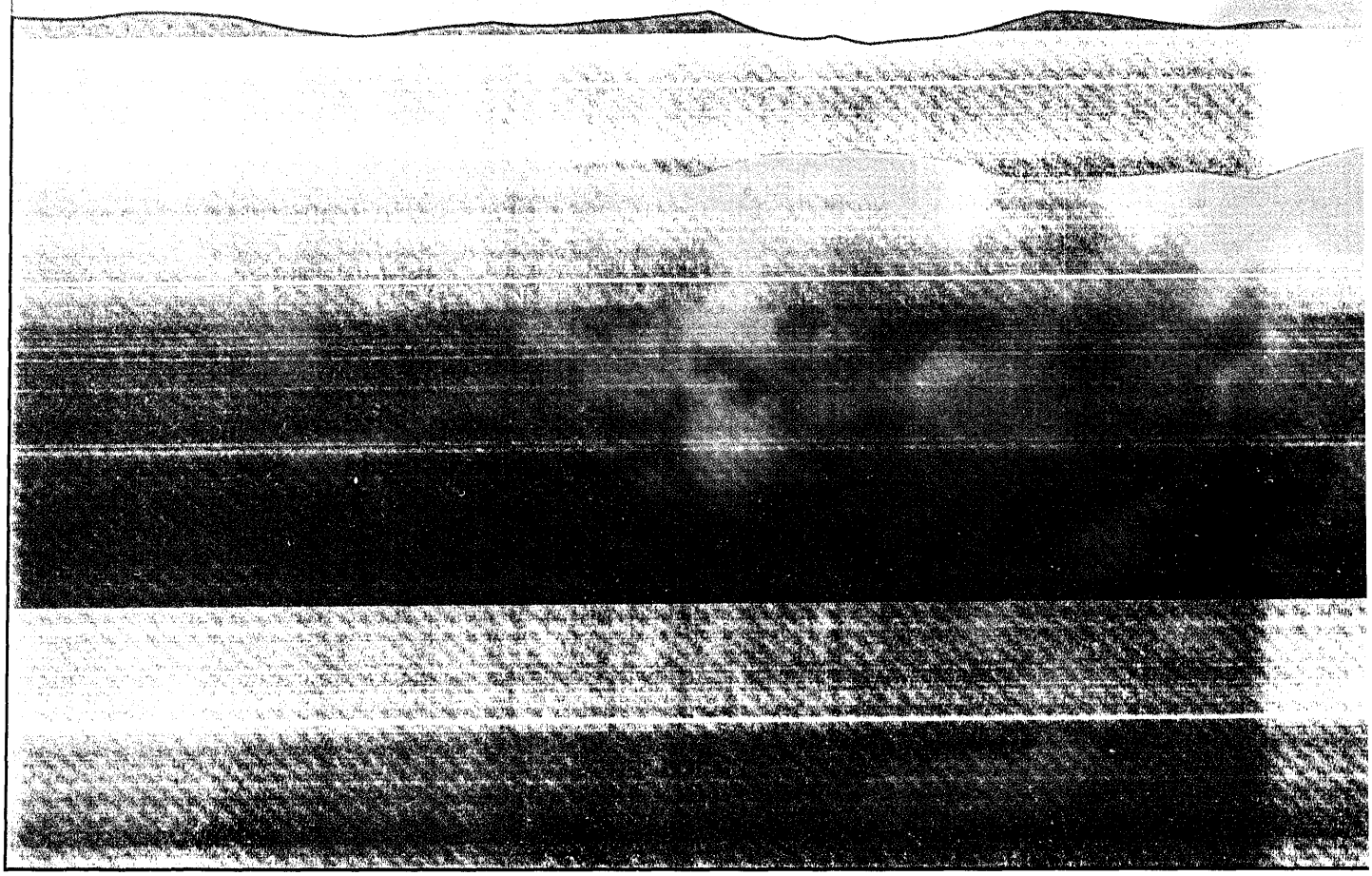

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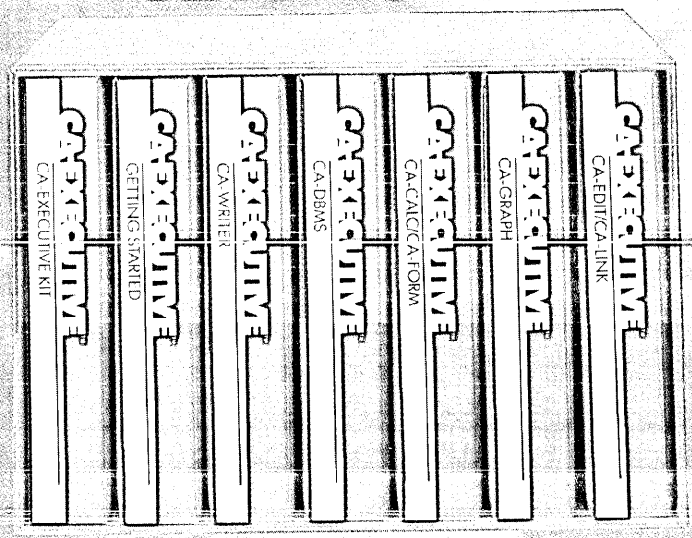

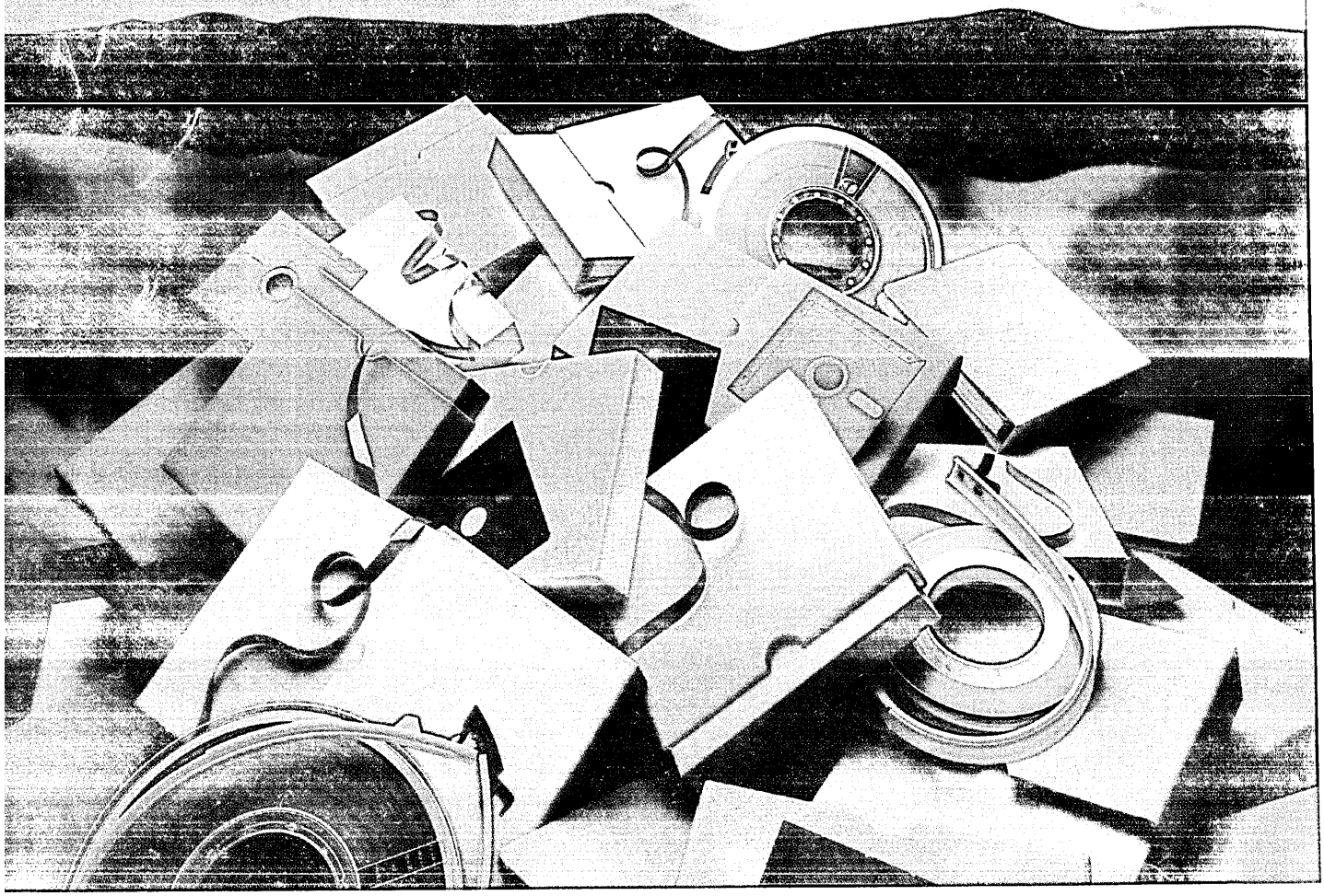

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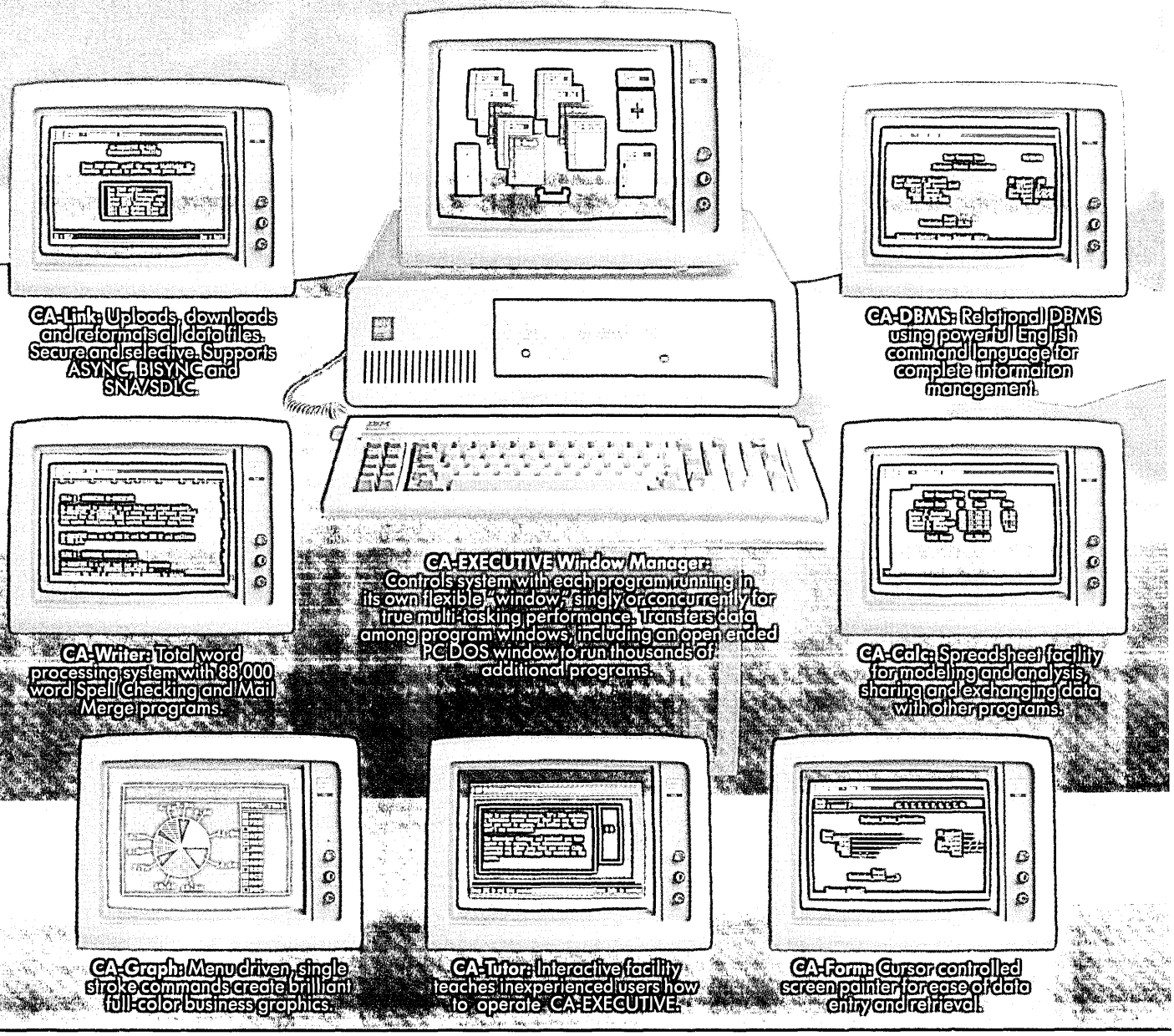

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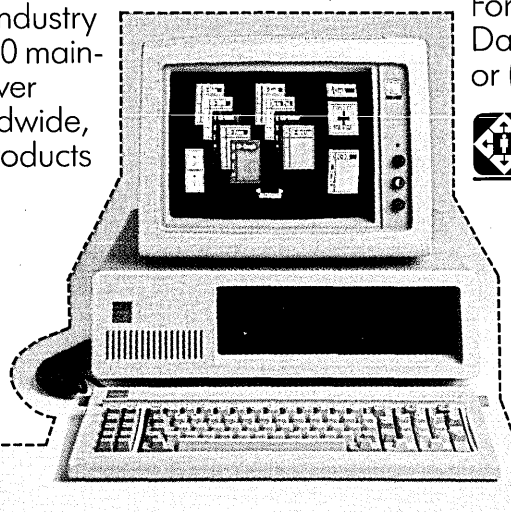

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ments will boost the company into a stable position. XRT Inc., Malvern, Pa., chose the second route, and it is just now beginning to learn whether it will succeed. Created in 1972 by Rocco L. "Rocky" Martino but virtually somnolent for its first dozen years, XRT produces software for commercial paper and cash management applications at large money management institutions. The software is sold only on Tandem NonStop and IBM Personal Computer hardware.

This year has seen a burst of activity at the suburban Philadelphia software house, and much of it can be credited to the signing of four big contracts—with American Express Credit Corp., ITT Financial Corp., General Motors Acceptance Corp., and Prudential Insurance Corp. The contracts, which vary widely in their size and scope, are all based on the firm's flagship product, the Commercial Paper Issuing System. XRT is counting on those four contracts to lead to others, especially in the commercial paper market where a handful of vendors supply only a few major users, and where word-of-mouth advertising is paramount. There are but 53 direct commercial paper issuers in the country, and many of those use timesharing services. While few in number, the issuers rely on computerized transaction processing capabilities as much as stock brokerages, currency traders, and other financial users. In going after the commercial paper market, XRT has decided it must rely on firsthand recommendations to sell its software.

The referral strategy has been getting results ever since XRT signed American

"I saw American Express right after Rocky had installed XRT's system there, and I knew that's what I wanted."

Express, in Wilmington, Del., five and a half years ago.

"American Express needed the commercial paper application, and came out with a specification document," says Tandem regional manager Anthony Narducci. "XRT was at the time a small and young company, and they developed the application and won the contract, buying our hardware and then reselling it as part of the deal." The contract was worth under $50,000.

"It's remarkable the results American Express achieved," Narducci observes. "They had the worst performance of any paper issuer, but after buying the XRT package they were able to respond quickly to market conditions. They became the most aggressive company with the best rates." The American Express application attracted W. Gene Gerard, senior vice president and treasurer of ITT Financial Corp. in St. Louis.

"Tymshare had developed a commercial paper system for us, and given us a cut rate on it," Gerard claims, "but their costs kept going up every six months. Our volume tripled in three years and by 1980 we couldn't keep up using Tymshare. We began negotiating with XRT on Dec. 1, 1980, and by Jan. 2, 1981, we were up and running." Gerard says the XRT system enabled ITT to save $550,000 in the first two years over what Tymshare had been charging. In addition, he says, ITT's volume tripled again in the three years following the switch, and XRT enabled ITT to add several additional modeling, reporting, and interest payment on debt functions to the original application. Less than a year later, Gerard signed with XRT to add the cash management package to the initial system.

GMAC also discovered XRT on a visit to the American Express installation, says Robert Zane, GMAC's regional finance manager in Dallas. "We had an IBM-based system, but it failed too often because it didn't have the capacity to support our volume." GMAC is the largest commercial paper issuer in the country with 35,000 customers and $1 billion daily volume, 11% of the total commercial paper market.

"We simply cannot afford to be down, so about two and a half years ago, I drew up an RFP for what I wanted in a commercial paper software system," Zane recalls. "I visited some of my competitors, like Ford, Montgomery Ward, and Sears, to see what bells and whistles I might have missed. Then I saw American Express right after Rocky had installed XRT's system there, and I knew that's what I wanted."

What Zane saw was a system that provides for note issuing, treasury and cash management functions, interest rate setting and modification, customer and banking relations, and report production. All modules can be accessed interactively. Security and audit trails are included to meet the integrity demands of money managers.

Zane sent the GMAC request for proposal to seven companies, he says, of which three returned completed proposals within the allotted two weeks. "I wanted to see how fast people could respond to such a massive request. XRT was a clear winner, and on June 1 our quality assurance people will start banging the system around for three or four weeks. After that, we'll have a training period, and we should go fully online by Oct. 1."

At that point, GMAC and XRT will have been working together just over a year and a half on modifying the basic product to meet GMAC's needs. "We think XRT has one of the slickest systems to come down the pike in a long time, if for no other reason than that it's so massive and we could buy the whole thing and get it running so quickly," Zane says. "We chose not to give the project to our own dp staff because they run our 300 branch offices and wouldn't have been able to produce a system fast enough for us."

GMAC's commercial paper operation is split primarily between centers in Dayton and Detroit, with the field offices feeding into the same computer systems. GMAC is installing a dozen Tandem NonStop II cpus, six in Dayton and six in Detroit, along with five large-capacity disk drives in each city. It is connecting them through Tandem's Expand software, so that each city has a complete fault-tolerant system, with duplicated databases and full synchronicity. "We're protected if any component, system, or even city goes down on us," Zane notes.

"This was such a big order that it had to be approved by GM's Executive Council," he adds. Each of the two GMAC sites, says Tandem's Narducci, was worth significantly over $1 million to Tandem, representing one of the largest single purchases of NonStop equipment in Tandem's

Martino and staff wrote the system using the applications program generator that Martino had developed in the early 1970s.

history. "I'm sure Dr. Martino added the value of his software, and it was a pretty significant deal for them, too." XRT is wholly owned by Dr. Martino and does not divulge any financial information. Nonetheless, an XRT marketing executive no longer with the firm admitted, the GMAC deal certainly ran into the millions of dollars, and by comparison the American Express system "is pretty plain vanilla."

Martino and staff wrote the system using the Application Program Generator (APG), a combination program developer/compiler that Martino initially created in the early 1970s and has been refining ever since. After writing the product on a Wang system, XRT ported it to Tandem NonStop computers in the belief that commercial paper applications would benefit from the hardware's fault-tolerant capabilities. This past April, XRT announced a version of the product that runs on IBM PCs linked in a Nestar Systems network. That version requires two file servers to ensure fault tolerance. Both the commercial paper and cash management programs now run on the Personal Computer network.

Prudential Funding, the commercial paper subsidiary of the Boston-based insurance giant, has already installed the software using the Nestar network, and Prudential's treasury department was scheduled to complete its installation of the cash management system for a PC network June 1. XRT acted as an oem for the Prudential deal as well as for all of the previous contracts, acquiring the hardware and then reselling it. It now prefers to sell the software only, Dr. Martino says. ✱

MANAGING DP

DP MOVE CHANGES MOOD

Data center relocation means more than just a new site.

by Edith Myers

Take a data center operating 24 hours a day, seven days a week, in the throes of converting from one hardware/software combination to another and growing from 72 people to 200 in a two-month period. Now, move it to a new facility in record time with no disruption in service. No mean task.

"We were told it couldn't be done in less than a year," says Robert L. Hamic, senior vice president at Westlake Data Center, which did just that. The center, data processing arm of Financial Corp. of American (FCA) Los Angeles, was moved from a 20,000-sq.-ft. facility in Thousand Oaks, Calif., to two buildings with a total of 63,000 sq. ft. Another shell on the same site is available for future expansion.

"We were in a planning mode last March [1983]," recalls Hamic. "We found the buildings July 7, were in full production at the new site in September, and completed our move into the first building Nov. 1. Construction actually began while planning sessions were still taking place."

The first building houses computer operations. Occupancy of the second building, which houses programming and administration, was completed in April.

It was more than just a change in locale for the center's employees, none of whom were lost in the move of less than 10 miles. It was a whole new environment, for the new Westlake Data Center is anything but a typical data processing facility.

"A computer center typically is not a nice environment," says Hamic. "We wanted a warm and inviting atmosphere." They have it in the facility designed and constructed by Computer Facilities Group (CFSG), Cypress, Calif., with space planning and interior design by Van Breda Design Associates, Los Angeles.

Every square inch of the facilities is carpeted, including the 25,000-sq.-ft. computer area (up from 2,000 sq. ft. in the old quarters), housing the center's new IBM 3084, an IBM 4341-12, three Burroughs B4800s, and one B3800 plus associated peripheral equipment. And the computer room is not just a sea of machines. Each type of equipment is segmented by function, attractively partitioned off with much use made of woods, soft coloring, and plants. Tape drives are off by themselves. Artwork is everywhere in both facilities including the computer room and the rest rooms.

Hamic believes that the kind of atmosphere the center provides has increased employee productivity. He's not just interested in his own employees either. Attractive work areas have been provided for customer engineers from Burroughs and IBM and from the phone company. Reps from the two computer firms even share a small, separate lounge/refreshment room. "We don't want them to have to go too far away from their work areas," says Hamic.

The buildings acquired last July were windowless shells with tilt-up walls. "We had three shifts of the different construction trades working 24 hours-a-day to complete the project on schedule," said Tony Ard, president of CFSG.

"We specialize in computer facilities," says the contracting firm's Bob Brockett. "We deal with the same subcontractors time after time. Our learning curve is behind us." CFSG has constructed more than 500 computer facilities throughout the U.S.

There were some problems, such as when a CFSG workman inadvertently activated a Halon gas fire extinguisher or the indecision on the part of the center people. "We changed our minds about who sits where about 50 times," said Hamic.

The center serves all the administrative and financial departments of FCA's principal subsidiary, American Savings & Loan, which, with assets of more than $22 billion, lays claim to being the world's largest S&L. Its operators are highly security conscious. In addition to fire protection equipment and auxiliary power backup, the premises are protected by multiple discretionary entry/access levels and 24-hour surveillance. External door hardware has been removed from all but the front door and tv cameras constantly monitor every inch of the computer facility.

No signs on the outside of the buildings hint as to what's inside. In fact, from the outside the buildings could be thought to be warehouses. Inside, though, it's a different story. Bob Van Breda has created what he calls "an inside-out office." He placed windows in perimeter offices facing into the building and converted the 22-ft.-high roof into a gabled ceiling accented by redwood skylights. "I have created a functional interior atrium."

Through all the moving, conversion of most of the center's applications from Burroughs and its Thrift software, to the IBM 3084, running Hogan Systems software, proceeded on schedule. "We have everything up on both systems," said Hamic in April. "We have a survival plan which will keep us running on Burroughs for about another year." He said the center's work is equally divided between batch and on-line." The batch work is done at night with results put on a plane each morning for American S&L's headquarters in Stockton, Calif.

The plane is FCA's own, which accounts for a major application for the Westlake center that is highly unusual for a financial organization's dp operation. "We have our own on-line reservation system, which runs 24 hours a day, seven days a week," says Hamic. This is for a corporate charter airline run by Brooke Knapp, an award-winning pilot and wife of Charles W. Knapp, chairman of the board and chief executive officer of FCA. *

KEEPING THINGS SIMPLE

Fuel point-of-sale system was developed without anything exotic done in hardware or software

by Edith Myers

KISS, for keep it simple and stupid, is still a prime objective in much system design.

When the data procesing department of E-Z Serve Inc., an Abilene, Texas-based petroleum refining and marketing company, set out to design an automated fueling system whereby micros at remote locations could communicate with a mainframe at headquarters and could operate in a direct debit mode with banks, it went a step further.

"We went for SIBKISS, or see it big and keep it super simple," said David Ashby, E-Z Serve's dp manager.

On the simple side, E-Z "elected not to do anything unique or customized," but their micro box was homegrown, based on the Motorola 6809. It interfaces with cash registers at the retail outlets that are convenience stores throughout most of the Sun Belt states, and it is programmed in assembly language.

"Our objectives were quite simple. We wanted to create a situation that required little or no manual intervention and yet allowed us to control micros, as required, from a host computer [a Hewlett-Packard 3000]. This host was to remain as standard as possible with respect to functioning within a manufacturer's unaltered specifications and utilizing generally accepted data processing techniques and procedures. Peripheral equipment was to be utilized in an off-the-shelf fashion and again was to be devices generally accepted

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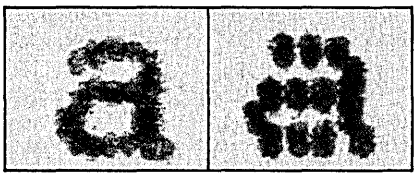

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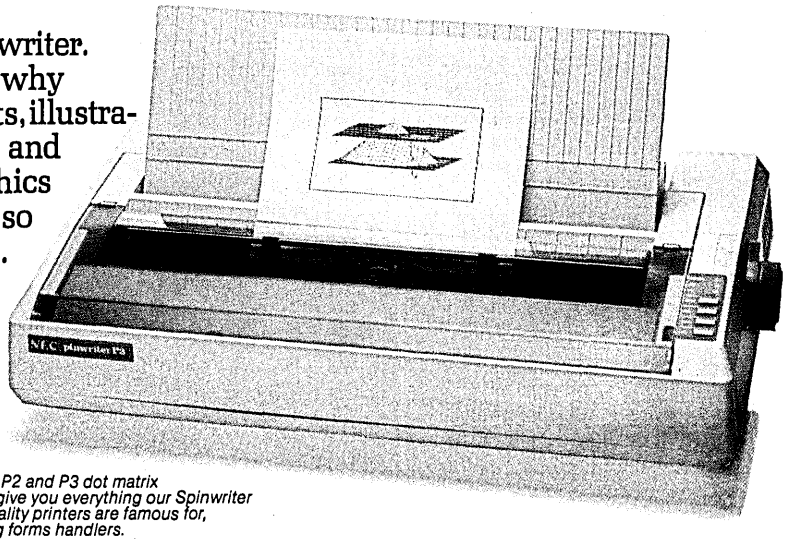

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CIRCLE 46 ON READER CARD

in the data processing community in a non-customized state.

"We used readily available software tools already on the market to relieve programming effort where possible. All programming was in COBOL so we could afford reusable subroutines." Ashby says.

Communications with the fuel site micros is done with dial-up asynchronous phone lines operating at 1,200 baud and even parity, says Ashby. The relationship between the HP 3000 and the micros is such that the HP acts as the master, initiating and directing the data transfer between the systems. "The HP has unique characteristics. If you throw data at the 3000 and it isn't ready for it, you've lost it."

The system uses Hayes Smartmodem 1200s to facilitate automatically initiated communications between host and micros, Ashby notes.

Describing the system at an HP user group conference last month in Anaheim, Ashby emphasized simplicity. "It is possible to effect a reasonably reliable data communications technique without doing anything exotic in the hardware or software."

The micro at the fuel site handles the communication necessary to authorize purchases requested by a cardholder with an acceptable magnetically encoded debit or credit card. Control information is downloaded to the micro, and stored transactions are uploaded to the host as part of the interaction between the micro and the 3000.

BENCHMARKS

MURDOCH COMPUTES: An ambitious, well-connected Australian communications and software company, the Computer Power Group, said it will to open an office in Manhattan to establish a marketing presence in the U.S. Based in Melbourne, Victoria, Computer Power is one third owned by the News Group, the publishing conglomerate headed by Australian entrepreneur and publisher Rupert Murdoch. Known for his worldwide string of racy tabloids, Murdoch has his headquarters in New York and is on the board of United Technologies, a huge U.S. defense contractor with big aspirations in Australia.

Manager for the North American operations will be Dr. Ted Prince, former head of the Australian Department of Social Services. Prince was the mastermind of Stratplan, an A$100 million ($108 million) project linking the nation's health and welfare offices with more than 7,000 color terminals, 400 minicomputers, and seven large mainframes over the next five years. Stratplan was the largest computer project ever tendered in Australia and one of the largest of its kind in the world.

Prince's move to Computer Power was approved by the Australian federal minister for social security, Senator Don Grimes, on the recommendation of an interdepartmental government committee. Computer Power managing director Roger Allen said that Stratplan was Wang Laboratories' largest order ever. The system's distributed processing network and database arrangement are considered state of the art.

Computer Power has stated it has several major objectives in coming to the U.S. The first is to export its products to the U.S marketplace and, through arrangements with U.S. computer manufacturers, into the worldwide marketplace. The company also hopes to act as a broker between U.S. vendors and Australian customers, a task that will be aided by the firm's high-level connections in the Australian government and the local dp scene. Furthermore, Computer Power wants to help other Australian technology companies move their products into the U.S. and world marketplaces.

The firm said it wants to recruit key individuals in the U.S. to work in Australia on technology transfer assignments. Australia is lacking in certain critical areas of computer science and would like to tap into American brainpower. Supposedly, U.S. recruits would be brought down under to lead or consult on projects staffed by Australians with resulting products owned by Australian companies. Finally, Computer Power wants to set itself up as a trading company to source and directly import U.S. hardware and software products to Australia. It would provide service and support functions.

Allen said that Computer Power had already signed or received letters of intent worth A$4 million ($4.35 million) for confidential services and products from U.S. companies and was negotiating a single contract worth that amount again in terms of export order value. Currently in Australia, Computer Power's main project is providing software and terminals for a rural database being set up experimentally around 100 private farms by a leading pastoral group, Elders-IXL. The aim is to provide videotex information services to farmers throughout the country, a project that, it is estimated, will cost about A$20 million ($22 million) over three to four years and require several thousand terminals and pcs.

Computer Power is also among those companies that have tendered to Australia's telephone monopoly, Telecom Australia, for hardware and software to be used in a new public access videotex gateway service for databases.

The system is to be called Viatel and will be launched late this year, according to current plans. Computer Power is also well positioned to help Murdoch's News Group in its ambitious plans to establish a worldwide electronic information collection and delivery system.

MORE IBM PCS: IBM has begun production of its popular personal computer at the third location worldwide, its former typewriter plant in Wangaratta, Australia. The factory, 60 miles from the state capital of Melbourne, joins a similar operation in Greenock, Scotland, as an offshore production facility for the machine.

Although according to an IBM Australia statement that in 1983, worldwide November/December shipments exceeded total deliveries for 1981 and 1982 combined, the PC has been in short supply. Australia, like other countries, has been on a quota of about 15% to 20% for local dealers, many of whom have imported quantities direct to satisfy short-term orders. Because of the differences in electrical power components—Australia is mainly on two-phase 240/250-volt current—many of the imports have come from Europe. Indeed, Switzerland has been a leading source of PCs for Australia, but a few organizations, like Computerland, with established channels in the U.S. have been importing machines and changing power transformers locally.

IBM Australia, which has said that it has observed dealer importations "with censure," has now stated that the Wangaratta production line is ahead of schedule and will start filling customer orders at the conclusion of quality control tests on both the computer units and plant processes by experts who have been sent from Boca Raton, Fla. IBM Australia was aiming at early June for deliveries of the first PCs, which would be about a month ahead of the originally estimated deadline. Bringing Wangaratta on stream will substantially increase IBM's world production, which will then be three times greater than in 1983. An IBM Australia spokesman said that with two plants operating, one PC was being made every 16 seconds, but with the three lines going it would be one every seven seconds. Although IBM Australia will not disclose sales figures, industry sources have estimated that about 7,000 PCs have been sold in Australia since it was launched on Feb. 9, 1983, 18 months after the U.S. launch. The figure might have been higher had there not been a shortage of machines.

Quantities of the XT sold are not known. Deliveries of the PC are currently about one month late, and the XT about six weeks. Normal shipments of both machines are expected from July. IBM Australia announced its intention to manufacture the Personal Computer in Australia last October. The production counts as an offset benefit when IBM Australia is tendering for federal or most state government contracts. In 1973 IBM Australia was one of the first signatories to an agreement that foreign firms would provide tangible benefits by importing technology or providing local manufacture and training skills for Com-

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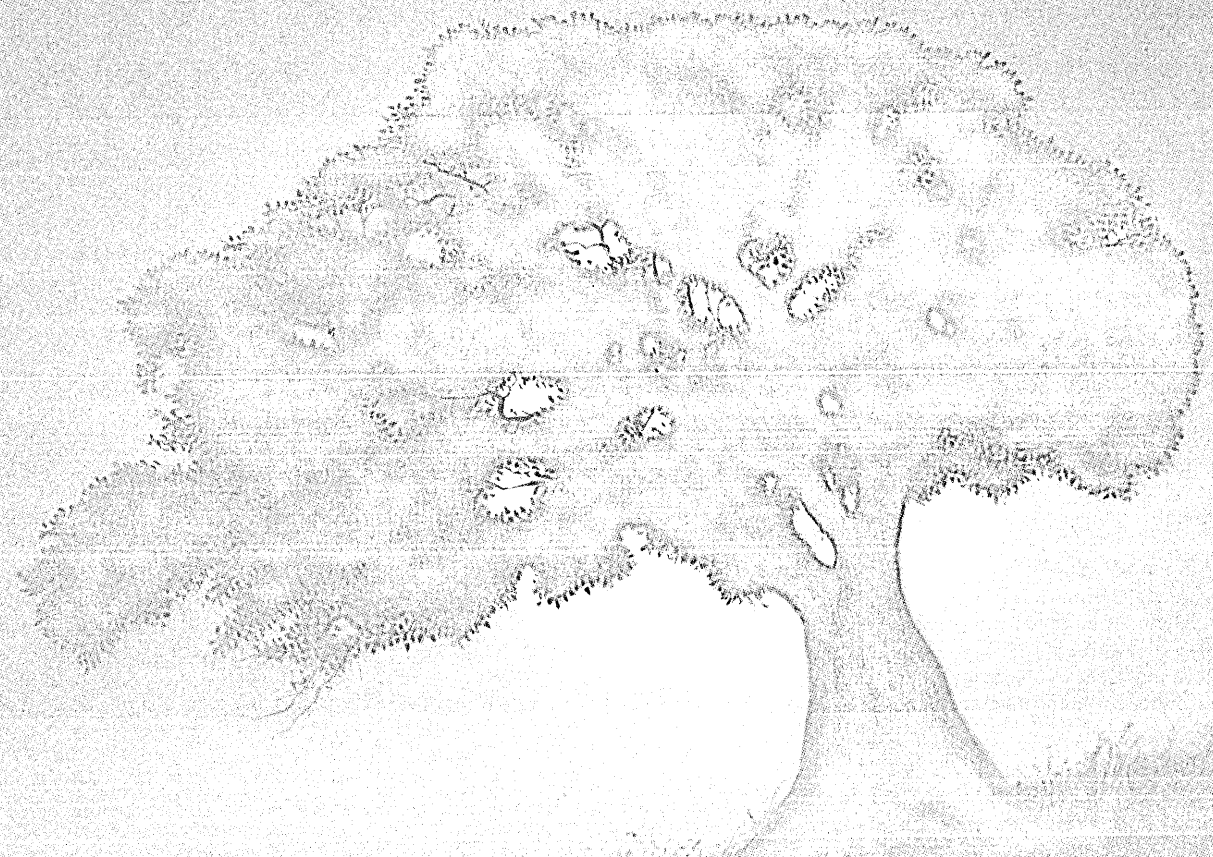

ACF2 is developed by SKK, Inc., Rosemont, Ill. SKK
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CIRCLE 47 ON READER CARD

monwealth government contracts.

The company is believed to have been short of offset credits in 1983 when it announced a scheme that would cost about A$50 million ($54 million) over five years and includes making the PC in Australia. Although neither the company nor the government will comment, it is belived that one of the major reasons for IBM Australia's not gaining the mainframe portion of the A$100 million ($108 million) Department of Social Services contract that went to Amdahl earlier this year was because it was deficient in offset credits.

The plant was previously set up by IBM Australia in 1978 to make electric typewriters for the Australian, New Zealand, and Asian markets as far away as Hong Kong, and this production has only recently been discontinued. The PC will also be sold into these areas. In addition to assembling the PC, IBM Australia has commissioned several Australian companies to make power transformers and other components, among which are some circuit boards and plastic parts including the machine's case. IBM Australia has also set up a software development center, which is commissioning mainframe software to be used internationally by the corporation. An A$5 million ($5.4 million) order for mainframe operating system software has recently been completed by a Sydney company, Datec.

THIRD STRIKE: Trilogy Ltd, has delayed planned first shipments of its large-scale 370-compatible mainframe for the third time in recent months, claiming in a filing with the Securities and Exchange Commission that it would not make delivery until 1987. Two months ago it said the delivery date had been rescheduled to mid-1986 from late 1985. Originally, the wafer-scale integration-based machine was to have entered the market in early 1986, to take on IBM's expected Sierra/Trout series. Gene Amdahl, the troubled company's chief, has been forced also to redesign his machine to be a dual-processor instead of a uniprocessor. In its SEC filing, Trilogy said it would spend its $100 million in working capital by the fourth quarter of next year and would then have to seek "significant additional financing" to complete the project. The firm, which is backed with over $200 million worth of venture capital and grants from the Irish government, Sperry Corp., Digital Equipment, Control Data, and CII-Honeywell Bull, said it is investigating the use of its wafer-scale technology for conventional semiconductor devices for sale in the merchant market.

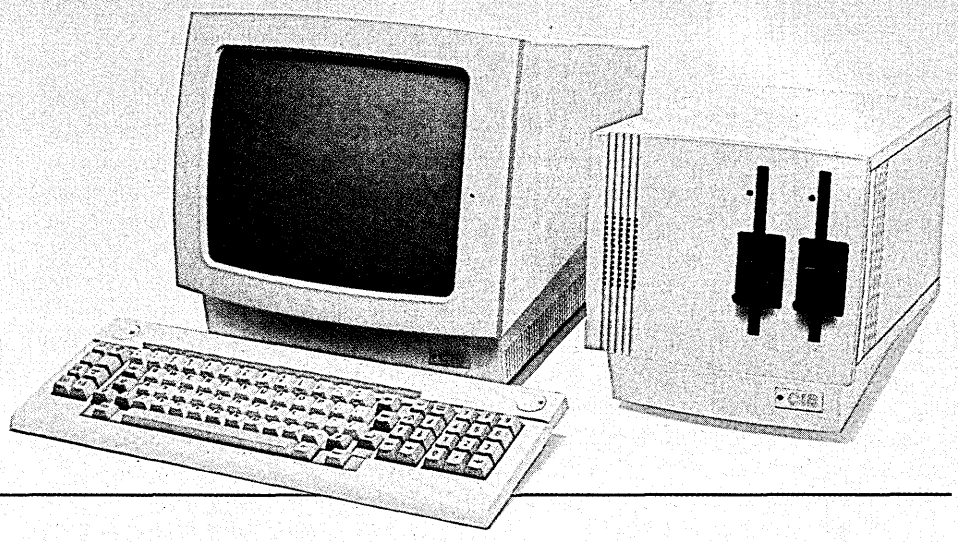
DECSYSTEM REPRIEVE: Digital Equipment Corp. has brought out a pair of higher-capacity models for its DECsystem-10 and -20 mainframes, boosting performance by about 20%. The company had said a year ago it would not develop any new generations of the systems, angering many users (see "Hitting a Dead End," May 15, p. 77). DEC vice president of large system marketing Rose Ann Giordano admitted that the impetus behind the models 1095 and 2065 was user unrest following the cancellation of the so-called Jupiter machine. The systems achieve their performance increases through the use of an 18KB cache/pager and a doubling of the hardware page table. The 1095 starts at $395,000, and the 2065 starts at $355,000, each with 2 megabytes of main store. The performance boosts can also be achieved on installed KL-10 processors using an upgrade kit for $40,000. The Maynard, Mass., firm also announced three software packages for the DECsystem line. The Datatrieve-20 data management package is priced at $10,000, version 6.1 of DBMS-20 at $34,500, and version 4 of Traffic-20 for $6,900. Deliveries of all the products are scheduled for this summer, Giordano said.

COOPERATION: In an effort to penetrate the 32-bit microprocessor market, two of the most contentious semiconductor makers have joined hands. Texas Instruments and National Semiconductor said they would work together in developing National's Series 32000 chip family which is said to offer 1-MIPS mainframe performance. The two firms will compete with each other in selling the chip family but will cooperate in design automation and manufacturing techniques. Each will have the right to market the 32000, introduced last year as the NS16000, on the open market and each will have manufacturing rights. A "long-term" agreement was signed between the two firms, but no financial details were revealed. Both companies emphasized that the deal is not a mere second sourcing agreement but that it calls for a high level of technical cooperation between the two archrivals. Federal antitrust issues were investigated before the deal was signed, but neither firm expects any trouble in that regard. National hopes to get in on the 32-bit mpu market against the efforts of the16-bit leader, Intel, by offering a processor whose architecture is not tied to a previous generation and which offers such mainframe features as demand-paged virtual memory. TI, which never got very far in the 16-bit mpu market, despite an early entry, is hoping to regain a foothold in the general purpose processor market.

OUTSTANDING: IBM chairman John R. Opel told some 2,000 shareholders at an April 30 annual meeting in Los Angeles that 1983 had been an "outstanding" year for the giant from Armonk. He claimed leadership in both large- and small-scale systems and said the company has "intensified efforts" to improve its position in medium-scale systems. He indicated IBM will not modify its business practices in the Common Market, saying "discussions with EEC authorities are still very active. If they [the full commission] decide to require us to provide specifications before announcing products, we believe that decision will not survive." Opel said IBM spent $3.6 billion on R&D and engineering in 1983, bringing to a total of $13.3 billion such expenditures over the last five years. As an example of a return on this investment, he cited announcement earlier in April of an experimental 1 million-bit memory chip. Parrying questions from shareholders, the IBM chairman said that the PCjr. has not been "as successful as I would like it to be"; that IBM is working on supercomputers to do work at super speeds, but "we haven't decided what is the correct design, the jury is still out"; that he wouldn't rule out products at the ultra-low end such as Commodore's 64 and Coleco's Adam; that IBM believes in "free and open interconnection and stands ready to participate with competitors and governments abroad" toward this end; and that the company will continue to emphasize development of software for the PC.

TELECOM TIMETABLE: If Sen. John Danforth (R-Mo.) has his way, there will be a new U.S. telecommunications trade policy. Call it close-the-door-slowly. Danforth, chairman of the Senate International Trade Subcommittee, recently introduced the Telecommunications Trade Act. Already the most open in the world, the U.S. telecommunications market apparently will know no bounds following the Bell System breakup. Danforth's bill is designed to get even with those countries that the U.S. lets in but that keep the U.S. out. The bill sets a three-year timetable for negotiations to liberalize world telecommunications trade. The U.S. would use the market-access opportunities created by the AT&T divestiture as leverage to open markets in other places, namely Europe, Japan, and Canada. If those negotiations have gone nowhere after three years, tariffs on imported telecom equipment will rise to 35 % from their current 5% to 15%.

Industry is less than thrilled at the prospect. "We are uncertain about the efficacy of such proposals and are not at all convinced that protectionist policies would be in the best interest of the U.S. communications equipment industry," says Edwin Speivack, president of the North American Telecommunications Association. "The bill is unclear and has no objective criteria," a spokesman for CBEMA says. "It's a negative reciprocity bill in disguise. It's another escalation of negative trade and another form of protectionism." They'll all have a chance to tell it to Danforth during the subcommittee's hearings, which are scheduled to begin shortly after June 15.*



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Aura takes an approach that redefines the structure of personal computer software. Because its database provides central information storage from which graphs, word processing documents, and spreadsheets can be built.

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Consider that an unlimited number of Aura's 255 row by 63 column spreadsheets can be linked together at the touch of a key. And that with Aura's ZOOM feature, a user can instantly inspect the details behind any cell of information derived from any other spreadsheets.

Spreadsheets can even be created from existing database information and then turned into graphs or charts.

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Aura's high resolution graphics also let end users do it themselves. In fact, they can draw their own graphics interactively or call them up ready-made from a menu.

And it's easy to design everything from organizational charts to corporate logos. Because while free-form graphics are being created, the menu remains on the screen to guide the user along.

Business graphs can be generated from information in the database, a spreadsheet or directly from the keyboard. And prepared graphs and charts can reflect figures from a given point in time or from the most current information in the database or spreadsheets.

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Just a sampling of Aura's word processing functions include ruler operations, search and replace, block operations, headers and footers, printer control and automatic reformatting.

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Aura's integrated elements are only the beginning of its power. Because Aura also has an applications generator in its database module that takes it a quantum leap ahead of any other personal computer software.

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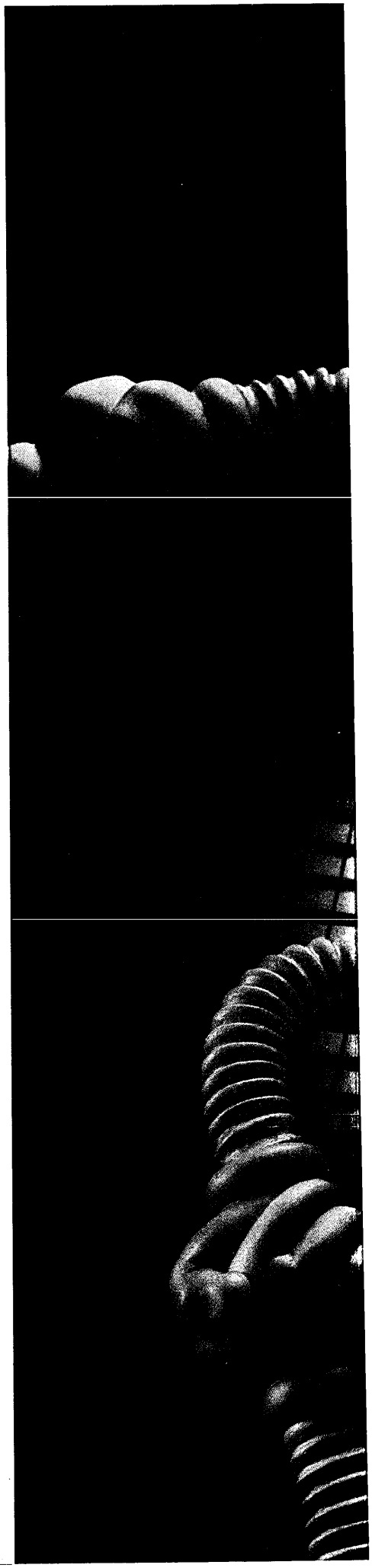
double-density floppy disk drives.

How protocol converters get dissimilar devices to communicate, thereby creating consistency where there once was none.



THE LITTLE HANDSHAKE MACHINES

by Eric D. Siegel

Pity the poor data communications manager, stuck trying to deal with incompatible terminals, new demands for interconnectivity, and front-office concerns about buying equipment that may be obsolete in a couple of years. Proud new owners of various incompatible personal computers demand to connect to full-screen IBM 3270-type applications packages running on the mainframe computer; salesmen complain that all their desktop space is taken up by the three or four different terminals they are forced to use; and no one wants to discard expensive equipment before it is depreciated or spend hundreds of thousands of dollars on new hardware that may soon be obsolete.

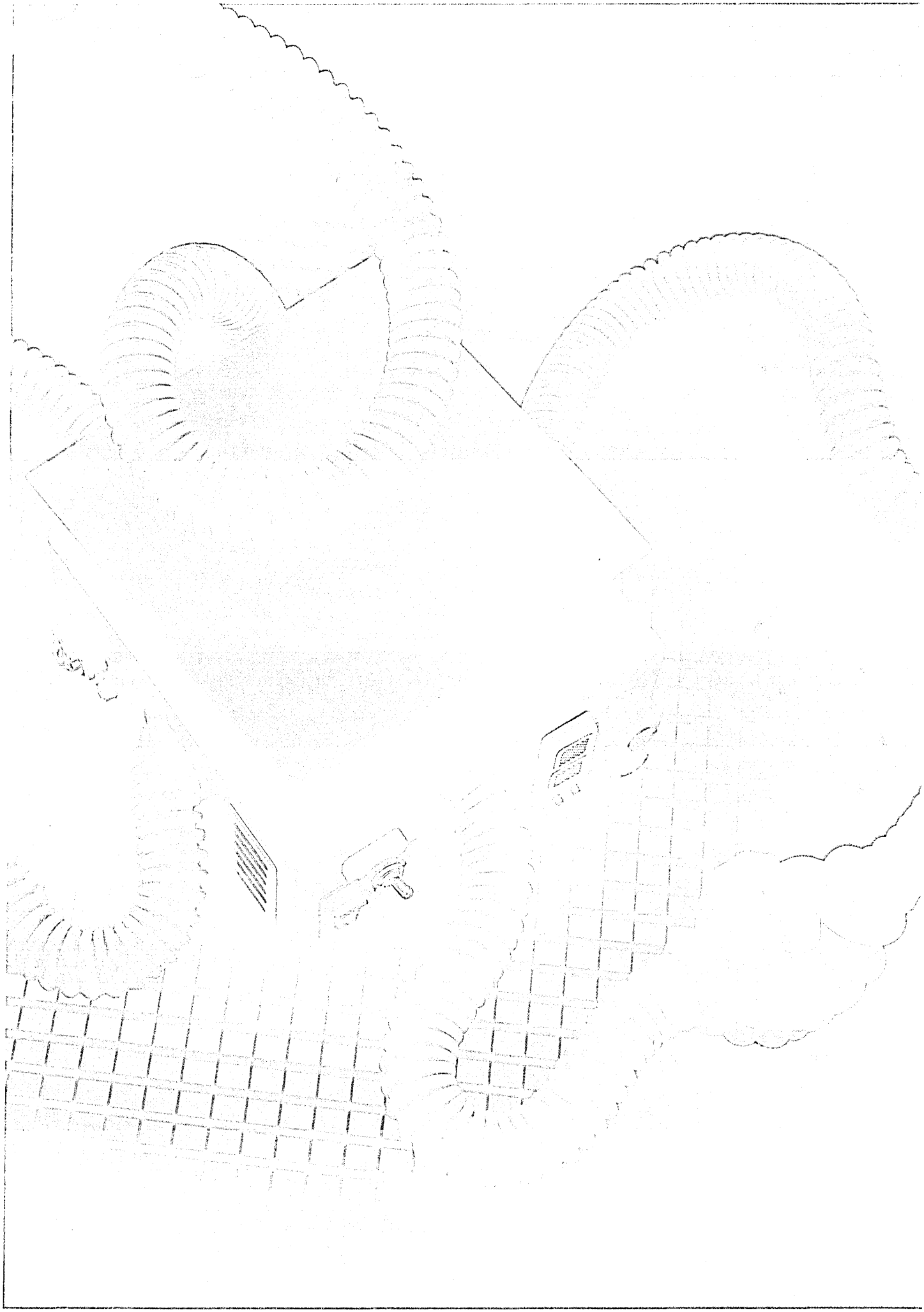
No wonder, then, that advertisements promising communication between incompatible terminals or systems are so intriguing to the datacom manager. For a surprisingly low cost, these products and services offer to solve all problems. For example, the Renex Corp., Springfield, Va., has a $5,000 protocol converter that permits more than 100 different types of terminals or personal computers to hook up to a computer port designed for an IBM 3270 full-screen terminal; Lee Data, Minneapolis, sells a terminal that can change from a full-screen 3270 to an ASCII teletype at the flick of a switch; and Tymnet, San Jose, offers a network interconnection service that automatically translates among incompatible terminals and host computers while providing underlying data communications, as well.

Why the sudden boom in protocol conversion? Hasn't the need always been with us? Well, yes and no. Originally, data communications systems were designed to be dedicated to a single application or an integrated family of applications. Terminals were bought and installed for specific applications, and the computer programs were written with those particular terminals in mind. Data communications systems for different applications were often developed independently of each other, which resulted in many more incompatible terminals, transmission systems, and protocols (the sets of rules used to manage the flow of data on a communications path).

Computer center personnel concentrated on getting a few major data communications applications up and running, while attempts to integrate all systems into one compatible network were placed on the back burner. Any available staff members were used to keep existing systems operating; there was little effort to spare for the problems of integration.

In the late '70s, however, management began listening to the complaints of users who had to deal with multiple terminals on their desks, and some new economic and technical forces appeared that made protocol conversion a hot topic. Microprocessor technology had improved to the point where the cost of protocol conversion declined sharply; personal computers began to appear, as did widespread use of portable terminals (users wanted to be able to dial in to IBM 3270-type applications); and the use of satellite links,

PHOTOGRAPH BY WALTER WICK/MODEL BY KATHY JEFFERS



Selection of a particular protocol converter appears to be based as much on effective advertising as on any other factor.

FIG. 1

PRIMARY TYPES OF PROTOCOL CONVERSION

CATEGORY	FUNCTION	PRICE
Protocol converters IBM 3270-type Cluster Emulation	Replaces IBM's 327x cluster controller, allowing a number of asynchronous ASCII devices or personal computers to be attached. No changes are needed to the IBM host; the ASCII devices appear to be members of the IBM 3270 family.	$2,000-$20,000
IBM 3270-type Terminal Emulation	Allows attachment of an ASCII terminal or personal computer to the coax connection for an IBM 3270-type terminal.	$1,500
Satellite Delay Compensation	Allows use of a modern, efficient HDLC-type protocol over a satellite link while the terminals use older protocols.	$300/month
Data Link Conversion	Allows use of a protocol over the link that is different from the protocol used by the terminals.	$750—$2,000
Terminal Emulators IBM 3270-type emulators	Terminal may be used as an IBM 3270-type device or an ASCII full-screen terminal for communication with a non-3270 application, such as remote time sharing.	$2,000
Value-Added Network Services IBM 3270-type to Async Conversion	IBM 3270-type terminals may access standard asynchronous applications and (with some vendors) vice versa; translation is done by the network.	ask vendor

which work better with the newer protocols, increased.

A number of companies entered the field of protocol conversion by offering to replace the IBM 3270 series cluster controller with a combination cluster controller and protocol converter. (Indeed, almost all protocol converters currently marketed are of this type.) This new device allowed companies to use inexpensive full-screen asynchronous ASCII terminals in place of the costly IBM 3270-series terminals. Users could now save up to 50% on the cost of a terminal cluster, and they were often allowed dial-in operation for additional convenience and possible savings on line costs. Other companies began to make converters that enabled various portable terminals and pcs to interact with existing mainframe terminal ports, without requiring mainframe reprogramming.

Once data processing and data communications managers realized such converters were available and that they actually operated as advertised, the market demand began to boom. Not only would such devices and services decrease the cost of interfacing with the growing numbers of incompatible terminals, but they would also help allay the fear of being caught with obsolete equipment. Now, in many cases, all you need to match a large existing inventory of equipment to a new system is a number of protocol converters or a protocol conversion service.

Protocol conversion is, therefore, an idea whose time has come. Let's take a closer look at the protocol conversion function, and then discuss various methods of performing those functions—today and in the future.

FIVE SEPARATE FUNCTIONS

"Protocol conversion" usually describes a method that allows two or more incompatible devices to communicate. It involves five separate functions, not all of which need be present:

- Buffering/speed conversion;
- Code conversion;
- Data link protocol conversion;
- Device presentation emulation; and
- Specialized multiplexing, switching, or routing.

Buffering/speed conversion is used to permit interaction between two devices that communicate at different fixed rates. For example, a 1,200 characters-per-second terminal may be connected through a buffered protocol converter to emulate a 30 characters-per-second Teletype. Because the buffer size is limited, however, some restrictions must be placed on the amount of data transferred before the terminal pauses and allows the buffer to empty.

Using binary numbers, *code conversion* translates among the different codes that represent characters. Typical codes are the American Standard Code for Information Interchange (ASCII), IBM's Extended Binary Coded Decimal Interchange Code (EBCDIC), and the Baudot code.

Data link protocol conversion allows devices or systems with different data link protocols to communicate. Data link protocols are sets of rules programmed into hardware or software used to manage the flow of data along communications links. They automatically handle retransmission of erroneous data as well as addressing and control of terminals to ensure that only one terminal transmits at a time (the contention function or the poll and select function). Examples of these protocols are the international standard High Level Data Link Control (HDLC); IBM's subset of HDLC, called SDLC; IBM's older protocols, among them the Binary Synchronous Communication protocol (Bisync or BSC); and the Burroughs Poll/Select protocol. As virtually any protocol is more efficient and less error-prone than the rudimentary, unblocked, asynchronous transmission method normally used by Teletype-like devices, and because some protocols (notably the HDLC-type) are far more efficient than others (such as Bisync) over satellite transmissions links, protocol conversion before and after transmissions is becoming important.

Device presentation emulation, also called datastream conversion, allows one type of device to appear to a remote terminal or host computer as if it were another type of device. For example, a 3270-type emulator appears to the IBM host computer as an IBM 3270-type cluster controller or terminal. Meanwhile, it provides all the functionality of an IBM 3270-type terminal to an inexpensive, full-screen asynchronous terminal with

3270 and System 34/36/38 Users
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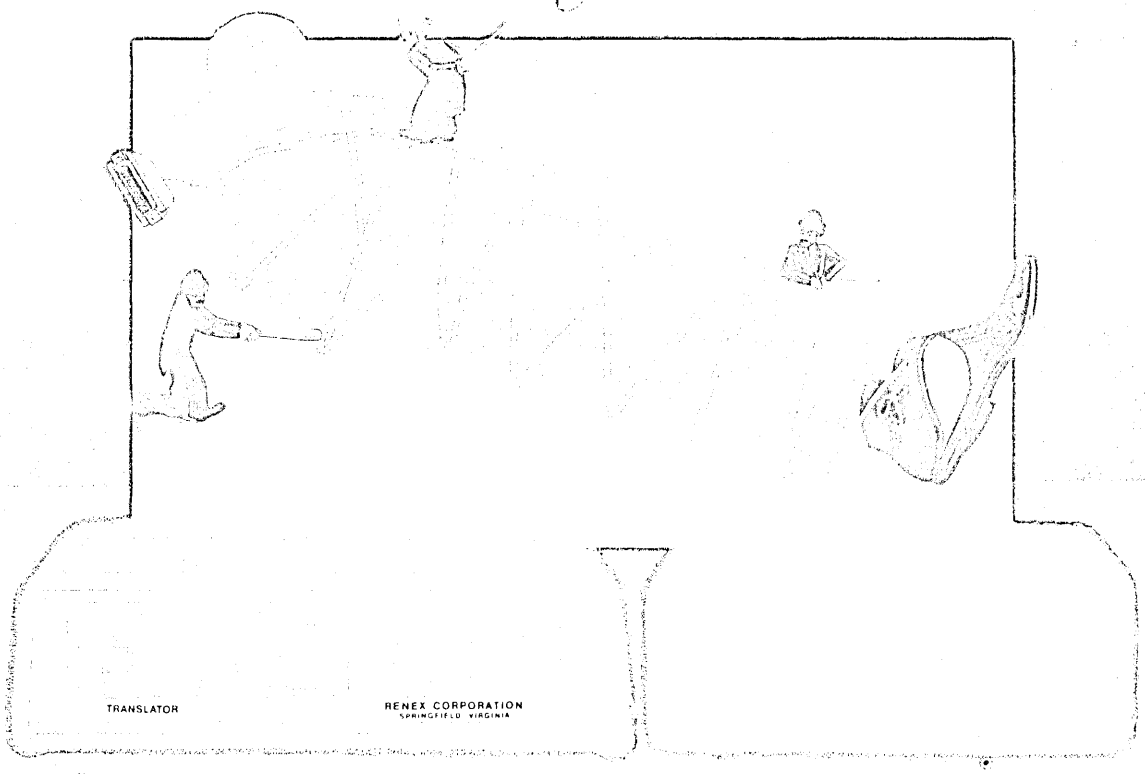

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Beehive ATL-004, 008
CIFER 2600
CITOH 101
Colographic MVI-100, 7
Concept 100, 108, AUT APL
Datamedia 1520A, 3045
Datamedia COLORSCAN 10
Dasher 6052, 6053, D450
Dasher D100, D200, D400
DEC VT52, VT61, VT100
DEC VT125, VT101, VT131
Delta Data 4000, 7260T
DTC-382
Direct 800 Series
Datagraphix 132A, 132B
Envision 220, 230
Esprit 78, 51
Falco TS-1
General Terminal SW10
GTE Microphone
Hazeltine 1400 Series
Hazeltine 1500 Series
Heath H19
Hewlett Packard 2621, 2641
Hewlett Packard 2645, 85
Hewlett Packard 86, 125
Honeywell VIP 7200, 7800
IBM Personal Computer
IBM 3101
IBM Displaywriter
Informer 205
Intertec Superbrain
ISC 2405
KSR (Hardcopy) terminals
KSR Silent 700, Dec LA-120
Lear Siegler ADM3A, 5, 11
Lear Siegler 22, 23, 31
Lear Siegler 32, 36, 42
Liberty Freedom 100, 200
Micro-Term ACT-5A
NABO 4404
NTI Displayphone
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Soroc 120, 130, 135, 140
Tab TB2415
Tanberg 2220, 2230
TEC Series 70, ET-100B
Tektronix 4000 Series
Teleray Model 10, 12, 16
Teleray 100, 1000 Series
Televideo 910, 912, 920
Televideo 950, 970
Teletype models 40/2,4424
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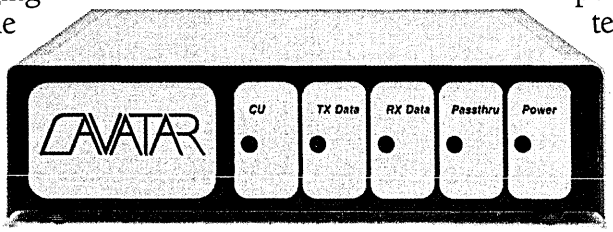
Introdu

Link Tha

Today, you have to live in two different worlds. One belonging to IBM. The other to everyone else.

With that in mind, companies have come along with a variety of products that attempt to link the two together. But somewhere along the line, they all look a little dumb.

Enter the AVATAR PA1000™ Protocol Converter. It's the most intelligent way to bring personal computers, portable computers, or low-cost ASCII terminals into the IBM coaxial environment. For the first time, overburdened DP/MIS executives can look forward to truly smooth integration, minimal confusion, and fewer demands on their time. And users can get an affordable, easy-to-use way to tap the riches of their IBM mainframes.



So if you're looking for the best of both worlds, keep reading. And you'll see why the AVATAR PA1000 can out-think any product on the market.

First of all, the AVATAR PA1000 is an almost *universal* link. With no modification, it connects to virtually any personal or portable computer you have: IBM, Apple, DEC, TRS 80, Kaypro, COMPAQ, NCR, and others.

The AVATAR PA1000 also connects to the DEC VT100, IBM 3101, LSI ADM5, Televideo 910, ADDS Viewpoint or other compatible terminals.

The PA1000 connects coaxially to an IBM 3274/3276 cluster controller, so whatever personal computer or terminal you use will perform all the functions of an IBM 3278-2. The coaxial connection also means you won't be in for a future shock: ever-changing IBM protocols will be no problem.

	AVATAR PA1000	vs.	IRMALINE™
Easy to install	YES		YES
Q/A installation	YES		NO
English language commands	YES		NO
Help screens	YES		NO
Keyboard types	5		1
Remote dial-in/ security password	YES		YES
Dual host access	YES		NO
Local screen printout	YES		NO
3278 status line modes	3		1
Price	$995		$1395
Availability	Immediate		(?)

Two hosts are better than one. So in addition to the coax connection to IBM, the

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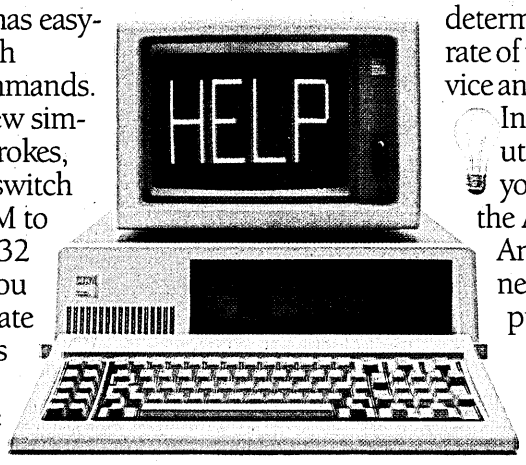
ging The tThinks.

AVATAR PA1000 gives you an *extra* RS232 port. That gives you access to other local or remote asynchronous host computers or local printers.

HELP! If you need it (and who doesn't) you have help screens to put you back on track. The PA1000 also has easy-to-use, English language commands.

With a few simple keystrokes, you can switch from your IBM to the extra RS232 port, giving you access to private data networks and public databases like Dow Jones. And when you switch back, the AVATAR PA1000 is smart enough to *remember* your IBM screen.



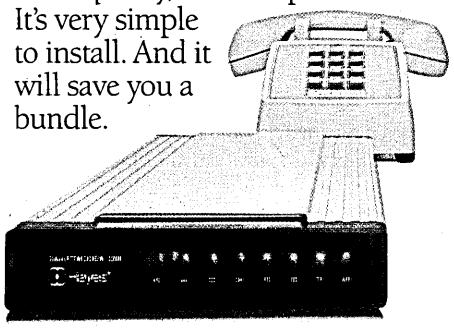
In a distributed terminal network, remote dial-in from personal computers or asynchronous devices is increasingly important. You can dial into your PA1000 at the nearest cluster controller, and reduce communications costs dramatically in the process.

Just by typing "1-2-3" (how much simpler can you get?), the PA1000 *automatically* determines the baud rate of the attached device and is ready to go.

In just five minutes (no kidding) you can install the AVATAR PA1000. And you don't need to be a computer operator.

The AVATAR PA1000 even gives you a file transfer option that lets you transfer information back and forth between your personal computer and an IBM mainframe.

What will AVATAR think of next? The latest news is our PA1500, a link that lets you print the output from your IBM host on a low-cost ASCII printer. It supports high-speed dot-matrix, letter quality, and line printers. It's very simple to install. And it will save you a bundle.



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CIRCLE 51 ON READER CARD

the ASCII character set and some elementary cursor and screen manipulation commands. Some unusual ASCII key combinations must be used to represent special 3270-type keyboard keys, but the cost advantages of this approach are considerable. A similar example is using an emulator to connect an inexpensive ASCII printer to an IBM system as if it were an expensive IBM 3270-type printer.

Specialized multiplexing, switching, or routing, while not meeting the narrow definition of protocol conversion, often appears as part of a protocol converter. The leading examples are the protocol converters designed to substitute for IBM 3270-type cluster controllers. These converters allow up to 32 full-screen asynchronous ASCII terminals to attach to one 3270-type link from the IBM mainframe. They multiplex the data streams and perform the conversion between 3270-type and full-screen ASCII device presentations. As a result of this multiplexing function, only one protocol converter is needed for an entire cluster of terminals. Other functions of advanced protocol converters include switching terminals between two host computers that may use different protocols, and allowing the use of dial-up terminals in systems originally designed to accommodate only permanently wired terminals.

NOT ALL FUNCTIONS DISCUSSED

Note that a number of functions are not included in this short discussion of protocol conversion, although they are available in some converters. Among them are physical interface conversion, asynchronous to synchronous conversion, network gateway functions, and packet assembly/disassembly (PAD) functions. Academically speaking, these are protocol conversion functions, but they are not usually considered major converter functions. Various inexpensive adapters are available to interconnect the different types of physical interfaces as well as asynchronous and synchronous devices. Other devices, designed to perform network gateway functions and PAD functions, are so complex they are normally considered a separate class of device. Though distinct from protocol converters, they do often include protocol conversion as an additional feature.

There are three primary systems for handling the five basic protocol conversion functions:

- Protocol Converters,
- Terminal Emulators, and
- Value-Added Network Services.

The method of operation is basically the same in all three systems—the difference is in where the operation takes place. Protocol converters are normally separate hardware units that are connected between the network and the incompatible device or devices. Terminal emulators are terminals or personal computers with built-in protocol converters that allow them to connect to incompatible networks at the flick of a switch. Value-Added Network Services are data transmission services that incorporate protocol converters into their data transmission network. These services give users the benefits of protocol conversion without the hassles of hardware procurement, operation, and maintenance. Fig. 1 illustrates these three primary methods of protocol conversion. Protocol conversion can also be performed by personal computers, by software within the mainframe computer (e.g., SNAX software for Tandem systems and Sim3278 for IBM systems), or within a programmable terminal (e.g., the Codex CDX-268 Terminal Series). For our purposes, however, these methods are beyond the scope of this article.

Fig. 2 is a list of protocol conversion vendors. Unfortunately, the field of protocol conversion is changing so rapidly that any attempt at a comprehensive list is seriously outdated by the time it is published. There are a number of standard references that can be used along with Fig. 2 as a starting point in the search for suitable products. Examples are *Data Sources*, published quarterly by Ziff-Davis Publishing Company; *Data Communications Buyers' Guide Issue*, published annually by McGraw-Hill; *Data Decisions/Communications Systems*, published by Ziff-Davis Publishing Company; and *Datapro Reports on Data Communications*, published by

FIG. 2

PROTOCOL CONVERSION VENDORS

PROTOCOL CONVERTERS

TYPE	MANUFACTURER
CM	AST Research Inc. Sunnyvale, Calif. **CIRCLE 350 ON READER CARD**
MV	Alphamatrix Inc. Feasterville, Pa. **CIRCLE 351 ON READER CARD**
M	American Satellite Co. Rockville, Md. **CIRCLE 352 ON READER CARD**
MV	Ark Electronic Products Inc. Melbourne, Fla. **CIRCLE 353 ON READER CARD**
CTMV	Avatar Technologies Inc. Hopkinton, Mass. **CIRCLE 354 ON READER CARD**
CTMV	Black Box Corp. Pittsburgh, Pa. **CIRCLE 355 ON READER CARD**
C	Carterfone Communications Corp. Dallas, Texas **CIRCLE 356 ON READER CARD**
CM	Codex Corp. Mansfield, Mass. **CIRCLE 357 ON READER CARD**
CM	Commtex Inc. Crofton, Md. **CIRCLE 358 ON READER CARD**
C	Computer Communications Inc. Torrance, Calif. **CIRCLE 359 ON READER CARD**
C	Control Concepts Manassas, Va. **CIRCLE 360 ON READER CARD**
CM	DPX Inc. San Jose, Calif. **CIRCLE 361 ON READER CARD**
M	Data Plus Inc. Lorton, Va. **CIRCLE 362 ON READER CARD**
CV	Datastream Communications Inc. Santa Clara, Calif. **CIRCLE 363 ON READER CARD**
V	Datagram Corp. East Greenwich, R.I. **CIRCLE 364 ON READER CARD**
CV	ICOT Corp. Mountain View, Calif. **CIRCLE 365 ON READER CARD**
CMV	Incaa B.V. Apeldoorn, Holland **CIRCLE 366 ON READER CARD**
CMV	Innovative Electronics Inc. Miami, Fla. **CIRCLE 367 ON READER CARD**
CM	International Anasazi Inc. Phoenix, Ariz. **CIRCLE 368 ON READER CARD**
C	IBM Corp. White Plains, N.Y. **CIRCLE 369 ON READER CARD**

Key
C = IBM 3270-type Cluster Emulation
T = IBM 3270-type Terminal Emulation
M = Miscellaneous: data link conversion, satellite delay, switching, etc.
V = Protocol conversion for non-IBM protocols: Burroughs, Honeywell, Sperry, etc.

C JBM Electronics Co.
Hazelwood, Mo.
CIRCLE 370 ON READER CARD

CM KMW Systems Corp.
Austin, Texas
CIRCLE 371 ON READER CARD

CV Kaufman Data
Communications Inc.
Mountain View, Calif.
CIRCLE 372 ON READER CARD

CT Local Data
Torrance, Calif.
CIRCLE 373 ON READER CARD

CM Micom Systems Inc.
Chatsworth, Calif.
CIRCLE 374 ON READER CARD

CM Microcom Inc.
Norwood, Mass.
CIRCLE 375 ON READER CARD

C Peripheral Technology Inc.
Redmond, Wash.
CIRCLE 376 ON READER CARD

C Perle GSD Inc.
Chicago, Ill.
CIRCLE 377 ON READER CARD

CM Protocol Computers Inc.
Woodland Hills, Calif.
CIRCLE 378 ON READER CARD

C Renex Corp.
Springfield, Va.
CIRCLE 379 ON READER CARD

M Sherwood Digital
Electronics Inc.
Salt Lake City, Utah
CIRCLE 380 ON READER CARD

CM Teltone Corp.
Kirkland, Wash.
CIRCLE 381 ON READER CARD

CMV Thomas Engineering Co.
Concord, Calif.
CIRCLE 382 ON READER CARD

C Timplex Corp.
Woodcliff Lake, N.J.
CIRCLE 383 ON READER CARD

CMV Tri-Data
Mountain View, Calif.
CIRCLE 384 ON READER CARD

M Universal Data Systems
Huntsville, Ala.
CIRCLE 385 ON READER CARD

CMV Wall Data Inc.
Redmond, Wash.
CIRCLE 396 ON READER CARD

MV XMIT AG
Widen, Switzerland
CIRCLE 386 ON READER CARD

TERMINALS WITH 3270-TYPE EMULATORS

C. Itoh Electronics/ALM Inc.
Newport Beach, Calif.
CIRCLE 387 ON READER CARD

Cybernex Ltd.
Buffalo, N.Y.
CIRCLE 388 ON READER CARD

Lee Data Corp.
Minneapolis, Minn.
CIRCLE 389 ON READER CARD

Term-Tronics Inc.
San Diego, Calif.
CIRCLE 390 ON READER CARD

VALUE-ADDED NETWORKS WITH 3270-TYPE CONVERSION

AT&T Information Systems
Morristown, N.J.
CIRCLE 391 ON READER CARD

GTE Telenet
Vienna, Va.
CIRCLE 392 ON READER CARD

ITT World Communications
Secaucus, N.J.
CIRCLE 393 ON READER CARD

Tymnet
San Jose, Calif.
CIRCLE 394 ON READER CARD

Uninet
Lenexa, Kans.
CIRCLE 395 ON READER CARD

Datapro Research Corp.

The decision to invest in protocol conversion services has historically been based on three things: a desire to keep old equipment after upgrading to a new, incompatible system; the need to avoid the extensive programming that is required to match a growing variety of incompatible terminals; or on economics (although a new member of the 3270 family, the IBM 3178 terminal, is almost as inexpensive as a simple ASCII terminal; this recent development has considerably weakened the economic argument). Once the decision to invest has been made, selection of a particular protocol converter or conversion service appears to be based as much on effective advertising as on any other factor.

As the market matures, other considerations become more important. Chief among them is ease of use, both for the terminal operator and for the technicians who must set up and maintain the network. Some early protocol converters required technicians to set over 100 miniature switches within the converter. More recent ones present easy-to-use menus on terminals attached to a control port, thus greatly simplifying setup and use of the system. In addition, the protocol conversion system should match the particular terminals in use, instead of simply being a generic solution for all terminals in a certain class. Specific solutions for each type of terminal allow a more user-friendly choice of options and layout for emulated keys and functions.

Data throughput is another consideration that is receiving more attention, and deservedly so. The workload generated by 12 or more terminals attached to a single protocol converter is considerable. Some early models reacted by slowing down, thereby increasing the processing queue and delay through the converter. Recent models, with more powerful microprocessors and better software, have minimized this problem.

CONSIDER OTHER FACTORS

Other factors to consider before purchasing a protocol conversion system include:

Compatibility with other equipment. Details of equipment interfaces at both the terminal and host end of a data link are often obscure, yet a protocol conversion system depends on them to avoid buffer overflow and to ensure proper operation of host and terminal. Sometimes, mainframe vendors elect to change the protocol used at the host end of the link, which causes problems for the protocol converter unless it is easily reprogrammable. Use of a protocol conversion system on a multidropped line to the host adds other opportunities for trouble. Unfortunately, there is no substitute for actually trying the proposed system.

Network management. Many terminals have extensive error control and status reporting facilities. How is this emulated by the protocol conversion system when a simpler terminal is used? How will the protocol conversion system respond to test messages sent by the host?

Growth options. What growth is expected in the number of devices and functions? A system that can grow according to need is an advantage.

In the future, protocol converters merged into other devices, such as terminals and data communications network nodes, will be commonplace. They will cease to exist as separate components. For example, the protocol conversion function will appear more often within intelligent terminals, personal computers, local area networks, and private telephone switching exchanges. This trend is already evident as protocol conversion companies are acquired by main-line data communication companies (e.g., the acquisition of International Computer Controls by Micom) and as the remaining protocol conversion firms scramble to increase the power and options available on their machines—making them, in effect, communications processors in their own right. Examples of this new integration are Micom's micro 7400 combination of a modem with a switch and protocol converter, and Digital Pathway's combination of its Defender II dial-back security system with a protocol converter.

TYING IT ALL TOGETHER

For the past several years, one of the nation's most prominent property and casualty insurance companies has been using 65 protocol converters in an on-line network supporting its widely scattered base of affiliated insurance agents.

This company operates throughout the United States and Canada with dozens of branch sales and service offices located from coast to coast; the branch offices, in turn, support hundreds of independent insurance agencies and their customers.

All branch offices and many large agencies are on-line to the headquarters' IBM 3081 running both custom and standard insurance applications software. The network feeding into the 3081 includes more than 2,000 local and remote IBM 3270-type terminals (which operate in bisync mode, accessing their IMS and TSO applications packages via BTAM under an MVS/VS2 operating system). Until recently, venerable Memorex 1270 front-end processors supported the terminal communications, but these have been replaced by an IBM 3725 communications controller in anticipation of converting to a VTAM/SNA environment.

To minimize the money spent on terminal controllers, the insurance company, has as much as possible, loaded each controller with its maximum complement of 32 terminals. Loading the controllers fully also allows more cost-effective communications from remote sites by minimizing the number of telephone lines required.

The company first considered protocol converters because it had to provide services to smaller and more remote insurance agencies at costs proportionate to their respective business levels. The vendors of the synchronous terminals used, IBM and Raytheon, could easily have provided 3270 or 3270-compatible clusters for these remote locations, but the low number of terminals per location and low traffic volume made such an expansion unjustifiable.

The firm decided instead to provide agents with low-cost asynchronous terminals and modems for accessing local protocol converter nodes. Such an arrangement would provide a high degree of network flexibility (since access to the nodes would be through dial-up lines), while retaining an interface to the host computers and their software that would be indistinguishable from IBM's own 3270s. In addition, it was known that some protocol converters could also support sharing of the dial-up line between a display terminal (or personal computer) and a printer at the same agency location. This capability allows a terminal and printer to function simultaneously and independently, even though they share a single, dialed phone line to the converter.

The decision to use protocol converters evoked some anxiety concerning security, training, compatibility, and network topography, but in retrospect, the overall corporate impact was no greater than if "real" 3270s had been installed. In fact, some of the converters features that had been seen as problems turned out to be virtues instead.

Security is a good example. The terminal-following-terminal dial-up capability (not even available with "real" 3270s) originally caused some concern about data security. In a case where one agent's disconnection from a converter node wasn't properly completed (e.g., failure of the dialed phone line), it was possible that another agent dialing in might unintentionally gain access to the first agent's files. The company simply stipulated, however, that an automatic log-off procedure be a mandatory feature of the converter selected. The CA20 Protocol Converter from Industrial Computer Controls Inc. (now a part of Micom Systems Inc.) was chosen partly for its ability to send a preprogrammed log-off message to the host computer upon sensing a terminal line disconnect. This, coupled with a two-level password scheme, helped ensure system security.

Concerns regarding operator training also proved unwarranted, since many of the users were new to computing and thus weren't troubled by any differences between 3270 and ASCII terminals. To smooth any remaining problems of unfamiliarity, the DEC VT100 terminals and IBM Personal Computers originally offered to the agents were provided with stick-on labels for the appropriate function keys, but after only a few days of using the ASCII terminals, even these reminders were not required.

Finally, network topology was defined. Locations for the protocol converters were chosen so that user agencies could reach them through a local call. This frequently meant the converters would be installed in the offices of larger agencies, but in some cases, because the converters and their modems require so little space, it was possible to install the equipment in telephone answering service offices.

There were some initial problems involving hardware failures and transmission errors. ICCI was a small company, manufacturing its hardware in not-so-efficient, low-volume production. At first, this did lead to hardware problems. But, because ICCI was acquired, the original CA20 protocol converters have been superseded by units of a third generation Micom design that are manufactured in a highly automated large-volume facility. Now, hardware failures with the units the insurance company is installing are very rare.

One unsolved problem is the occasional data transmission error on the asynchronous telephone line between the remote terminals and protocol converters. While there are error-correcting devices that give synchronous-type error control to these asynchronous links, the insurance company elected instead to live with the occasional glitches and to rely on human "error controllers" to request retransmissions when necessary. (Note that such occasional errors are not a problem on the synchronous line between the converters and the IBM 3725, due to the error-correction functions inherent in bisync communications.)

Network management of the geographically dispersed system could also have become a problem, but it didn't. Micom's protocol converters provide a unique command port that allows easy changing of terminal assignments and converter configuration—without physically going to the converter site as would be required for a "real" 3270 controller. Using the command port, the protocol converter can be set for the appropriate mix of lines and terminals prior to shipment. (The configuration data resides in nonvolatile memory.) Should changes be required later, the company's network control group can dial up the password-protected command port.

With earlier products, it might have been necessary to ship new PROM memories from the factory, or at least to send a trained technician to the site to reset the equipment.

As the firm expands into SNA, the converters will be migrated to the new operation just as their more expensive IBM 3274 controller counterparts will be. The company has come to believe so strongly in the protocol converter concept for its far-flung territories that it expects to double the number of devices in service over the next year, thereby increasing the number of agencies to which it can extend its on-line services—which, after all, was the reason for the exercise in the first place.

—Scott I. Brear
Director, Protocol Conversion Products
Micom Systems Inc.

Eventually, the universal acceptance of international standards for data communications may decrease the need for protocol converters as terminals and hosts become more compatible. But that day is far off—probably 10 years or more away—and the increasing availability of protocol converters will go a long way toward relieving some of the data communications managers' worries about future incompatibilities within their networks. ✱

Eric Siegel is a staff consultant at Network Strategies Inc., Burke, Va., and provides consulting assistance to commercial and government clients in computer network design, network architectural issues, performance measurement, software design, and systems security. He was previously employed at Mitre Corp., and holds a BS and a master's in electrical engineering and computer science from Cornell University.

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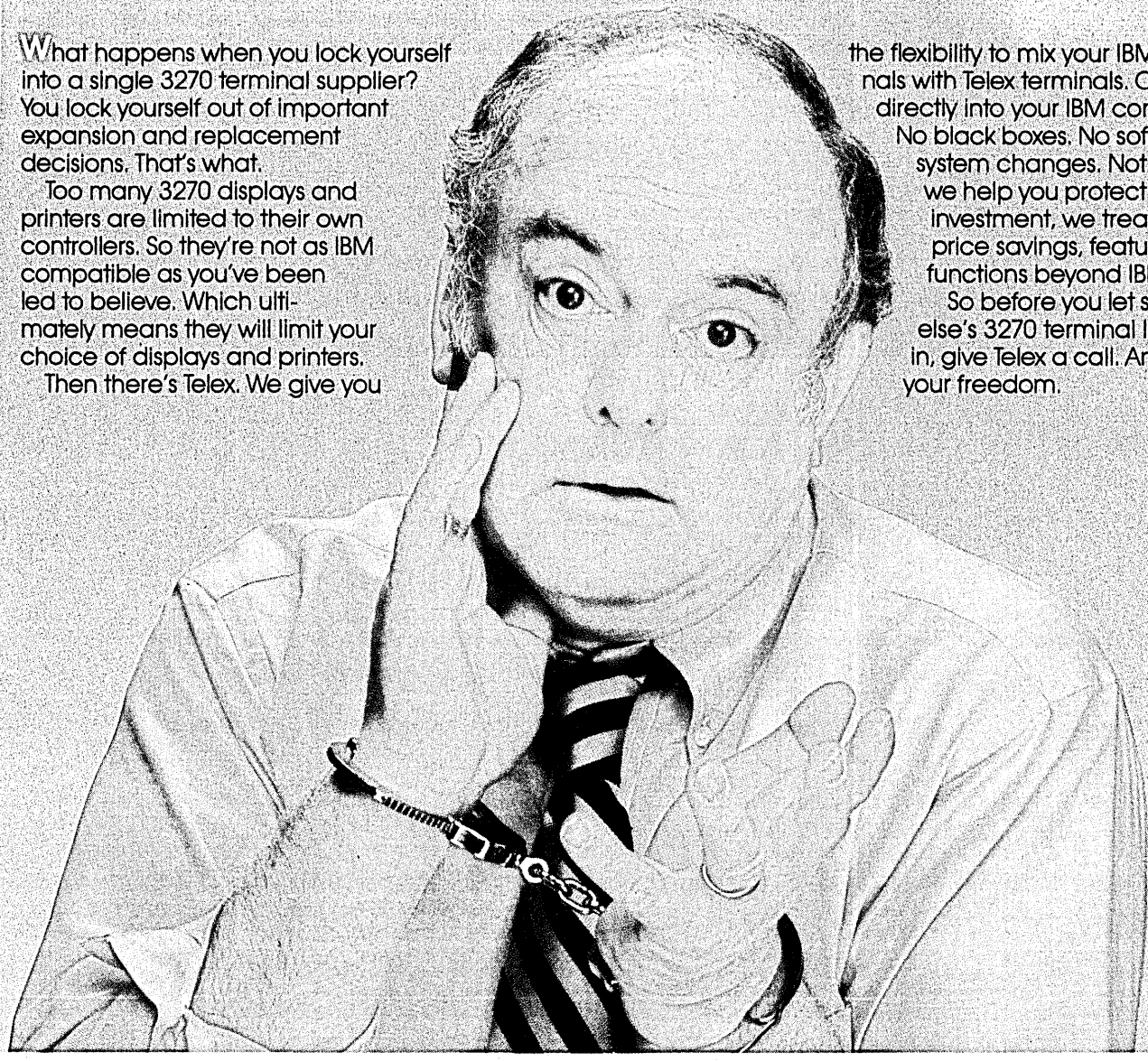

What happens when you lock yourself into a single 3270 terminal supplier? You lock yourself out of important expansion and replacement decisions. That's what.

Too many 3270 displays and printers are limited to their own controllers. So they're not as IBM compatible as you've been led to believe. Which ultimately means they will limit your choice of displays and printers.

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TELEX 3270 ALTERNATIVES

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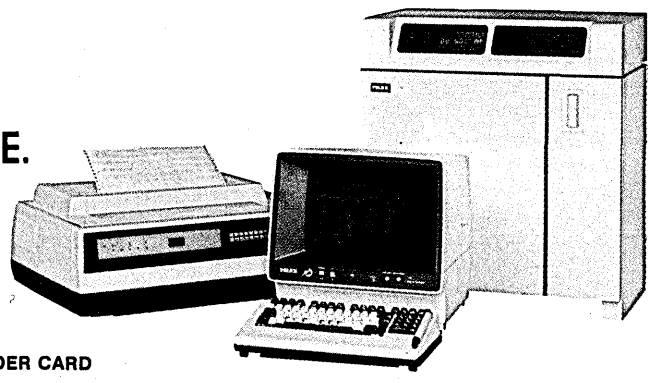

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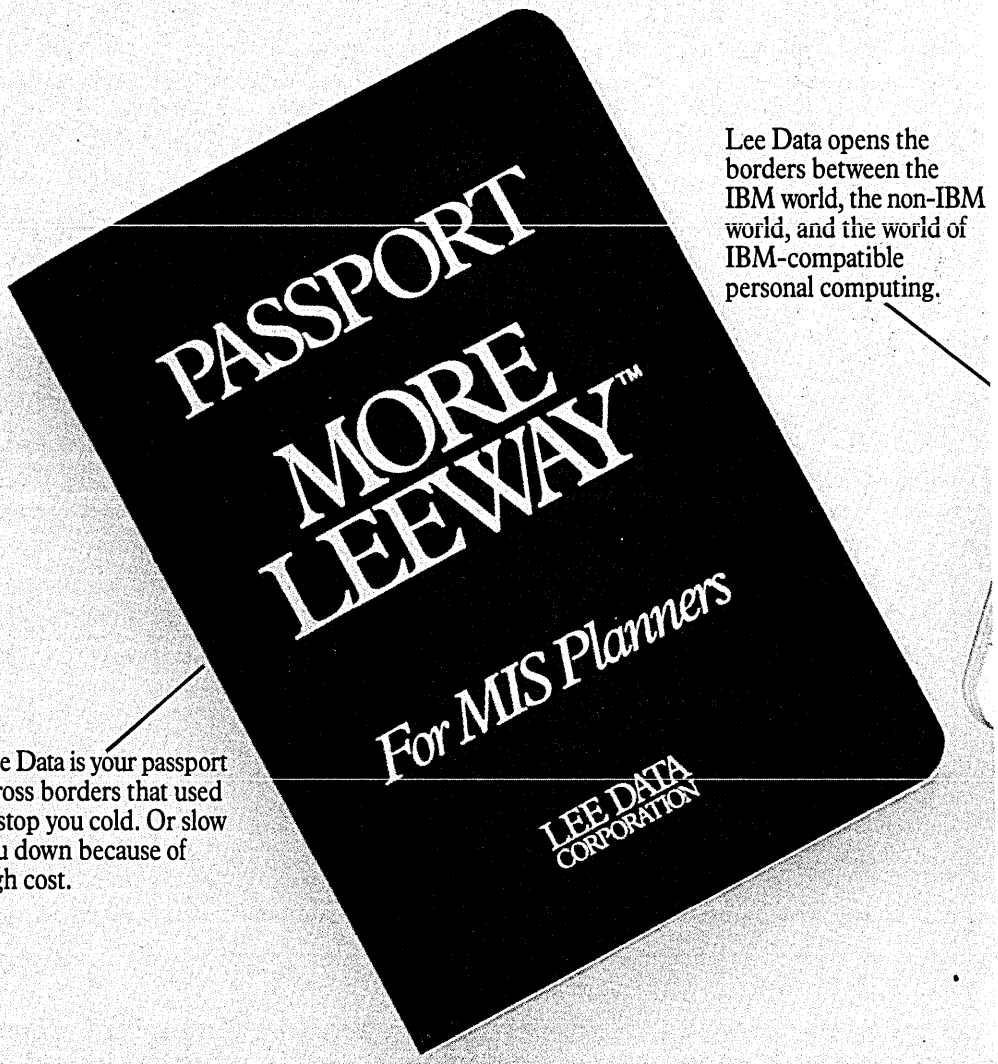

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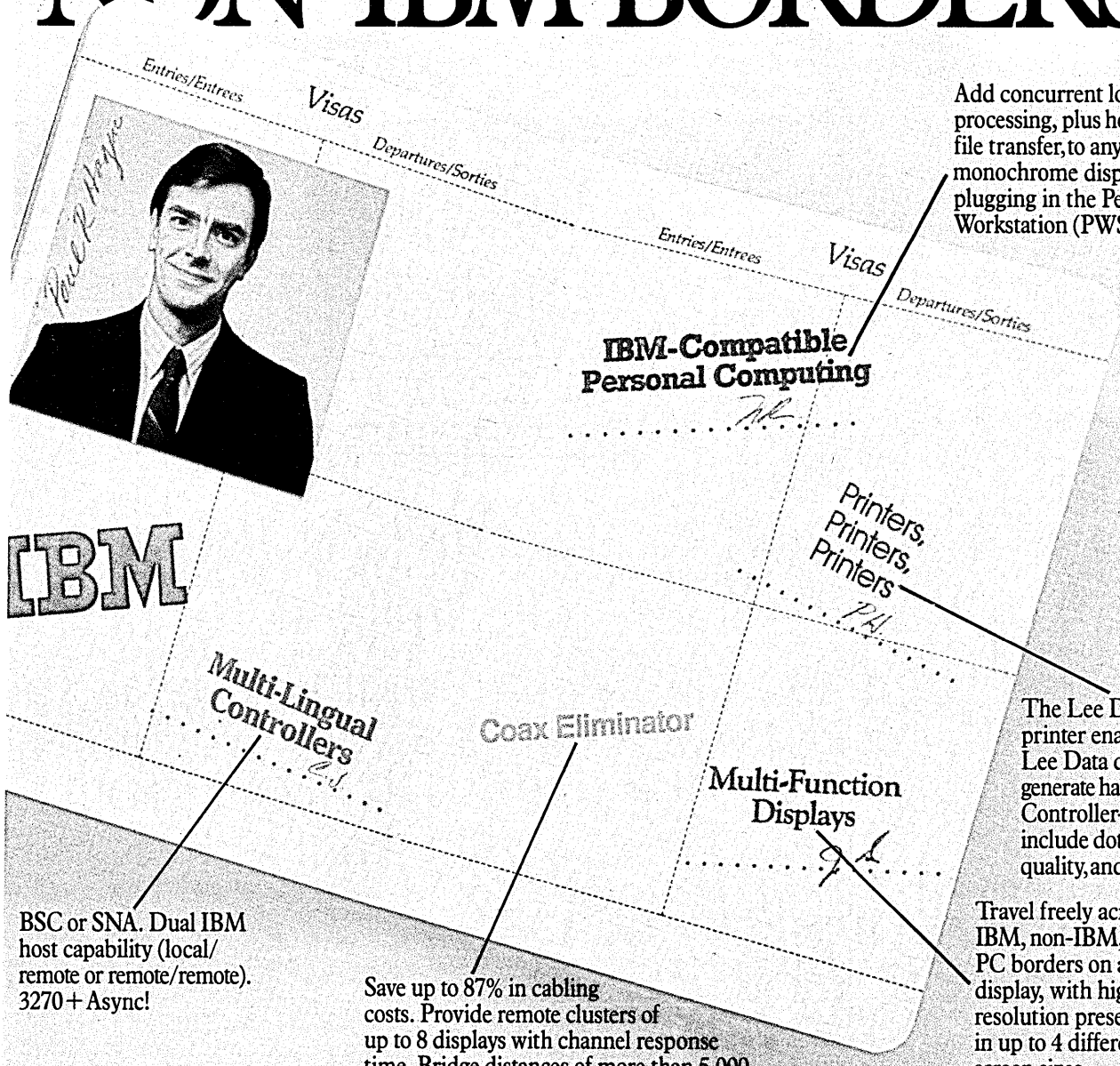

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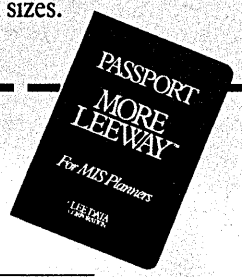

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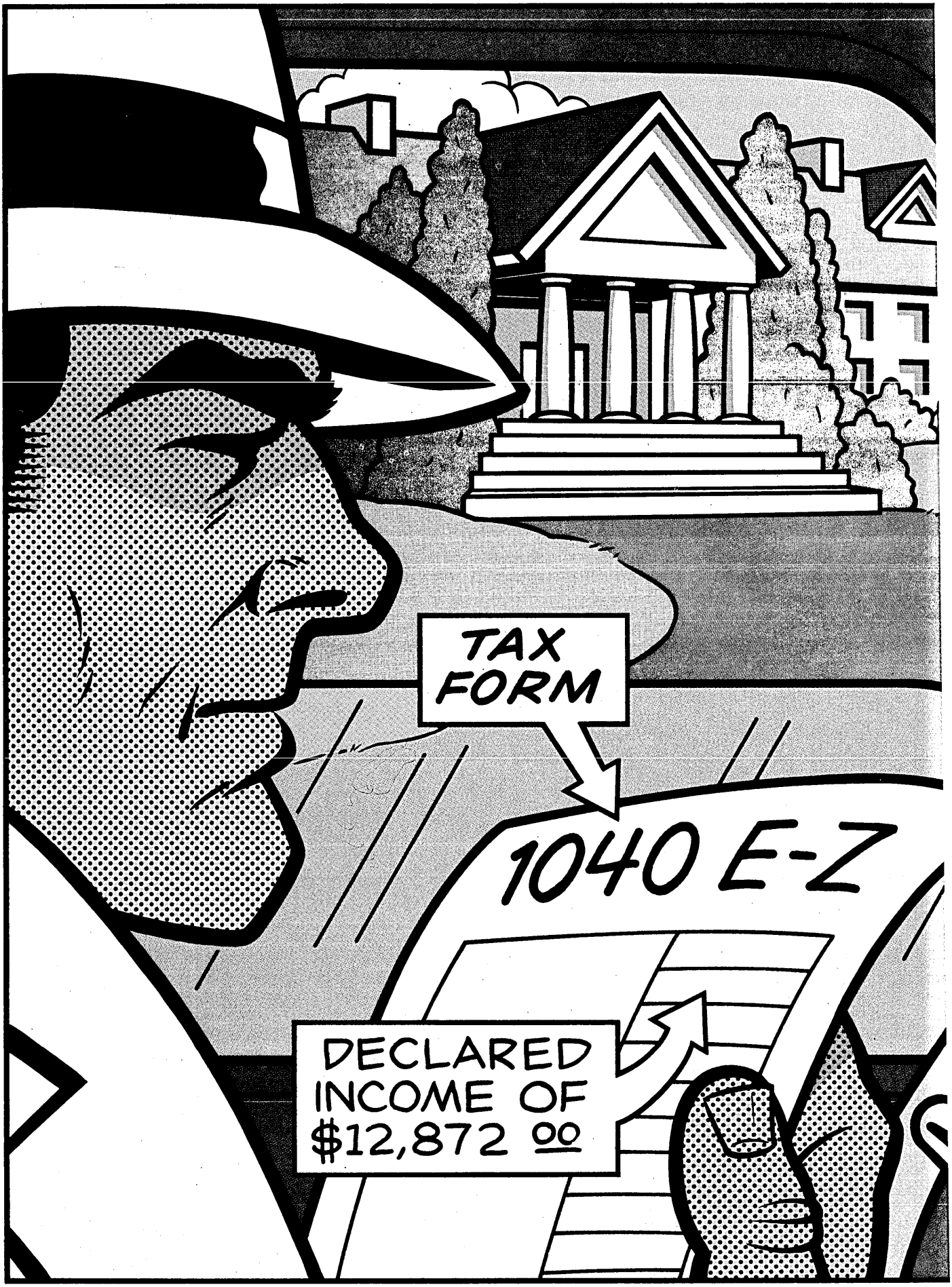

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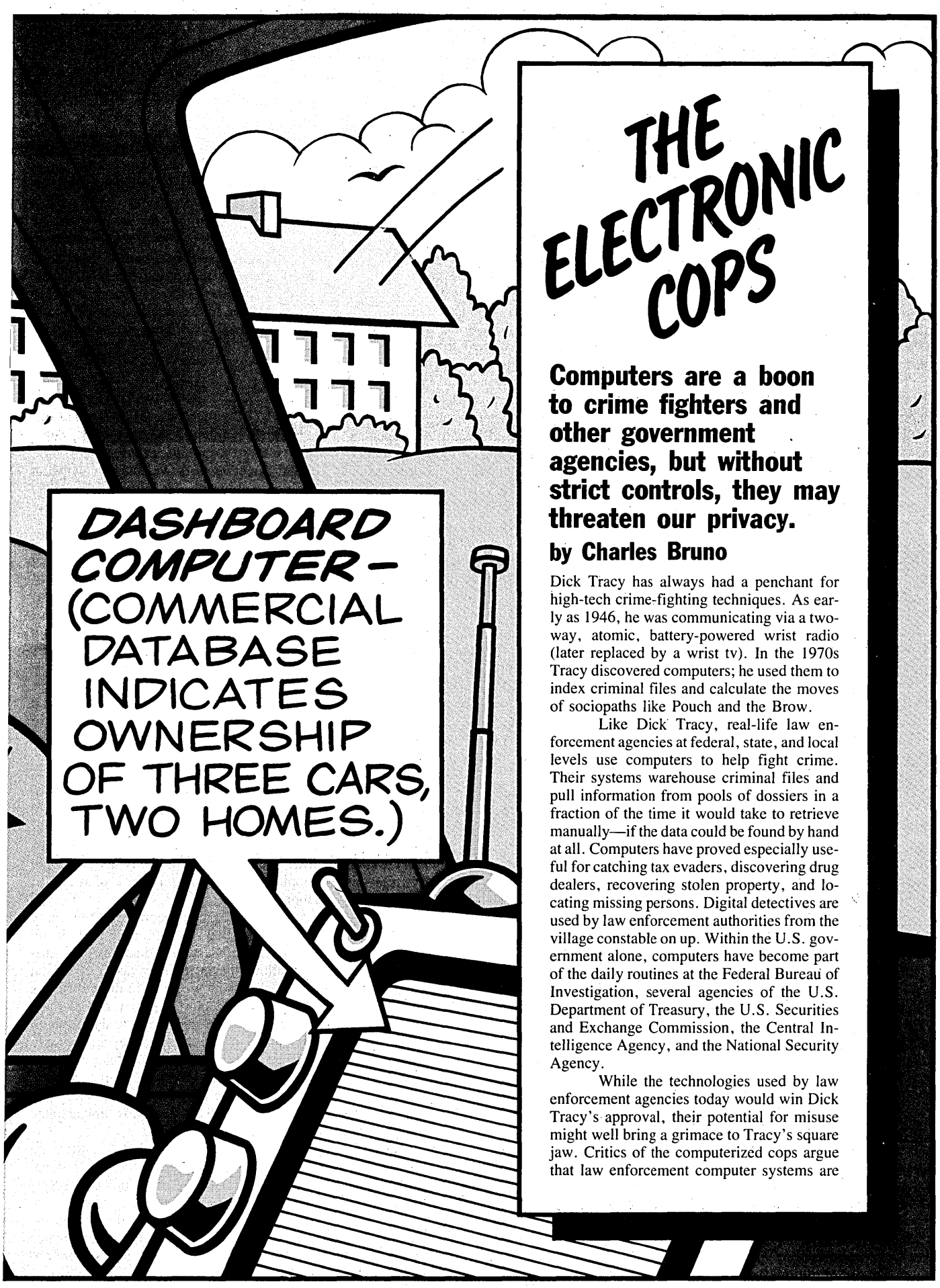

THE ELECTRONIC COPS

Computers are a boon to crime fighters and other government agencies, but without strict controls, they may threaten our privacy.

by Charles Bruno

Dick Tracy has always had a penchant for high-tech crime-fighting techniques. As early as 1946, he was communicating via a two-way, atomic, battery-powered wrist radio (later replaced by a wrist tv). In the 1970s Tracy discovered computers; he used them to index criminal files and calculate the moves of sociopaths like Pouch and the Brow.

Like Dick Tracy, real-life law enforcement agencies at federal, state, and local levels use computers to help fight crime. Their systems warehouse criminal files and pull information from pools of dossiers in a fraction of the time it would take to retrieve manually—if the data could be found by hand at all. Computers have proved especially useful for catching tax evaders, discovering drug dealers, recovering stolen property, and locating missing persons. Digital detectives are used by law enforcement authorities from the village constable on up. Within the U.S. government alone, computers have become part of the daily routines at the Federal Bureau of Investigation, several agencies of the U.S. Department of Treasury, the U.S. Securities and Exchange Commission, the Central Intelligence Agency, and the National Security Agency.

While the technologies used by law enforcement agencies today would win Dick Tracy's approval, their potential for misuse might well bring a grimace to Tracy's square jaw. Critics of the computerized cops argue that law enforcement computer systems are

Despite controversies, computers have made law enforcement easier and more efficient.

being used in ways that go beyond their original designs. They say these electronic gumshoes have been used to intrude into the lives of innocent Americans, violating their rights.

Among those who are concerned with the potential misuse of cops' computers is Senator William Roth Jr., a Republican from Delaware best known for cosponsoring the Kemp–Roth tax cut bills. Acting in his capacity as chairman of the Senate Committee on Government Affairs, Roth wrote a letter to the Office of Technology Assessment last August in which he said: "It has come to my attention that several federal agencies have apparently made subtle but significant changes in their computer systems which may have expanded or otherwise altered the use of those systems in ways not intended by Congress." For instance, Roth said, the Federal Bureau of Investigation's National Crime Information Center (NCIC) computer system began as a simple electronic bulletin board, but has since been converted into a nationwide system for monitoring the whereabouts of persons merely "of interest" to the government.

For years, the Justice Department denied accusations that it had spent the mid-1970s building dossiers on dissidents. According to a recent article in *The Nation*, however, Justice Department officials now admit that the FBI had indeed compiled dossiers on political activists during those years.

SLEUTHING WITH A SYSTEM

Despite this and other controversies, computers have made law enforcement easier and more efficient. The Treasury Department touts one of its computer-aided collars, the Araujo investigation, as a crime-stoppers' textbook case of systematic sleuthing. It is a true story that has a clarity of plot rarely encountered outside comic strips. It is also an example of how the government can use computers against crime without needlessly violating privacy.

According to court papers and newspaper accounts, Jaime Araujo was arrested in 1979 on charges that included narcotics trafficking, currency reporting violations, and income tax evasion. Government agents nabbed and convicted him with the aid of the Treasury Enforcement Communications System (TECS). TECS is a dual-processor Burroughs B-7700 used by the Treasury Department and its affiliated agencies. Included in its repertoire of programs is software designed to detect criminal activity. In the Araujo case, the output of the system was so damning that the defendant chose to avoid a legal battle. (The prosecutor Araujo faced was Robert Perry, now pressing the government's case against John DeLorean.) Instead, Araujo pleaded guilty to 10 criminal counts. He was fined $1.2 million and is now serving a 35-year prison sentence.

Araujo was the leader of a group of at least 21 others, authorities say. The gang deposited its profits from the heroin trade in the Mexican-American National Bank in San Ysidro, Calif., near the Mexican border. Between September 1976 and April 1978, Araujo's organization made 39 deposits totaling $15.4 million in amounts ranging from $99,000 to $860,000. Some of this money was moved across the border as cashiers' checks in order to buy dope. (Another $32 million in cash may have been moved, according to the authorities.)

While the Araujo gang's drug smuggling was undetected by Customs agents at the border, its financial trail was picked up by the TECS computer. When the drug dealers carried checks across the border, they filed currency monetary information reports (CMIRs); their alternative was to have the returned cashed checks lead to their instant arrest. Treasury also got copies of all the gang's bank transactions in excess of $10,000. These were supplied by the Mexican-American National Bank because it, like all U.S. banks, is required to file reports on such money transfers. TECS was used to match the bank reports with the border filings. With that information, Treasury agents began an investigation that ended with the arrests of Araujo and 21 of his gang members.

The TECS system used to nab Araujo costs $10 million a year to operate, and has been in use since 1969. At its heart is a combination of commercial and privately developed software; Treasury employees refused to describe either category of programs in detail. Via a private network, TECS supports 1,600 terminals located in Treasury Department offices around the country; transmissions are scrambled to meet National Security Agency (NSA) encryption standards. In order to log on, users must identify themselves to the operating system and enter the day's secret access code.

TECS is operated by the Customs Service and is also used by other Treasury department agencies, including the Bureau of Alcohol, Tobacco, and Firearms; the Internal Revenue Service; and the U.S. Secret Service. These agencies all have direct access to TECS. Each uses the TECS hardware and generic software but sets up its own database; each may also shield its data from the other agencies on the system. In addition to these on-line users, other agencies (including the FBI, Drug Enforcement Administration, U.S. Department of State, Coast Guard, CIA, and NSA) may use TECS indirectly. So can Interpol, the international police coordinating agency and the only TECS user not operating under restrictions imposed by U.S. law (although the spook agencies, CIA and NSA, are exempted from many regulations imposed on America's purely domestic police forces). When one of these outside organizations wants data from a TECS subsystem, it submits a written request to the appropriate group within Treasury. A "gatekeeper," appointed by the agency controlling the data, determines what information shall be provided to the requesting party, and then forwards any approved material in hardcopy form to the inquirer.

FBI WAS HIGH TECH PIONEER

Treasury may be one of the more sophisticated computer users among law enforcement agencies, but it is not the first to go high tech. One pioneer in digital detective work was the FBI, which at one time was handcuffed by its paper files. "Prior to 1967," recalls Sean McWeeney, chief of the FBI's organized crime unit, "everything was on index cards. Agents didn't have time to search through all the indexing to find a file, so there was a whole group of clerks for extracting data."

In 1967, the FBI established the National Crime Information Center to maintain computer-based files on missing persons, warrants, stolen property, securities, criminal histories, and registered property (guns and vehicles, for example). With an annual budget of $6 million, NCIC houses some 15 million records previously stored by the FBI in a labyrinth of filing cabinets. Among the files are entries on one in every 30 Americans—more than 8 million individual dossiers. Observers of NCIC have published assertions that in a few years, these files could grow to include dossiers on 90% of all U.S. residents with arrest records—as many as 35 million people, or approximately 40% of the U.S. labor force.

To manage its records, NCIC currently uses two IBM 3033 mainframes in a fail-safe configuration. Custom and commercial software allows the FBI to index vast files of data; the FBI, however, declines to discuss NCIC's programs in detail. Other law enforcement agencies also tap into the NCIC databases to obtain information on cases they are trying to solve. About 64,000 federal, state, and local police agencies, government prosecutors, and judges have authority to access NCIC via one of the 17,000 terminals now linked to the center's databases.

Data transmission links to NCIC are controlled by a separate agency, the National Law Enforcement Telecommunications System (NLETS). It was created by Congress at the request of state agencies that feared the FBI would take control of all criminal justice communications. NLETS acts as a system operator, retrieving and routing NCIC files.

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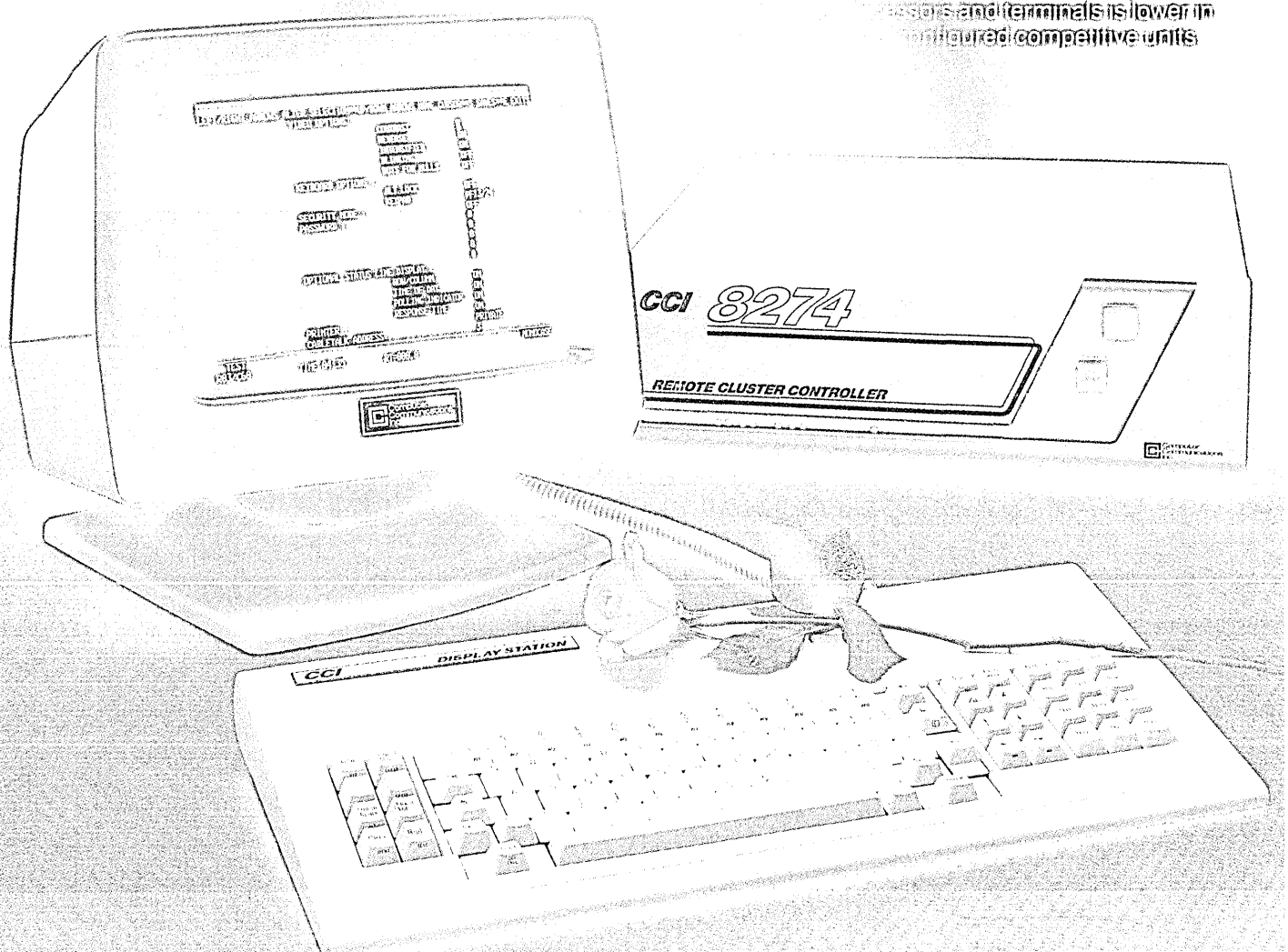

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The National Crime Information Center maintains computer-based files on one in every 30 Americans.

At the local level, law enforcement records range from sophisticated data processing shops to boxes of index cards and a Teletype. One of the more advanced systems is that of the New York City Police Department. The NYPD has an IBM shop that runs commercial as well as custom programs under VM on four 370-158 computers. The department recently installed its first IBM 3081 and plans to couple it with one of the four 370s. NYPD has over 700 terminals located throughout the city, linked to headquarters by dedicated communications lines. In order to log on, police and civilian personnel must first identify themselves to the system with a personal identification number.

The NYPD is one of 19 local agencies with direct access lines into NCIC. Other local police organizations must access NCIC via state law enforcement computer systems. These systems warehouse data on state and local offenders while serving as communications links to NCIC.

Far removed from the problems of solving street crime, the nation's two most secretive intelligence gatherers, the CIA and the NSA, are also highly automated. Both flatly refuse to be interviewed about their computers. A CIA spokesman, Dale Peterson, says that because the CIA is an intelligence group, knowledge of its computer facilities is not in the public domain. A spokesman for the NSA echoed Peterson's refusal. In fact, the NSA is so publicity shy that many U.S. citizens have never even heard of it.

CREATED BY SECRET MEMO

The NSA was created by a top-secret memorandum signed by President Truman in 1945. Today, it continues that heritage of behind-the-scenes activity as it secretly monitors telex messages, radio transmissions, and other communications, then channels and sorts this information for the President, the CIA, and the FBI. It is an electronic espionage organization, utilizing what experts say is the largest computer complex in the world. In *The Puzzle Palace*, a book about the NSA, author James Bramford interviewed a former officer in charge of computers, who told him: "I had five and a half acres of computers." In its computer arsenal, the NSA boasted the Stretch, a computer designed by IBM in the late 1950s that was so large and powerful IBM believed it would be useful only to the NSA and the Atomic Energy Commission. Today, the NSA's computers—reportedly supplied mainly by IBM and Cray Research—are housed in rows of buildings at headquarters in Fort Meade. Many of the computers are kept in underground quarters.

This abundance of crime-fighting and spying computers, some of them secret, has privacy advocates worried. These critics say the incredible power of today's computer systems creates a huge potential for misuse and abuse. During the early 1970s, Congress, too, became convinced of the need for safeguards to protect citizens from computer-powered invasions of their privacy. In the aftermath of the Watergate scandal, Congress passed the Privacy Act of 1974. It is a broad statement that includes provisions controlling the creation, dissemination, and use of files by government agencies. But while Congress recognized that information technology has the potential to infringe upon the privacy of individuals, the Privacy Act does not thoroughly protect the integrity of computer-stored criminal files. Specifically, the Act does not delegate authority to regulate and judge the use of criminal history files. Although Congress has stated that special legislation was needed to monitor law enforcement agencies and their use of computerized criminal files, it has never enacted it.

"The Privacy Act has turned out to be a terribly ineffective method of protecting privacy because it allows agencies to exchange information, virtually without restriction, within a department that has a number of completely different missions," says Robert Bellair, a Washington, D.C., lawyer specializing in privacy rights. (Bellair has represented the National Committee on the Confidentiality of Health Records, the National Association of Manufacturers, and the Domestic Committee on the Right to Privacy.)

Several critics agree with Bellair, saying the Privacy Act is too broad and that it allows too many exceptions to the rules. They say the Act is ineffective mainly because no single person or agency is in charge of enforcing it. Nor, they say, is anyone authorized to protect privacy rights not covered by it. Under provisions in the Act, the Office of Management and Budget is tabbed as an overseer; but OMB has no enforcement powers and is often (jokingly) referred to as a "Jewish mother" pleading with agencies to abide by regulations. The Justice Department alone has the power to oversee the computer-based law enforcement activities of other federal agencies, but it has had little incentive to monitor them closely. As a result, says Frederick Weingarten, a senior analyst with the Congressional Office of Technology Assessment, managers of computer-based law enforcement systems have interpreted the Privacy Act to suit their own needs.

"It's not an issue of technology anymore," asserts Weingarten. "Instead, it's an issue of what types of data are being entered into these computers. Many people who worry about information technology issues like these believe the problems stem from a lack of central responsibility. Remember, each of

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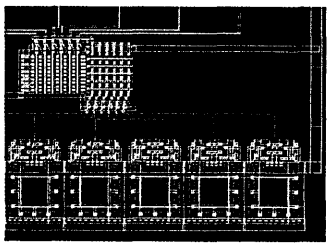

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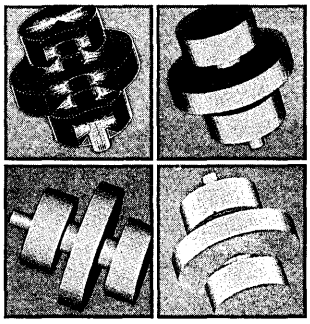

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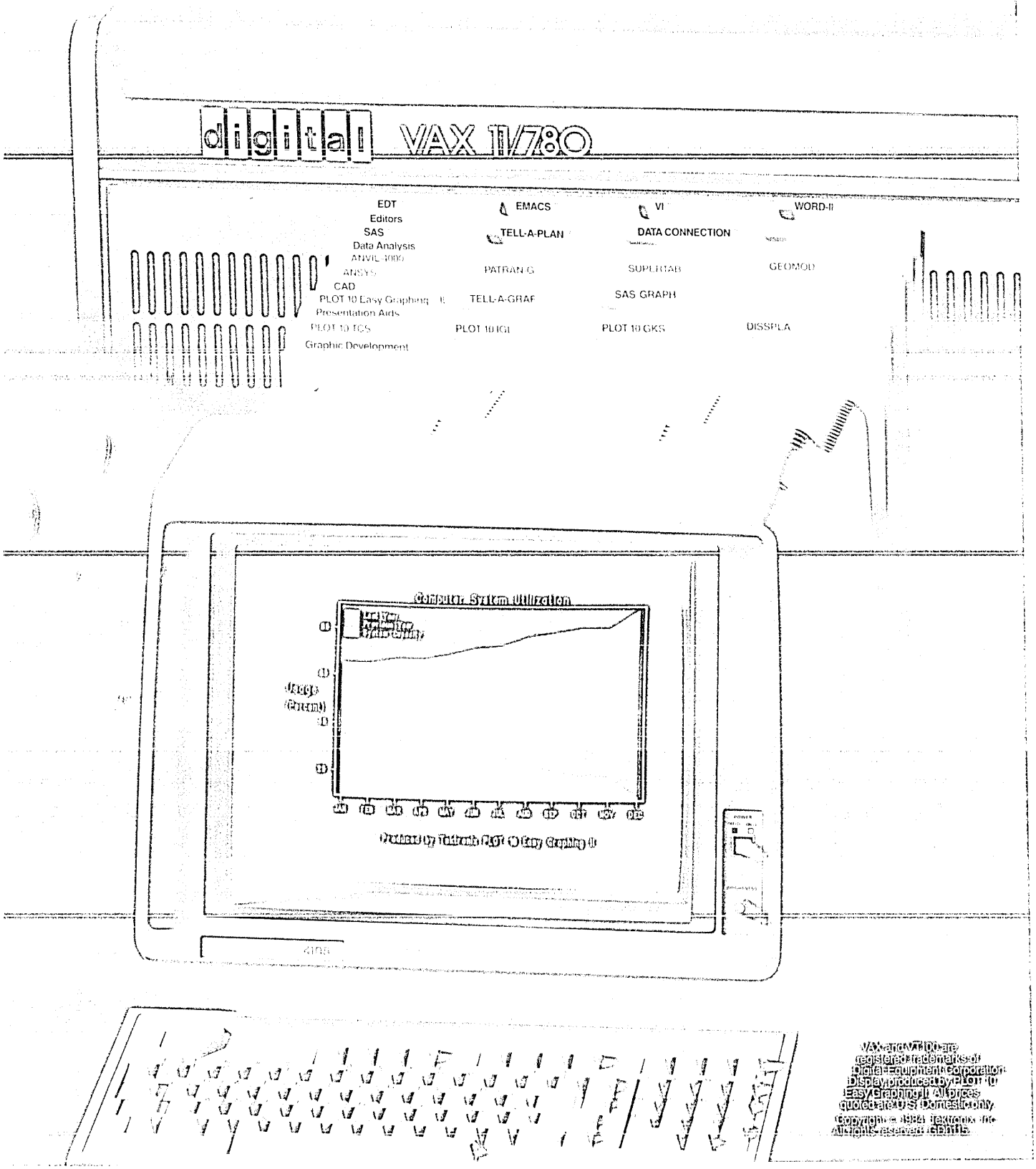

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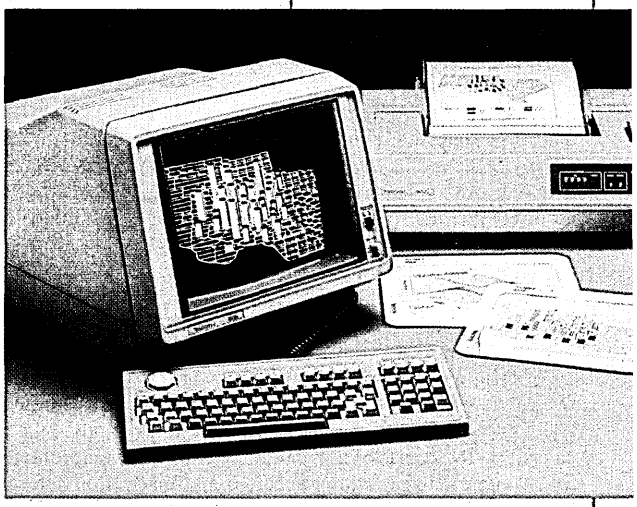

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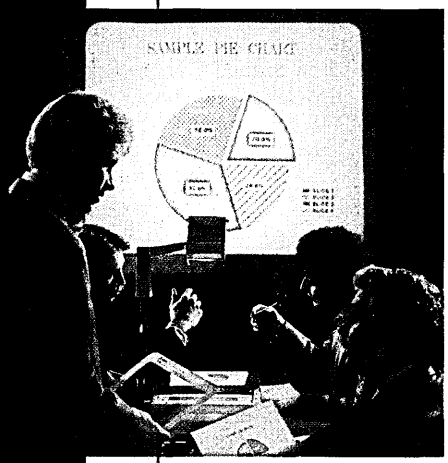

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Sometimes, obsolete data that should be destroyed are not, to the detriment of a private citizen.

these different agencies is trying to do its own particular job, and that means they're not going to put privacy rights very high when they balance them against other objectives."

Privacy advocates also criticize the lack of data integrity within databases, the sharing of data between law enforcement agencies, the buying of commercial lists, and even the ways in which the agencies run their systems. They say that much of the information stored in the recesses of government mainframes is either inaccurate or incomplete. In its most recent report, the Office of Technology Assessment (OTA) sampled two groups of NCIC arrest records, and found inaccuracies in both. In the first, it found that 27% of the sampled files were missing information about the case outcome. In the second, about 20% of the records had inaccuracies. Nor are the FBI's files the only ones with inaccuracies. In October 1982, OTA found that some state-run, computer-based criminal history systems had even more inaccuracies than the FBI's. Thirteen states, OTA found, reported that more than half their criminal arrest records lacked disposition information, and eight states, OTA says, indicated that disposition reports were missing from more than 75% of their arrest records.

"There's no question that the accuracy of criminal history records is poor at the federal level," says privacy lawyer Robert Bellair. "A good portion of the problem is caused by the courts. They've failed to show much interest in providing accurate and up-to-date disposition information. The result is that you have many criminal history records that indicate the charge and the arrest but no final settlement of the case." Both innocent individuals and convicts who have served their sentences wind up becoming victims when an incomplete file is relied upon, he says.

Law enforcement agencies generally agree that inaccuracies in their computer records is a problem, and that missing disposition information is especially troublesome. Yet the FBI and the other law enforcement agencies that depend upon NCIC data have not shown any interest in updating the FBI's criminal history files.

DATA MISUSED, ABUSED

Another issue bothering critics of computer-based law enforcement systems is that data can be misused and abused. Sometimes, obsolete data that should be destroyed are not, to the detriment of a private citizen. This type of abuse is clearly illustrated by the story of Christopher North, told in *Privacy: How to Protect What's Left of It*, (Doubleday, 1979), a book written by Robert Ellis Smith, the Washington, D.C., publisher of *Privacy Journal*, a newsletter about privacy rights.

North was a schoolteacher and part-time postal worker who lived in San Francisco. According to Smith's book, North was arrested in 1974 after he approached the U.S. Secretary of Transportation, who was touring San Francisco's subway system. Seeing the cabinet member in a subway station, North asked him if he thought President Nixon should be impeached. Instead of getting the Secretary's opinion, he was arrested by police, who charged him with assault and resisting arrest. He was then arraigned, fingerprinted, and slated for trial.

All charges against North were eventually dropped. But his arrest record, stored in computer files, had already been accessed by transit, city, and state police, as well as the San Francisco FBI office and FBI headquarters in Washington. At the same time, copies of his fingerprints were mailed to these agencies. Information surrounding North's arrest was also supplied to his two employers, the Postal Service and the California State Board of Education. Yet, according to courts of law, North was innocent of any wrongdoing.

This issue has been addressed by the courts. In 1974, the U.S. Court of Appeals for the District of Columbia ruled in *Menard vs. Saxbe* that the FBI and other agencies have a responsibility to prevent dissemination of inaccurate arrest and conviction records and must take reasonable precautions to prevent inaccuracies and incompleteness. (One question left unresolved by the court's ruling, however, is what should be done with fingerprints obtained in initial arrest proceedings.)

"If a person has been arrested and subsequently the charges are dismissed, that person has the right to have all records expunged, and you also have the right to get a printout of those expunged files," explains Edward Sharp, MIS director in charge of the New York Police Department's computer-based operations. "If you have a smart lawyer, he'll petition the judge to issue a court order to have the records destroyed." Sharp adds that once the court order is issued, it is up to New York State's Office of Court Administration to ensure the records are destroyed and to notify all involved agencies with recorded files on the individual.

NCIC cannot force its user agencies to keep files up to date. "It's a voluntary system. No police agency is obliged to enter a warrant, criminal history, or other file," explains David Nemecek, who manages the NCIC center. In fact, Nemecek says, under current regulations no user agency is penalized if they fail to enter a disposition.

Criminal justice officials assert that NCIC files are kept current through a series of checks and edits mandated by the Privacy Act; however, the frequency of checks and edits is determined by each agency. At various intervals, law enforcement agencies at all levels are supposed to run computer audits and destroy unsubstantiated entries. But, after a 1982 survey, OTA concluded that only 13 of 49 responding states had ever conducted a record quality audit. Routine audits, the OTA report contends, are more the exception than the rule. At the local level, New York City's Police Department, which has about a dozen computer databases, runs data integrity tests quarterly. In addition to checking criminal history files, the NYPD checks warrants and stolen property against NCIC tapes. "If we find a certain auto or warrant that is no longer active, we kill it from the records before they are sent back to NCIC," explains MIS director Sharp.

Automated police agencies are, in some cases, unwilling to tie their files to the systems of others. "Our feeling here," says Treasury's Richard Shriver, "is if there's useful data in an automated file, we will not connect it to other databases electronically; there should be a person as a gateway" between the two record systems. And some agencies do not share their files under any conditions.

IRS WON'T SHARE ITS TAX DATA

At the Internal Revenue Service, itself a branch of the Treasury Department, no data from taxpayer filings are shared. This proscription is spelled out in the IRS code. The IRS processes tax returns in batch mode, on a complex built around an NAS 9060. IRS computer files occupy 200,000 reels of magnetic tape at its processing center in Martinsburg, WV. (The IRS does have an investigative unit for catching tax evaders that uses Treasury's TECS. Due to the confidential nature of IRS financial investigations, however, no other agency has access to its TECS files.)

While many officials in charge of law enforcement computer systems say their data are shared only with other law enforcement agencies, Robert Ellis Smith, of *Privacy Journal*, reports that the FBI is considering whether to open NCIC to users other than police. For instance, NCIC might be accessed by state officials screening applicants for state licenses and employment. Such access may be within the law; data sharing with an authorized government department certainly is.

Attorney Bellair explains that file swapping among agencies within a department is left virtually unchecked by the Privacy Act of 1974. For instance, Treasury is a department with many different missions. These different missions require the collection of sensitive information. The worry is that information might be shared between, say, Customs, which collected it for law en-

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Some observers say that respect for individual privacy is on the rise.

forcement purposes, and the IRS, which might want to compare the data against tax returns. Treasury officials, however, deny such practices occur.

Bellair counters: "The routine use of the rule of exception in the Privacy Act [which allows for exchange of data between agencies for a different use than what the data was collected for] really means that it's business as usual for the federal government. I don't know if we're any better off in 1984 than we were in 1974, when we passed the Privacy Act."

Nor does the Privacy Act prohibit agencies from buying or obtaining data on individuals. It does, however, restrict them from acquiring large lists—unless the list can be shown to be relevant to the agencies' specific needs. The Privacy Act leaves the definition of what is and what is not relevant very loose, and the IRS did, in fact, acquire a medical journal's subscription list to see whether all the doctors on it had filed. The Office of Management and Budget is authorized to review the types of lists bought by federal agencies, but it doesn't have the ability to stop an agency from using a list.

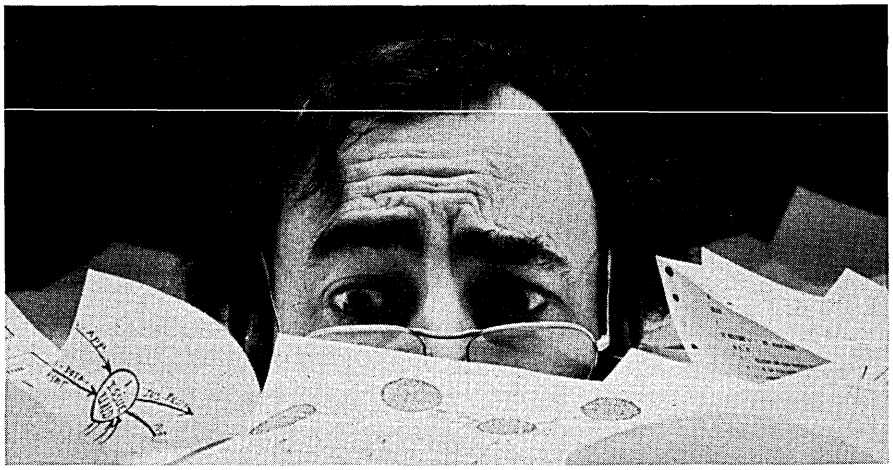
The IRS is buying large lists from commercial sources in an attempt to improve its detection of tax evaders. It has acquired lists of households from credit agencies in four test districts: Brooklyn, N.Y.; Indianapolis, Ind.; Milwaukee, Wisc.; and Reno, Nev. Although these lists contain personal information, the agency says it is not concerned with the life-styles of individuals. The IRS says it is not interested in tracking taxpayers who have filed returns, but in catching nonfiling tax evaders who, the tax men say, accounted for $3 billion in lost revenue in 1981 alone. But *Forbes* magazine reported last September that the IRS had advertised in the *Commerce Clearinghouse Daily* for information from sources who could provide names, addresses, and annual incomes of Americans.

"The IRS is playing with words when it says it is not interested in life-styles," says *Privacy Journal*'s Smith. "What car you drive, what places you shop, that's different from another's life-style." Critics question the premise that, in today's credit-buoyed economy, spending habits necessarily reflect income.

Although some observers of the government's growing collection of dossiers argue that things are getting worse, others say that respect for individual privacy is on the rise. "It's not just because it's 1984," says OTA's Weingarten, "but public concern has grown, and within the next five years or so, there will be some major battles over agency practices." Recently, Congress has reopened inquiries on the use of computers in law enforcement agencies. On April 5, a House Judiciary subcommittee completed hearings on "1984: Civil Liberties and the National Security State." Testimony was provided both by advocates and foes of our computerized record systems practices.

While police agencies and their allies maintain that their record systems, admittedly imperfect, are necessary to preserve order in the civilization, Robert Smith reports that others advised Congress to keep a keen eye on the situation. *

Charles Bruno is an associate editor at Technology News of America Co. Inc. in New York City.



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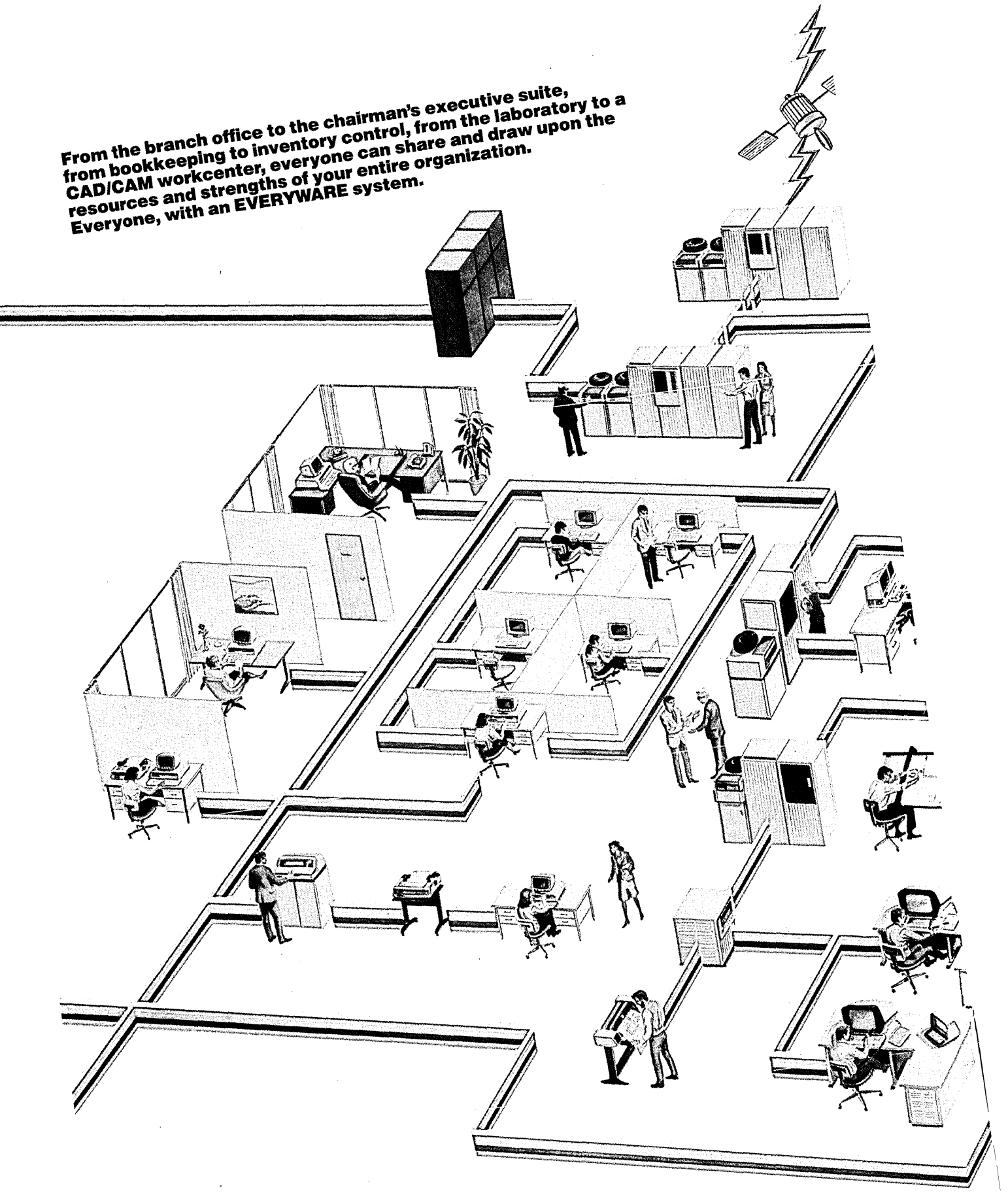


Unrealistic goals can cause several kinds of problems in software development projects—including total failure.

THE LONG AND SHORT OF SCHEDULES

by Robert W. DePree

Software development schedules have a major impact on whether a project will meet its completion date. Yet large software systems are complex enough to render any up-front estimates accurate only in a wide −50% to +200% range. Only after the full system analysis, functional specification, and top-level architecture are done can a reasonably accurate estimate be derived.

For a large software project, this might require six to nine months' effort by a team of senior technical people. Therefore, managers are forced to come up with rough preliminary schedules that they'll most likely be held to throughout the project development process.

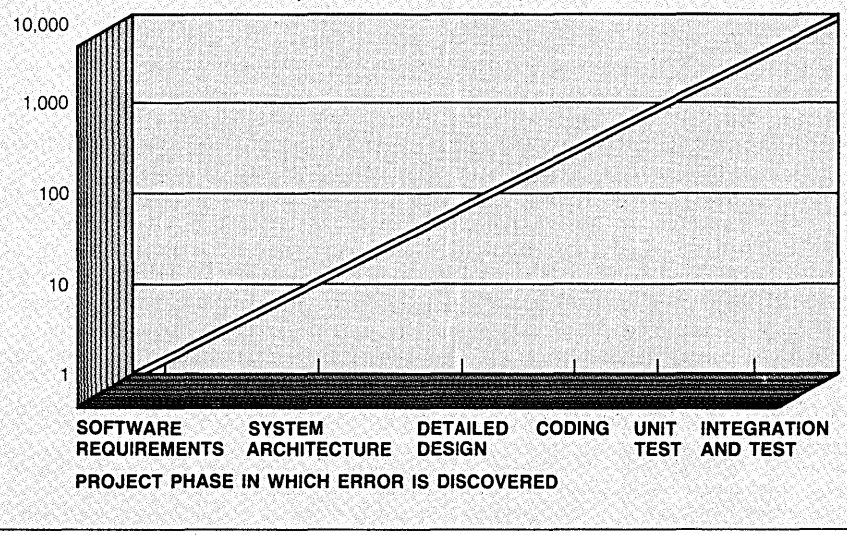
The software development manager typically uses one of two approaches to this problem: he submits either a very conservative schedule or one that pleases higher-level management. The former approach often means the manager will initially take a good deal of heat from marketing and upper management, rather than face years of ulcer-inducing schedule slips later on. Defending a preliminary schedule against this pressure is difficult because the schedule has little basis in fact. Further, such a defense can actually damage a career. This makes the second approach, developing a schedule based on an end date passed down from above, the more popular one. Managers using this approach often feel that people who believe in schedules based on nothing more than their own wishes deserve what they get. Occasionally, managers even convince themselves that such schedules are valid.

With either approach, managers are under the gun to stick to their schedules. So before deciding which approach to take, managers should consider what effect schedules have on the actual time needed to complete a project.

Too short a schedule will delay project completion, or, in the worst case, cause a project to fail. There are three reasons why short schedules have such drastic results: they require increased development efforts, they often use obsolete hardware technology, and they lower the project teams' morale. Because such schedules demand greater amounts of development resources, the cost to correct errors grows as well, and the project may wind up partially integrated.

FIG. 1

RELATIONSHIP BETWEEN COST OF CORRECTING ERRORS AND THE DEVELOPMENT CYCLE



The later in the development cycle an error is caught, the more expensive it is to correct. Studies in both the defense and private sectors show the cost to correct errors rises exponentially through a product's life cycle, as shown in Fig. 1.

Typically, a short schedule does not allow time for the development process's critical early stages. Since these stages produce relatively intangible output that cannot be quantitatively measured, managers often rationalize that reducing their schedule allotment is perfectly acceptable. If the scheduled time for these stages is less than the minimum time needed, the errors or omissions that result will take considerably more time and effort to correct in later stages. Serious errors or omissions made in the requirements specification or product architecture that are not caught until system testing may be more expensive to correct than starting the project over. A schedule which is too short can cause the entire project to fail.

Another trap resulting from short schedules is the partial integration syndrome. In this syndrome, the schedule allows only

Employees will work to an aggressive schedule if they believe the goal is attainable.

enough time for partial completion of the various subsystems. In an effort to rationalize the problem, management declares the partially completed subsystems to be Phase I, Version 0.1, or some such name. The development team is ordered to proceed with integration and testing of the partial subsystems. Although this effort consumes quite a bit of development resources, it is largely invalid and must be repeated entirely when the system is completed.

Things get even worse if attempts to cover schedule slips are made by declaring a number of "phases" and partial integrations. The resources required for these repeated partial integrations can be as voluminous as the true product development effort. Again, a short schedule will delay the actual time needed to complete the project.

HARDWARE A MAJOR DECISION

A major decision made at the start of a large project is the choice of hardware technology. A software schedule that does not reflect the actual completion date may result in the wrong hardware selection. For example, the initial software at XYZ Company said System A would be ready in 1980. Based on this information, the decision was made not to go with 64K RAM chips and a new 16-bit microprocessor. The software was a year late, partly because of the old hardware's memory and performance constraints. The final product had to compete with products that used advanced hardware technology and this ultimately led to the failure of XYZ's product in the marketplace.

Finally, a schedule will affect the morale, and consequently the productivity, of the development team. Studies in organizational behavior show employees will work to an aggressive schedule if they believe the goal is attainable and they're committed to achieving it. But if they view the schedule as totally unrealistic, their productivity will fall off significantly, and again the project will be late. It should be noted that excessive management attention, in spite of good intentions, can also have a negative effect on the project team's morale. As long as they perceive the schedule as being within the realm of possibility, however, morale will not be adversely affected.

On the other side of the coin, we have long schedules. Most managers have an ingrained belief in Parkinson's Law, which holds that a task expands to fill the time alloted for it. There are several factors in software development that make this particularly true. Two primary factors are the nature of software testing and a phenomenon called creeping elegance.

Software testing can prove a system doesn't work but cannot prove a system does work. In addition, testing usually takes half a project's development time, although schedules rarely allow for this. Clearly, software testing can go on indefinitely. Since it occurs at the end of the development process and has no good objective ending point, it is difficult for management to determine a cutoff point.

During product development, the development and marketing staffs always accumulate a list of useful features they'd like included in the product. A development team perceiving some schedule slack may start adding additional features to the system to fill available scheduled time. This phenomenon, creeping elegance, is sufficiently subtle as to elude management control. It is accompanied by such phrases as, "I think I can squeeze that in with no schedule slip." In fact, adding features to a stable system is a very dangerous process. Creeping elegance may not only fill the time on a slack schedule but actually cause the schedule to slip.

Too short, too long, or inaccurate schedules can hurt the project. Yet the actual time needed to complete a large project can be determined only after a lengthy and expensive effort. How, then, is the manager to schedule a large project?

First, managers at all levels must recognize that schedules are dynamic tools for getting a project done, not static decrees from above. A preliminary schedule is just that, an initial estimate based on limited information. At each of the major milestones in the development process, more information becomes available that helps refine the schedule. Just as the technical details are being refined while the project progresses, the schedule is refined to show an accurate end date. Upon completion of the product architecture stage, a reliable schedule can be developed for the first time. At each milestone, this schedule is reviewed and, if necessary, revised.

USE BEST MODELS AND DATA

To develop these schedules, the manager needs to use the best existing models and information. Although a large software development project is unique, many empirical models have been developed based on other large projects. (Interested readers should see *Programming Productivity Issues for the '80s*, published by the IEEE in 1982, for some samples of empirical modeling.) In many cases, companies have developed their own empirical models. These have the disadvantage of a smaller statistical base but the advantage of pertaining directly to the organization working on the project.

The willingness to revise schedules calls for a new concept of egoless management, analogous to the popular concept of egoless programming. Egoless programming maintains that programmers must not let ego prevent them from recognizing and correcting their errors. The development organization is structured to encourage this by removing the stigma from the action items that result from design reviews and code walkthroughs. Likewise, managers cannot let their egos prevent them from correcting inaccurate schedules. Although few managers have trouble shortening a schedule, most do not want to acknowledge a schedule slip. Remember: the schedule does not dictate reality. Ignoring the problem won't make it go away. By not correcting a short schedule, the manager may be creating an even greater slip, and is certainly costing the company more money.

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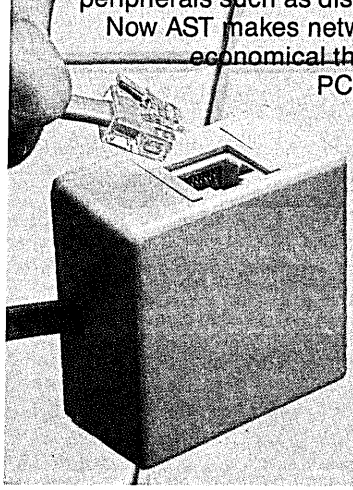

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Management must have the discipline to hold to the agreed upon development methodology.

achieve, but necessary. There is always someone in the management hierarchy who'll claim he could have done the project in half the time. Managers must be mature enough to recognize that such people are making the statement based on virtually no data. They just enjoy hearing themselves talk. As with egoless programming, the organization must remove the stigma of revising schedules. Managers should be encouraged to justify their schedules, find ways to make up for slippages and, when necessary, revise schedules. The company will thereby have the best information available at all times. Organizations that discourage honest schedules will not only pay heavily in development costs, but also in manufacturing, marketing, and sales. Manufacturing orders inventory and tools according to the end date of the development schedule. Marketing arranges ad campaigns and the marketing support organization according to the end date. Sales builds a sales force and makes initial customer contacts by it. When a product is announced shortly before its development collapses, perhaps the greatest loss is to the company's integrity.

Here are three basic rules to remember when scheduling a project:

• Revise schedules only at major milestones. A major pitfall to avoid is reactive scheduling. If schedules are modified at every evidence of a change, they become absolutely meaningless to the development organization that must be committed to them. Tactical schedules for achievement of the next major milestone may have to be adjusted, but the overall schedule should be revised only at the milestone itself. This stability prevents the development organization from becoming disoriented and demoralized.

•Hold to the methodology. Management must have the discipline to hold to the agreed upon development methodology. Large-scale software development efforts have a way of invoking the fight or flee response. Managers must resist the impulse to shortcut the methodology. On large projects, such shortcuts normally lead to major slips late in the effort or complete failure. A strong configuration management department under separate stewardship can prevent such breakdowns. Milestones can be reported complete only when the final documents or baselines are under configuration management control.

•There is alway enough time to schedule a project. Statements such as, "You can't take two weeks to develop a schedule: you have only six months to complete the project," are not valid. They presume an end date even before the first schedule is developed. Such an end date, if premature, can cause a project to fail. The company is much better off finding this out with an accurate scheduling effort than with a full development effort. The preliminary schedule will then allow time for schedule calibration and revision at major milestones. Good scheduling management will consume technical as well as managerial resources, but the resources are well spent. Managers who insist on unrealistic schedules and hold to erroneous end dates only cost their companies more money. ✱

Robert W. DePree is president of Decisionware, a Melbourne, Fla., consulting firm. Previously, he was a system architect with the Harris Corp. and assistant director of the Center for Information Research at the University of Florida, Gainesville.

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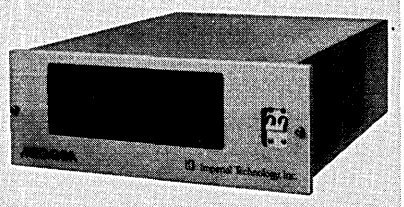

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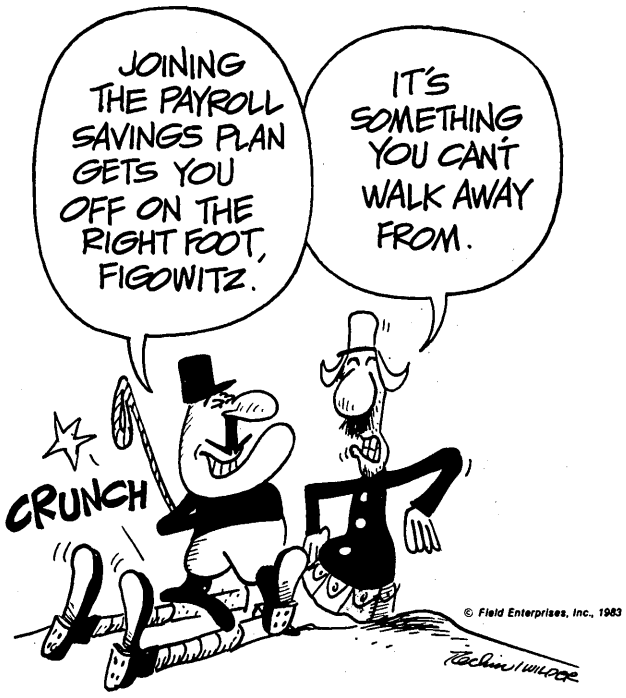

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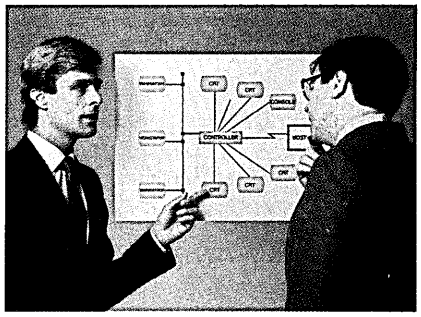

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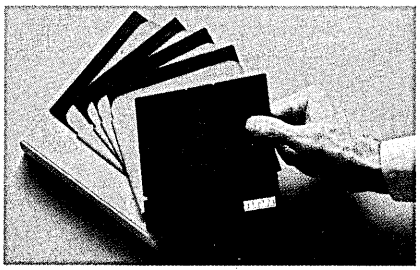

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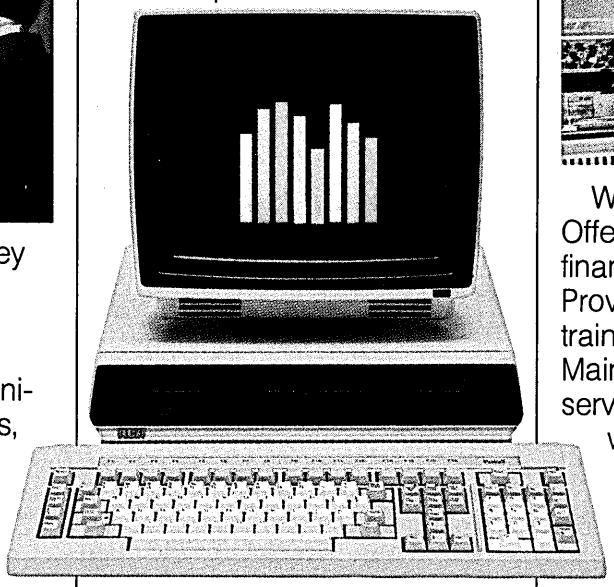

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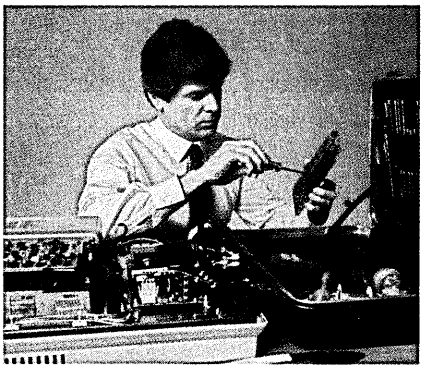

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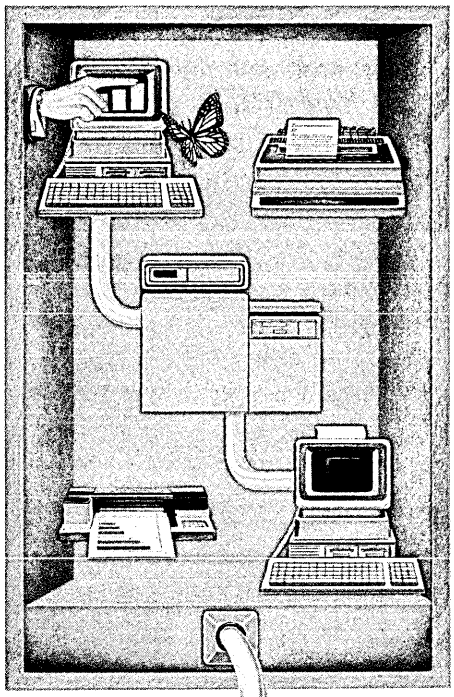

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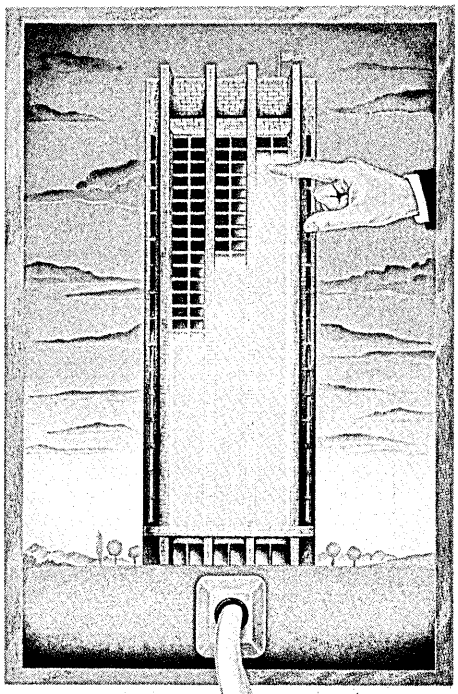

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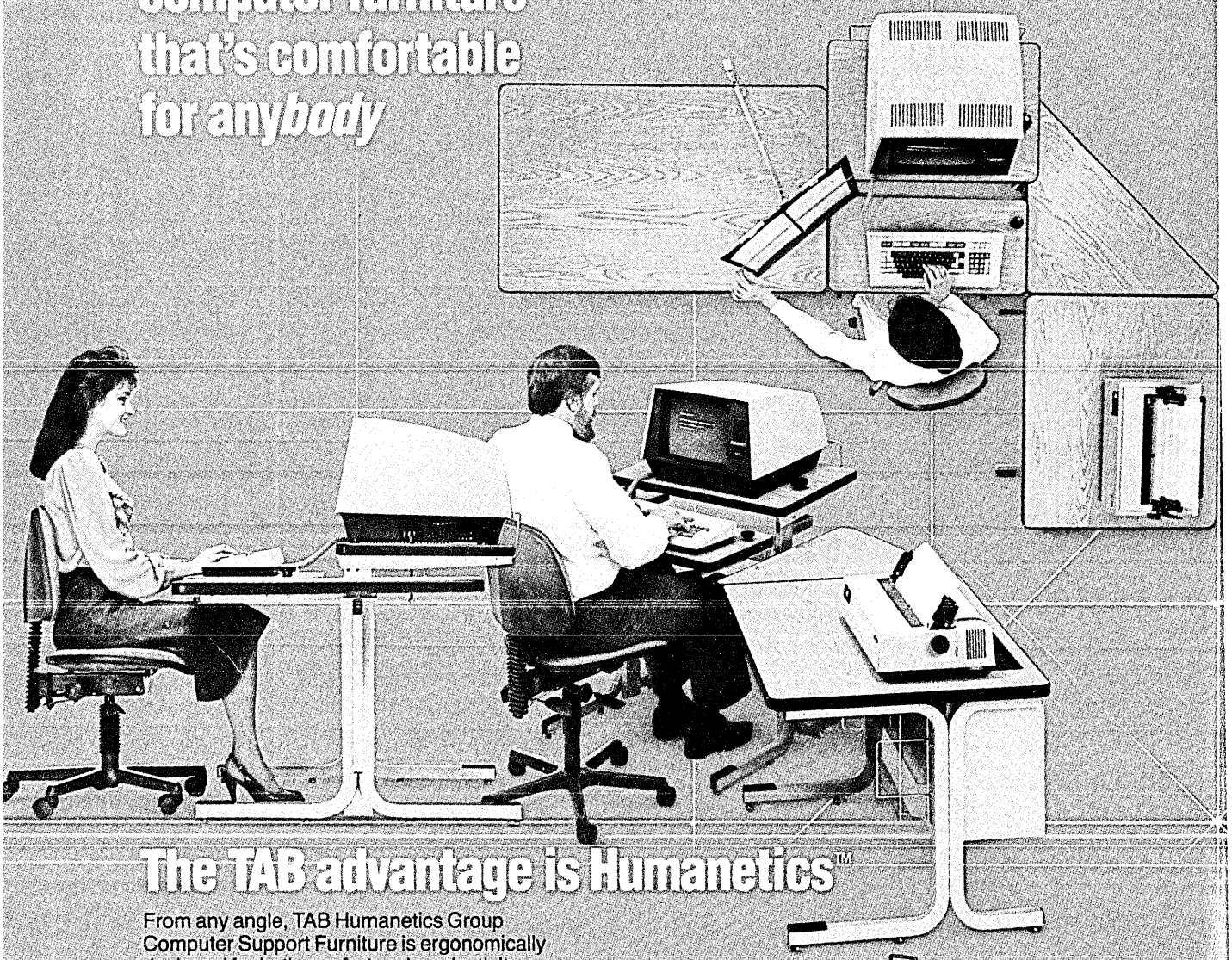

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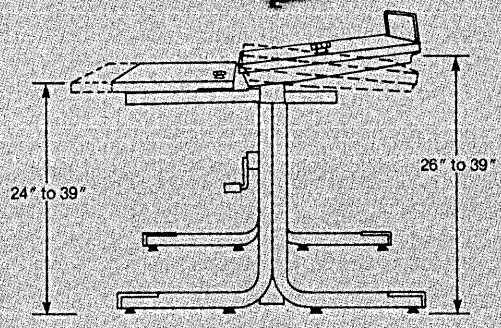

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No compliments, plenty of flak, and the combined talents of a plumber, air conditioning expert, floor designer, and user-coddler.

IN PRAISE OF OPERATIONS MANAGERS

by Shirley F. Prutch

An operations manager is a masochist, a perfectionist, an introvert, an extrovert, a diplomat and a suburban parent; a person who is all things to all people—and all machines.

What does an operations manager do? When the job is done well, the operations manager appears to do nothing. But think about what an operations manager's job is. This person provides on-demand computer cycles. That should be the proverbial piece of cake, but in order to do it well, the operations manager must first provide a place to house Computer.

Computer may demand a top floor condominium, a town house, or a half-timbered Tudor on two acres of land; or it may be content as a vagabond, happy and productive wherever it may be. If Computer is choosy, the operations manager must meet its environmental demands, making sure that it dwells in an appropriate climate. If water is needed, it must be provided at the right temperature: Computer does not want the choice of hot or cold showers; water temperature must be constant. Computer will be twice as choosy about the temperature of the air in which it resides and the power source that gives it the juice to run on.

Flooring must be considered. The cables connecting the various parts of Computer are usually placed *under* the floor. This assumes a raised floor, stressed for the proper weight per square foot, placed high enough from the original floor to handle the cables, and furnished with a floor covering that is pleasing to the eye, easy to care for, and not static-generating.

The operations manager, therefore, becomes a plumber, an air conditioning expert, a floor designer, and an electrician. Power distribution units, circuit breakers, water chillers, etc., all become vital parts of the operations manager's life as well as vocabulary.

Who else in a data processing organization cares when a roof leaks? By definition, if a roof leaks it will leak into the computer room and form puddles on top of the cpu. If a pipe is to break in a building, almost by definition, the pipe will break under the raised floor and spritz into the heart of the cpu. If a bolt of lightening will take down a power line, that power line will inevitably be the one that feeds the cpu. If an oil crisis ensues and oil becomes difficult to come by, that tank which feeds the diesels to provide the computer room's uninterruptable power supply (the one the operations manager has diligently fought for and installed to keep power forever even) will be the tank that runs out first. It will occur in the middle of the above-mentioned thunderstorm.

In most cases, the housing of Computer must be secure. As any operations manager can tell you, security can come in all forms, from a radiation-proof "tank" to a simple lock—cypher or otherwise—on a door. An operations manager must know how secure Computer must be.

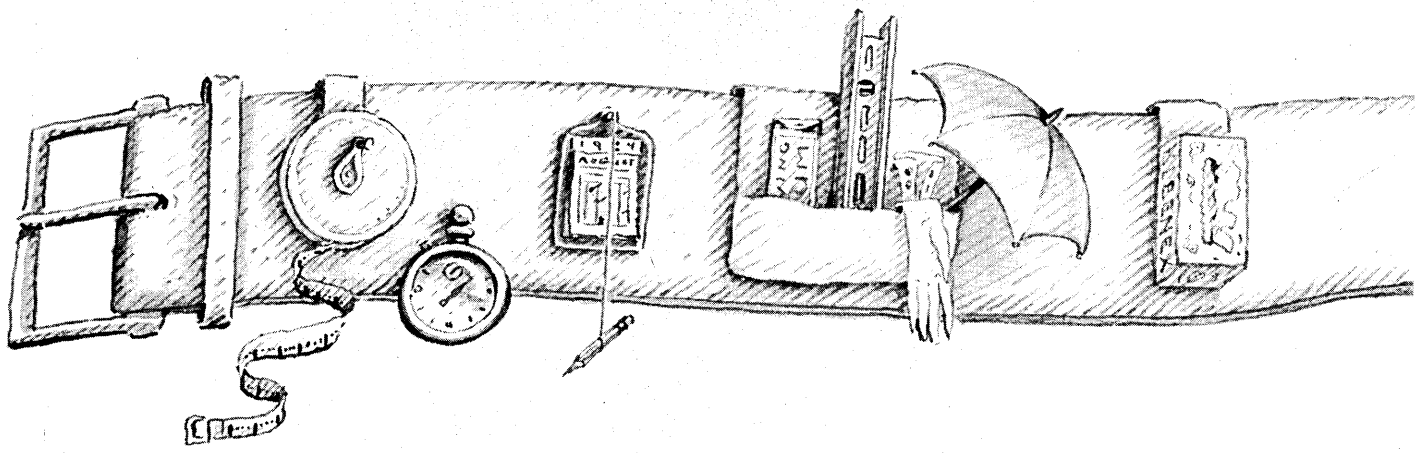
When the housing is established, the operations manager must provide the cpu and all the peripherals to make the cycles available. Designing the layout of Computer (or Computers!) becomes much more chancy than getting the living room furniture right after a spring cleaning. "Distance between boxes" also becomes a critical factor.

Cables with appropriate connectors must be on hand, and hooking up a box becomes a major job, for cable must be strung. In most cases, that means lifting the floor and finding room for the cables underneath.

Don't forget that the floor will be cut at the appropriate mark to get the cable through and that when flooring is replaced, it must be level. To make Computer comfortable in the area, the operations manager must schedule installers from various vendors. They, in turn, must install and test everything before the operations manager agrees to pay for the hardware.

Nothing to it! Except that every vendor wants first shift Monday to Friday, and when they've finished, invariably they feel

ILLUSTRATION BY BACHRUN LUMELE



Who else can take the abuse when things are not perfect?

they are 100% correct. The operations manager now becomes the keeper of the clock, scheduler of who installs what and when and of who checks whom and when. Then the operations manager becomes the person who either accepts what has been accomplished or gets everyone back together to fix the problem when the system is rejected. At this point the operations manager becomes Henry Kissinger: in these meetings fingers point everywhere but at the person pointing and diplomacy is all. "Not my job" and "not my fault" are phrases the operations manager hears constantly.

Once a system is accepted, the operations manager is still not finished: the operating system that gives cycles to the user must yet be installed. Operations managers once again find themselves back in the same boat as when installing the machine, scheduling various groups of people and ensuring that "parts play together." And, now the operations manager must provide the people to operate the equipment.

COMPUTER RUNS ITSELF

According to the budget, the operations manager always has too many people. After all, Computer runs itself. How many people are truly needed to run Computer? How many people are needed to mount tapes? (Tapes are definitely close to obsolescence; ask any technician. But then, ask the operations manager who runs a vintage-1970, heavily modified payroll system that uses 12 tapes once each week.) The people who run Computer must be trained. They must also have career paths, they must be given performance appraisals: and most of all, they need to feel wanted. Whose job is that? The operations manager's, of course.

Once the operations manager has a computer room with Computer installed, a system running, and a staff ready to run it, all that remains to be done is to tell User to "come and get it."

As easy as "notifying User" sounds, it is yet one more job for the operations manager because the customer is *always* right. The operations manager can't just clang the cymbal and expect User to know "dinner is ready." Instead, the operations manager *notifies* User.

Caring for User provides all the same challenges as coddling Computer does. At this stage, it is the people who need the tender loving care. But there is a difference, for now the operations manager must ensure that the customer-interface function can deal effectively with User. To deal effectively with User, the operations manager must have User-friendly people. They must be people who can answer User's questions and solve problems—always in a friendly manner. The operations manager must also be sure that the customer-interface people can react appropriately when the day on which the cycles are not available arrives.

The day the cycles are not available is always the day that the chief executive officer needs to use the system or see a demonstration. They will not be available. Unavailability of cycles occurs for a number of reasons, all of which are the responsibility of the operations manager. One invariable reason for this unavailability is that the operations manager has accepted the challenge of introducing a new service.

It must be remembered that an operations manager must always be in touch not only with the perceived needs of User, but also with User's real needs. For example, it is the operations manager who must decide that a system such as RAMIS II English needs to be added to give User the freedom to ask questions in everyday English.

Simple, simple solution.

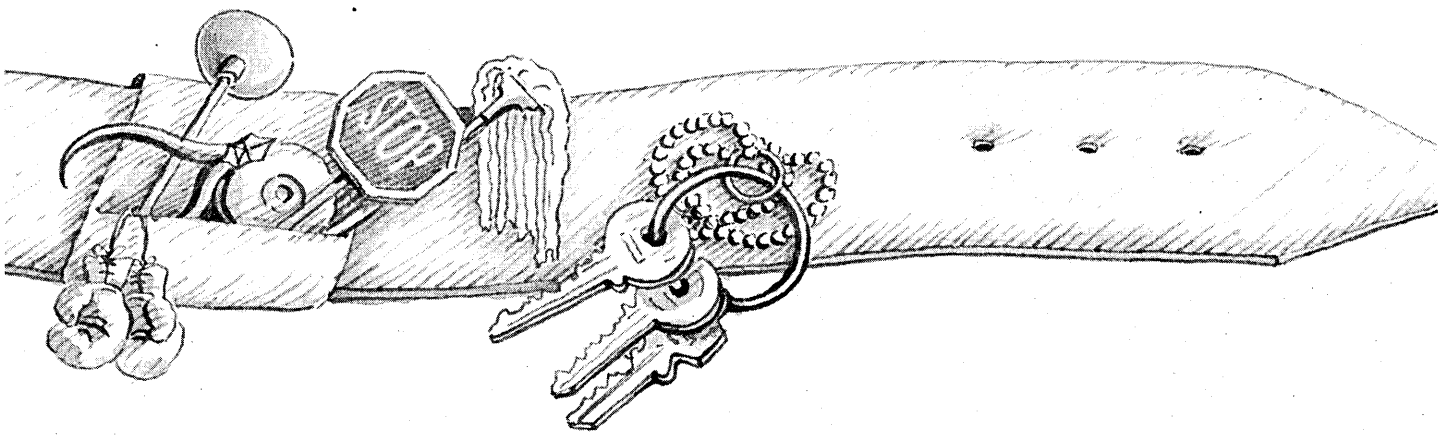
In such a case, the operations manager again goes back to ground zero and starts scheduling the addition to the operating system. Then testing time must be scheduled as must acceptance of the system. After this, the operations manager schedules training for the customer service people and makes sure that User is notified of the new capability as well as about the training that is available. (True, the operations manager may not be responsible for User's training, but good operations managers are always aware that the training is done, for operations managers worth their salt know that if they are to succeed, *nothing* is not their job. Indeed, though they may not be responsible, they are always accountable.)

An operations manager never takes new things for granted. When any new service is introduced, the operations manager has always fought against the reason for the installation. To take things for granted may put the operations manager back behind the "8 ball." Why? A simple fact called dollars. The operations manager must never forget that the basic job is to provide the exact number of cycles at the lowest cost. Here the operations manager becomes the balancer: not too many cycles and—definitely—not too few. A balancer between enough redundancy for continued service but not too much to raise the cost.

Though leading edge technology must be employed for better, cheaper cycles, it must not be so leading edge that it always is down or in an "I'm fixing mode."

Vaccination against a salesperson's line is a must for operations managers. Each salesperson has the best; has something to make everything the best; and definitely has the best solution to every one of the operations manager's worst problems. The operations manager, however, must decide which solution is real, which solution will be effective, and which is needed.

So back to why an operations manager deserves praise. Operations managers deserve praise for the same reason that heads of families deserve praise. There is a Moth-



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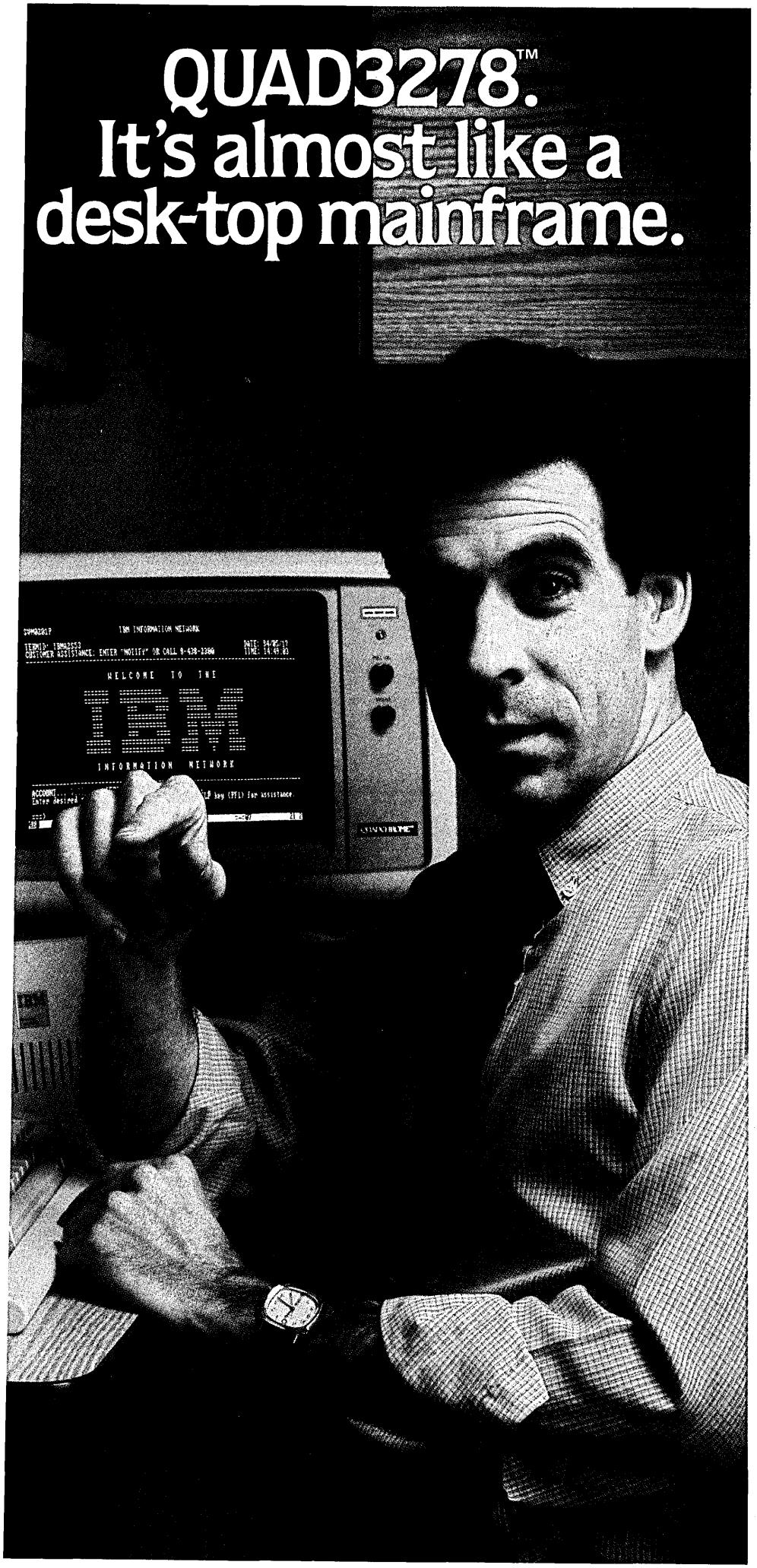

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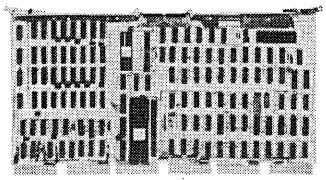

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er's Day and there is a Father's Day; there is a Grandparent's Day and there is even a Children's Day.

There should be an Operations Manager's Day.

KEEPING ALL PARTS TOGETHER

An operations manager, like the head of a family, keeps all parts together. The head of a family receives no praise when family members can, say, find food in the refrigerator and always have clean clothes in the closet. A head of a household receives no praise when each and every member of the family feels special and when each member of the family knows that he or she is loved the most. The head of a household receives no praise when the budget is balanced.

The head of a household does, however, get flack when some members of the family feel they cannot buy what they want or when a check bounces. A head of a family gets flack when there are not enough cars to go around, or not enough time to provide ferry service throughout a quarter of the state.

Think about it. Indeed, an operations manager is head of a family.

The family head takes each and every member of the family and works to make sure that they receive training, that they know their manners, and that they grow into responsible adults. When a head of a family accomplishes this role, no praise is given: they are only doing their jobs. By these definitions, an operations manager indeed fills the bill.

Who else can take all the abuse when things are not perfect. And when operations managers do their job to perfection, no one even notices.

In praise of operations managers? You bet. We should never forget that they provide the basis for our profession. User never knows they are there, just as User should never know where their computational power is. A programmer, a database manager, a systems designer, none of these people should know. But should they praise the operations managers? Indeed they should. The praises should be shouted from the rooftop of every installation that has a computer, no matter how large or small, nor how many. An operations manager's job is large no matter what.

In praise of operations managers? Yes, praise them and love them. In my job at Martin Marietta Data Systems, they keep me straight with my users. Or if praise is too difficult, at least say "thank you" on one of the many days when you receive excellent service. *

Shirley F. Prutch is vice president and general manager of Martin Marietta Data Systems, Martin Marietta Corp., with primary responsibility for the Martin Marietta Accounts Division. In this role, she is responsible for direction and execution of all data processing within the Martin Marietta Companies.

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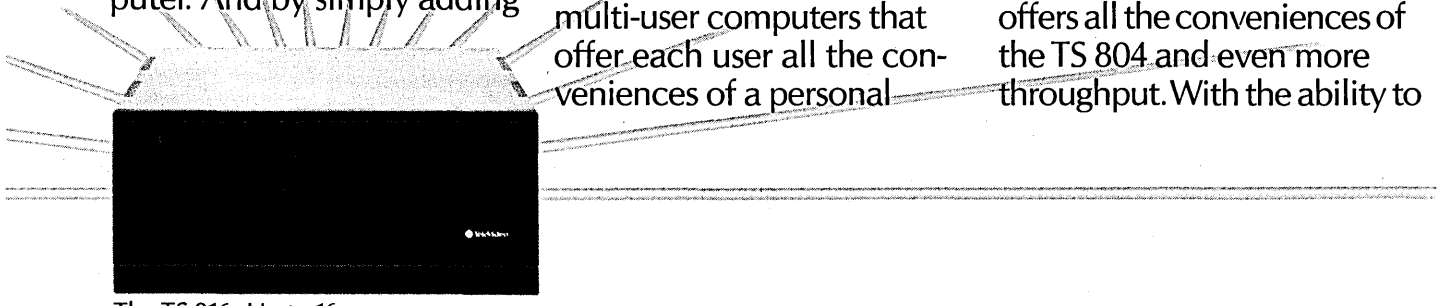

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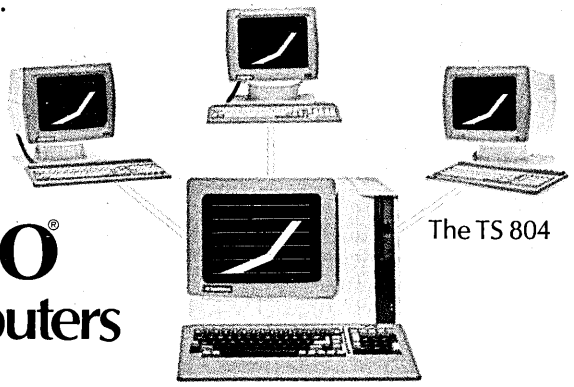

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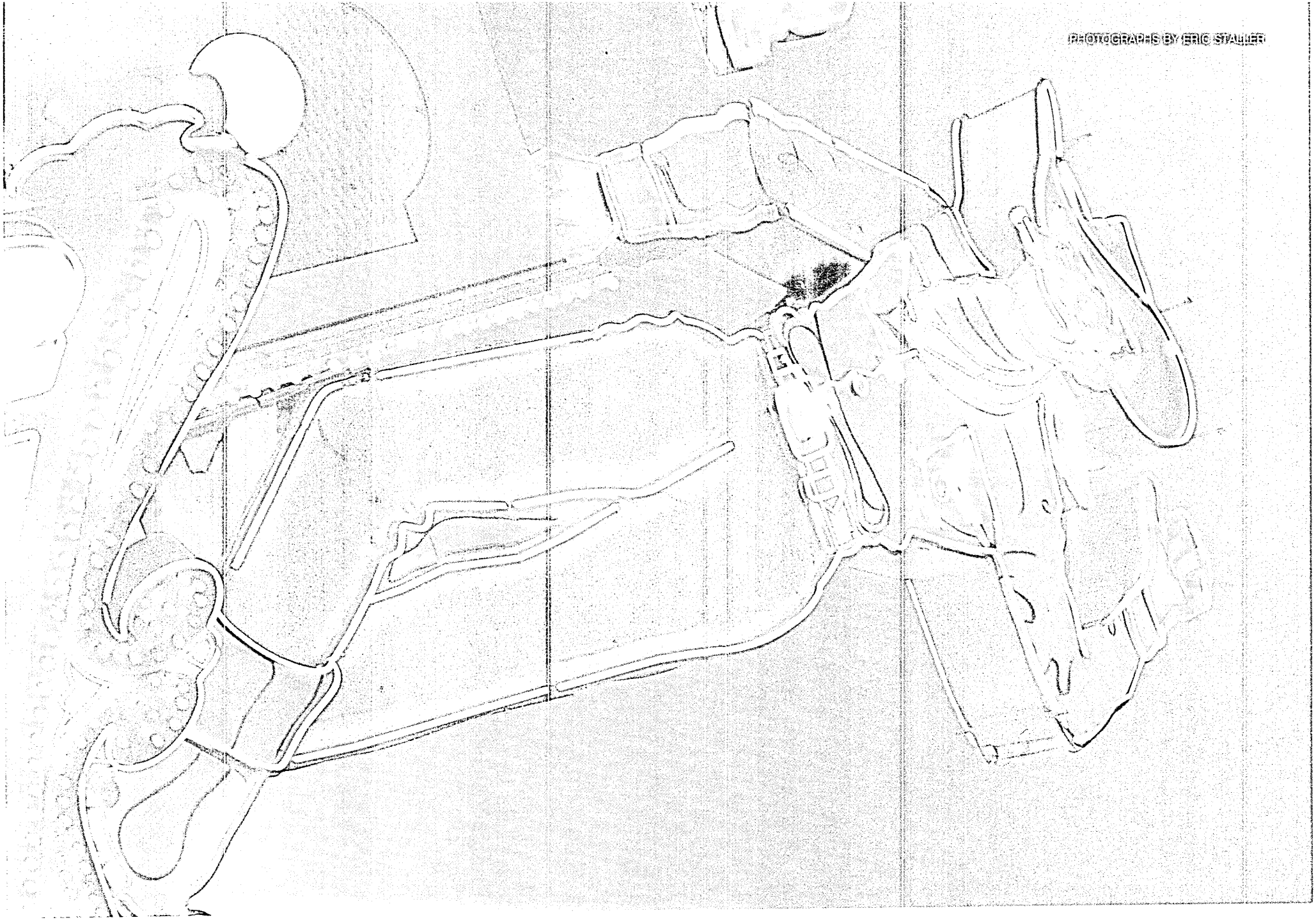

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NCC '84: THE VENUE IS VEGAS

In Contemplation of a Journey to the City of Lost Wages

Buckle your belt, put your seat back up;
Prepare to begin your descent.
Banish all thought of a minor crack-up
And silence your stomach's dissent.
That brilliant stain on the desert floor
Is the site of NCC 84.
You've been nine times, but you're back for more;
Next month you'll be happy you went.

Ride on a ramp past the airport slots—
Don't think about what they portend.
Don't let Charo's voice tie your brain up in knots—
You haven't a fortune to spend.
Remember the words of your stay-at-home spouse:
The gambling advantage resides with the house.
The celebrity welcome's a species of chouse;
It's a conference you've come to attend.

Check into Caesar's, the Circus, or Sands,
And life you right up to your room.
(That fat Elvis mimic who sings with the band
in the lobby can't carry a tune.)
Get out your program and plot out your stay:
Which vendors to visit and try to assay
Which sessions appear just a bit recherche
And which look a little jejune.

Next morning, well rested, head out in the heat
And follow the herd to the conference.
(You wisely wear comfortable shoes on your feet;
they really can make quite a difference.)
Then behold! Vast and Wondrous! The great NCC!
Part circus, part riot, and part jamboree!
There are thousands of pamphlets available free,
And salesmen who tend to grandiloquence.

Trudge roomward that evening across a great floor,
The province of septuagenarians
Who gamble at slots 'til their shoulders are sore,
And goggle at natty Rotarians.
Later, at Bally's, a show and cuisine:
Strange, feathered women and sole almondine.
Your colleagues all hoot but you've started to dream
Of disk drives and modems and screens that are green
And spreadsheets and mixes and booths and brochures
And a networking scheme that has lost its allures
And tomorrow's only Tuesday.

NCC PROGRAM PREVIEW:

BEST BETS

WORKING WITH WORKSTATIONS

There's been much talk about what management workstations can and should do. That talk continues as Evelyn Wilk, a senior manager at Arthur Andersen in Chicago, kicks off her Tuesday morning session on management workstations and integrated information systems. The eye-opening session, scheduled to run from 8:30 a.m. to 9:50 a.m., will take a look at workstation wares that help managers analyze, structure, and present information.

Managers have more work these days and are demanding more from their workstation tools. Should these support systems have voice and image capabilities? And how can these new tools of the trade be integrated into a company's existing information structure? These questions will be addressed by three companies that answered them in real life. Representatives from new startups SYdis, SBDL Inc., and Metaphor will reveal how they've gotten their workstations to work for them.

THE 32-BIT CHIP DISSECTED

The 32-bit microprocessor has arrived, and with its arrival come new architectural and applications questions. Three Tuesday sessions analyze the products and processing that are being spawned by this technology. A 10:30 a.m. session led by National Semiconductor's Richard Mateosian explains the 32-bit architectures developed by Hewlett-Packard, AT&T Technologies (Western Electric), National Semi, Zilog, and Motorola.

While HP's and AT&T's new microprocessors are not commercially available, the three semi suppliers' 32-bit chip sets are slated to hit the open market this year. The P754 Draft 10.0 standard that has been backed by all three vendors will be scrutinized at a session chaired by J.R. Jump of Rice University. The three different hardware/software approaches to implementing this standard will be discussed in detail by each manufacturer at this 10:20 a.m. session.

Later that day, another session, headed by ITOM International president Omri Serlin, will examine some of the new multiprocessor architectures to which the 32-bit chip has given birth. These architectures are being commercially applied at both ends of the computing spectrum—in multi-user transaction processing systems and in personal office and engineering workstations. A Q&A period will be included at the end of this session, which runs from 1:30 p.m. to 2:50 p.m.

SUPERCOMPUTER WORLD

There are currently more than 100 supercomputers crunching data around the world—wares that are worth close to $1 billion. A Wednesday morning session headed by the National Bureau of Standards' John Riganati will summarize the latest state of the supercomputer art. Issues such as components, architectures and applications, packaging and cooling, performance, peripherals, and upward compatibility will be probed at the 8:30 a.m. to 9:50 a.m. panel.

If you're still supercurious about supercomputers, you can stroll over to another session scheduled to start at 10:20 a.m. Franklin Kuo of SRI International will lead a panel discussion designed as a follow-up to last year's fifth generation session. Panel participants will present an update on the various worldwide R&D efforts in the fifth generation realm of supercomputers.

UP CLOSE & PERSONAL

No one in the industry has been closer to the personal computer phenomenon than Portia Issacson. A phenomenon in her own right, Issacson has watched the pcs she's plugged go from nowhere to everywhere. It's therefore no surprise to see the industry's foremost pc prognosticator turn up at this year's NCC presiding over a panel of consultants who will attempt to forecast the future.

Those predictions will be heard at the 3 p.m. Monday session, which promises to be a lively hour and a half. Topics will include professional workstations, portable computers, and startup opportunities in such areas as computer retailing—a field Issacson should know something about, since she was the proprietor of her own profitable pc stores.

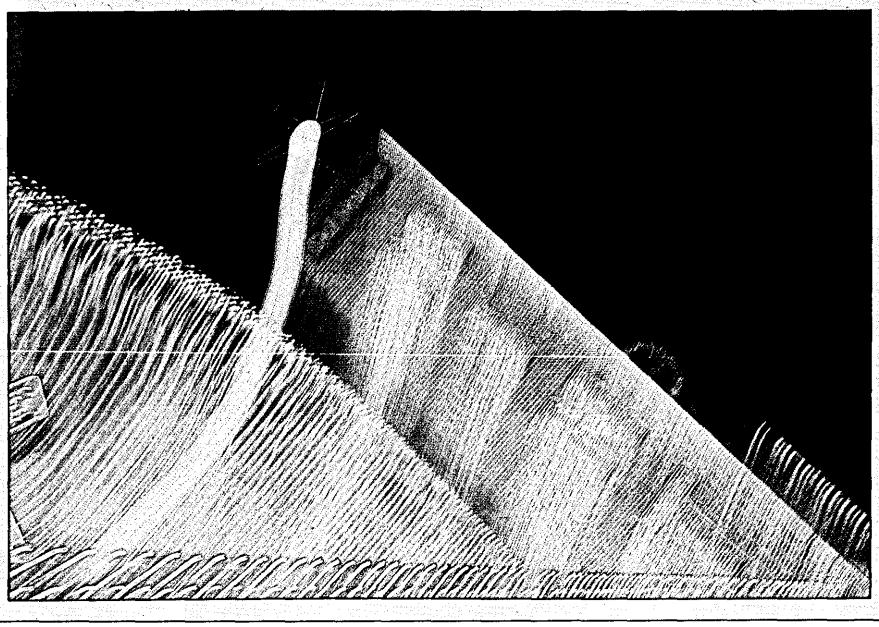
A more user-oriented approach will be featured in a Tuesday afternoon session chaired by *Personal Computing*'s Robert Lydon. This session, scheduled for 3:20 p.m. to 4:40 p.m., focuses on the user interface that is making personal computing easier to learn and use. What could make pcs even more of a pleasure to use are advances in such technologies as voice recognition and synthesis. These subjects and other non-keyboard interfaces are the topics that will be discussed by a group of industry followers.

GETTING GRAPHIC

For users everywhere, getting the picture is indeed the problem. The proliferation of graphics packages and products has given users software as well as hardware headaches. Every month at least five new graphics software packages for the IBM PC appear on the market. Also every month, at least 10 new graphics displays and hardcopy systems are announced. It's no wonder that users are in a quandary over which ware to turn to. Some graphics guidance is in store for NCCers who sit in on a Tuesday session hosted by Alan Paller of AUI Data Graphics in Washington, D.C. The graphics guru will give a rundown of the 20 major trends in graphics hardware, software, and applications at the 10:20 a.m. session.

A more practical point of view will be presented in a 1:15 p.m. panel on Monday moderated by Monsanto's Dave Ackmann. Panelists from three companies will describe how business graphics became popular within their organizations. They will cover such topics as hardware/software selection, training and support, data access, and the integration of graphics into existing systems.

Still another side of the graphics



picture emerges in a Thursday morning session that focuses on standards. The 8:30 a.m. session, which will be led by Tom Wright of ISSCO Graphics in San Diego, will provide an overview of the key graphics standards.

SOFTWARE ENGINEERING & ENGINEERING SOFTWARE

You wouldn't be taking a gamble if you bet that most dp managers would pay plenty to cut software development costs. Those dp managers hankering to do just that better leave the Las Vegas gaming tables and mosey on over to a Wednesday afternoon session on software engineering techniques. Headed by Hughes Aircraft's Ron Willis, the 3:20 p.m. session will examine software engineering techniques that are aimed at reducing program development costs. One paper will discuss reusable software, and another will detail an effective video game prototyping environment that's based on a high-level, interactive language.

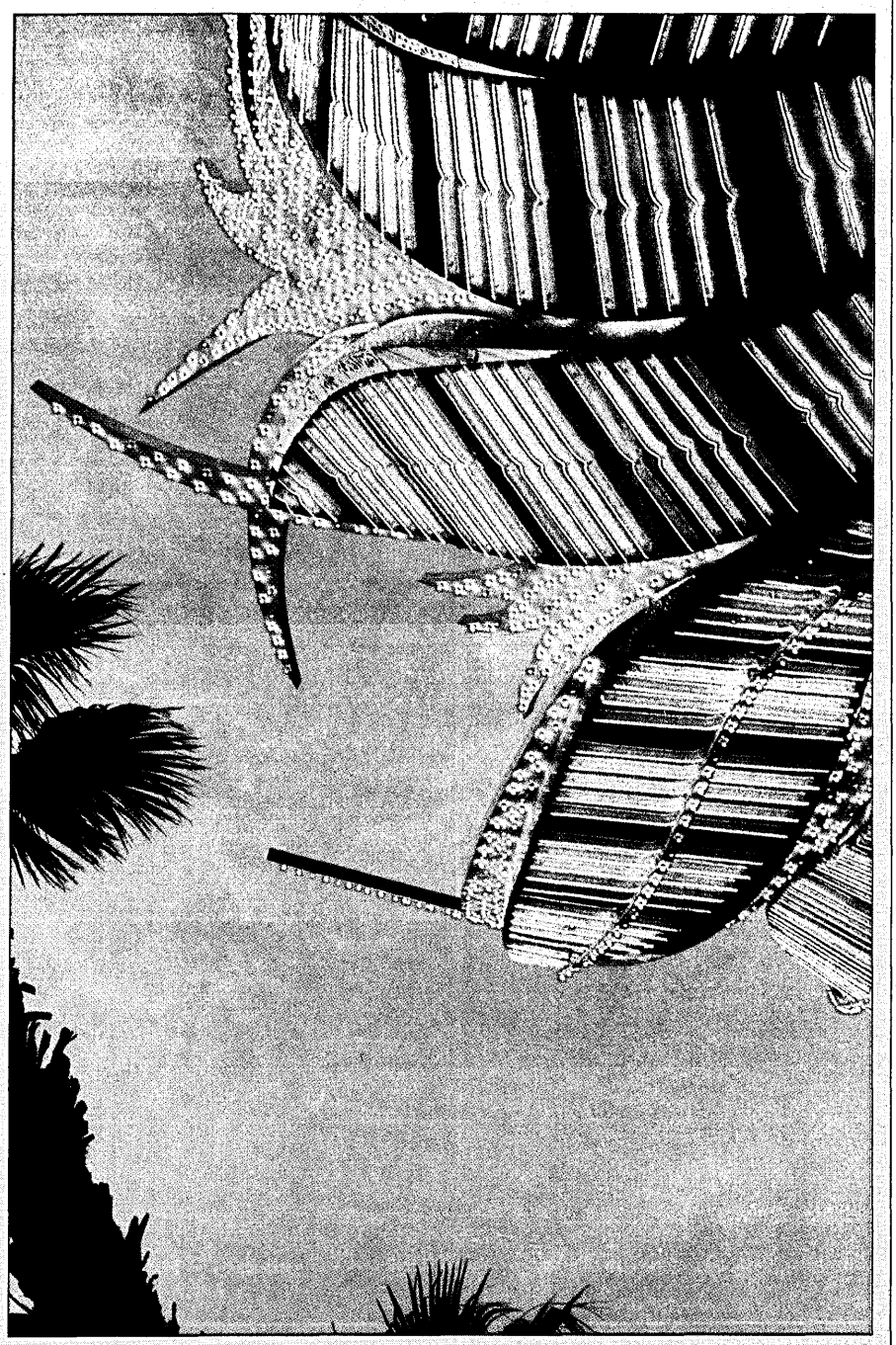
Doing some reverse engineering without mirrors, we come to the subject of engineering software. Maria Penedo of TRW in Redondo Beach, Calif., will head a session, scheduled for 8:30 a.m. Wednesday, on software engineering workstations. Included in the discussion will be explanations of the FlowGuide workstation that helps in the writing and maintenance of programming projects, and Plexsys, the PSL/PSA enhancement that creates a workbench environment for information system design.

ARTIFICIALLY INTELLIGENT

Are experts artificially intelligent? Practically speaking, yes. Just ask Dr. Peter Friedland of Stanford University's Computer Science Department, who chairs a Wednesday morning session on the practical expert systems that have emerged from the growing field of applied artificial intelligence.

Early risers who attend this 8:30 a.m. get-together will hear design details from system builders and inside tips from users who have come to know and rely on expert systems.

Are teachers artificially intelligent? One jaded student recently complained that "my teachers don't have any brains—artificial or otherwise." Maybe not, but systems do—or will, once AI researchers learn how to develop computers tailored for individual instruction. To achieve that goal, a program must be both expert in teaching as well as in the subject matter. It must understand a student's particular conceptions and misconceptions and it must also be able to generate and solve content problems. A session Monday at 1:15 p.m., led by Yale University professor Elliot Soloway, delves into knowledge-based training systems that seek to meet these individual instruction requirements.



OFFICE OVERVIEW

For many people, automation begins and ends in the office. Those beginnings and endings—happy and otherwise—will be discussed in detail at several NCC powwows. One of those meetings, hosted by OA specialist Patricia Seybold, will examine design and functionality in today's office systems. Targeted for Tuesday at 10:20 a.m., the session will explain how vendors are integrating the delivery of various applications systems onto a single terminal that has communications capabilities and a common user interface to most office applications.

This integration cry has also been sounded by users who are looking for ways to create office information systems that merge microcomputers, word processors, mainframes, peripherals, local networks, and comm gateways. Several vendors, led by Sperry's Janet Millenson, will describe their integration solutions in a session set for Tuesday at 1:30 p.m.

While office-of-the-future technologists may be striving for the paperless office, they certainly have no desire to create the voiceless office. In fact, voice, which is the most commonly used medium for communication in offices, will be a big factor in the future. Turn up on Tuesday at 3:20 p.m. and you'll be able to listen to session leader Howard Morgan of Advanced Office Concepts spell out the advantages of voice messaging, voice synthesis, and voice recognition.

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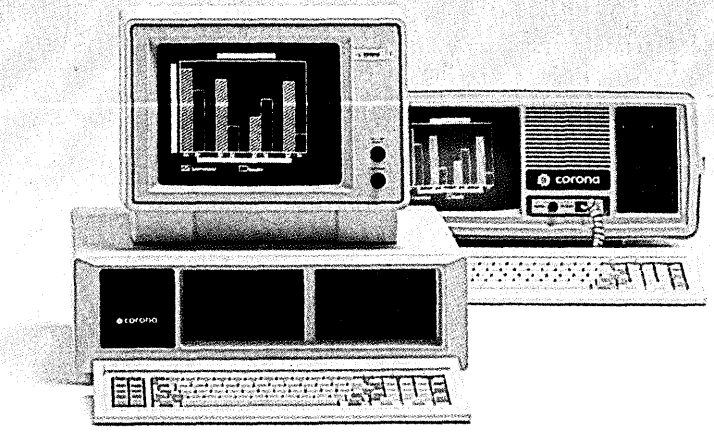

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How to answer the question, "What is this project really worth to our firm?"

SYNCHRONIZING SYSTEMS WITH BUSINESS VALUES

by David G. Robinson

The experience is becoming frustratingly common. Senior management identifies an opportunity to use information systems for strategic advantage—a chance to analyze and target fragmented markets, lock in customer relationships, bring about a significant reduction in operating expense, or deliver new products and services. A project team is formed; expectations are high, and valuable managers commit lots of time to the system development task.

Several years later, deep disenchantment has set in. The complexity of the effort, both in business and technical terms, has risen markedly, as has its cost. No one is certain when results will be achieved, although a stripped down version of the system is being pursued on a crash basis. Meanwhile, senior management wonders what happened to the original, seemingly simple idea and worries that the opportunity has been lost.

Traditional solutions to these problems have had a technical bias: "The problem is in the way projects are managed—therefore, a more structured approach is needed." "Traditional system development is too slow—we need productivity aids." "The technical risk is too high—better risk measurement tools are needed." While these and similar remedies are sometimes helpful, they do not deal with the fundamental issue: the *business value* of the proposed system.

In fact, once a systems effort is begun, the original focus on business value is frequently lost. New needs arise from every quarter. There are discussions about the integration of data with the technical architecture. New technologies are explored. But the basic question, "What is all this really worth to the business?" goes unasked, except maybe at low levels of management.

The sad fact is that the concepts used by most companies to understand the value of information systems are seriously outmoded, and make it difficult to allocate these resources across the business. Consequently, companies are making decisions about systems without a clear sense of their business context and, in many cases, the decisions are wrong.

Managers have traditionally evaluated their information systems activities with some form of return-on-investment (ROI) measure. ROI has been popular because it matches the capital investment evaluation framework—one with which managers in industrial companies are comfortable. (In financial institutions, which do not spend as much of their management energy rationing capital, a formal use of ROI measures for information systems has been less prevalent.) Further, ROI enables senior management to avoid the effort it takes to understand information systems projects.

JUST A NUMBERS GAME

Too often, though, the ROI justification becomes a numbers game between submitting and approving management. In a recent case, the director of manufacturing in a medium-sized company saw a new material requirements planning system as a vehicle to introduce badly needed discipline into his organization. His company's culture, however, required him to present the project in quantifiable, ROI terms. Accordingly, he theorized an inventory reduction of five %, which yielded an attractive ROI for his project. What followed was a long dialog between the manufacturing director and his senior management on whether or not the inventory reductions were really available. The project finally moved forward, but it had been approved by senior management for reasons very different from those of the manufacturing director.

Over the past two years, in over a dozen companies, my colleagues and I have used a broader, more effective set of approaches for understanding the business value of information systems.

The management style and direction of most business units typically reflects a tension between market and control orientations. Businesses with a primary growth objective tend to focus heavily on the marketplace and their position in it. As markets mature and competitive activities prove less effective, a control orientation to ensure that costs stay in line and the business remains profitable takes over. These two orientations play against one another: businesses find it extremely difficult to grow quickly while maintaining tight controls.

The significance of this for dp management is that different businesses value information systems differently. As shown in Fig. 1, market-oriented businesses favor actions that affect their market position. These typically fall into two categories: those that provide competitive advantages, and those that bring the business to parity with its competitors.

Gaining competitive advantage. This is the most important objective a business can achieve with an information system. Financial institutions have come to see information systems activities as extensions of their products and services and, therefore, think of systems in competitive terms.

So, too, do other business sectors. In the late 1960s and early 1970s, new, automated order-entry systems provided some companies a clear competitive service advantage. Freight and vehicle tracking systems have played a similar role in the transportation industry. The automation of engineering and technical functions today offer an opportunity to shorten product development time, or to lever scarce proprietary technical resources and facilitate growth.

Achieving parity. The earliest examples here also come from the financial services sector. Five years ago, it was not unusual for one major bank in a regional market to be the sole provider of ATM services; today, in major markets, it is common to see several competitors.

The use of airline reservation systems as marketing tools has prompted competitive responses, too. Many airlines have introduced bonus programs for frequent travelers,

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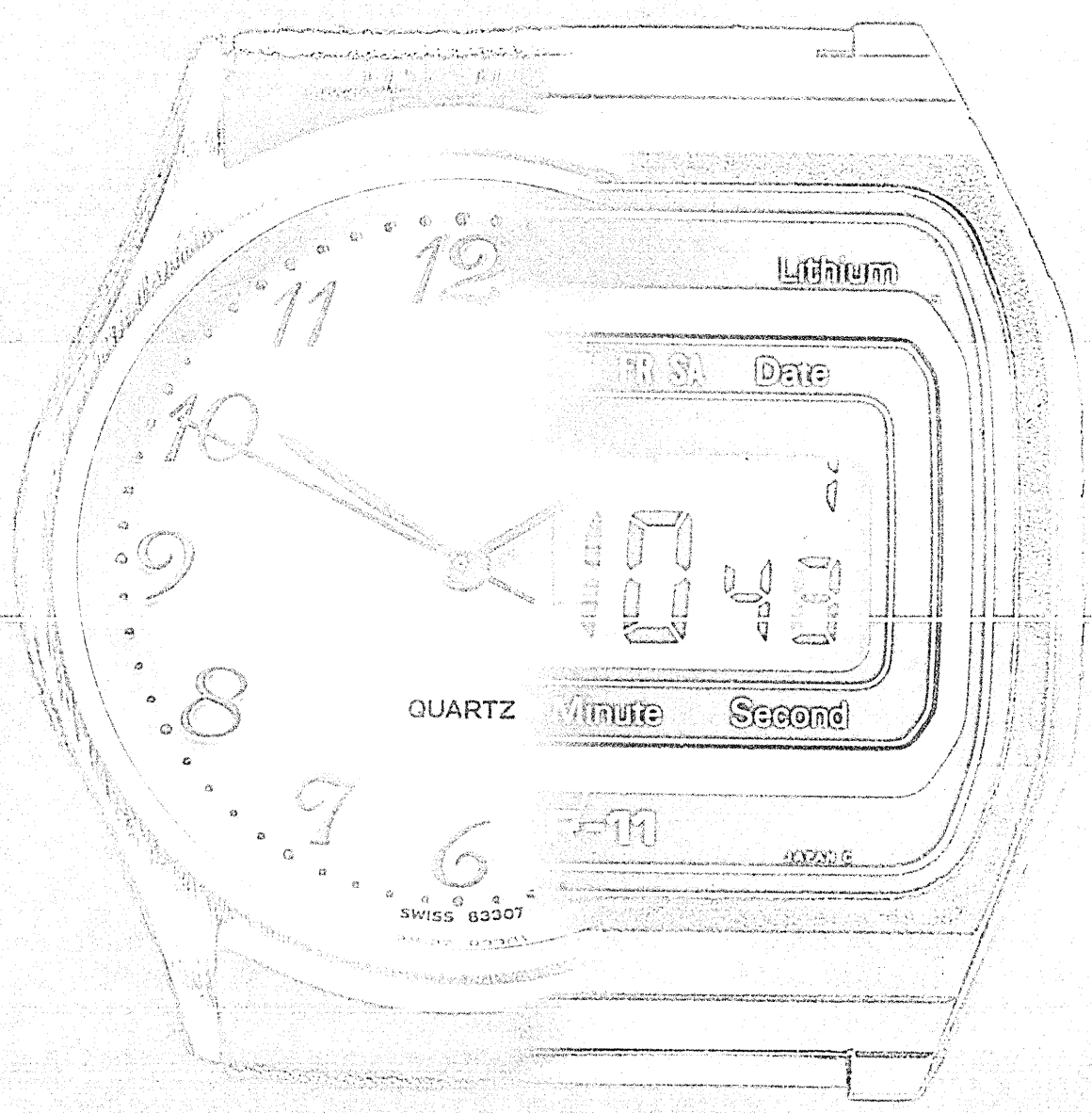
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By examining the business change first, technology can be understood more clearly.

and these programs require automated support. The absence of an information systems capability is viewed here as a competitive disadvantage, so a company must pursue the new capability simply to stay even.

Competitive advantage and parity are most important to a management that is market-oriented and thinks in such terms when evaluating strategic business programs. In such cases, these dimensions will generally be much more useful as strategic planning tools than ROI calculations. In businesses with an operational focus, traditional justification approaches are more appropriate. Fig. 1 shows two basic subcategories of information systems value for operationally focused companies:

Measurable cost savings. The ROI is useful and appropriate in situations where improved operational efficiency is a major business objective.

Intangible benefits. Though these have acquired a bad name in management circles, and some companies have attempted to eliminate them as justifications for new information systems, they remain in fairly wide use. Opportunities that cannot be crisply quantified tend to be relegated to the "intangibles" category for lack of any better way to describe them.

FIG. 1

THE STRATEGIC ORIENTATION OF THE BUSINESS DETERMINES SYSTEMS INVESTMENT PRIORITIES

	AUTOMATION BENEFIT	BUSINESS ORIENTATION GROWTH	BALANCED	CONTROL
Improve market position	• Gain meaningful competitive advantage	1	2	5
	• Achieve competitive parity	2	3	4
Improve business operations	• Measurable cost savings	3	3	3
	• Intangible benefits	4	5	5
Nondiscretionary	• Necessity	3	3	3
	• Replacement	3	3	3

Priorities shift due to: • Market attractiveness
• Profit potential
• Market position

1 = Most important
5 = Least important

BENEFITS MAY BE MASKED

There are, however, intangible benefits that may be quite meaningful to certain companies, but that may be masked by ROI justification methods. In an example from a leading insurance company, investment managers view automated management tools as an important means of attracting management talent. Another example comes from the technical director of a manufacturing company, who recently expressed his concern about the sloppiness of company recordkeeping procedures. While there are no immediate, tangible benefits from improving them, he believes the company would now find it difficult to defend against a serious product liability claim.

There are two other frequent motivations for investing in new information systems. Both of them have to do with systems that are nondiscretionary, that is, they do not add incremental business value, but must receive a share of the overall information services investment.

Replacement systems. A significant number of applications programs developed in the late 1960s and early 1970s are nearing the end of their useful lives. Few companies have come to grips with the need for replacements, which cannot be avoided and will compete with new systems for funds.

In one major industrial company, the companywide replacement cost of the applications software base is estimated conservatively at over a quarter of a billion dollars. Information systems management believes that at least half of these systems must be replaced over the next five years, and is deeply concerned about balancing replacement requirements with new applications.

Necessity systems. Continuing regulatory changes require companies to alter their information systems, with little or no added business value. Other kinds of changes may also require an investment that yields no value. For example, a division might be required to make major financial systems modifications in order to meet corporate reporting requirements.

Fig. 1 brings business thrust (growth vs. control) together with six dimensions of value to provide a value analysis framework for understanding the appropriateness of information systems investments in a strategic business context. A growth business, with its heavy orientation toward the marketplace, will place the highest value on systems that can positively affect that position. Control businesses, by contrast, favor systems that provide operational benefits or operate to defend market position. As the type of value deviates from the basic thrust of the business, the proposed system becomes less attractive. This is a feasibility issue as well as one of strategic alignment; a control business has a management culture that is less likely to succeed with market-focused systems.

The value analysis framework can be used in two ways—to set priorities among individual systems projects when resources are shared, and to manage the overall distribution of information systems spending. The framework helps to clarify the kinds of systems on which businesses should be focusing their energies. An insurance company looking for new sources of growth should focus on systems that affect its market position, most likely in the new product area.

Conversely, senior management in a high-control business, such as a depressed producer of industrial commodities, would find systems with quantified cost savings most attractive and should, thus, be more wary of proposals that seek to improve market position.

In diversified companies with multiple business segments, information system resources are still frequently centralized above the segment level. Managers in these companies can use the value analysis framework to understand how they should allocate resources.

INSURANCE A CLASSIC CASE

The life insurance industry presents a classic case. The relatively mature whole life business competes for resources with growth businesses such as universal life or group insurance products. The whole life business, with its large installed systems base, is often the most

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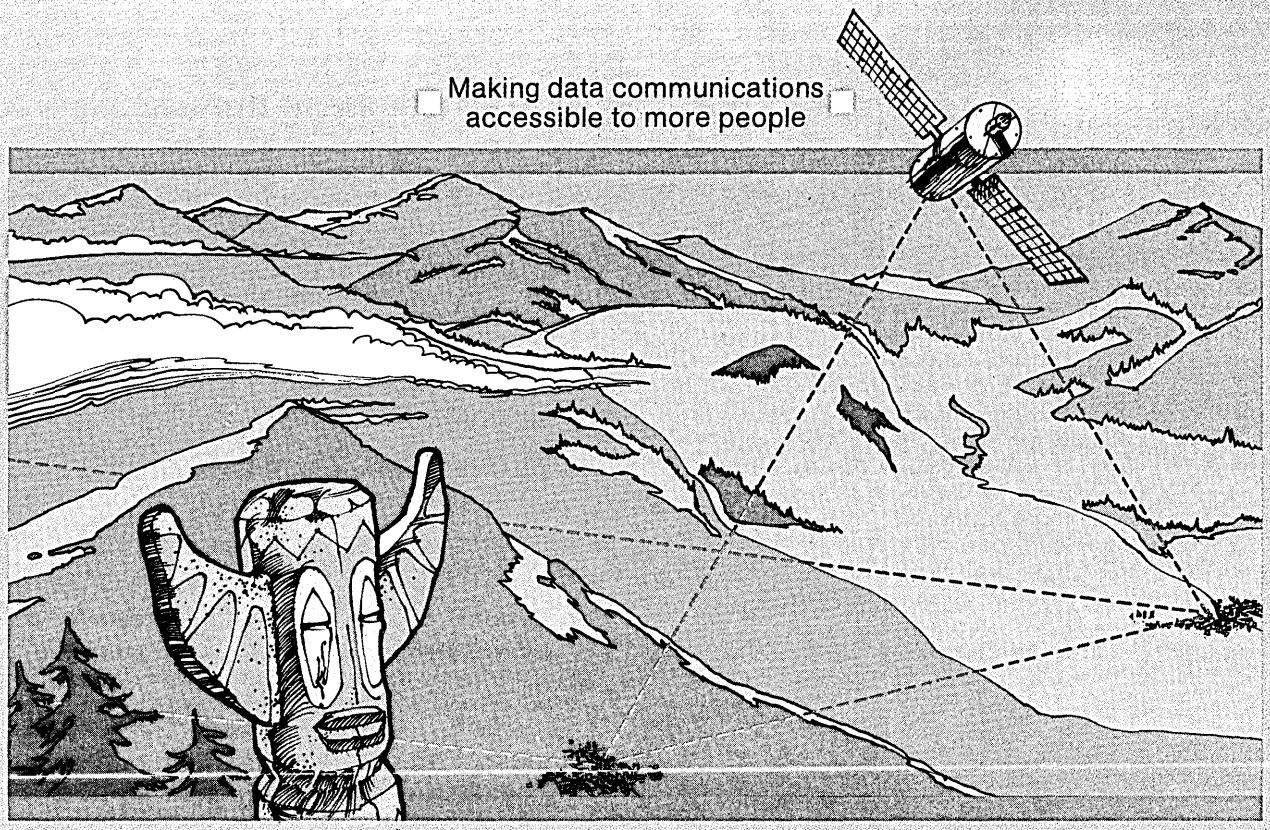

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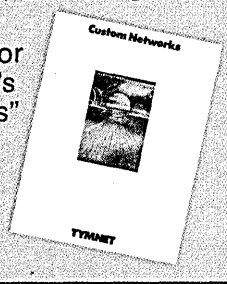

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The value analysis framework helps businesses clarify the kinds of systems on which to focus their energies.

experienced user of information services and may consume a disproportionate share, to the detriment of the growth businesses. Senior management must intervene to strike a balance.

While the value analysis framework is useful for evaluating information systems opportunities that have already been identified, the problem of identifying new opportunities remains. Companies that develop parity systems in response to their competition may wonder why it was their competition, not themselves, that became innovators. Part of the problem lies in the difficulty senior managers traditionally have experienced in dealing with information systems. The question, "What do you want from information systems in your business?" does not elicit the creative thinking that leads to strategically important information systems.

A better approach begins with the recognition that information systems alone do not generate business value. A system makes possible a *change* in the business operation, and it is the change that generates business value. In planning for new information systems, therefore, managers should ask the question, "What would we change in the business to improve it (or what is already being changed), and what value would we expect to gain from the change?" Once a desirable change has been identified, the role of information systems in implementing it can be examined with clarity.

In many cases, line managers and information systems professionals pay little or no attention to the business changes inherent in proposed new systems. For example, the senior management of a mature manufacturing company had identified high inventory levels as a key business problem. In addressing the problem, operating managers focused on a material requirements planning (MRP) system. No one asked the basic question: "Why are inventories high, and what do we need to change in the way we manage them?" When senior management recognized this failure, the systems effort was deferred until more basic management issues, such as stockout service levels and stocking locations, were addressed.

Once management had identified the business changes needed to reduce inventories, the system support question was revisited. While still needed, new information systems were seen to play a less central role, and a much smaller, much less risky system investment than the original MRP system was found to be suitable.

In another firm, a large manufacturing company, new product development was viewed as critical. R&D managers felt strongly that improved information systems would help them shorten the product development cycle, which involved the processing and analysis of considerable amounts of data. Again, the basic management question, "What must we change to shorten the R&D cycle?" had not been clearly addressed. When senior managers analyzed the problem, they concluded that basic business changes in the R&D process would yield the desired reductions in product development time, and that system support was, in fact, a minor issue.

FIG. 2

AUTOMATION-RELATED BUSINESS CHANGES

Productivity changes	• Eliminate manual labor • Process clerical volume
Product/service changes	• Function as new products • Provide product-related services
Communications changes	• Link geographically separate entities • Link organizationally separate entities
Managerial changes	• Analyze performance • Implement structured decisions • Facilitate unstructured decisions • Forecast the future

MANAGERS CAUGHT UP TOO FAST

These and other examples lead to the conclusion that business and information systems managers often become caught up in the automation problem too quickly and thus fail to address the fundamental business changes that will be required if the proposed system is to be successful. Part of the problem here is that information systems are typically designed by user and information services managers who lack the strategic perspective of senior management. Thus, they tend to view automation as a way to improve procedures already in place, rather than first gaining an understanding of the actions necessary to improve the business, and then addressing the role of automation in effecting those changes.

Fig. 2 provides a breakdown of the business change concept into four broad categories. Taken together, these categories cover most of the types of business changes that information systems make possible. This taxonomy is used in two ways. First, it provides a checklist to use when thinking through potential automation opportunities in the strategic systems planning process. Having broken down the business into its strategic segments, and then, further, into manageable pieces, a planner can test the impact of proposed changes in each area of the business. By examining the business change first, technology can be understood more clearly in the context of business objectives.

A value-oriented approach to identifying and evaluating the strategic business impact of information systems follows:

- First, segment the overall business into strategic business units, or recognize the segmentation used in other areas of the management process (such as in capital budgeting).
- Within each segment, examine the potential value to be achieved from known or proposed business changes.
- Once the proposed changes and expected values are clear, examine the potential role of information systems in effecting each change.
- Use the value analysis framework (modified to fit the business segmentation approach used) to help establish strategic priorities.

In the absence of useful frameworks for depicting the business value of information systems, technical managers often gravitate toward strategies that provide technical efficiency or reduced costs. Unfortunately, when viewed in the light of the business value to be obtained from proposed systems, these strategies sometimes turn out to be wrong.

For example, cost pressures and shortages of development personnel make the common or shared systems approach attractive to many organizations. Under this approach, a single computer system is developed to serve several different but similar users within the organization. Order entry and manufacturing systems are two operational areas in which common systems frequently have been attempted. The rationale behind a common approach seems compel-

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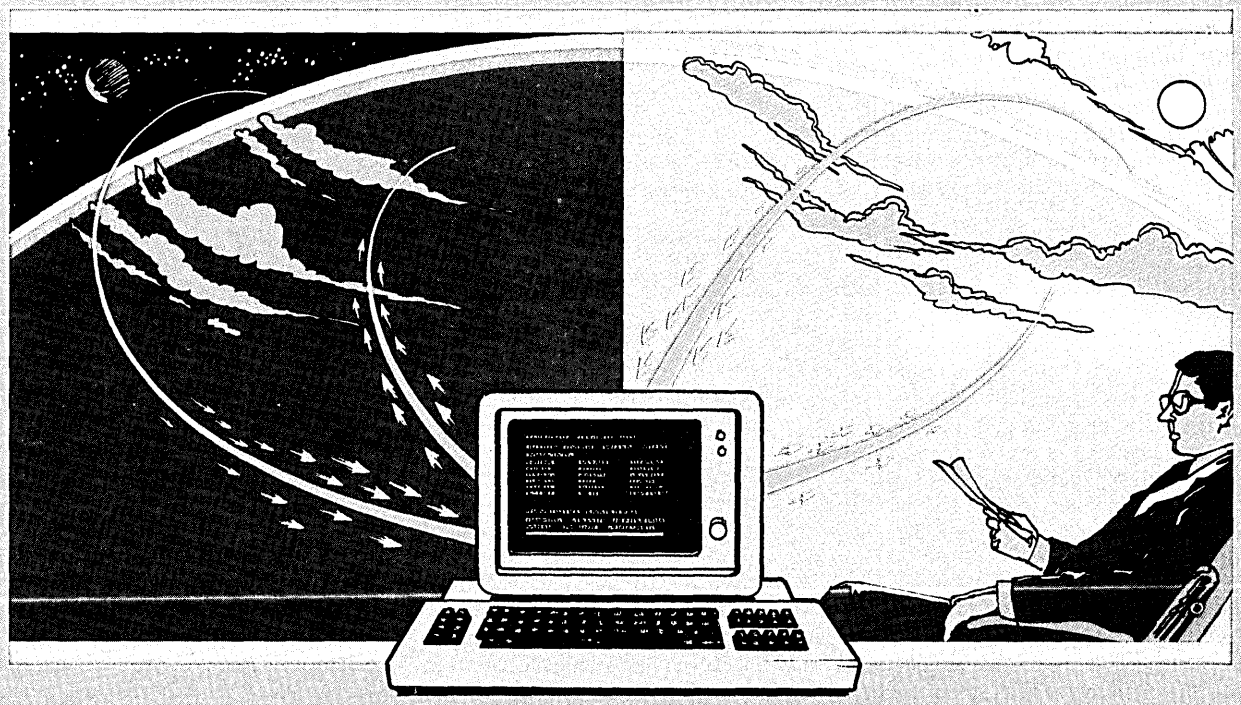

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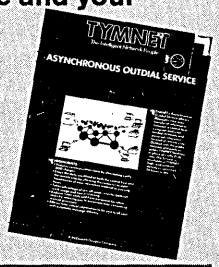

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The common thread is a straightforward trade-off between information systems control and business value.

ling; why develop multiple systems when one can meet the needs of many?

The application of a business value framework, however, can show a common system to be inappropriate even when operations appear to be virtually identical. For example, a mature control business might expect a new manufacturing system to yield production efficiencies, while a growing business might look to the system to smooth its ability to meet customer service requirements. If a common system approach is used in this type of situation, the development effort can become too large, costly, and complex as the organization tries to build a system to meet the needs of both businesses. Alternately, the system will be biased toward one business segment at the expense of the other. Saving system development cost through common systems makes sense only when business needs are met.

It is usually taken on faith that systems development is carefully controlled and well documented. If controls and standards prevent critical business needs from being addressed in time, however, they are inappropriate. Consider the case of a medium-sized manufacturing company with a large, diverse industrial product line. The firm was reorganized into strategic business units so that individual pieces of the business could be managed more discretely. The business itself was unprofitable and needed to be turned around in a hurry.

Unfortunately, the existing information systems could not support performance reporting needs along the strategic business unit lines of the new structure. Without a new reporting capability, the organization was powerless to make use of the new business structure it had implemented. It was clear that a new reporting system had to be created quickly. The strategy chosen was to build a new internal financial reporting system on top of the old one within three months.

In executing this strategy, every classic rule of controlled system development was broken, and the resulting system will probably last no longer than 12 to 18 months. On the other hand, a traditional development approach would not have produced a system in less than a year. Understanding the business stakes involved in this case led to the selection of a nontraditional strategy.

FIG. 3

ROLE OF THE CORPORATE INFORMATION SYSTEMS UNIT

AUTOMATION BENEFIT	BUSINESS ORIENTATION GROWTH	BALANCED	CONTROL
Gain meaningful competitive advantage	E	E	E/C
Achieve competitive parity	E	E/C	C
Measurable cost savings	E/C	C	C
Intangible benefits	C	C	C
Necessity	C	C	C
Replacement	C	C	C

E = Effectiveness orientation
C = Control orientation

ROLE OF CORPORATE GROUP

In a number of diversified organizations, centralized information groups are attempting to provide leadership to the company by establishing policies and standards to improve information systems management. These organizations sometimes also provide consultative services in areas requiring scarce technical or functional knowledge. Leadership efforts fall into two broad categories: those aimed at controlling decentralized activities, and those aimed at improving the effectiveness of information services in decentralized units. Control activities include development of standards and approval or oversight mechanisms. Effectiveness services are usually provided through expert consultants who help decentralized units with particularly difficult technical or management problems in areas such as telecommunications or process control.

Corporate information services units should carefully think through which of these two roles (effectiveness and control) they should be providing to the different business units in the company, instead of defining a monolithic set of services and standards for all business units. Fig. 3 modifies the value analysis framework to show how these two corporate roles should vary for different business units.

For example, if a growth business has an opportunity to gain a competitive advantage with new information systems, it becomes imperative that the new systems be implemented as rapidly as possible. In such a case, the corporate group should adopt an effectiveness posture and either assist in the implementation or get out of the way. On the other hand, a control business using information systems to gain an incremental ROI would more appropriately lean toward efficiency and the production of technically sound systems that will last. In this latter case, the corporate role of "controller" through the application of standards and approval policies makes much more sense.

The common thread running through all of these examples is a straightforward trade-off between information systems control and business value. Because value is so seldom clear, control-oriented, information systems rules (such as development standards or common systems cost savings) tend to dominate. While this may be fine for control-oriented businesses, it can be highly inappropriate when a growth business is pursuing a market opportunity and a crisp, timely business response from the systems support group is needed. Information systems managers need to adopt a value-based approach if the traps present in conventional information systems management thinking are to be avoided.

The value-oriented approaches advocated herein have been strikingly successful. By adopting business value as *the* primary criterion for selecting information systems investments and managing the investment resources, and by applying an appropriately rich framework for understanding value, companies are getting their information systems on track as major weapons in today's increasingly competitive business climate.

David G. Robinson is a vice president of Index Systems Inc., a Cambridge, Mass.-based professional services firm. He's a frequent speaker on using information systems for competitive advantage, and is responsible for Index's strategic systems planning practice. He holds an MBA degree from Harvard Business School and an AB degree from Princeton University.

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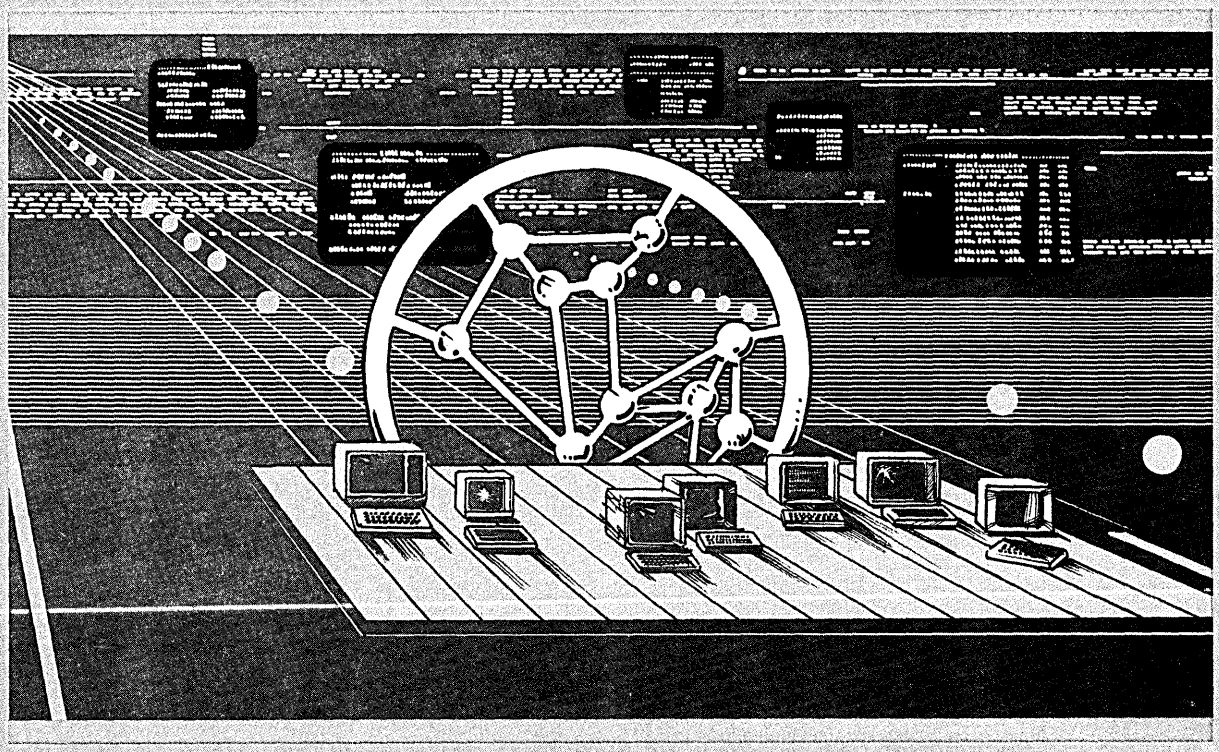

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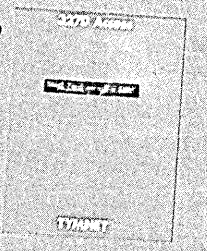

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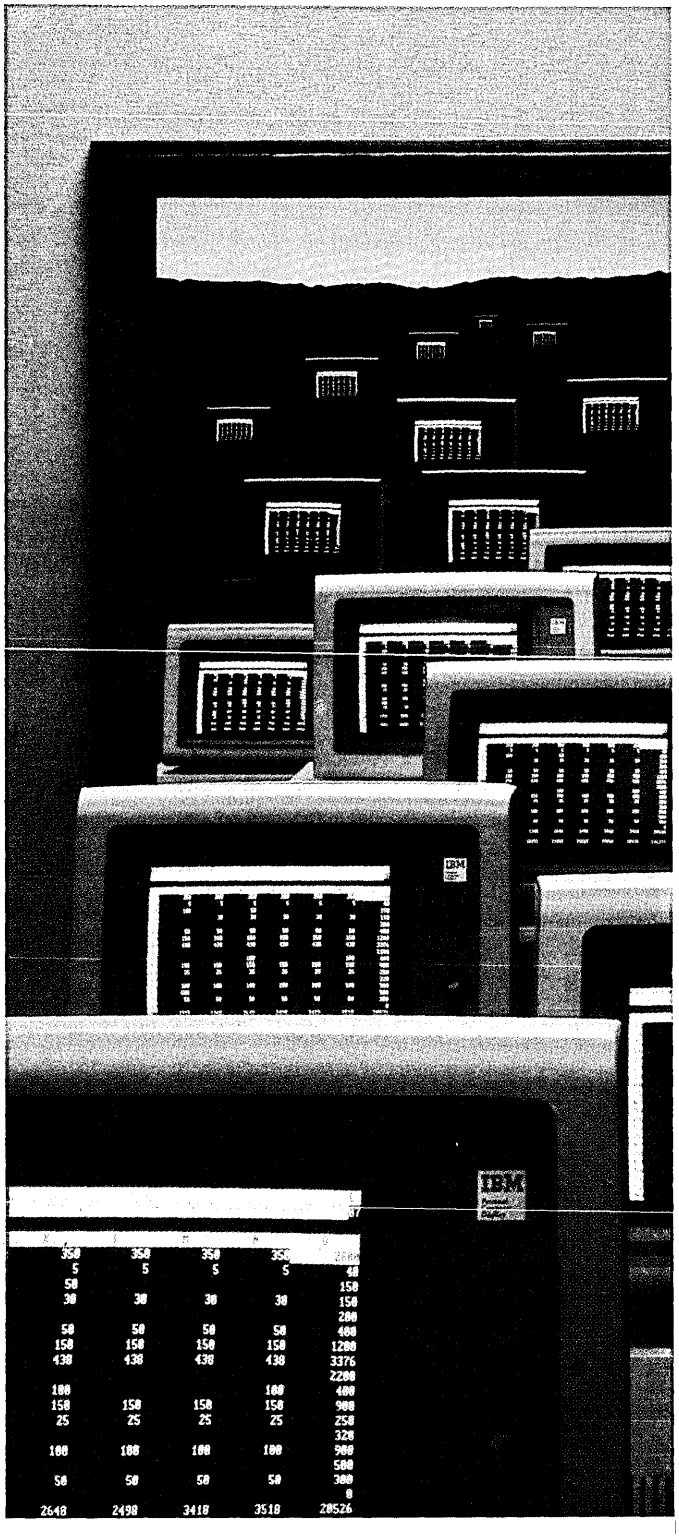

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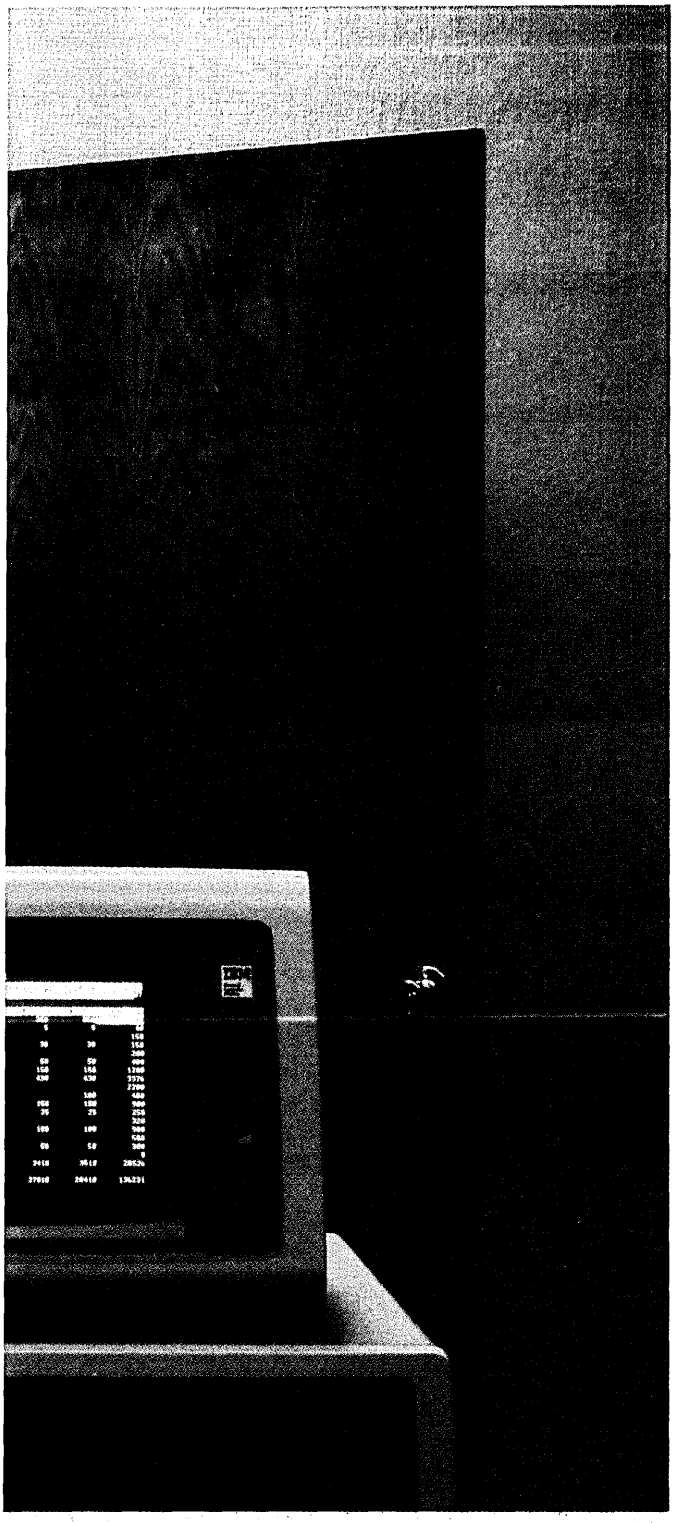

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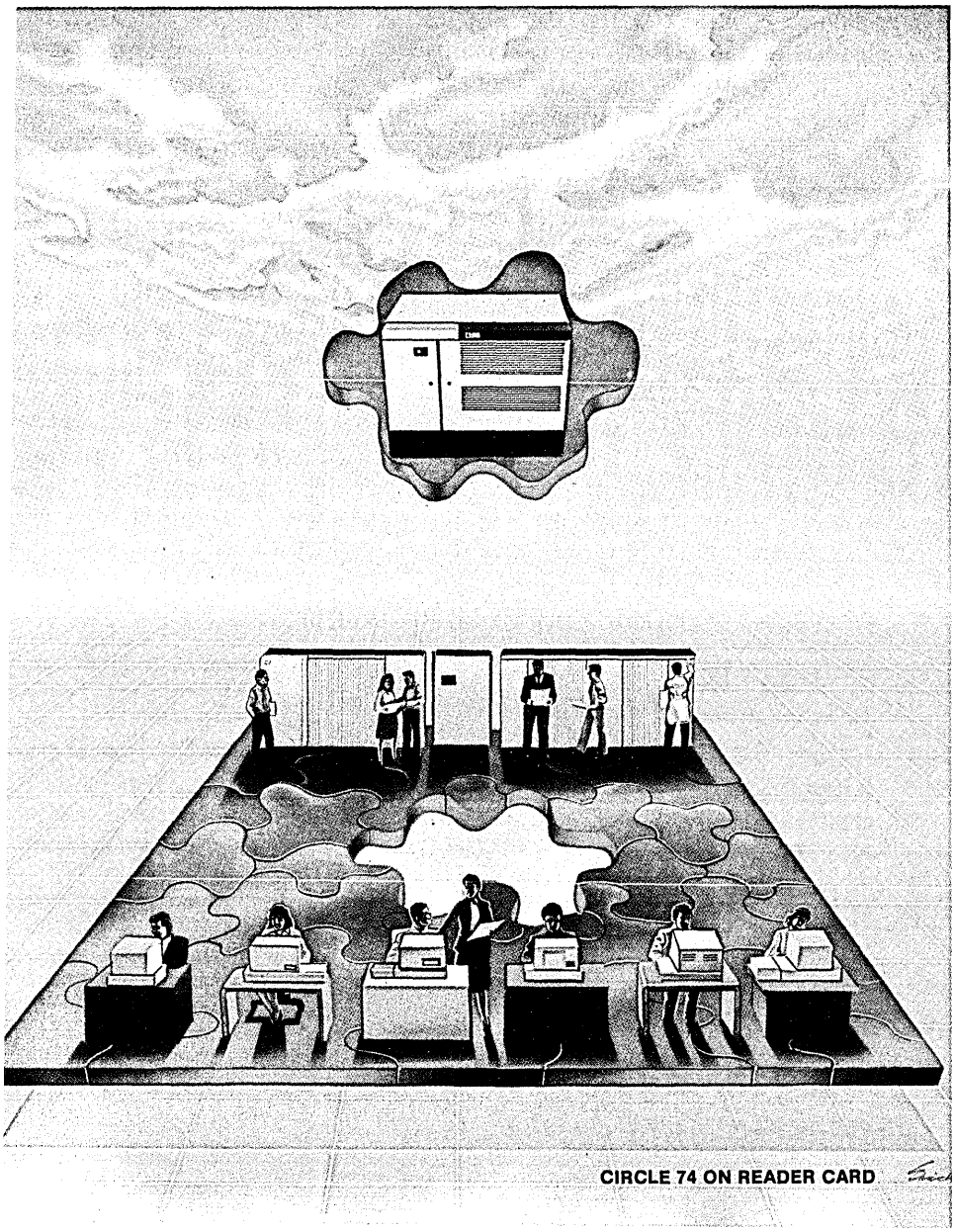

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DMBS specialists build the foundation that supports the company's strategic objectives.

DATABASE: THE BEDROCK OF BUSINESS

by Robert M. Curtice and Paul E. Jones Jr.

Strategic business planning is carried out by high-level corporate managers. They use this process to define the organization's position in the marketplace and the industry's bases of competition. Specific strategic business objectives result from analysis of the corporation's standing relative to its competitors.

Database design is usually done by departments near the bottom of the organizational hierarchy. They are concerned with planning, logically structuring, and implementing the databases that support the organization's information systems.[1]

In many companies, there is little connection between these two activities because of the separation of organizational levels. Nevertheless, the database design process should take into consideration the strategic business objectives: the logical data structure of planned databases must contain the data needed to develop tactical plans, to measure progress toward the objectives that are established, and to implement systems in support of specific business goals. This organizational gap between strategic planners and data managers must be bridged somehow if management's direction of the enterprise is to be well supported by the company's computer systems.

Many information system development projects involve the design of databases or files. In most dp organizations, the scope of any database design effort is intentionally kept narrow; only the data needed by a specific application system are analyzed during a given project. For example, when a commercial bank needs a new consumer loan application, its database design activity is restricted to defining the consumer loan account file. The structure of the data in this file is usually derived by studying the current operating procedures (some automated, some manual). Such a narrow view of data goes hand in hand with the idea that systems can be kept independent of one another.

This application-specific approach is quite different from the integrated database concept used by other organizations. In these environments, no application stands alone because each needs to share data with related applications. Moreover, the database is consciously generalized so it can support users' inquiries and future applications, not just the project of the moment. This approach, also called information resource management or data-driven architecture, looks well beyond the immediate needs of the application about to be developed.

Understandably, designing databases to support an integrated database environment cannot be included as part of every individual implementation project. By definition, the database must contain data that can be used in more than one implementation effort. Since those data will be shared by several applications, they need to be viewed, defined, and designed from all application perspectives. The time to bring this broad view into play is before any specific implementation project, not during it. We call this broader, overall design activity logical database design.

Logical database design, also known as conceptual design, is concerned with establishing the fundamental concepts used to organize and define the data. This is in direct contrast with the physical design, which focuses on selecting the appropriate data storage technology, engineering the data access methods, and solving performance and recovery problems.

The logical design process is broad in scope. It encompasses many potentially interrelated application areas, sometimes even the entire organization. Consequently, in addition to meeting the particular needs of individual applications, this process can cover territory that is never touched by the "one application at a time" approach. It can address issues of data sharing, meaning, and consistency across various application areas and organizational units, and it can incorporate ways to meet requirements that are not explicitly included in the initial list of functional applications.

WORKING OUT PROBLEMS

On the other hand, the integrated database concept generally requires both the dp and user departments to adjust their attitudes so they can work out objections such as:

- The "all our eggs in one basket" problem. People who think the integrated database means putting all data into one centralized database have a valid point about risk if physical centralization is being proposed. It is rare these days, however, for large databases to be built as monoliths. People talking about integrated data are usually discussing logical integration—common data definition and a single source for each piece of data. Data can be physically distributed into several databases or even several geographical locations. The data can also be duplicated if needed, provided the single update source is preserved. A conceptually integrated database does not imply building a single monstrous data file; it implies understanding how to keep the pieces working in harmony.
- The "sounds good theoretically, but . . ." problem. The idea of integrated databases can't work in practice for the following "reasons": the concept is too complicated; the organization would never agree on procedure; it's foolish to plan for future contingencies; the company would not stick to the plan even if it could formulate one. The reality is that a growing number of organizations have completed construction of a logical data framework for large segments of their operation and are using it, successfully, to guide actual implementation. They simply do not know why anyone would consciously prevent pieces of the data resource from working together.

Developing the logical database design for the entire organization or a major segment of it is certainly a significant undertaking. It requires heavy participation from knowledgeable and forward-looking personnel representing many functions of the company (naturally, they are just the people who can least be spared). But there are method-

[1] We are using the term database in a broad sense—it does not necessarily imply use of a formal database management system. In this sense, almost all organizations have computerized databases.

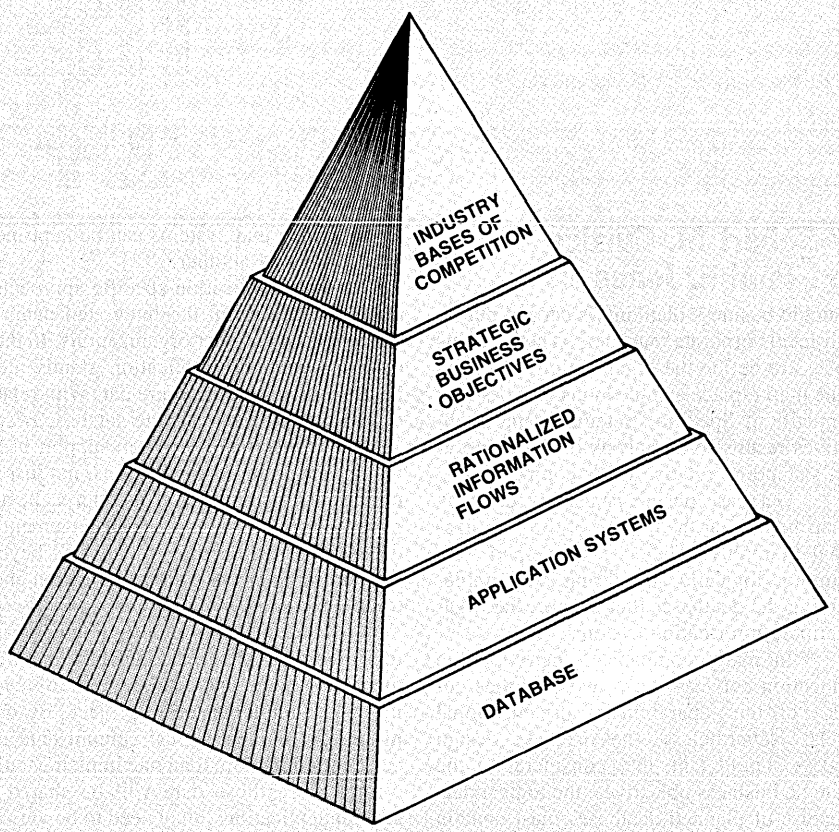
The goal is to lay down a data framework that will serve the organization for many years.

ologies to accomplish it. Our own method has been applied to more than 30 major situations, including some extremely large database problems; it typically requires four to eight months to complete. Another solid approach is Daniel S. Appleton's PDM-80 method (see "Data-Driven Prototyping," Nov. 1983, p. 259). IBM's Business Systems Planning (BSP) methodology, while similar on the surface, is incomplete and superficial in its treatment of data when compared to more advanced techniques.

The advanced logical database design methodologies devote some attention to rationalizing the organization's data practices. This process challenges the way things have been done, even though some tasks may already be computerized, and looks for a better way to deal with the company's data. After all, the goal is to lay down a fundamental data framework that will serve the organization for many years to come. To build in the idiosyncracies from the past (many of which were introduced to get around other idiosyncracies) doesn't make much sense. Every organization has such inconsistencies, ambiguities, and redundancies. A few of the more common examples include: several pieces of data that really mean the same thing; one piece of some data that means one thing in one case, something else in another; different criteria for determining the date of sale by different departments; code assignments that have been twisted to indicate something they weren't intended to; and inconsistent numbering schemes.

FIG. 1

THE DATABASE IS THE BEDROCK



DESIGN BECOMES A PLAN

Once established, the logical database design becomes a plan showing what the data should look like when and if the company can free itself from the legacy of past influences, such as obsolete technologies (paper, punched cards), outmoded practices, narrow views of the business they're in, economic trade-offs that are no longer valid, and the burden of past investments in machines, software, and procedures that cannot be changed overnight but should be when the opportunity arises. Like all plans, it must be revised periodically, but real data relationships are remarkably stable—no major redesign is required unless the organization radically alters its business.

The data plan provides a framework that guides both the development of new programs and the revision of established "workhorse" programs. It serves as a tool to help information users and systems developers understand the corporation's data and how those data must evolve. Such a plan is important because modern organizations expend a great deal of effort processing data. To the degree that data concepts are inconsistent, unclear, and ambiguous, companies will accordingly suffer productivity losses. As managers become increasingly interested in interacting directly with computerized data (e.g., the information center, end-user computing), poor data practices become more noticeable and less tolerable.

Another goal of logical database design is to incorporate future requirements, or at least the ability to meet future requirements. When the company's direction is spelled out, the logical database design needn't be infinitely flexible. Specific provisions can be incorporated into the design to handle any likely eventualities. This is of great practical value, since incorporating all eventualities, even if it were possible, would introduce such excess baggage and lack of purpose that the design would be of little use. Providing for the future is where strategic business planning has a significant and constructive impact on database design.

The strategic plan identifies the business the organization is in. The term can apply to nonprofit organizations as well by substituting "mission statement" for "business the organization is in." It establishes the bases of competition—in other words, what it takes to be successful, what's important. It defines the critical success factors or business objectives for the organization, thereby determining how the company will deal with its competition. The decision makers and planners who appreciate these business objectives can provide valuable insight into the future. In turn, data specialists can lay the groundwork in the database design to support that future.

For example, a distribution company presently has one warehouse. In all likelihood, current data practices in such a company will not even recognize "warehouse" as an object type. Suppose the strategic business objectives indicate the company will need many distribution points in the future, to improve customer service in the face of expected competition. From a logical planning standpoint, there is a big difference between one warehouse and two, even though there is little difference between two warehouses and

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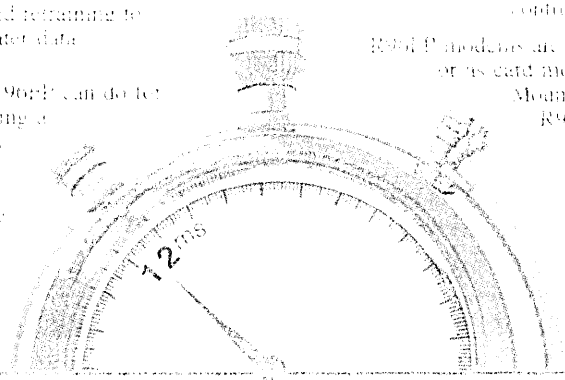

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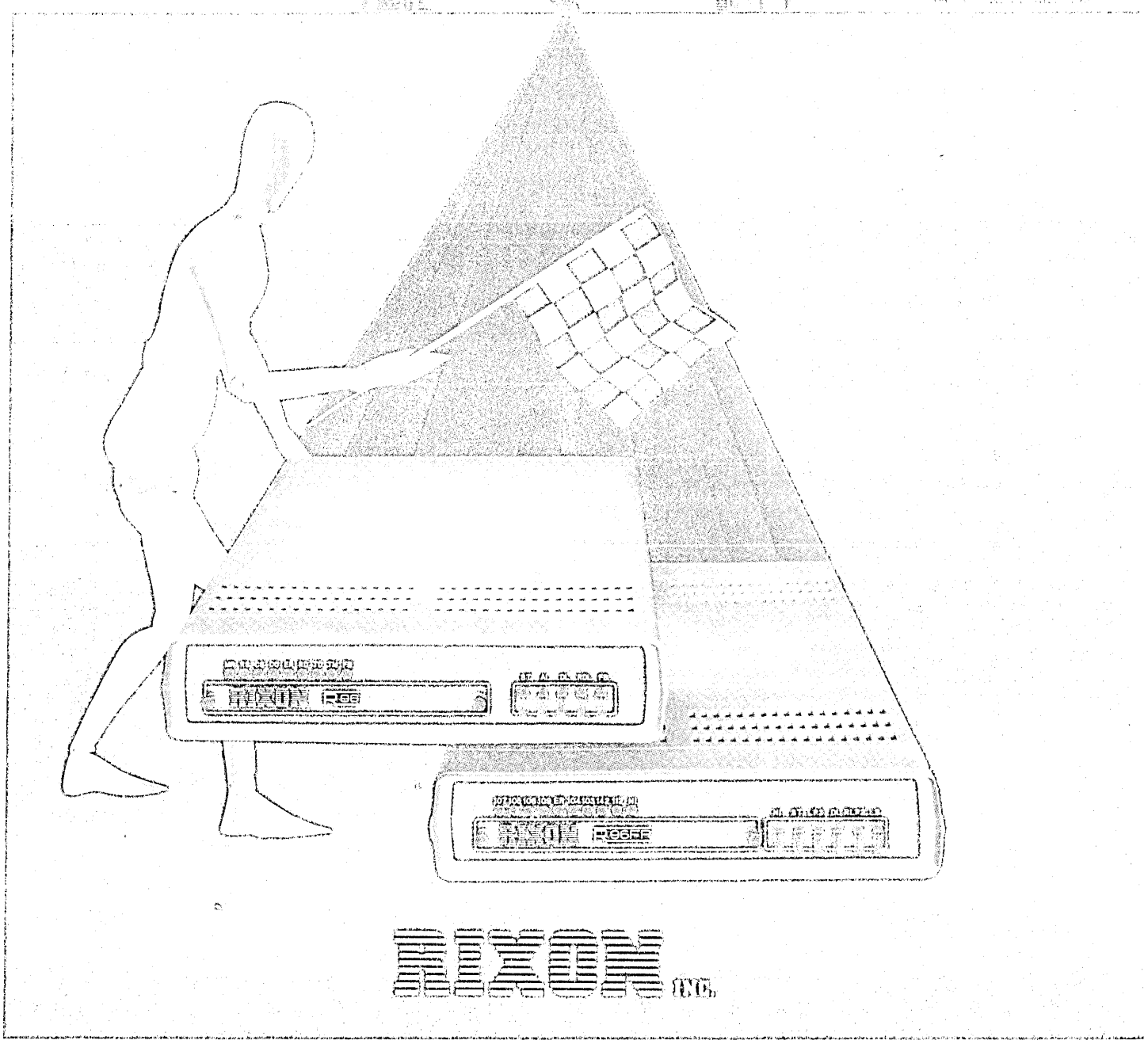


It is strategically important to introduce basic changes in data concepts.

twenty. Any database or information systems plan predicated on having one warehouse will be considerably difficult to modify to handle more than one.

The reason for this phenomenon is interesting. If there is only one warehouse, the company's information apparatus does not need to know what a warehouse is. It is simply an unspecified extension of the plant, and everything goes through it. But when there are multiple warehouses, new rules are needed. Such warehouses are not extensions of any plant, nor does everything go through a given warehouse. There are differences between the warehouses that need to be understood and programmed. Location, organizational role, available space, products inventoried, transportation, market accessibility, and cost profiles become very important pieces of information on which decisions will be based. In short, a working concept of what a warehouse is needs to be included. Adding the multiple warehouse provision into the system plan and the database plan is probably fairly straightforward. Retrofitting existing systems to incorporate such a capability could, however, be an immense undertaking.

A more subtle example concerns the distinction between an account and a customer. Many information systems permit one person to have several accounts, and as a consequence each account is treated as the fundamental object type or an independent entity. This happens even though there are some operational (data processing) reasons that suggest all accounts belonging to a single customer should be unified. For instance, it would be more efficient to change the persons's address once instead of six times on six different accounts. Yet, if the concept of a unified account is unfamiliar, dp may well elect to manage independent accounts.

STRATEGIC BUSINESS REASONS

Most companies today find there are important strategic business reasons for treating the customer as the fundamental object type and the account as the subordinate type. One reason is the need to determine customer profitability, as opposed to account profitability. Another is to create the opportunity to offer new inter-account services. Most organizations are loath to extend credit in one account to a customer who has defaulted in another. This change in data philosophy applies equally well to the banking industry, securities dealers, insurance firms, and even public utilities.

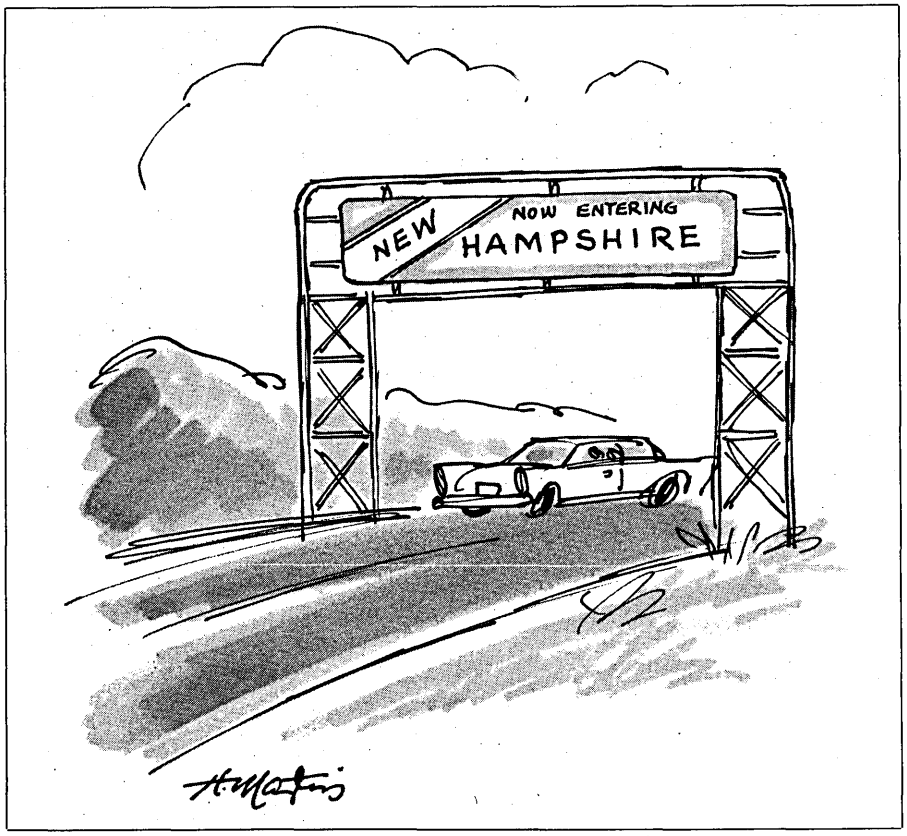
Dramatic changes, many triggered by deregulation, are taking place in the transportation industry. New business strategies are in the works, and it is obvious that the corporation's data framework must shift to support the revised plans. Rates will not be set by tariff but by negotiation in the marketplace. Freight forwarding capabilities and intermodal services will give broader-based companies a competitive edge. In this environment, established data concepts like tariff and waybill will no longer serve the strategic needs of the enterprise adequately.

The above examples are real. In each case it was strategically important to introduce basic changes in data concepts. The dp department can easily be overwhelmed by the implications of such changes, and may even appear to join other affected departments in resisting the new directions. Fortunately, by clarifying exactly what is needed at the logical database design level, a plan for change can be formulated, and the computer department's capabilities can be marshaled to facilitate the transition. Thus, management has a real incentive to make sure strategic objectives are reflected in the logical database structure.

Whether forced by events or by a sense of the inadequacy and sluggishness of existing systems, companies are finding ways to incorporate strategic business objectives into logical database design. This, of course, makes the process of data system planning more interesting to senior management. Indeed, they have reason to require that the design demonstrate support for their strategic objectives.

Strategic business planning can and should influence logical database design. For the company to guide its behavior by strategic business objectives (or critical success factors), the basic information flow patterns in the organization need to be rationalized and adjusted. As the information flow efficiently supports day-to-day operations, it must also help achieve the company's strategic objectives. And while automated information systems support these flows, the database is the bedrock upon which the application systems rest (see Fig. 1). Its fundamental data concepts must be compatible with the management concepts in which the strategic business objectives are expressed.

To this end, management should evaluate the data plan to ensure it supports company goals. Management must find ways to make sure the strategy is explicitly reflected in the logical database design. ❋



CARTOON BY HENRY MARTIN

Robert Curtice and Paul Jones spend most of their time designing databases and working on other data management-related projects for clients of Arthur D. Little Inc., the Cambridge, Mass., consulting firm. They claim to have been involved in the design of well over 100 databases, which is, they believe, a record.

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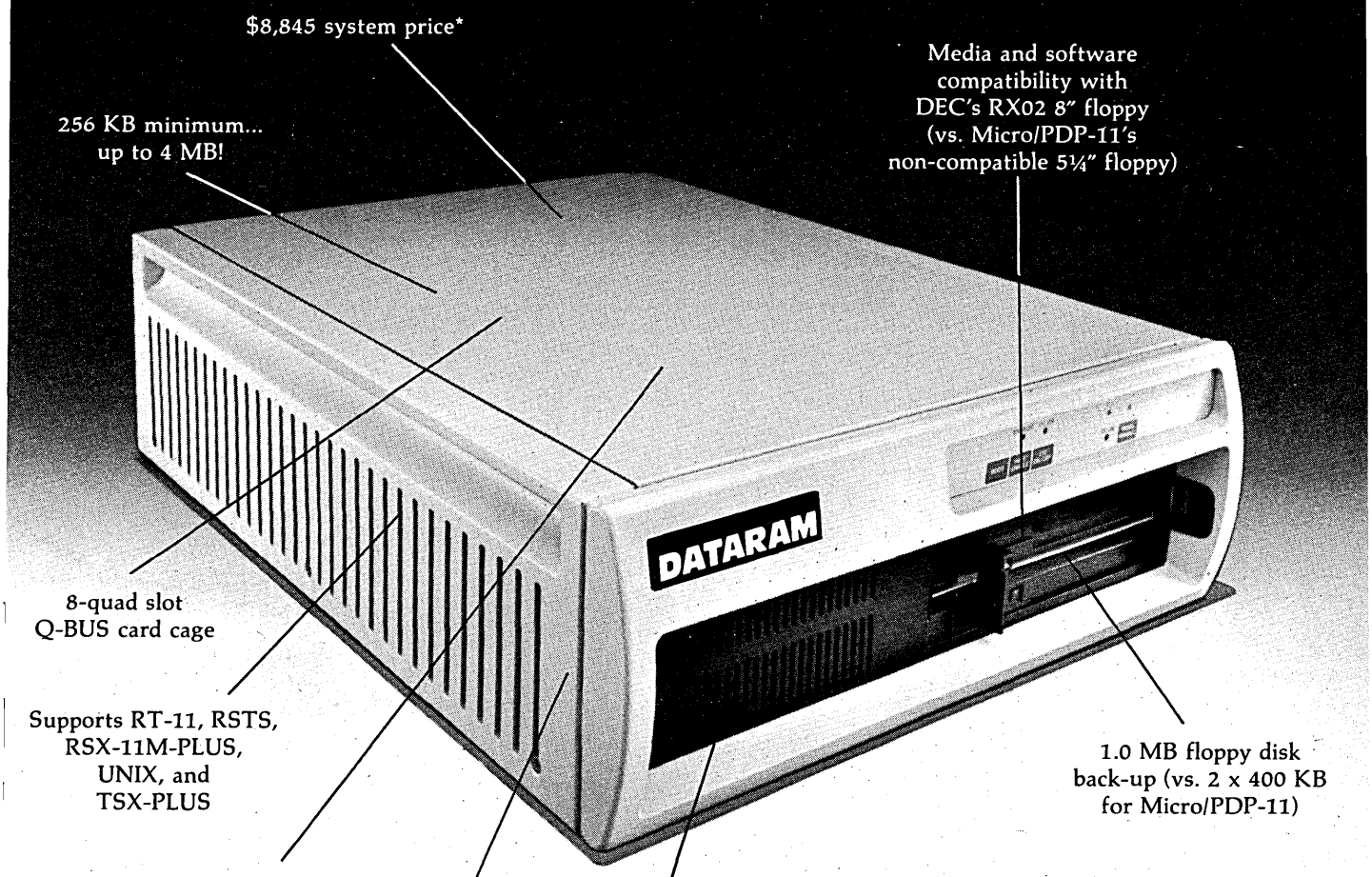

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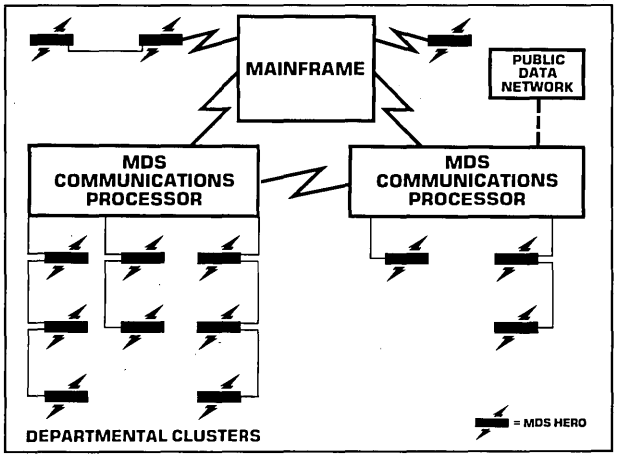

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Systems grow old, but they rarely die; structured retrofit is a technique for keeping them vigorous.

IMMORTAL SOFTWARE

by Nicholas Zvegintzov

When Lemuel Gulliver heard from the Luggnuggians that, in their country, once in a great while a child would be born immortal, he was struck with delight:

"Happy Nation, where every Child hath at least a Chance for being immortal! Happy People who enjoy so many living Examples of antient Virtue. . . But, happiest beyond all Comparison are those excellent Struldbruggs, who being born exempt from that universal Calamity of human Nature, have their minds free and disingaged, without the Weight and Depression of Spirits caused by the continual Apprehension of Death!"

Gulliver's hearers answered him with "a Sort of Smile, which usually ariseth from Pity to the Ignorant." Gulliver had mistakenly assumed that the Struldbruggs enjoyed eternal youth, health, and vigor. They did not. The question was not whether a man would choose to be always in the prime of youth, but how he would pass a perpetual life under all the usual disadvantages of old age. The Struldbruggs were bitterly unhappy, envious both of the vices of the young and the deaths of the old.

In our own age there is something analagous to Jonathan Swift's Struldbruggs. Software systems are, if not immortal, extremely resistant to death or decommission; and they become increasingly cantankerous and miserable as they age. They are the Struldbruggs of the twentieth century.

Girish Parikh and I, while editing a book of readings published by the IEEE Computer Society titled *Tutorial on Software Maintenance,* looked for material on the death of software. Since death is part of life, we argued that death is part of the software life cycle as well. Although we reprinted a piece by Peter Denning, then president of the Association for Computing Machinery, that pointed out that student programs are born at the beginning of the semester and die at the end—unrealistic at both ends—and a famous piece by Michael Spier of Digital Equipment Corp. about a piece of software that should have died, but did not, we could find no adequate data, or even convincing case studies, on the decommissioning of software.

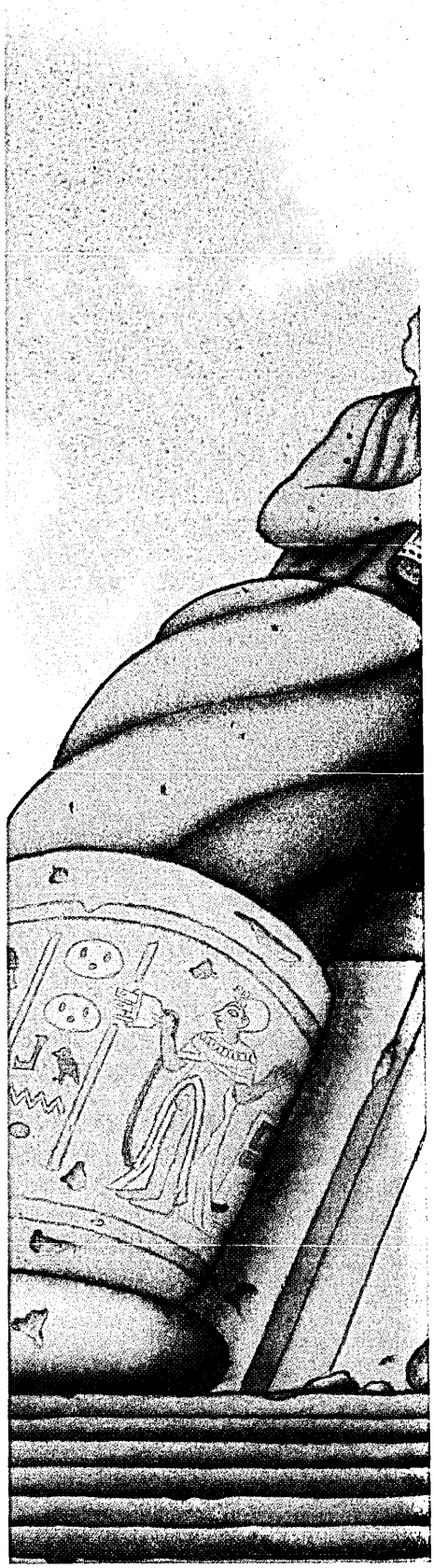
Most of the material that I have gathered about software death is about systems that live on when they should die—software Struldbruggs:

- SIOP (Single Integrated Operational Plan) is the software supporting the U.S.A.'s national strategic war plan; it is the system on which the movie *War Games* was modeled. A 1982 unclassified Air Force paper reports that the War Plans Programming Directorate has been unable to make progress in upgrading old programs within SIOP, and that a release cycle takes five years, with up to two years for software modification.
- The Internal Revenue Service programs that scan 1040 forms are written in assembly language, and are updated annually.
- UCLA Professors Bennet Lientz and Burton Swanson, questioning 487 data processing organizations on the maintenance of heavily used software, found a sizable group of systems 12 to 20 years old.
- Every major organization that I have examined has at least some 1950's-era programs running either in emulation or crudely translated into more recent languages.
- A major corporation spent $5 million on a new human resources database, programming in a fourth generation language. They never succeeded in linking it to the existing payroll software. The new development project was canceled in a fiscal crunch; the payroll software survived.
- Another major corporation has two card punch machines, heavily used, in a service area adjacent to their carpeted and tastefully furnished Corporate Information Center.

SURVIVAL IN TERMS OF BLAME

Responsibility for these survivals is often assessed in terms of blame: dp management blames programmers for conservatism and obstructionism; programmers blame upper management for not making resources available; upper management blames middle management for poor leadership; and vendors and journalists blame the dp profession in general as defensive of their jobs.

Instead of blaming groups of people



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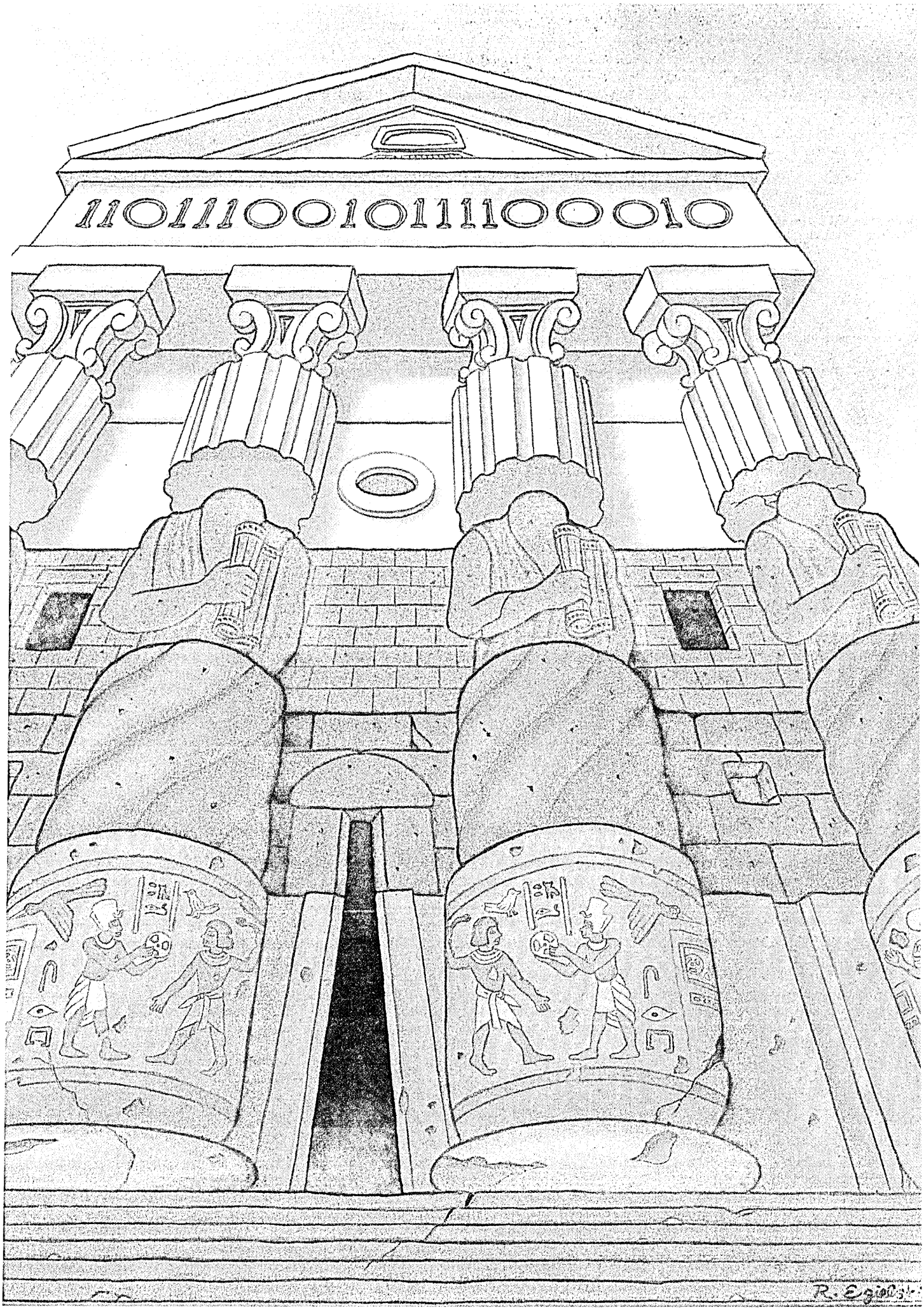
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Structural decay is not caused by wearing out of parts but by their unnatural permanence.

for their supposed slowness in replacing software, we can turn the question around to ask what the technical and economic forces are that promote the replacement of software. We will find that these forces are not strong. Instead, slow replacement is backed with sound reasons; it is not due to some defect in the data processing staff.

The primary reason for replacing software is that it becomes unnecessary. This is the strongest force for software death, and it sometimes occurs. Naturally, there is no conflict about a replacement.

Second, the software ceases to run on the hardware for which it was intended. This is very uncommon, at least if the software has been installed and shaken down. Software shares the general reliability of all digital systems, and functions that have worked correctly do not cease to work. Nor does software age, except in the specialized way that is treated below.

Third, the hardware on which the software runs is replaced. This force is equally weak. For one thing, since IBM's introduction of the System/360 architecture, manufacturers have been wary of hardware incompatibility and are moving to consolidate rather than proliferate operating environments. For another, software is now developed in higher-level languages that can be used with different hardware. If the hardware is incompatible, it can be made to look compatible by emulation or simulation, as has been done for the IBM 1401 and 650 programs still running in 1984.

Fourth, the software does not adapt to changing conditions. Software does not adapt itself, of course; it is adapted by maintenance staff. The whole apparatus of software maintenance—50% of all resources put into software, according to reliable statistics—is designed to protect software against this death. Since software tracks the real world, and the real world changes in evolutionary increments, changing software incrementally is an effective use of resources.

Fifth, another, stronger, piece of software that does the same task is developed or is available for purchase. This is that controversial case in which older software is not replaced as often as many people feel it ought to be.

But two real economic forces make replacement more expensive than it appears. First, the existing software has a territorial advantage: its adaptation to changing conditions has accommodated it to many local idiosyncracies and conveniences that are not easily reproduced in a purchased or developed replacement. Second, the existing software is the vehicle for the existing transactions and information. A system is not just an assemblage of software; it is the channel through which information flows. The more the system is used, the more information is flowing; and, as with water, so with information—the greater the flow, the harder, more dangerous, and more expensive to deflect. Engineers could conceivably dig a new course for the Mississippi River; the current flow could conceivably be deflected; but the cost of this digging and deflecting would be dwarfed by the cost of relocating all those activities that depend on the present course.

So software systems live on even when younger and stronger software is available to supplant them. And, like mortals and Struldbruggs, they grow old. Some of the earliest and best-validated observations about real-world software are those of Meir Lehman and Laszlo Belady—the Laws of Software Evolution Dynamics. Two of these laws, simply restated, are 1. Systems grow; and 2. As they grow, their structure decays, unless work is put into restoring it.

This structural decay is not, as in physical systems, caused by wearing out or breaking of parts, but by the unnatural permanence of parts. Old software systems:

- are written in old languages,
- use programming and design practices that current management would not permit,
- do not take advantage of streamlined facilities and standard routines,
- have been arbitrarily extended and patched in directions not envisaged by the original designers,
- have increased in size beyond what the structure was designed to bear,
- have been extended in function without a corresponding extension of the supporting documentation.

If software systems were physical machines or biological organisms, there would be no alternative to letting each system degrade in the above ways until its quality was so low that the benefit of replacement outweighed the cost. However, software systems are not physical or biological; they are abstract.

A fundamental theorem of computing, provided by Alan Turing, is that the same system can be mechanized in an infinite number of ways and in an infinite number of languages. If the old system is useful but cranky, there are an infinite number of new and more flexible ways to express it. The question is, can you transform your system into a better implementation?

CHANGING ONE STEP

The encouraging answer is that, in general, you can; even more encouraging to the prudent manager is that systems can be changed in a sequence of small steps, each of which goes a short way in the right direction, cumulatively transforming old to new. You can move a system incrementally up through the software technology.

The strategy for such transformation is much like the strategy for renovating an old house: in each step you tackle the most troublesome outstanding problem, or the problem that most prevents you from tackling anything else. Suppose the roof leaks and the plaster has fallen: fix the roof; while the plaster is down, fix the ceiling wiring; now that the roof is secure, fix the plaster; now the plaster is up, paint the room; now the room is painted, sand the floors. This may not be the same order you'd use to build a new house, or the order your neighbor is using to renovate the house next door, but it fits the house on which you are working and it gets the job done. James Elshoff and Michael Marcotty, working at General Motors Research Laboratory, took a production PL/1 program that was a nightmare of criss-cross logic, and in 13 steps, at a little more than an hour for each step, converted it into a simple, readable, modularized form.

It is sometimes instructive to ask a group of production programmers and their managers, "What would each of you do to the software that you are responsible for if you were given a week to work on it free from the pressure of making any user change?" The varied answers reveal that programmers and managers have clear and definite ideas on what the worst structural problems in their software systems are, and that these problems vary from system to system:

"I would clean up the data names so that one thing only has one name."

"I would get rid of those four programs in the [Brand X] language by recoding them in [Brand Y] to match the rest of the programs."

"I would make a chart of the entire sequence of activities, showing how the transactions and reports and files interact."

"I would put three edit programs which are variants of each other into a single tabledriven program, so that I could cut my maintenance by two-thirds."

"I would convert the master file to a database, and get rid of all the homegrown key-search and key-update mechanisms."

The activity of changing the form of a software system without changing its function is called "retrofit," a name introduced into the software field by J. Cris Miller of Peat, Marwick, Mitchell & Co. Retrofit was originally a military term denoting the practice of refitting an existing ship or plane with updated equipment. Continuous retrofit ensures that the respected war-horses of the military, such as the B-52 bomber, are virtually new machines under old skins. It is thus a fitting term for the evolution of the modern OS/MVS-XA operating system from the vener-

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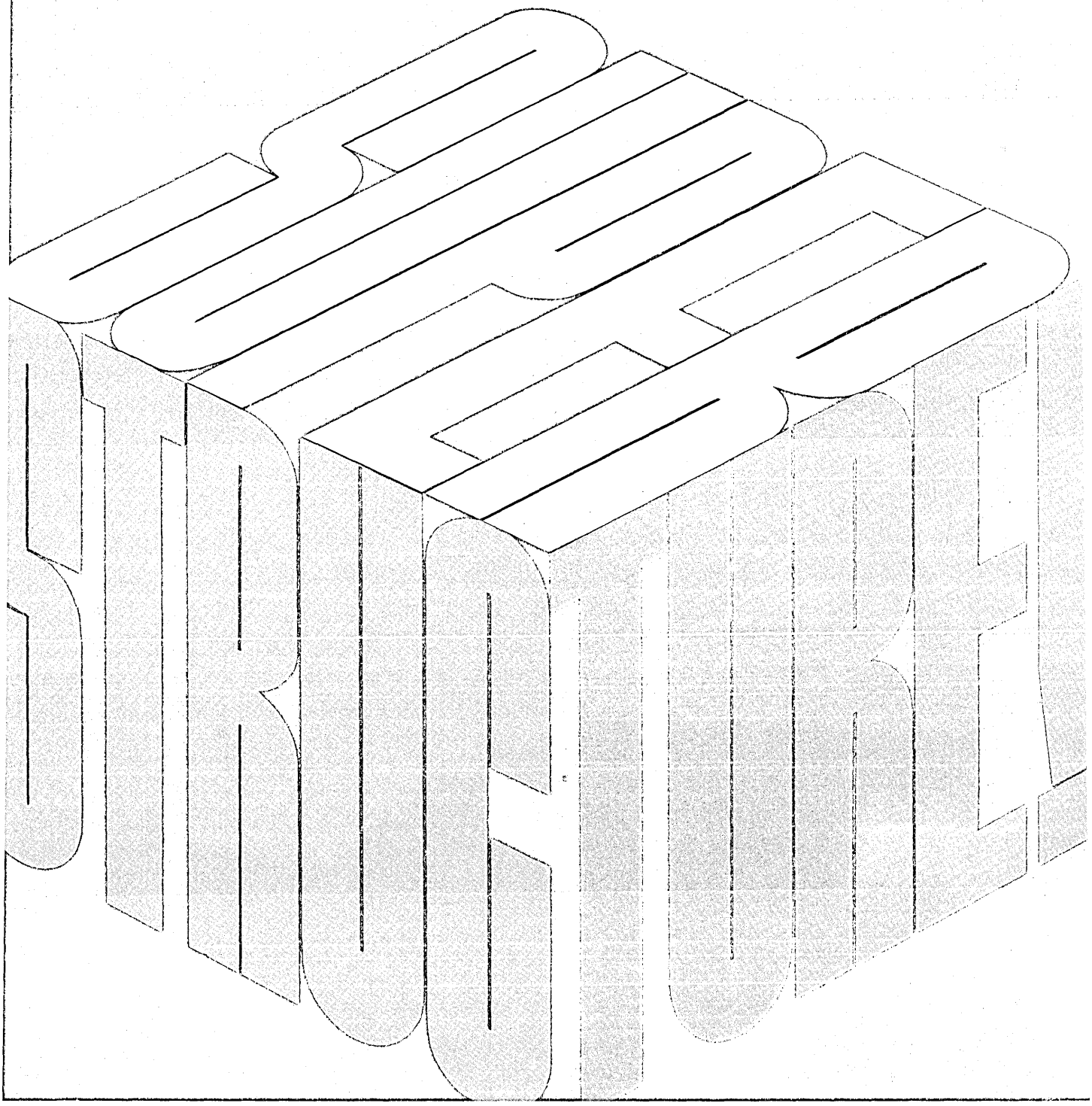

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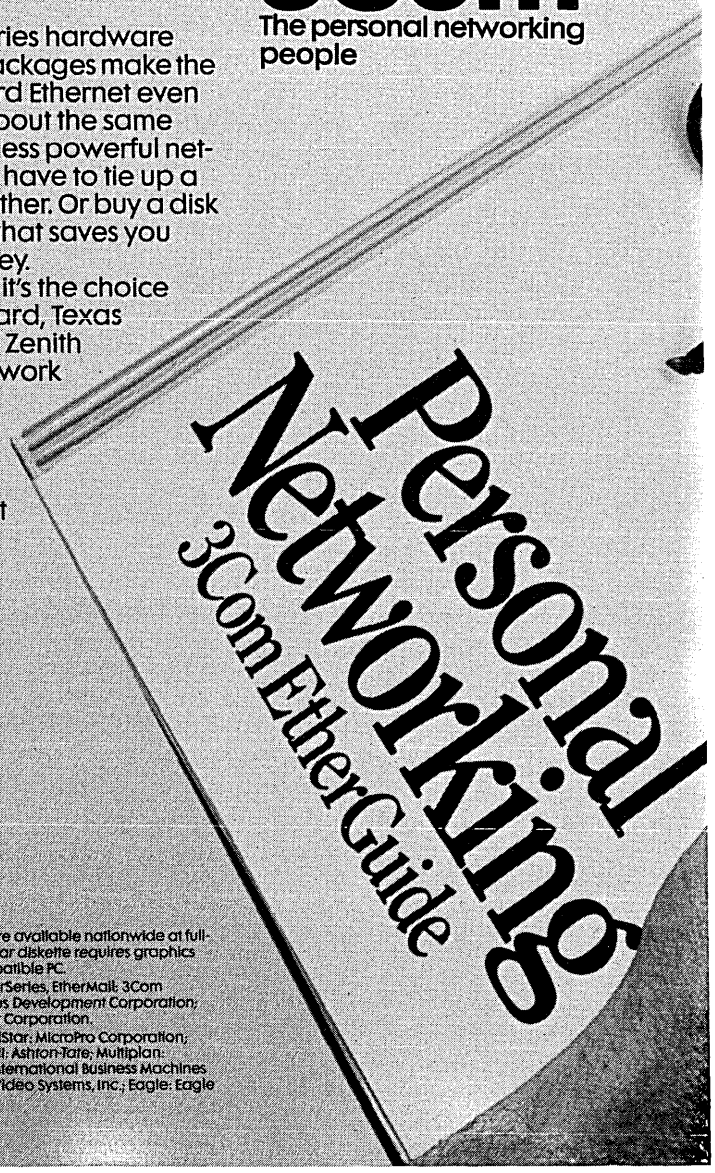

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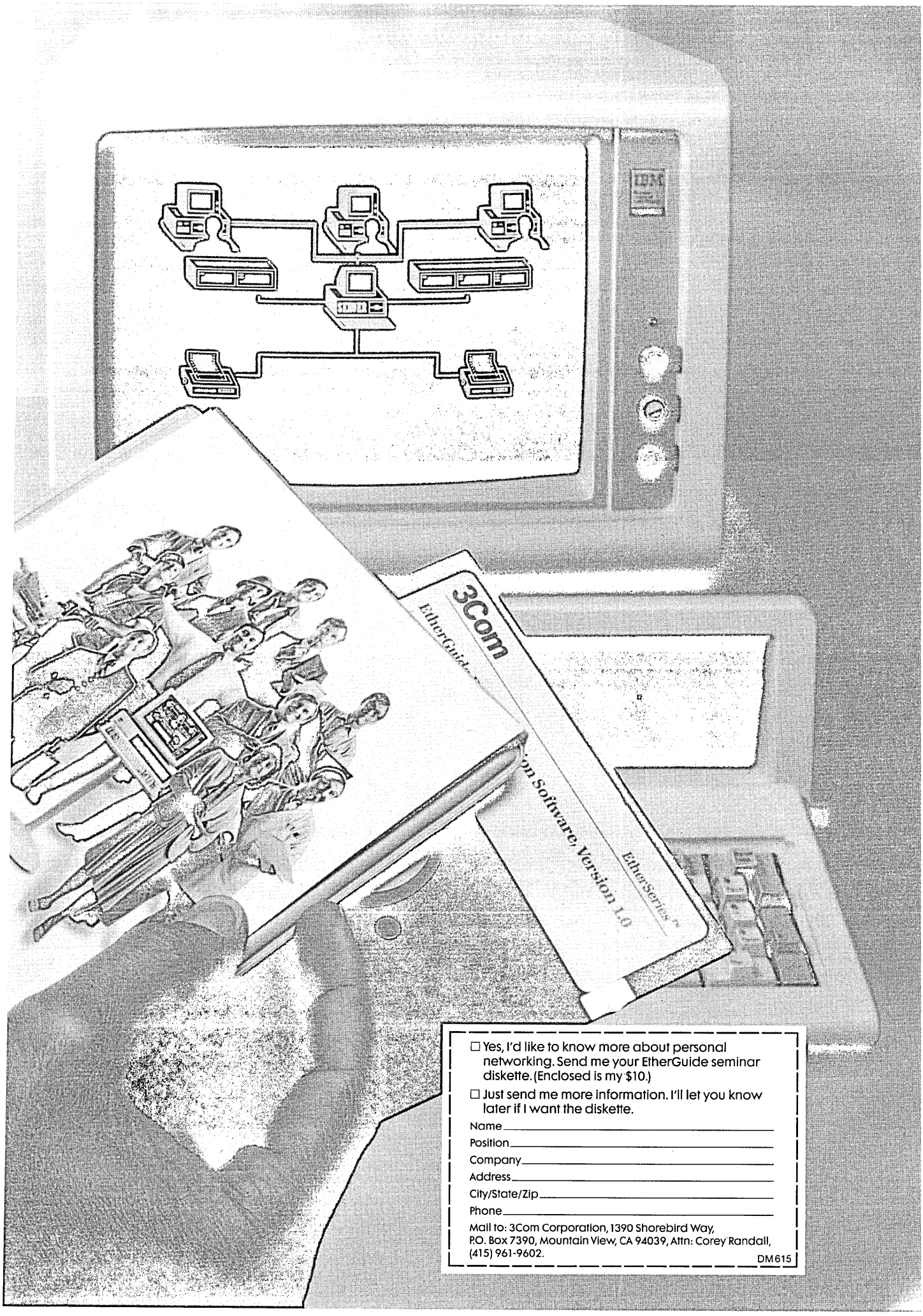

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Good technicians minimize their work by striking a balance between direct enhancement and retrofit.

able OS/360 of 1966. It also explains why it is no easier to persuade the American taxpayer to invest in a brand-new B-1 bomber than it is to persuade the IBM customer to invest in a brand-new operating system.

When would a dp group find it worthwhile to change form if the customers are only willing to pay for changes in function? Answer: when the cost of changing function can be brought down by changing form.

Howard Rubin, professor at Hunter College in New York and author of the Estimacs software cost-estimation package based on a validation sample of some 1,000 projects, reports that software systems with good documentation and low complexity can be expected to take 20% less effort to modify than those with no documentation and high complexity. Although 20% is a considerable saving, an all-out project to increase documentation or reduce complexity has its own costs and may not pay off in the foreseeable future. The challenge, as in any engineering or managerial activity, is to find the correct mix of two resources—in this case, change of function and change of form—to provide the maximum productivity.

In Fig. 1, the horizontal axis represents the proportion of productive staff time used on retrofit tasks as opposed to direct customer requests. The vertical axis is a measure of productivity: number of customer requests completed per month. Assuming that staff resources are fixed and that staff can be used for any mix of direct customer requests or retrofit, the best software maintenance policy is the mix that maximizes the productivity. At the left axis, all resources are used on direct customer requests. Requests are being completed, but at a rate that is constrained by the complexity and poor structure of the system. As we move to the right, more resources are being shifted to internal retrofit projects; their cost is more than compensated by the increased ease in completing customer requests. This improvement peaks at a certain point—on this version of the graph at 22%, or about one workday per workweek. Internal projects to improve the system beyond that point are only apple-polishing; beyond it, productivity declines to zero.

Finding this maximally productive mix is analogous to finding the right mix of preventive maintenance in maintaining a physical system. (They are not the same because software maintanance, consisting chiefly of enhancement, is different from physical maintenance, consisting chiefly of repair.) The cost of the maintenance crew of, say, a railroad is distributed between preventive maintenance in the shops (inspection, routine service, etc.) and direct repair in the field. The best mix is the one that provides the highest uptime for the railroad as a whole.

There is no magic formula for finding that optimal point. The 1,478-page McGraw-Hill *Maintenance Engineering Handbook* puts it this way:

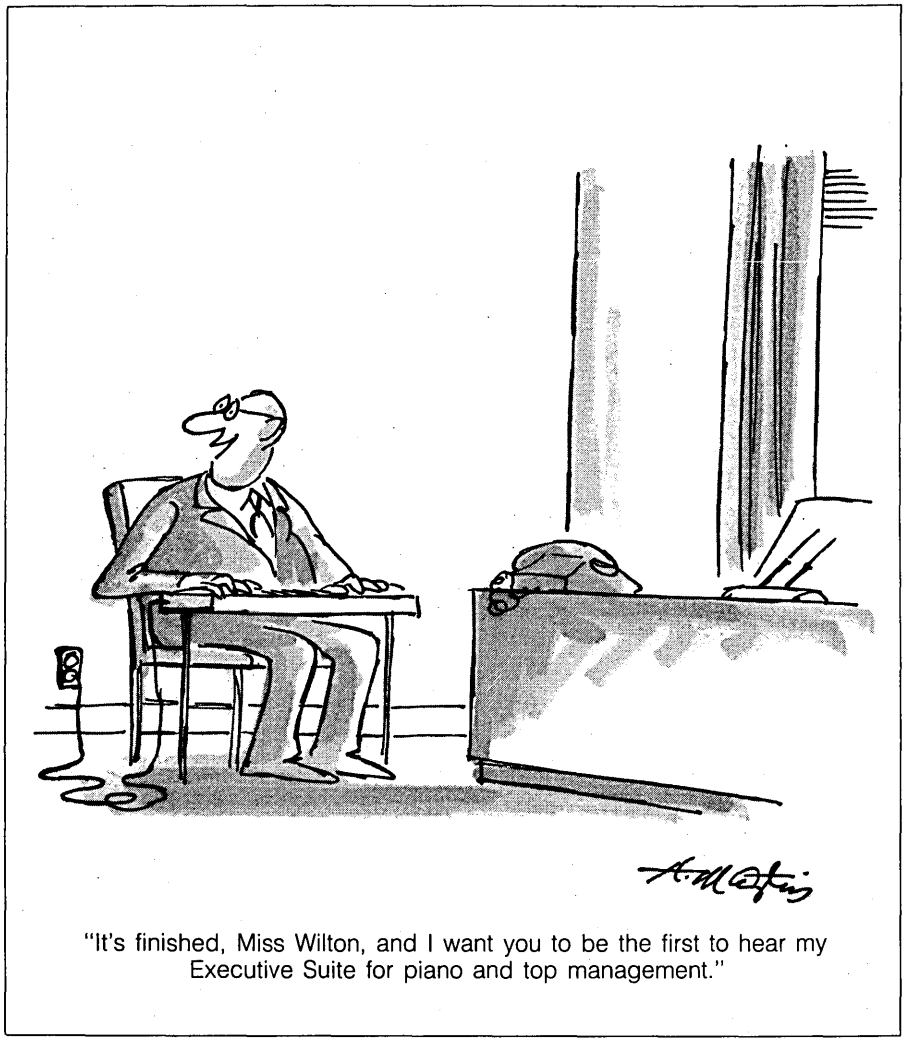
THERE IS NO MAGIC FORMULA

"How can one know when he is overmaintaining, or undermaintaining, or doing just the right amount? It's a matter of individual analyses of actual results. . . If there are no repairs, chances are you're overmaintaining. If there are too many repairs, the inspections aren't getting at the root of the trouble. The dollar appraisal always helps you arrive at a good balance."

To find that equivalent point for software maintenance, look at the worst software and at the best technician.

The worst software is the oldest, the least understood, the most disorganized, or the hardest to work on. On such software it is easy to measure directly the extra time that the technicians require to overcome its problems—increasing the size of a table, working around a module that cannot be understood, and so on. It is also easy enough to find small projects that provide an immediate improvement. The time taken making improvements versus the time saved by employing them gives the manager a feel for the load of retrofit in the worst case.

The best technician is the fastest, smartest, possibly the idlest and most arrogant, maintainer in the shop. The best technician is like the old dog the farmer observes when picking the site for a new farmhouse: the place the old dog likes to lie in is where there is most sun and least wind. Good technicians reach a balance between direct enhancement and retrofit to minimize their work. They intuitively find the maximal point on the graph. In shops where retrofit is not an explicit practice, good technicians often have a reputation for doing retrofit under the table: "The program was such a mess I rewrote it without telling anyone." Good technicians get away with this because they



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The creators of effective software tools are a small, elite group.

can handle code faster than their peers and therefore have a cover for under-the-table activities. The less speedy technicians have less opportunity to choose their own mix. Nevertheless, they also should be doing retrofit. Having discovered an appropriate retrofit mix from the best technician, you can apply it to the less good technicians.

In truth, the resources for retrofit vary with the importance of a quick turnaround of enhancement requests. Just as preventive maintenance rises with the requirement for fast repair, so retrofit rises with the requirement for fast enhancement. You can, therefore, expect to see the proportion of retrofit in the software maintenance mix rise as volatile interactive systems become the norm.

The concept of retrofit as a response to immortal software is a new one, and the pioneer innovators and case studies are just appearing. The modern practice of retrofit starts with J. Cris Miller. Miller, 46, the holder of two master's degrees in economics, a native Californian transplanted to Chicago, is a man who sees enough complexity in the world around him without adding the complexity of degraded software. In 1973, Miller angrily denounced the articles in DATAMATION that proclaimed a "revolution in programming" by IBM's Improved Programming Technologies. The techniques seemed completely inapplicable to the world of existing software.

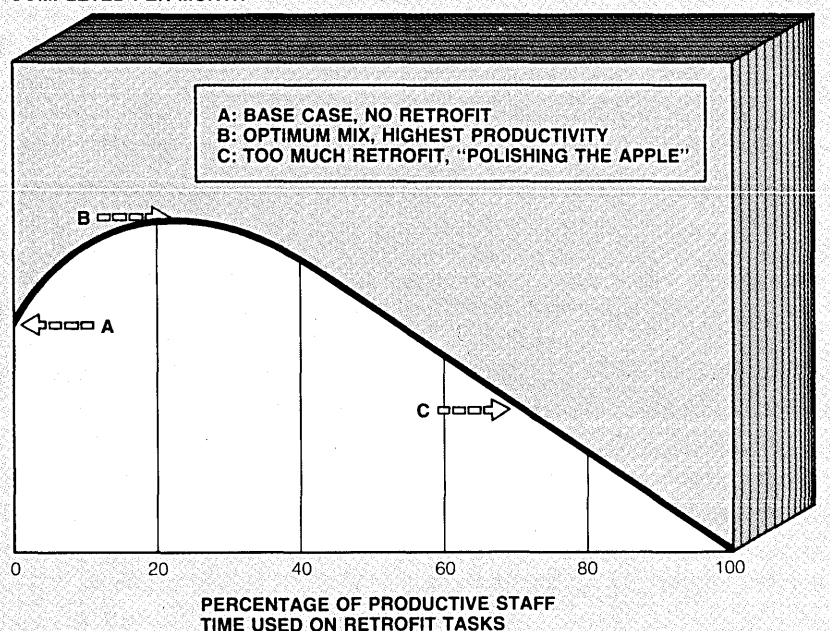
IBM publications and the Yourdon Inc. curricula of that time outlined theoretical methods of converting any program into a structured program. These methods were offered as a proof that any process could be expressed in a structured way. But what if some means could be found to introduce the structured techniques into existing software? In 1976, Miller spent a month researching and interviewing programmers, and wrote a report with the less-than-catchy title, *Improved Programming Technologies Retrofit: A Study of the Application of Improved Programming Technologies to Systems Developed without Improved Programming Technologies*. It outlined a strategy to defer major rewritings of a system and extend its life.

Miller's idea was that programs should be put through a software assembly line—a sequence of software tools that would systematically and automatically analyze and reverse unnecessary complexity. There was no tool for the central problem, that of control structure complexity, sometimes called "spaghetti code," so in 1978 Miller wrote a program originally called SOWSEAR (the material from which SILKPURSES are made)—a COBOL structuring engine.

A structuring engine, in his words, "Transforms an executable program written in a given language, but of undetermined structure, into another program written in the same language with a well-defined structure; and the resulting program produces the same transformation on any set of input data as does the original program."

FIG. 1

FINDING THE OPTIMUM MIX



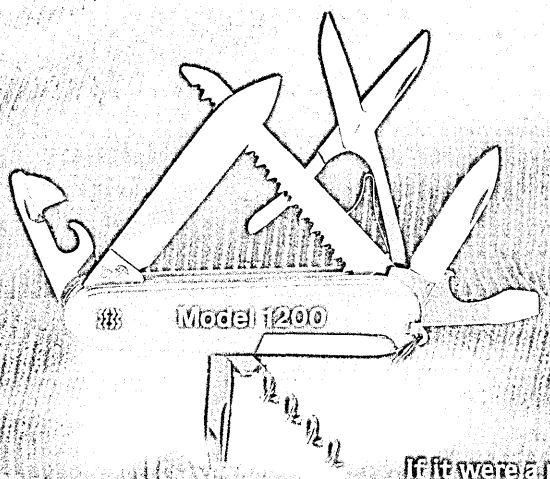
Miller has a programmer's idealistic faith in the force of an idea; to know how to do something is to get it done. The real world is more stubborn. As Miller himself recalls, there were at least two occasions when he tried to give the entire process away for free—and there were no takers. At approximately the same time, Michael Lyons, now 32 years old, returned home from service with the U.S. Army in Europe, determined to found a business. In 1978, he heard from a mutual acquaintance of a talented dreamer who claimed to have a process for rejuvenating software. Lyons investigated, liked what he found, created a business plan, raised venture capital, and in 1979 he and Miller founded The Catalyst Corporation. He set out to promote their service, Structured Retrofit, using a charismatic speaking style best described as a cross between a Mormon missionary and General George Patton.

In 1983, after a joint project with Peat, Marwick, Mitchell & Co., in which they rejuvenated a system for ITT Diversified Credit Corp. at a price that undercut rival redevelopment bids by more than half, they sold the company and its process to Peat, Marwick. In 1984, readers of certain business and banking papers began to see color ads from Peat, Marwick with a surrealistic scene of lurid sunset and melted watches: "The landscape of your computer software can grow rather twisted over the years. . . " With a staff of 20,000 and 95 operating offices, Peat, Marwick has the muscle to make Structured Retrofit into a nationwide service.

AN IDEA STILL VIABLE

Nevertheless, Miller's original idea, that any technologically aware dp group could use an assembly line of software tools to rejuvenate their own software in-house, is still viable and has a champion in H.W. (Bill) Morgan. Morgan is a software wizard who could not look less like a software whiz-kid. Fifty years old this year, he has the quiet manner of someone who installs and services cash registers. A native of Washington, D.C., he graduated with a BS in Mechanical Engineering, and for 13 years he sold large hardware for IBM.

In 1969, Morgan switched to selling consulting, and after a few years he realized that "the lack of program documentation was the bane of every site's existence." He taught himself COBOL by reading a manual in his spare time and wrote a program, now market-



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Perhaps software is facing a mid-life crisis and is grasping for the fountain of youth.

ed by MAC Computing Inc., Silver Spring, Md., ad DCD-II, that indexes and charts a COBOL program. In 1978, he wrote a program, SCAN/370, to answer the programmer's question—not a trivial one in COBOL—"If I am here in the program, how could I have gotten here?" In 1983, he realized he knew enough about COBOL's control structure to write his own structuring engine, called SUPERSTRUCTURE. (SCAN/370 and SUPERSTRUCTURE are marketed by Group Operations, Inc, Washington, D.C.)

The creators of effective software tools are a small, elite group, and Miller and Morgan, though no-holds-barred rivals in public, are respected colleagues in private. Their specialty, the simplification and streamlining of systems of COBOL programs through the use of tools, does not exhaust the topic of software rejuvenation. Turing's theorem, that a system can be mechanized in an infinite number of ways, does not apply just to COBOL programs, or just to programs, but to data, utilities, documentation, user procedures, configuration management, and all the activities that go into a total system.

All over the world, more or less in ignorance of each other, groups have been rejuvenating different aspects of their systems during the last few years:

Seattle, Wash. 1978. Boeing Computer Services decided that they had to live with an obsolete and cranky suite of applications for another 3 to 5 years, pending a database redesign. George Goodwin used a front-end development tool called Maestro, marketed by Four-Phase Systems, to analyze and distinguish the underlying function of the software from its surface disorder.

Tokyo, Japan, 1979. The Central Research Institute of the Electric Power Industry designed a Maintenance Support Facility for programs on IBM-compatible Hitachi machines, including data dictionary control of all naming conventions, a testing harness, and a project control framework for management. As a first implementation, a team led by Michio Suzuki unified the data names in software running at Chugoku Electric Power Company and brought them under the data dictionary.

Gütersloh, West Germany, 1981. The Bertelsmann Publishing Corp. received software for ordering, billing, packing, and distribution. It had inaccurate documentation and inadequate test data. A group at the Software Engineering Service in Munich, led by Harry M. Sneed, used a suite of PL/I tools to retrofit specifications and test facilities for a portion of the system.

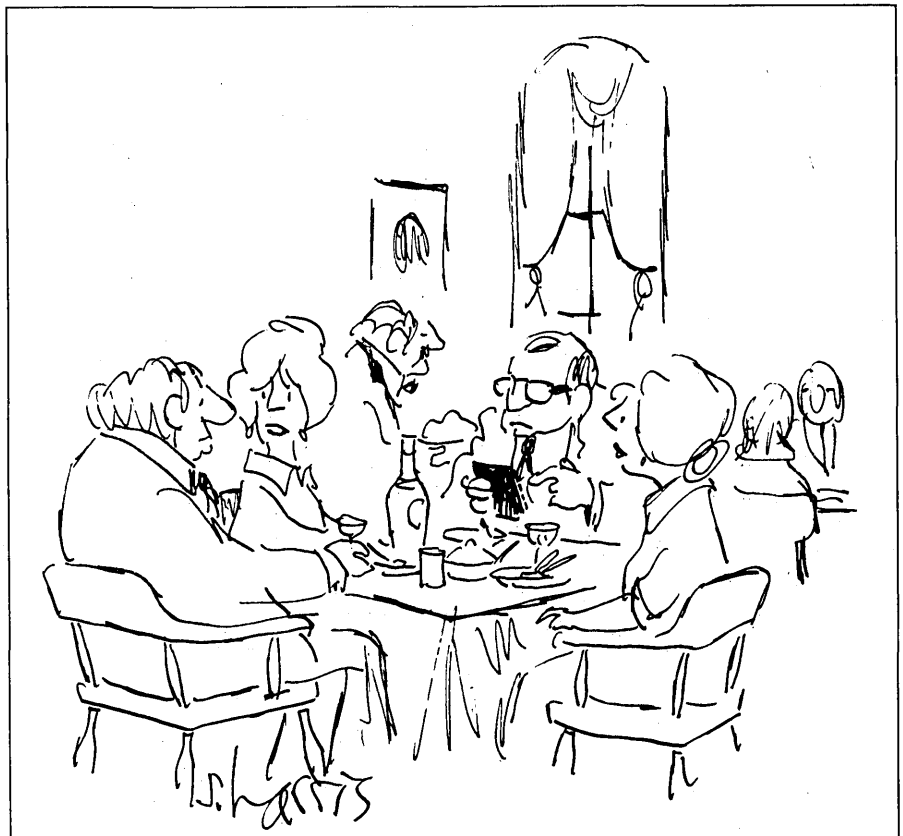
Dahlgren, Va., 1983. A support group at the Naval Surface Weapons Center was assigned new combat software written in a Navy language (CMS-2) to run on Navy computers (AN/UYK-7). Concerned about the problems of supporting the software, they generated for their command typical scenarios of error reports and enhancement requests, and showed that they lacked the proper support tools for quick response. They were authorized to create such tools. A quality assurance team, led by David E. McConnell, using the same computer and the same language, retrofitted from the delivered system a database reflecting the as-built configuration.

The idea of software rejuvenation, as opposed to redevelopment or rebirth, is a trend of the 1980s. Perhaps software, at the age of 40, faces a mid-life crisis and is grasping an option not available to human beings—the fountain of youth. The benefits are mixed, as Lemuel Gulliver would have discerned. A working title for an early version of this article was "Adapting to Immortal Software." An early reader pointed out: "You have shown how software adapts to immortality—by retrofit. But how do *we* adapt to immortal software?"

Joseph Weizenbaum, in *Computer Power and Human Reason* (W.H. Freeman and Co., 1976), suggested that the computer arrived "in time to save. . . social and political structures that otherwise might have been either radically renovated or allowed to totter under the demands that were sure to be made on them." He and other thinkers regard the computer not as a wave of change, but as a conservative force that has channeled American energy into converting old processes into new mechanisms instead of into creating new processes. The immortality of software is a force in the same direction. Gulliver reported that the Struldbruggs were disenfranchised and disinherited at age 80:

"Otherwise, as Avarice is the necessary Consequent of old Age, those Immortals would in time become Proprietors of the whole Nation. . . which, for want of Abilities to manage, must end in the Ruin of the Publick."

Immortally young software may be even more troublesome to us than immortally old software. Where nothing grows old, what room is there for anything new? ❋



"Don't mind Henry. He always figures out what the meal costs compared to what it would have cost at home."

CARTOON BY SIDNEY HARRIS

Nicholas Zvegintzov, 44, a New York City writer and consultant, aims to live long enough to recover his development cost, plus a small profit.

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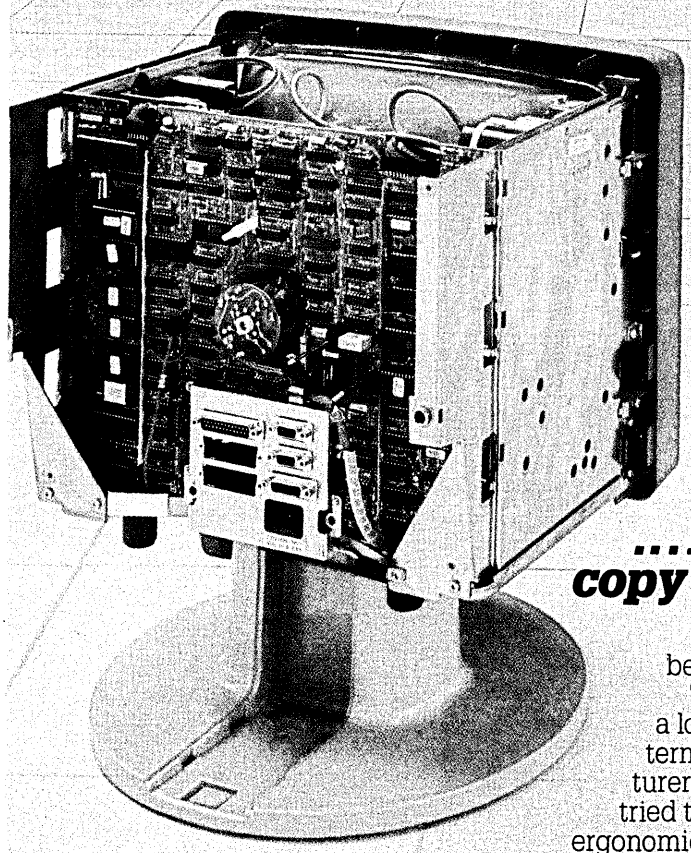

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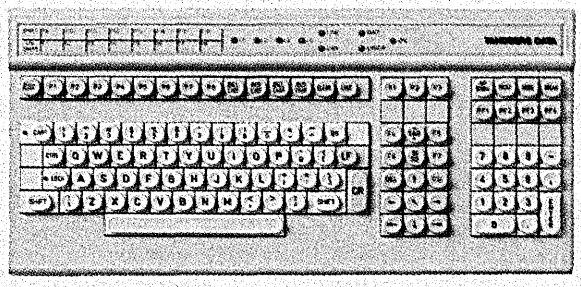

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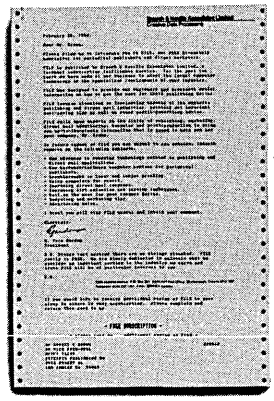

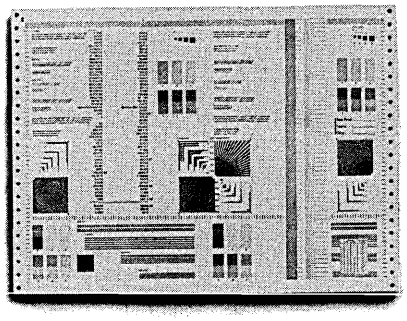

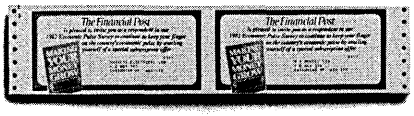

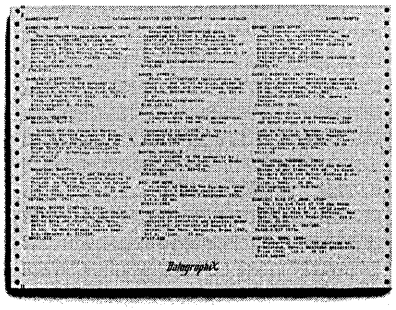

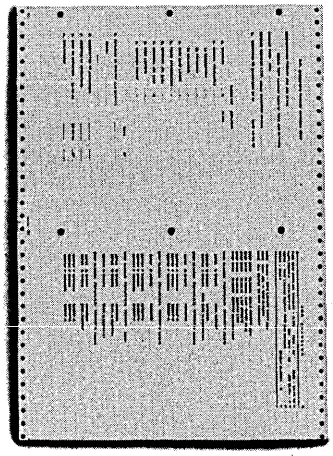

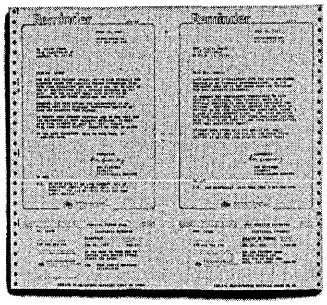

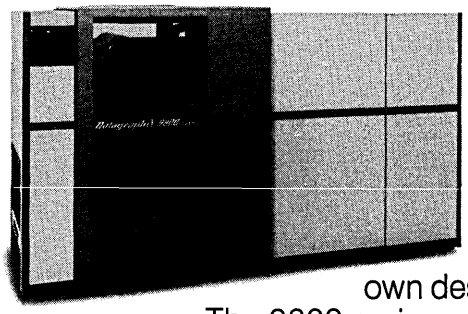

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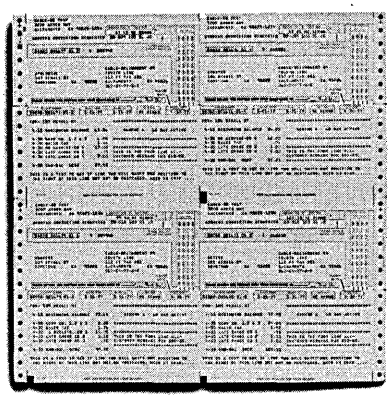

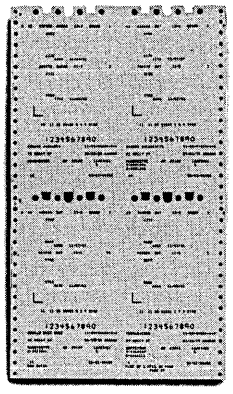

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CIRCLE 84 ON READER CARD

In operational systems it isn't the speed of coding that matters, but the quality. That's why 4GLs are less useful than sound management practices.

RETHINKING PRODUCTIVITY

by Bill Inmon

In the ongoing search for technical solutions for all of the problems of data processing, it has been proposed that fourth generation languages are the secret to productivity and the reduction of the applications backlog. Fourth generation languages are certainly appropriate for decision support, prototyping, and environments where there is a limited amount of data and/or processing. But there is evidence that for operational systems, fourth generation languages and application development without programmers don't deliver the productivity gains their advocates claim.

The case for fourth generation languages is appealing. The ability to write code faster is put within the reach of all computer users, not just the traditional programmer. Indeed, if all code was written at the machine level, then the speed of coding would be a massive roadblock to productivity. PL-1 and COBOL represent superior productivity enhancements over machine code and, in certain cases, fourth generation languages represent a similar enhancement over COBOL and PL/1. But in the case of operational systems, the speed of coding is not the real issue.

In support of the notion that fourth generation languages may only marginally enhance productivity is a comparison of practices and results at several different shops. Eight large European shops were analyzed over a period of six years, along with 10 shops in the U.S. and Canada.

In some cases the study was done continuously over the six-year period. In others, it was done only once. In every case the numbers were gleaned from at least one reliable source within the organization and from a profile of the shops. Where possible, more than one source was used for verification. In some cases actual documentation from the company was used for obtaining counts, such as employee rosters and number of machines currently in use.

After the results were tabulated, it was noted that there was an unusual correlation between productivity and geographic location. With only one exception, the European shops were much more productive than the North American shops. Only two North American shops (one U.S. and one Canadian) were in the same range as the Europeans.

The measurement of productivity in data processing is always difficult, especially when it's done at the micro level. There are many vagaries in measuring such things as lines of code produced—so many that we chose a macro measurement. The unit of measure chosen was number of data processing people per production-and-development mainframe in the operational environment.

All shops studied had multiple mainframes and had been in data processing for more than a decade. All used standard software (primarily MVS, IMS, CICS, and ACP). A variety of methodologies was found (SDM 70, STRADIS, etc.). In some cases large, complex worldwide networks were supported; in other cases, only small networks were supported.

The industries represented were banks, airlines, energy, manufacturing, insurance, automobiles, and engineering. A few governmental agencies and other miscellaneous businesses were also represented.

The shops were compared with other shops of the same size producing equivalent amounts of output. The output was measured in terms of on-line transactions processed, reports produced, network size and traffic, the number and size of systems in operation, the complexity of the systems in operation, and the length of time the systems have been in operation.

ATTITUDES TOWARD DP DIFFER

Given the disparity that was evident across geographic boundaries, it seems worthwhile to make a few observations about European and American attitudes toward dp. In general, Europeans feel (rightly or wrongly) that they are several years behind the state of the art technologically, while Americans feel (rightly or wrongly) that they are state of the art. Europeans feel that they must catch up to technology and are anxious not to repeat the mistakes of others. Americans seem to take a Missouri-style "show me" attitude, and are often bound and determined to do things their own way. These attitudes may explain some (but not nearly all) of the differences in productivity.

The macro measure chosen included all dp personnel except those involved in direct computer operations and data entry. It included programmers, analysts, maintenance, designers, technical support (DBA, systems programming, network support), planning, training, and so forth. It did not include users. (Contractors were considered to be employees unless the term of the contract was less than two months. Except at two companies, contractors represented only a fraction of the employees used in the comparison.) Both production and development

How can one group of people consistently be three times as productive as another using the same tools?

machines were measured. Machines dedicated to fourth generation languages were not measured if they were mainly used for decision support; had that not been the case, the results would have been grossly skewed in several cases.

The question was then asked, how many people are required to support (from top to bottom) the entire operational environment? The results were dramatic: in the productive shops, the ratio of people per mainframe was between 35 and 75 people with an average of 55. The nonproductive shops required so many more people that even if there were errors in calculation, the conclusions would remain the same. Staffing levels in these shops ran from 85 people per machine up to 225, with the average around 150. The larger the shop, the more people there were per machine. It seemed to make little difference whether a shop was predominantly on-line or batch.

The productive shops were accomplishing the same amount of operational work on identical software and hardware, but using about one third the number of people. And while fourth generation languages were fairly predominant in the nonproductive shops, not one productive shop (at the time of the study) had a fourth generation language, unless Mark IV is considered to be one.

Of the shops using fourth generation languages, there was a fairly clear-cut division between operational and decision-support systems. The number of machines required for decision-support systems was high, but the productivity enjoyed in that environment was deemed worthwhile. Neither the machines nor the personnel using fourth generation in the decision-support environment were included in the comparison. In the cases where fourth generation languages were being used operationally, however, the people and machines were counted.

The question is then posed, how can one group of people consistently be three times as productive as another using the same tools?

The productivity differences appeared to be due to a combination of factors: system quality; minimal organizational parochialism; minimal bureaucracy; proper use of technology; a blending of long-term and short-term goals; and management awareness of relevant issues.

System quality. The most striking difference was in understanding of system quality. In one of the most productive shops, not one major system had ever been rewritten because of poor design. The only rewrites were performed as the shop went from batch to on-line. Enhancements were made, but quality was such that no major rewrites were necessary.

10-YEAR-OLD SYSTEMS

The shop had systems over 10 years old that were operating satisfactorily, and there were many large complex applications. In contrast, many nonproductive shops exhibited a willingness to rewrite major systems over and over. In the worst case, a third major rewrite of a system was occurring within a five-year period. The nonproductive shops simply paid lip service to quality; they seemed not to have made the connection between quality and productivity. Instead, the nonproductive shops exhibited an attitude of trying to solve problems with technicians, technology, warm bodies, and a big budget.

For the nonproductive shops, system quality was almost a nonissue in the batch environment. Only a few paid much attention to quality in the on-line environmnet. But the productive shops, anxious not to repeat avoidable mistakes, approached the on-line environment very gingerly. In fact, the approach to the on-line environment seemed to be a major dividing line. Productive shops managed it well, while nonproductive shops did not.

In addition to many system rewrites, the nonproductive shops exhibited many examples of postimplementation design and development. This phenomenon occurred as shops raced to meet development deadlines, only to spend years trying to patch up the original shoddy design.

Design review, as the primary vehicle for quality control, was done properly and taken seriously in the productive shops, while most nonproductive shops either did not do design review or only went through the motions. They tended to believe that no design changes were made by going through the review process, and that management gave little support or attention to the findings of the reviews.

Productive shops, for the most part, realized that on-line system productivity was a product of the quality of design and coding, not the speed of coding. The on-line systems built in the productive environments were designed so that system performance and availability were integral. The on-line systems built in the unproductive environments paid little attention to data and process design but put great emphasis on the speed of coding. Interestingly, in the nonproductive environment, there were many cases where a system was rebuilt, but there was still very little attention paid to on-line quality; this accounts for the continual rebuilding of systems.

Organizational parochialism. The organizational attitudes in the productive and nonproductive shops were drastically different. In the productive shops, there was a sincere team spirit throughout the organization, while in the nonproductive shops, there were many cases of separatism. Shops that had a strong sense of team spirit were able to subjugate egos and personal interests for the achievement of common goals.

There was a strong sense of where the dp department was going in the productive shop, and a sense of how each section within the dp department fit into the plan. But in the nonproductive environment, there was a strong sense of ego and personal goals with little regard for the needs or directions of the organization. Indeed, many nonproductive organizations had no overall charter. Each little department had its own goals, which were most likely in disharmony with other departments.

Minimal bureaucracy. Related to parochialism is the issue of bureaucracy. While the productive shops were generally smaller (in terms of ratio of people to machines), the size of the shops was nevertheless substantial and required formal communications. For the most part, the productive data processing personnel were generalists. This gave them the freedom of not depending on other people or departments. The result was the ability to create and maintain systems with a minimum of fuss. The nonproductive shops showed a high degree of specialization, with many departments, subdepartments, managers, and so on. Getting anything done required a truly laborious process of approvals and committees, which used many resources. All other factors being equal, the resources required just to move work through the bureaucratic organization was significant.

Proper use of technology. Perhaps the most decisive difference was in the attitudes toward technology. The nonproductive shops were ever anxious to find a technical solution to everything. This is perhaps a result of promoting technicians to managerial positions, a practice that's prevalent in nonproductive shops. Each new piece of technology requires its own support.

AMAZING ARRAY OF EQUIPMENT

Some nonproductive shops had an amazing array of every kind of hardware and software imaginable. In contrast, the productive shops had fewer types of hardware and software. In addition, the productive shops generally valued managerial ability more highly than technical ability. The nonproductive shops placed great faith in technical solutions, while the productive shops looked for a broader set of solutions.

Blending long-term and short-term goals. The nonproductive shops seem to be divided into two groups: those that were on a crisis treadmill and looked almost entirely at short-term problems, and those that em-

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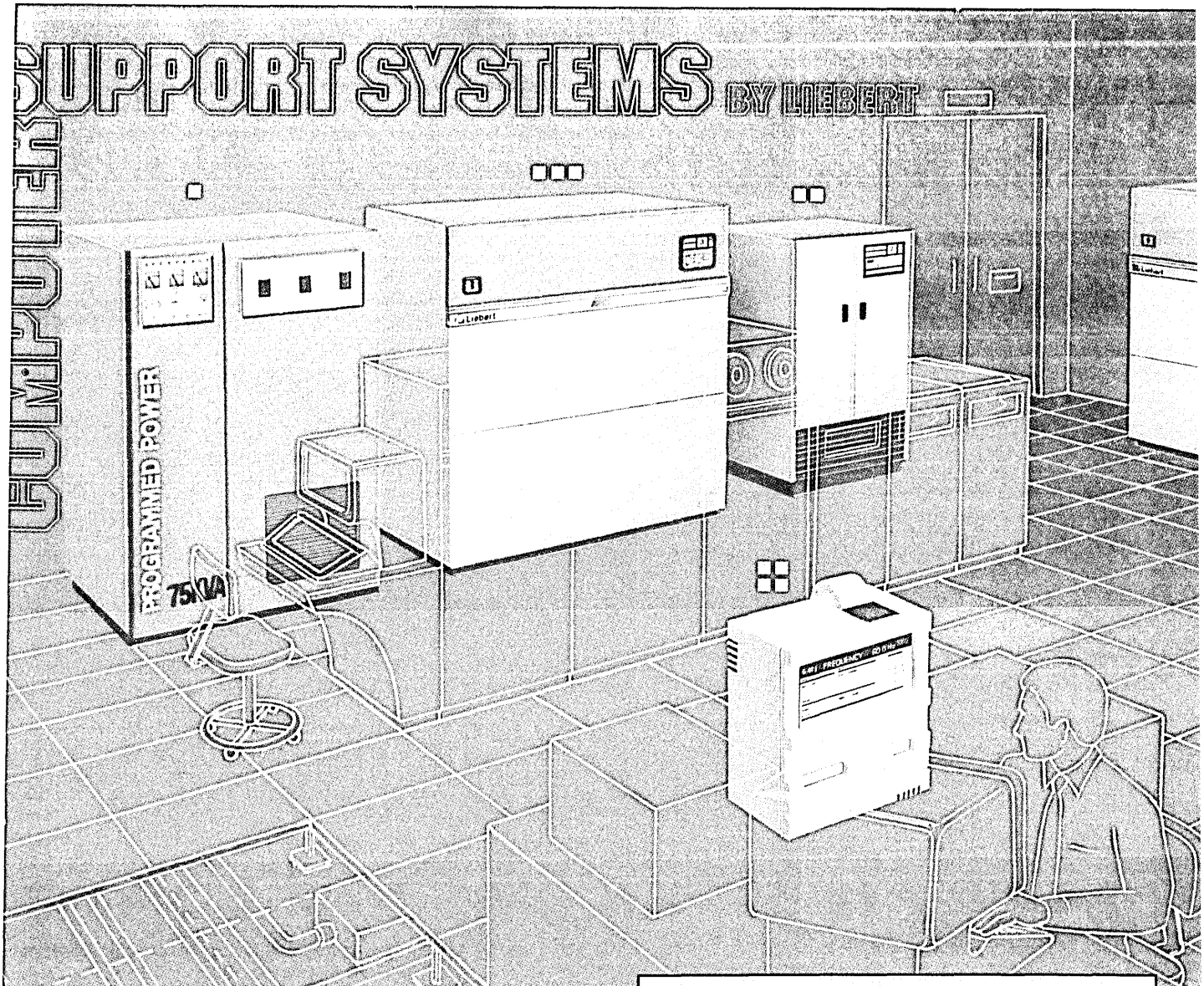

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For the most part, the productive data processing personnel were generalists.

ployed many "blue skiers," whose contribution to the organization was hazy at best. In the really large organizations there were many blue sky departments, whereas the smaller shops seemed to be incessantly in the crisis mode. The productive shops generally displayed a good balance between both long-term and short-term problems. (This was the least consistent factor throughout the comparison, it must be noted.)

Management awareness. The final factor was management understanding of the problems facing dp and the resources available to address those problems at all levels within the dp organization. In the nonproductive shops, management knew most of the buzz words, but had no idea how they applied to their organization or what the real issues were behind the buzz words. The choices of resource allocation were made almost exclusively on political considerations (i.e., which user yelled the loudest).

But management in the productive organizations was generally cognizant of what the issues were and what influence they had on the issues.

The picture here has been painted in extremes—in blacks and whites. In fact, there were competent managers in the nonproductive environment just as there were incompetent managers (but not many) in the productive environment. But the general trend that has been portrayed was consistent.

With one exception, no productive shop exhibited all of the critical factors for productivity. By the same token only one unproductive shops displayed a total lack of understanding of the critical factors. The contrast between the single most highly productive shop and the single most unproductive shop was truly remarkable. Most shops exhibited shades of grey, rather than black and white characteristics. There nevertheless was a distinct line between the productive and nonproductive shops.

There was one common thread throughout: The productive shops were consistently run with a tight budget, and the nonproductive shops were run as if the dp budget were infinite. Even though the tight-budget shops often expressed displeasure at having to live within a limited budget (and in some cases there appeared to be valid reasons for the discomfort), in the long run they were much more productive. It apparently is highly destructive to productivity to approach problems with an open check book and a purely technical approach.

Productivity in the operational environment is a product of several factors. Approaching productivity as if it can be bought, or as if there is magic software, such as fourth generation languages, is clearly a mistake. Managers must roll up their sleeves and come to grips with the issues they face, rather than try to buy their way out of them. Technicians can solve only some problems, so there is a limit to what they can and ought to do. The speed of coding is only a minor factor in the overall productivity of a data processing department. The quality of operational system design and coding is far more important than the speed with which it is done. ✱

Bill Inmon is a director at Coopers & Lybrand in Denver, specializing in information systems. He's the author of *Management Control of Data Processing* (Prentice-Hall, 1983) and other books.

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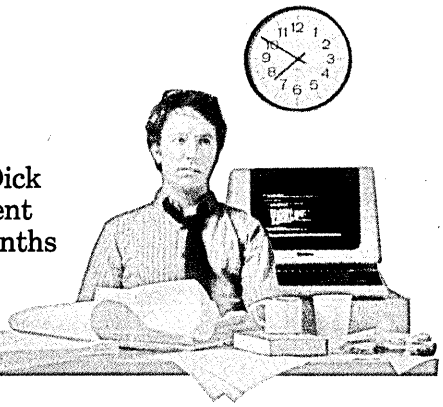

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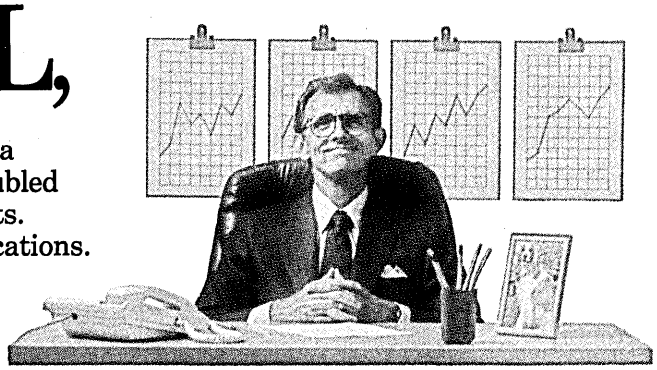

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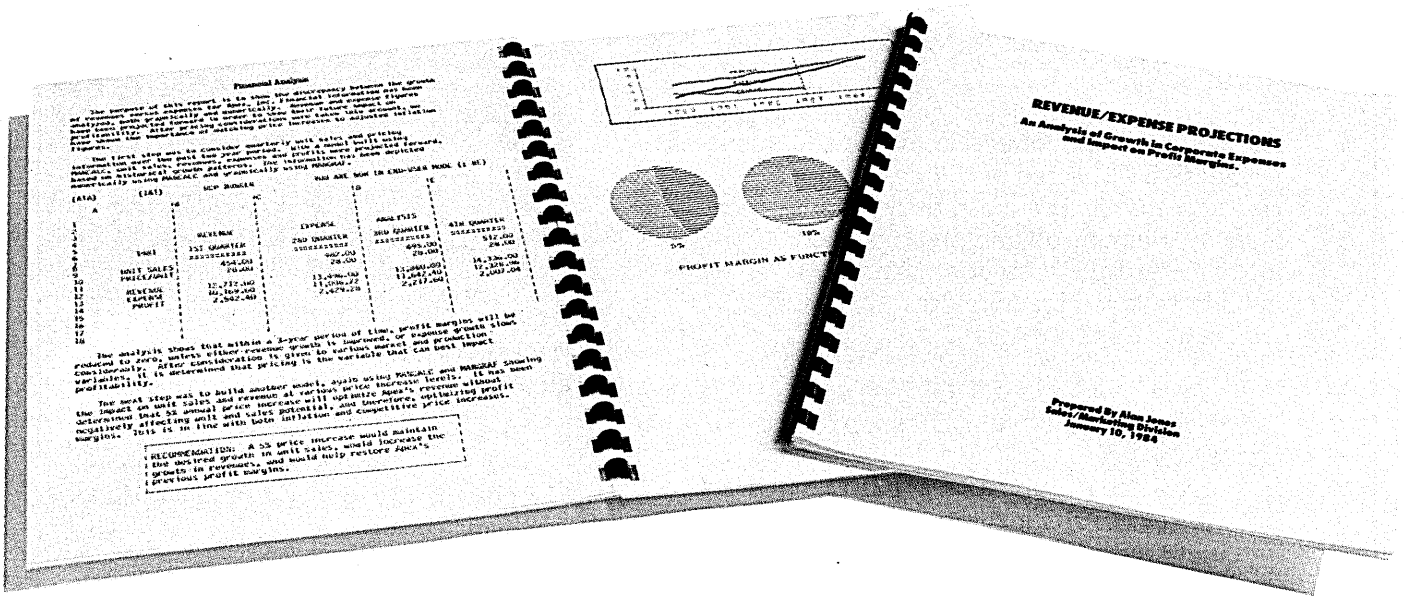

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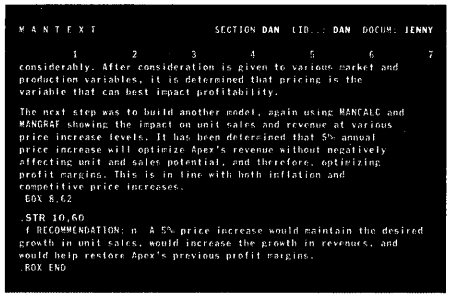

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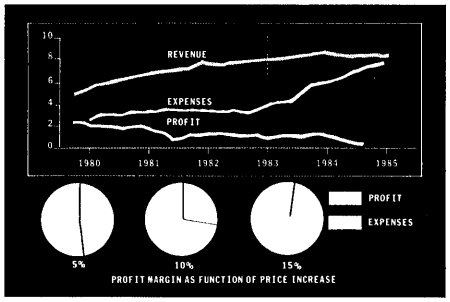

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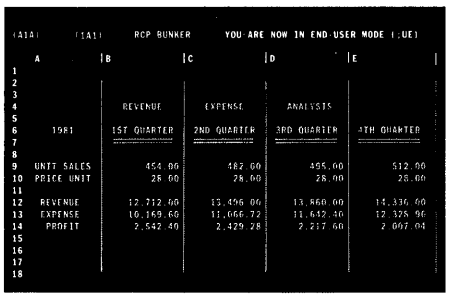

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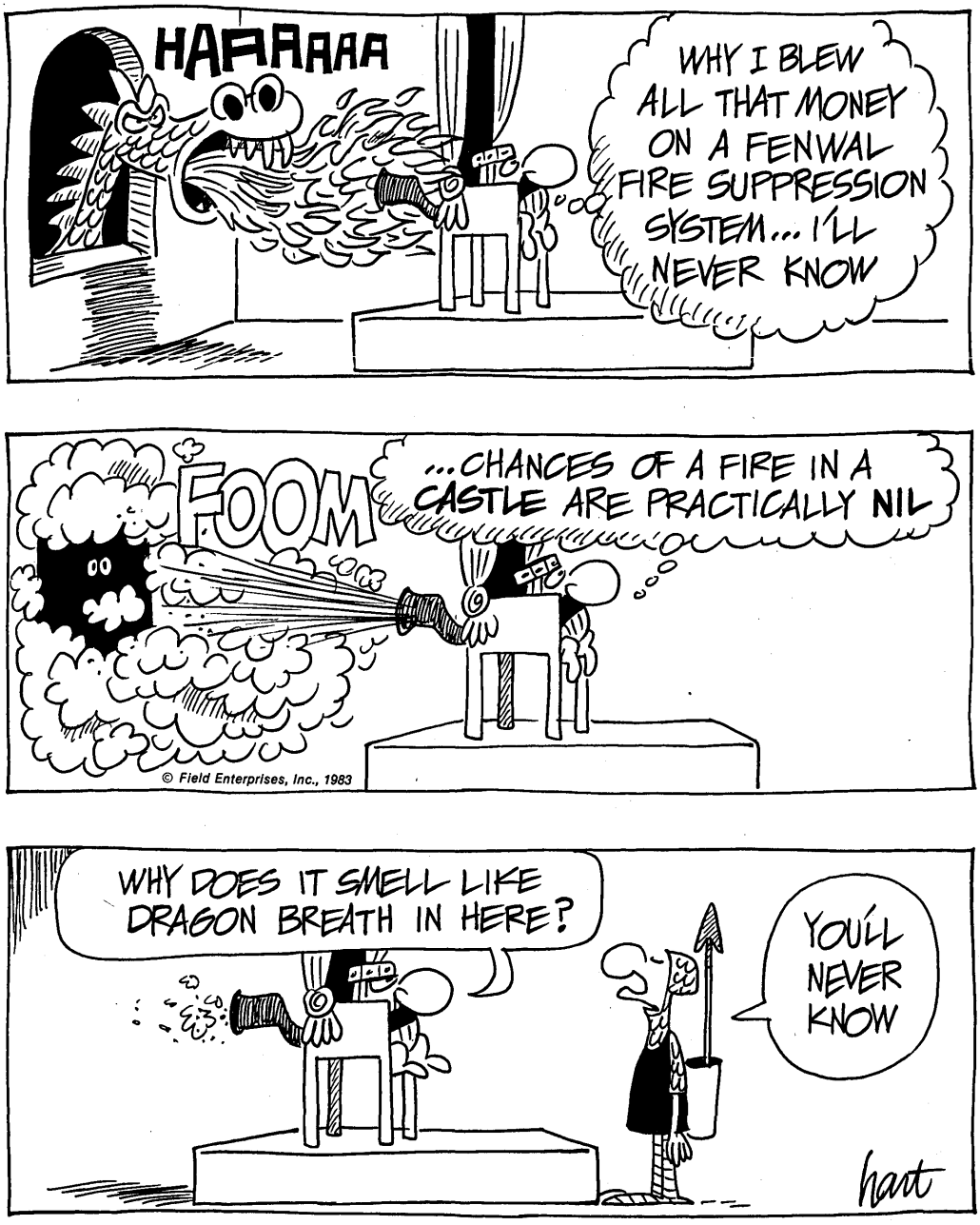

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CIRCLE 89 ON READER CARD

The true story behind the Great Todayan 5G project.

FIFTH GENERATION EPISTO-ENCABULATORS

by George E. Lindamood

Once upon a time there was a nation in the East called Today. It was a small nation, consisting of four principal islands plus more than one hundred smaller islands, but its population was more than 100 million. Today was a mountainous land, partially formed by volcanos, so much of it was uninhabitable. Hence, its people were crowded into coastal plains and inland valleys, living in cramped quarters that some Western visitors likened to rabbit hutches.

Through centuries of living so close together, Todayans developed cultural values that gave preeminence to groups rather than individuals. Singular action, particularly any that ran counter to the group's interests, was frowned upon. "The nail that sticks up must be hammered down," went the Todayan proverb.

For many centuries, Today remained essentially closed to visitors from other nations, which engendered a mysterious quality about the nation in the minds of foreigners. In Todayans, it bred a degree of xenophobia that, coupled with socially prescribed strictures of politeness, usually overwhelmed any temptation to be curious about foreigners.

During the eighteenth century, however, a strong leader, Bright Ruler, rose to power in Today and instituted a policy of encouraging Todayans to study Western ideas and methods, while retaining their own traditional values. Thus, Today eventually emerged as a strong industrial nation, fighting several successive wars with other nations during the following 100 years.

In the last of these wars, Today was defeated by the Western nation WE, which subsequently imposed military occupation under the rule of General Bellybutton, the leader who masterminded WE's victory. A strict but enlightened ruler, the general disestablished some traditional Todayan institutions and practices that he adjudged had contributed to the nation's military aggression. He also bestowed a modern constitution upon Today and initiated reconstruction of the nation as an industrialized, democratic state.

Once again the harsh realities of Today's geography came to bear; it had to become a trading nation to acquire goods to feed its people and support its industry. The necessity of coordinating and setting priorities for reconstruction gave rise to a modus operandi involving extensive consultation among government and industrial leaders. This was consonant with the traditional Todayan values that emphasized the group's well-being over the desires of constituent factions.

TRADE IS CENTER OF CONFLICT

This combination of Western ideas and traditional Todayan values worked exceedingly well, and less than 30 years after its defeat in war, Today emerged as a modern, strong, and efficient industrial state. It was so strong, in fact, that problems began to arise between Today and the Western nations—WE and its allies in Yurp. At the center of these problems was trade; initially involving basic commodities such as steel and textiles (the first industries Today rebuilt), and then involving manufactured goods such as automobiles, cameras, and ships.

Even as Today achieved preeminence in these industries, however, its leaders looked ahead to Today's evolution into a factual society. (As explained by Western philosophers, economists, and sociologists, a factual society is the next logical stage in economic development after industrialization.) At the same time, Western nations were also evolving into factual societies. Indeed, they were farther along than Today, owing primarily to their earlier development and application of the principal device for manipulating "soft things"—the episto-encabulator.

Today's evolution into a factual society made a great deal of sense, given its geographic circumstances. Unlike the production of "hard things," which required imports of raw materials and energy, the distribution and use of soft things required intelligent and educated humans—and, of course, episto-encabulators. Today, it so happened, had a good supply of intelligent humans, thanks in part to a long and distinguished intellectual tradition that gave Today the world's highest literacy rate. "So," reasoned Today's leaders, "let's build upon our strength —our people—whom we shall have to feed in any event."

Today's leadership perceived that the principal factor retarding their nation's progression into a factual society was its lack of an indigenous episto-encabulator industry. Since WE and the Yurp nations of UK, Fronz, and West Uber Alles had established techni-

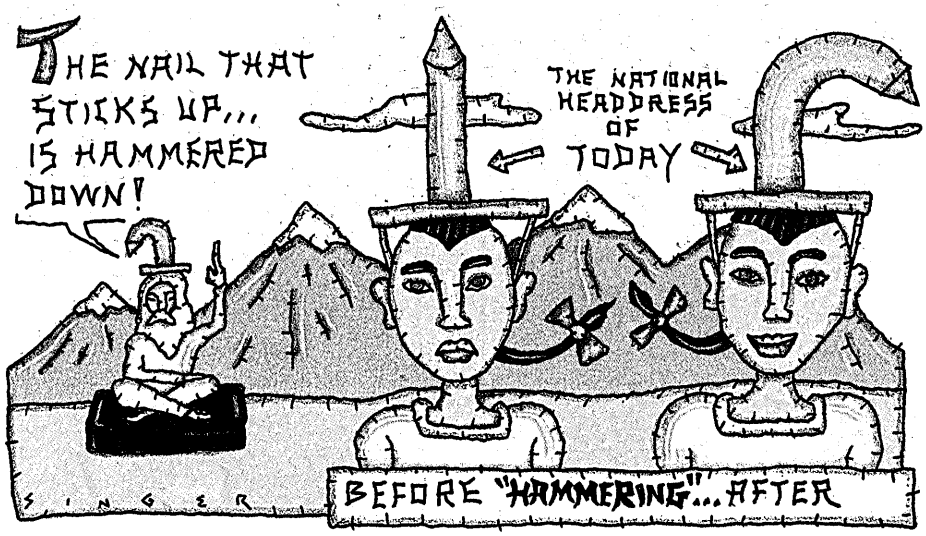


ILLUSTRATION STEVE SINGER

The principal factor retarding Today's progression into a factual society was its lack of an indigenous episto-encabulator industry.

cal leadership in this area, Today faced the problem of catching up to them.

First, in keeping with their cultural pattern, the Todayans set up a committee to study the problem. The committee recommended that 1. Today should learn as much as it could about how to make episto-encabulators by having its companies enter into technical licensing agreements with Western episto-encabulator companies; 2. Today should keep the foreign companies on a short leash in its domestic episto-encabulator market so Todayan people wouldn't get addicted to foreign products and Todayan companies wouldn't take too much of a beating while learning; and 3. the Todayan government should sponsor some research and development projects on episto-encabulators to spur Todayan companies along and keep them in line with overall strategy.

PUSH CAME 15 YEARS LATER

The committee that made these recommendations did so quite early in Todayan reconstruction—about 10 years after the war. But, because industries like steel and automobiles had to be given first priority, the push in episto-encabulators didn't come until nearly 15 years later. By that time, there had been a shakeout among the world's episto-encabulator makers, resulting in clear industry dominance by a WE-based firm, Universal Thinking Machines Inc. (see February issue of DATAMATION, p. 154, for more information on UTM).

The prospect of being dependent upon a single country and, worse yet, a single company, for supply of a critical element in the operation of a factual society was more than Todayan leaders could countenance.

Based on their experience in developing other industrial segments, Todayan leaders set out to establish the credibility of their episto-encabulator industry. This step was necessitated by the worldwide reputation of some Eastern nations for making cheap products of poor quality. To combat this, Today adopted a dual strategy: first, it developed episto-encabulators that were bigger and more powerful than the best UTM models; second, some of the newly developed Todayan episto-encabulators were UTM-compatible, that is, their "balderdash formats" were identical with UTM's and their "prestidigitation vocabularies" were nearly, if not completely the same.

This effort succeeded, and Today became confident enough of its episto-encabulator production that it removed (ostensibly, at least) the impediments levied on foreign episto-encabulator firms trying to sell in the Todayan domestic market. Todayan companies also began to export episto-encabulator systems and subassemblies, albeit on a modest scale.

This aroused great furor in Western nations, which were apparently shocked that the Todayans could come from so far behind to capture second place in such a short time. Given the great gap between first and second place, the Western nations—especially the first place WE—probably overreacted. They were perhaps conditioned by previous Todayan successes in steel, textiles, autos, ships, and cameras. About this time, Todayan companies also began exporting considerable quantities of meta-detritus, the principal component of episto-encabulators. Much ado was made about the fact that the Todayan companies producing episto-encabulators were also producing meta-detritus, which was not true of most Western companies (except UTM).

This made possible the Todayan episto-encabulator companies' transition into the next development phase: profitability. Western companies were quick to point out that their profits were still much greater than those of Todayan companies. To some extent, this may have been whistling in the dark, although Westerners seemed oblivious to the fact that Todayan companies don't care about piling up great profits. Their goal is to make a relatively small profit while serving "the group"—company, employees, nation, and (maybe) the world, in that order—by providing jobs and products.

At any rate, while Western nations grudgingly acknowledged and benefited from Todayan progress in meta-detritus, they told one another that they still enjoyed a significant lead over the Todayans in obfuscation, another essential ingredient in building episto-encabulator systems. "Furthermore," they said, "the development of obfuscation requires creativity, something that is antithetical to the Todayan group-oriented psyche."

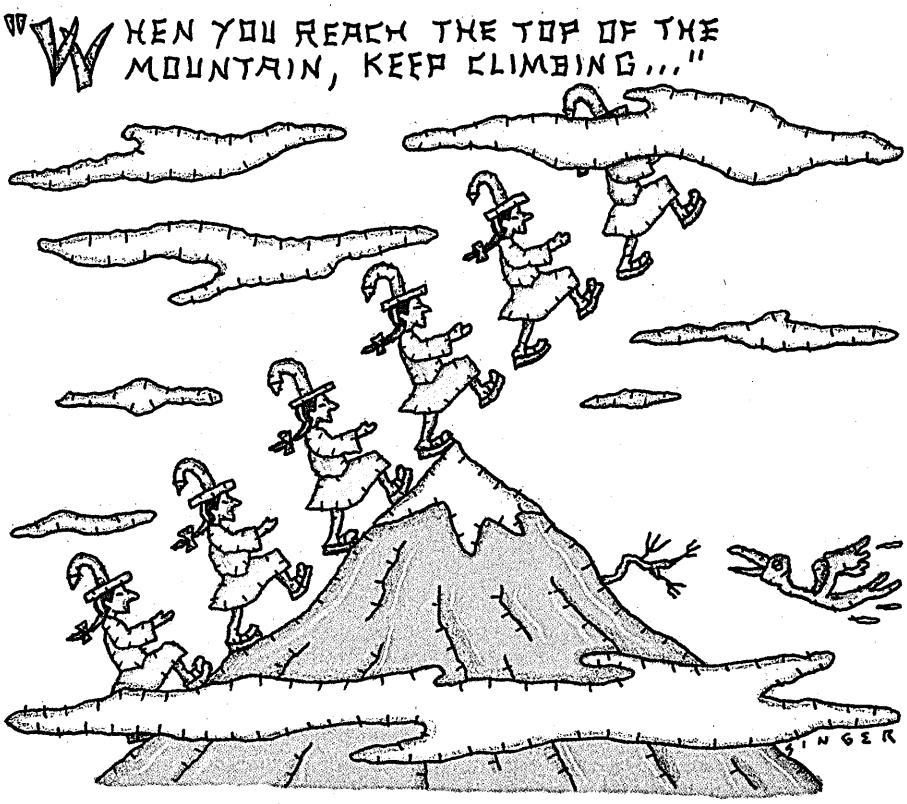
Westerners began to say that if Today wanted to be a first-rate industrial or factual society, it should put more emphasis on basic research (whatever that is) instead of projects that duplicated the results of Western technology. One suspects that much of this was flatulent rhetoric to bolster sagging Western morale and soothe wounded Western pride.

Nevertheless, the Todayans were serious and set out to move their episto-encabulator industry into the next and final phase of their industrial development paradigm: innovation. The first thing they did, which came as no surprise, was to set up a committee to study the matter. The committee deliberated for about three years, during which time they consulted with leaders in Todayan academia, industry, and government. The result was a plan for a basic research project called Fifth Generation Episto-Encabulators.

The committee's report began by giving the rationale for such a project: "Implicit in the concept of the factual society is the widespread use of episto-encabulators by the entire population. Therefore, the factual society of the future will require a new kind of episto-encabulator that is easy to use. These episto-encabulators will be qualitively different from those of the past. For the sake of convenience, we shall call them fifth generation episto-encabulators."

BASIC RESEARCH APPROACH

Next, the report presented the basic approach to be followed in research leading to fifth generation episto-encabulators: "The reason that current episto-encabulators are so difficult to use is that they are all of the 'Oldman' type—so named for Jack Oldman, one of the early developers of episto-encabulators. The problem with Oldman-type episto-encabulators is



that their basic mode of operation is very different from the way people think. That is why episto-encabulator obfuscation has become so complex and even more expensive than the tomfoolery. This project will pave the way for easy-to-use fifth generation episto-encabulators by doing basic research (whatever that is) in 'non-Oldman' episto-encabulator conglomeration."

In presenting its implementation plan, the committee said, in essence: "We really don't know what we're doing when we undertake basic research—or so we've been told. So we'll mess around for a while—say, about three years—making various kinds of sandboxes for each of the research areas. Then we'll try to decide which of these sandboxes promises to be the most fun, and we'll spend the next four years playing in them. If we're lucky, maybe we can build some neat sand sculptures to patch together into a prototype non-Oldman episto-encabulator during the final three years."

And so the Fifth Generation Episto-Encabulator Project (or 5G Project, as it came to be known) was born. The project's backers were pleased with their plan, although some were still a little uncertain about just what it meant to do basic research, so they decided to hold a multinational shindig to tell the world about it. "The Westerners will be pleased," the backers told one another, "to see that Today is finally assuming its proper role among nations by doing basic research."

Sure enough, the Multinational Shindig on Fifth Generation Episto-Encabulators attracted a great crowd. By most accounts, it was a success. The foreigners expounded and pontificated, and the Todayans listened attentively and took copious notes on everything they said. Everyone agreed the Todayans were simply marvelous hosts and that the idea of a fifth generation episto-encabulator was . . . well, interesting. There were, however, some hints of skepticism in the reactions of the foreigners, although most expressed it tentatively and couched it in very polite language.

First of all, the goals of the various research areas selected for the 5G Project were acknowledged as being rather ambitious. But the westerners were troubled because they didn't see how these goals could be attained by following the plans set forth by the 5G project planners.

What they failed to realize was that the goals were just that, goals: indications of which direction to go. In their minds, the project would be successful only if the goals were achieved. For the Todayans, actual attainment of a research goal would have been cause for chagrin, because then—in keeping with their saying, "When you reach the top of the mountain, keep climbing"—they would have to go through the time-consuming and distracting group-oriented process of selecting a new goal.

PROJECT PLANS TOO VAGUE

Second, the 5G Project plans seemed terribly vague to Western researchers, who had grown accustomed to writing research proposals that specified in advance what the result of the research would be, how long it would take to achieve those results, and how much it would cost. Why should the Todayans expect to get off with any less? Maybe they weren't ready for basic research after all!

Finally, some Westerners had doubts that even if the Todayans were successful (as defined by Western terms) in attaining their stated goals, the sum of these results would still be insufficient to create a working episto-encabulator system. Perhaps they were guilty of the mistaken thinking that the late Alan Watts characterized thus: "Instead of looking where the finger is pointing, they chose to stick it in their mouths and suck on it" (from his 1951 Vintage Book, *The Wisdom of Insecurity*).

If the Westerners had known the background of the 5G Project, they might have realized that Today's real motivation was not to develop a new generation of episto-encabulators. Instead, it was to give some bright young Todayans a chance to try their hands at basic research and, at the same time, give the government bureaucrats overseeing the project—especially those in the Todayan Ministry of Underhanded Double-Dealing with Yankees (commonly referred to by its nickname, MUDDY)—some on-the-job training in research and development management.

Enough time has now passed since the cataclysmic conclusion of the 5G Project that its true origin can be revealed. It so happened that when an earlier major Todayan government-sponsored episto-encabulator R&D project was winding down, the researchers involved were beginning to wonder what would become of them after the project concluded. One evening, as they joined in their national custom of "ladder drinking" in a local pub, one of them (probably on at least the eighth rung) had an idea. "What we've been doing is participating in this on-the-job training program in applied research and development, so maybe after it's over we could go on to do some basic research, whatever that is. It would be better than going back to working."

His colleagues reacted enthusiatically (especially, one suspects, to the idea of not going back to work). So all of them began thinking up basic research problems in whatever aspect of episto-encabulators interested them most. Being group-oriented, they then tried to put all their ideas together to present

The real reason for starting the 5G Project was to give some bright Todayans a chance to try their hands at basic research.

one big proposal to their superiors. But, they had come up with a rather odd assortment of topics. "This will never sell," they said. "We've got to find a better way to package this."

Somewhere about the 12th rung, one of them recalled that the Todayan government had recently subsidized development of 3.75 generation episto-encabulators—so named to suggest they were superior to UTM's latest 3.5 generation models—and was currently supporting R&D to provide meta-detritus for forthcoming fourth generation episto-encabulators. "Let's call it the 'Fifth Generation Episto-Encabulator Project,' " he said, "and we'll say that the research we propose will provide the basis for Todayan companies to produce fifth generation episto-encabulators."

The rest, of course, is history. The idea of developing a fifth generation episto-encabulator caught on like wildfire. "Episto-encabulator awareness" became the catch phrase of the day as Todayans began producing personal episto-encabulators (PEEs) in huge quantities.

PART OF A MASTER SCHEME

What these young Todayan engineers did not anticipate was that their idea (facade, really) would be taken so seriously throughout the world. No sooner was the Multinational Shindig on Fifth Generation Episto-Encabulators concluded than all sorts of articles began to appear in Western media that characterized the 5G Project as part of a Todayan master scheme for world dominance.

The Todayans were astounded. "We had no idea the Westerners would take us so literally," they said. "All we wanted was to try to do basic research, whatever that is." But nobody in the West paid attention to them. Instead, WE, UK, and Fronz started fifth generation episto-encabulator projects of their own.

There was great hullaballoo everywhere, not just about the fifth generation, but about episto-encabulators in general. WE and its Western allies almost forgot about their traditional enemies, the Ussrians, and began to think of Today as the enemy.

In Today, astonishment passed into faint amusement. Todayans tried to reassure Western nations that their episto-encabulator industries would not be devastated by a little friendly competition and that, in any event, the results of 5G Project basic research would be shared. But the Westerners persisted in overreacting, claiming that any Todayan advance in episto-encabulators would be their loss.

All this began to wear upon the Todayans, especially those in the 5G Project, who found themselves riding the tiger after their success in getting the project started. "I'm getting tired of the incessant stream of visitors from WE and Yurp," said the project leader. "They all come here like so many blind men feeling various parts of an elephant. They ask the same dumb questions, disturb us so we can't get on with basic research, and then go back to their respective countries and report that we can't succeed.

"Don't they realize we've already succeeded? We've gotten our society really hopped up for episto-encabulators. We've lifted the focus of our episto-encabulator engineers out of the teensy-weensy insignificant technical problems that are easy to solve and directed it toward the important goal of making episto-encabulators easy to use. And we've begun doing basic research. But most of all, we've demonstrated Todayans can be creative."

"Right on," said his colleague. "If it weren't for our creativity in launching this project, the episto-encabulator researchers in WE and Yurp wouldn't be enjoying the big money their governments are now throwing into their research projects.

"You'd think they'd be thankful to us for showing the way. I think we ought to bail out of the fifth generation episto-encabulator business right now, while we still have our sanity."

"Yeah!", said the director. "Life was much easier back in the good old days when they were doing the basic research and we were just following along. If this is what it's like to do basic research, and if Today has to do it to be number one, then I don't care to be number one! Let's let WE go back to playing number one, and Today can be a peaceful, happy number two! I'm going to go to MUDDY and have them shut down the Fifth Generation Episto-Encabulator Project!"

Surprisingly enough, the 5G project director met with very little opposition to this radical move. The very next day the Todayan government called together all those associated with the 5G Project and announced that the project was being terminated immediately. To soften the impact, the government also announced that all those working on the project would be permitted to retire immediately with generous pensions.

The entire group then went out for one final, tremendous bout of ladder drinking, and the next morning they all awoke to new and happier lives. All, that is, but those in one particular section of the project. Those that could not bear to part with their sandboxes joined in mass ritual suicide (which is a time-honored way of resolving impossible predicaments in Today) by injecting themselves with a toxic substance used in the manufacture of meta-detritus. Most of the others, the survivors, either entered religious orders or became itinerant poets. None of them had anything to do with episto-encabulators ever again. *

George Lindamood is currently the general manager of market research and industry analysis with Burroughs Ltd., Co. in Tokyo. Previously, he was a scientist with the U.S. Office of Naval Research, Liaison Office, Far East, also in Tokyo.

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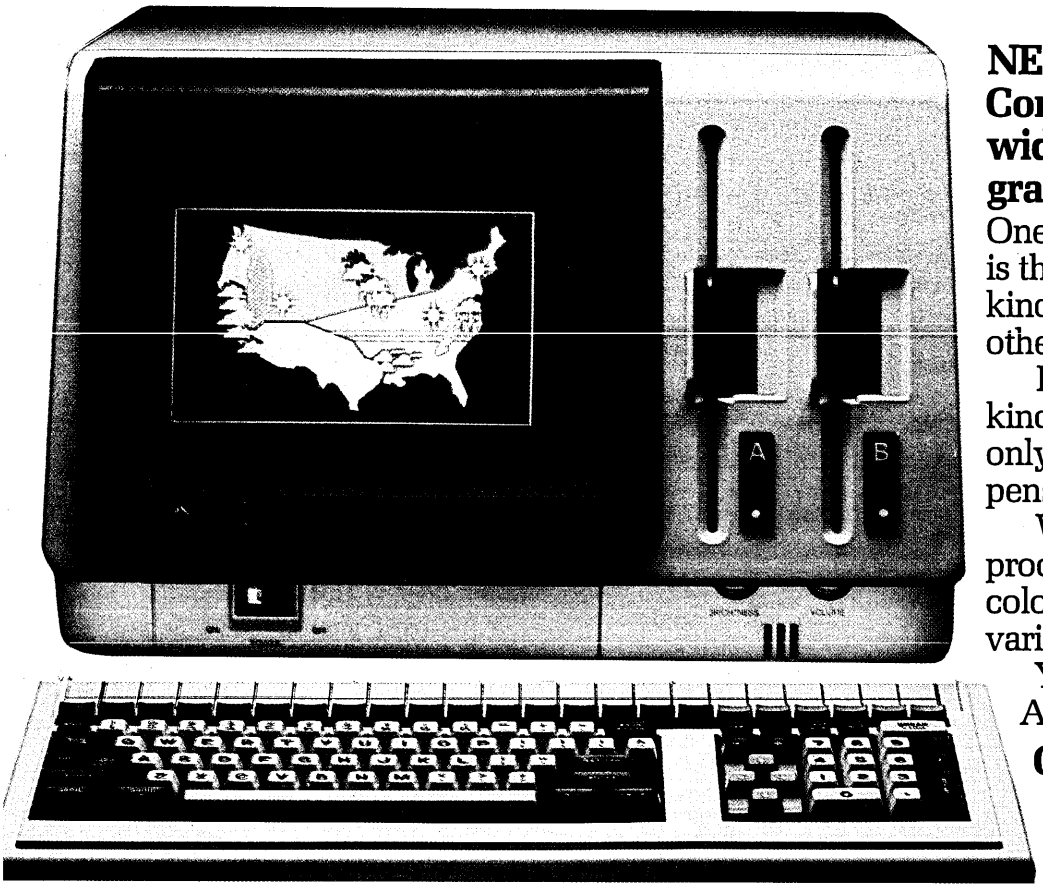

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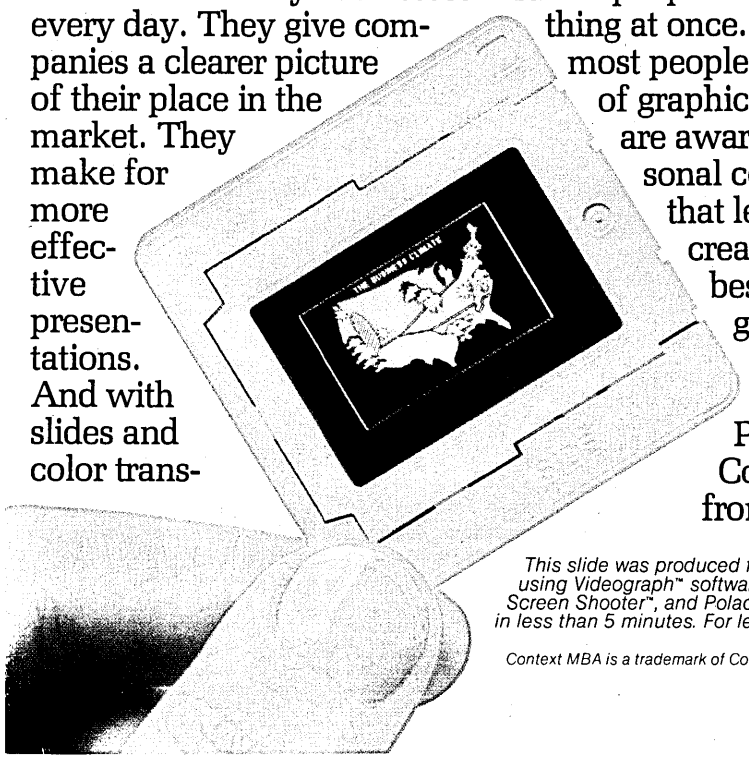

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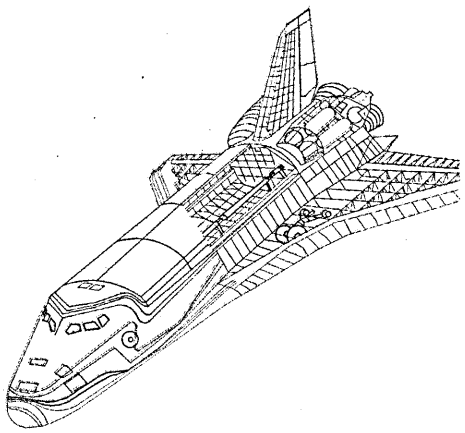

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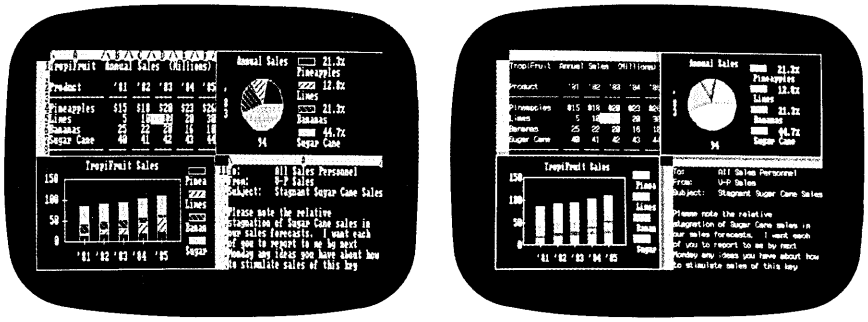

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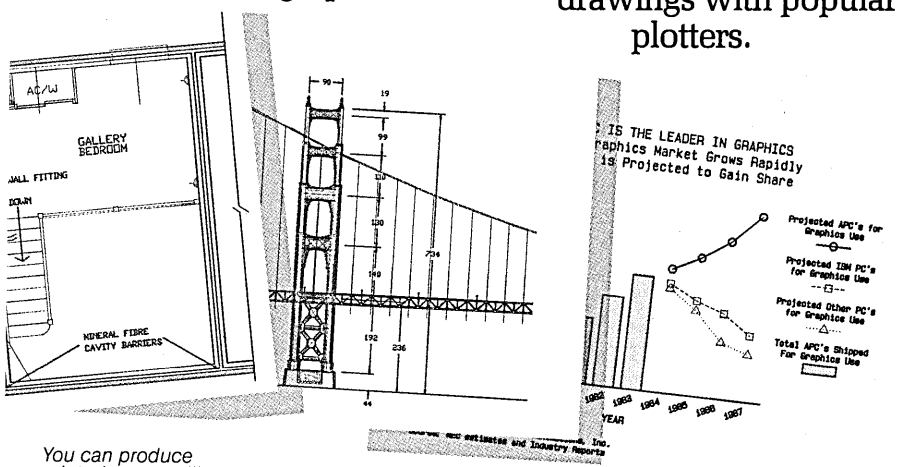

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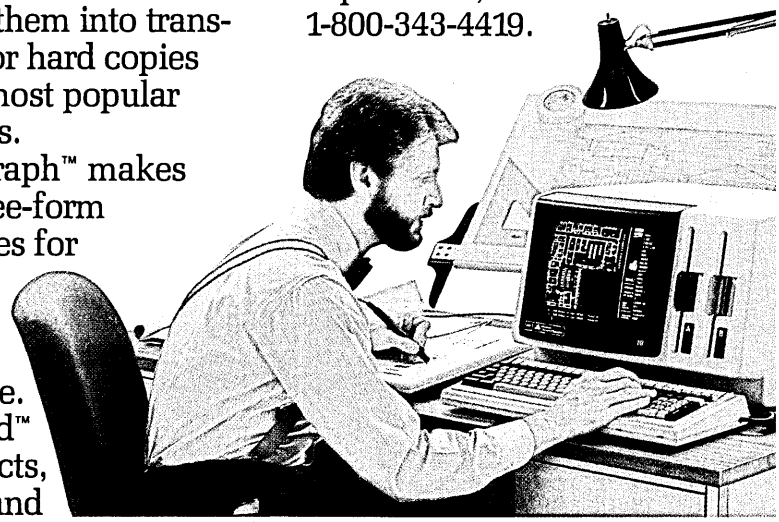

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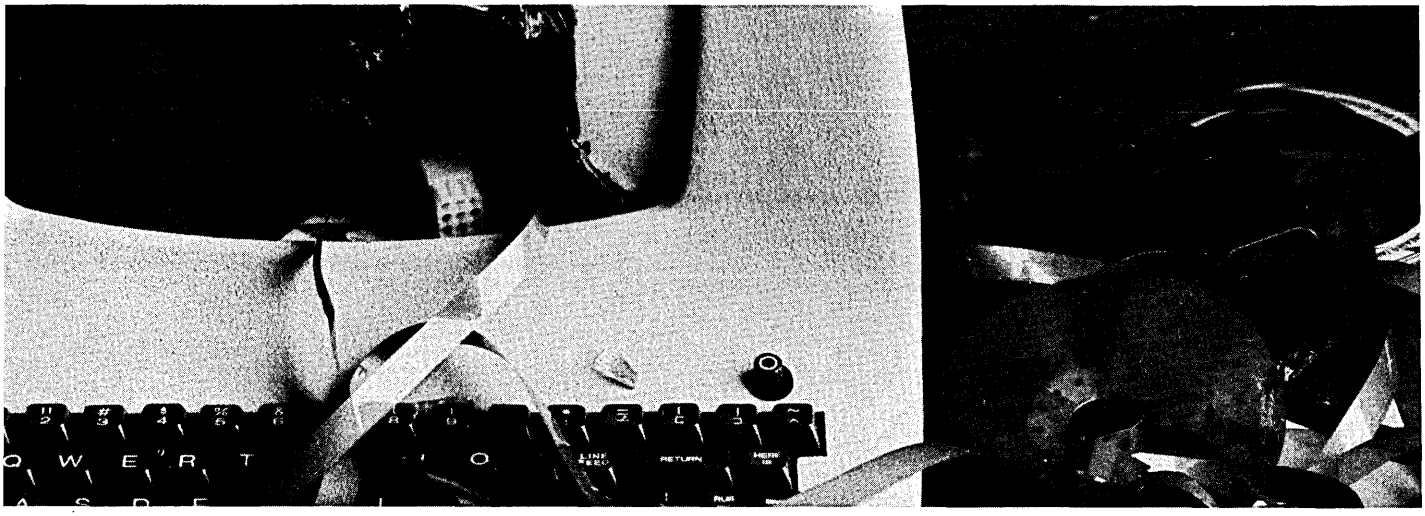

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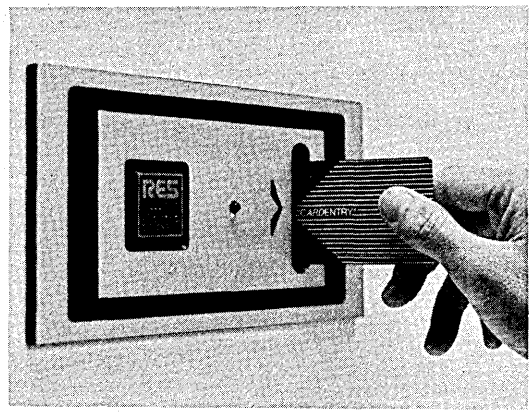

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Although its definition and purpose are often misunderstood, the DSS is a valuable asset when used for the proper applications.

ANATOMY OF DECISION SUPPORT

by Michael W. Davis

In the '70s, the term Decision Support Systems (DSS) was introduced to refer to information systems that primarily supported complex decision-making. Because of its pleasing tune, the phrase decision support was quickly adopted. Practically any type of information processing system became known as a DSS. Programmers and dp specialists began referring to their accounting and information reporting packages as DSSs. Vendors declared that their budgetary tracking and spreadsheet systems belonged to that new and vigorous breed called DSS. Even dp literature used the term DSS as a synonym for the traditional database management system.

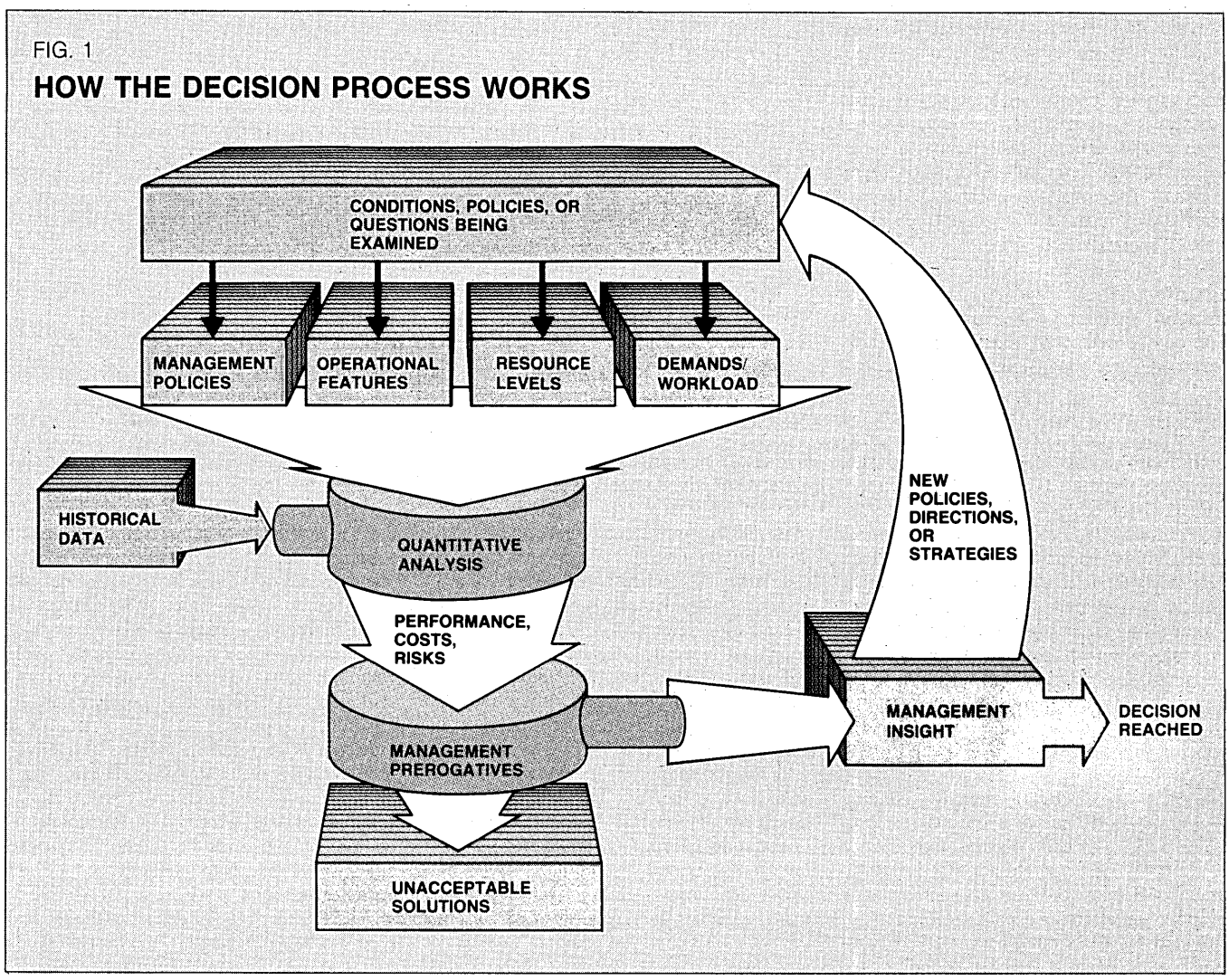
Many voiced concern that such a free-for-all would eventually cause DSS to suffer a similar loss of identity as that that had befallen its forerunner—MIS. What happened? Where do such misinterpretations come from?

It would help to reflect upon the general features and characteristics that distinguish DSS from other information systems, and to cite its actual applications.

To reach decisions, managers usually have to deal with vast amounts of data. Modern technology has made information storage

FIG. 1

HOW THE DECISION PROCESS WORKS



To support strategic decisions, the DSS is usually applied in a significantly uncertain environment.

and processing so accessible that the decision maker is easily overwhelmed and data-saturated. An effective information processing system can contribute to the decision process in two ways: by helping to manage large volumes of data and by performing complex computations in the blink of an eye. These two functions can be defined more explicitly as:

1. Information Management—the activity of storing, retrieving, and reporting information in a structured format convenient to the user; and

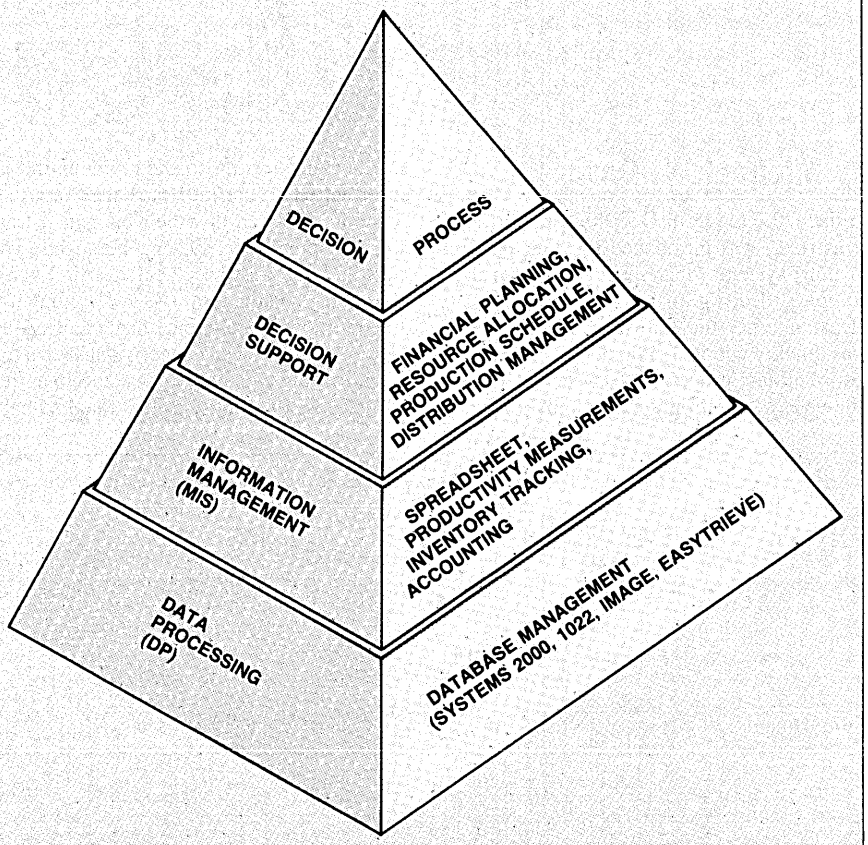
2. Data Quantification—the process by which large bundles of information are condensed or analytically manipulated into a few core indicators that extract the essence of the data.

To appreciate the part each function plays in the decision process, consider how complex decisions are "ideally" formulated (Fig. 1). Management sets out to evaluate how an organization is likely to behave under a variety of complicated circumstances. Information in the form of historical data, proposed policies, resource allocation, and so forth, is manipulated quantitatively to provide various performance, cost, or risk indicators. As management exercises its prerogatives and corporate insight, unacceptable alternatives are rejected and new ones are proposed. The process is repeated until a preferred direction or strategy is selected.

Practically all information systems provide the user with varying quantities of both information management and data quantification capabilities. The purpose of the DSS is to couple the speed and thoroughness of automation with the insight of human experience, while adding the proper blend of quantitative support. To be useful, however, the system must provide results that can be directly applied by decision-makers. This means the DSS must be an active component in the decision process and that the results are in a form readily accessible for management review and interpretation (not in a three-inch stack of computer printouts). On the other hand, if management's major use of a system is processing, tracking, and reporting large quantities of information, then the term management information system would logically apply. This natural hierarchy of information systems is based on their proximity to the decision process (Fig. 2).

FIG. 2

THE HIERARCHY OF INFORMATION PROCESSING SYSTEMS



SPECIAL FEATURES OF A DSS

Organizational planning and decision-making typically occur at three levels: operational, tactical, and strategic. Because of the diverse and dynamic environment affecting each level, the support provided by a DSS must be versatile yet attuned to the specific needs and conditions at each point in the decision process. The following discussion examines some of the more distinctive properties and features of DSSs, namely, breadth of influence (time span and organizational impact), structural flexibility, required precision, level of detail, data currency, and response time.

Managing the day-to-day affairs of an organization requires decisions of an operational nature. Such decisions deal with coordinating and scheduling some complex chain of events, or determining the best assignment of limited resources between interrelated activities. DSSs have been successfully used to support operational decisions in areas such as logistics and material distribution, personnel or task assignments, vehicle dispatching and routing, production scheduling, and workload scheduling.

Routine operations are generally managed under such dynamic conditions that the decision's life span and data's obsolence are measured in days, weeks, or months. This means the DSS must be capable of quick response and easy access for frequent use and updating by line level personnel.

Another distinguishing feature of most operational systems is the semifixed structure of the problem being analyzed. Demand and resource levels may vary but the kinds of information processed and types of questions being answered remain the same (how many workers, which routes to travel, what vehicles should be assigned, etc.).

Because operational problems are so intricate, a significant degree of detail and precision is required in the DSS. Misdirections usually result in costly chain reactions—time delays, late charges, overtime, and missed sales—throughout the total operation. This justifies the additional expense and effort necessary to maintain accurate and current data.

Another type of decision, the tactical type, deals with selecting the best methods for accomplishing the organization's near-

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Strategic issues offer the greatest potential for both gains and losses in the organization's overall performance and efficiency.

term objectives. The purpose of tactical planning and analysis exercises is to determine which procedures, policies, and provisioning levels will be the most effective in governing an organization's operational affairs. Tactical decisions are generally associated with broad managerial or administrative functions that cut across organizational lines (some examples include budget preparation, staffing policies, financial and budgetary management, internal control procedures, and procurement and inventory policies). DSS applications have addressed tactical questions in areas such as estimating staffing requirements and recruitment policies, predicting expected work load and resource/budgetary requirements, and financial planning and analysis.

Tactical decisions influence the practices and policies that will govern the organization for a moderate length of time, about six to 24 months. Since these decisions will be based upon predicted issues or conditions, the concern is not so much for current data, but for DSS robustness in dealing with uncertainty. Also, because the issues being evaluated are somewhat broader than those at an operational level, the precision and detail levels required are lower. Information is usually measured in averages and recommended directions are provided as ball park figures. For example, in an operational setting, the user would be concerned with specifics, such as scheduling Pilot A to fly with Instructor B in Aircraft C. With tactical issues, however, the manager is more concerned with general results, such as controlling staffing levels and expenditures to within 2% of allocation.

MAKING STRATEGIC DECISIONS

Organizations periodically explore alternative strategies to improve their effectiveness and stability over the long haul. Strategic planning deals with long-term issues (two to five years) that require an extended time frame to take effect or a significant lead time for implementation. Examples include major capital expenditures, new market entry, corporate reorganizations, field structure consolidations, and facility shutdown or relocation. DSSs have also been used successfully to perform strategic analysis in such areas as establishing long-range work force requirements, selecting facility locations and layouts, and evaluating long-term investment alternatives and capital expenditures.

Strategic issues offer the greatest potential for both gains and losses in the organization's overall performance and efficiency. Because it must see so far into the future, strategic analysis relies heavily on the speculative capabilities of management, which is often like trying to see through a dense fog at night with dim headlights. It also means the decision-maker must be willing to accept results that at best are very coarse.

To support strategic decisions, the DSS is usually applied in a significantly uncertain environment, using data that are low in precision. The purpose is to cite major large-scale differences between the proposed alternatives. Response time is rarely the issue. The crucial factor is to use as much corporate experience and insight as possible.

It's clear that the span of a decision, in terms of both time frame and organizational impact, is a major factor in DSS applications. At each successive level of the decision process, the time frame and scope of the decision increase.

There is a similar effect on the requirement and application of a DSS at each consecutive level of the process (operational to tactical to strategic). For example:

- The resulting impact broadens across the organization as does the potential payback;
- The required precision and level of detail decreases (e.g., operational support identifies the keyhole, tactical assistances provide guidance to the appropriate doorway, and strategic systems afford insight as to the general location or neighborhood of the house);
- Longevity and life span of the result increases;
- Structural flexibility increases (i.e., the amount of special syntax or rules that must be observed by the user decreases); and
- The required response time and data currency decreases.

Many DSSs apply to just one level of the decision process. But there are plenty of exceptions—situations when a DSS can be used to address and support decisions at several levels. Examples include distribution systems that determine the best assignment of resources and routes and evaluate the long-range effects of disruptions (plant shutdown, labor strikes) or new facilities (warehouses, production, and transhipment sites); and work force planning and management systems that help answer tactical questions about next year's expenditures and provide long-term projections for evaluating distant staffing requirements and patterns.

When choosing the "best" quantitative techniques for the analytical component of a DSS, few general rules apply. In practice, there appears to be no "absolute truth" governing selection of the most appropriate mathematical model. The analytical methodology used in each DSS is usually based upon the background and experience of the designer, not the profession's common ground rules. For example, in the development of a workload planning system for a decentralized organization, four independent teams were (unknowingly) working on exactly the same problem. The end result was that the economist group employed input/output analysis, the statistics division relied upon time series techniques, the dp department used discrete simulation, and the operations research team developed a heuristic combination of markovian analysis and linear programming.

Obviously, the path chosen is not nec-

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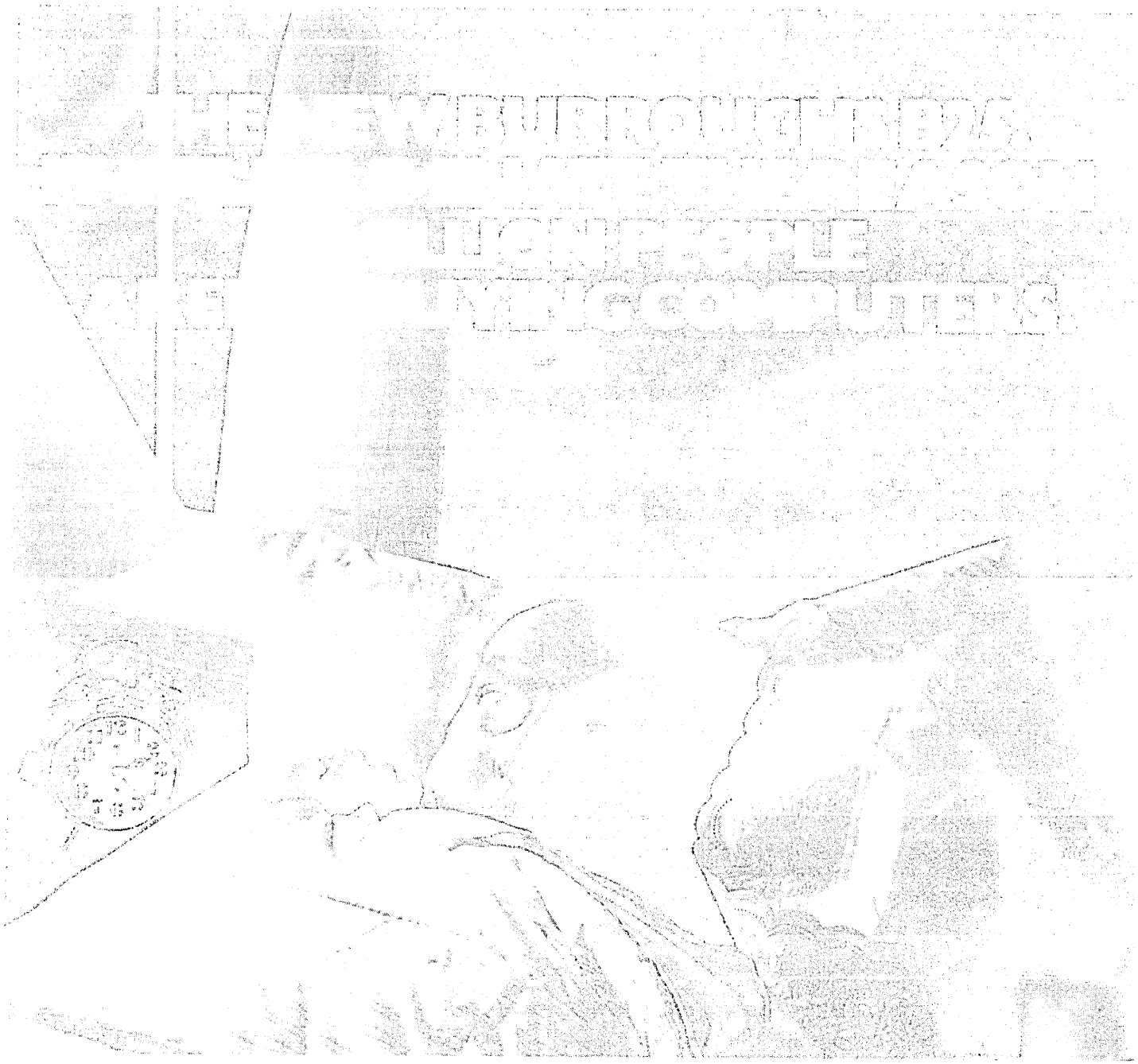
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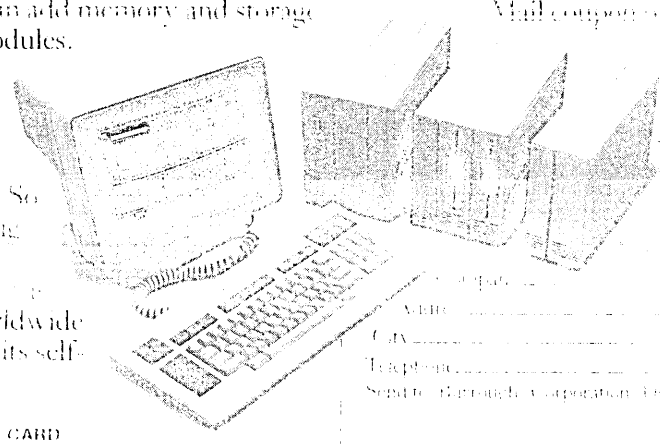

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The path chosen is not necessarily based upon some insight, but upon familiar roads previously traveled.

essarily based upon some insight as to the best route, but more frequently upon the roads previously traveled and familiar to the designer.

At its conception, many envisioned application of the DSS only in areas where:

- The manager is permanently linked by the umbilical to a terminal,
- The design could be totally generic, capable of molding to any application, and,
- The system would be devoid of predefined, structural restraints.

Practitioners found great value and potential in this concept, but rejected the criteria as being too restrictive for most real-world applications. The concept of DSSs eventually began a natural expansion that included those systems designed to meet a specific application with a predefined structure.

To distinguish applications where a predefined structure is inappropriate, the term knowledge based system (KBS) is now being used. KBSs are popular in the more exotic fields of artificial intelligence; command, communication, and control (C^3); and military intelligence, where solutions are derived by continually expanding the database using the results from each previous step. As new information becomes available to the decision maker, it is added to the process—an upside-down pyramid—providing solutions with greater and greater resolution.

To understand the difference between a DSS and a KBS, consider that a DSS typically advances the user step-by-step through a predefined pattern of prompts and output. The user must follow certain rules when identifying the specific values for each structured entry (number of aircraft available today, customer demands, number of personnel on board, and so forth). The results are intended to answer specific questions (which flights are scheduled, what routes have been assigned, which recruiting policies apply, etc.). A KBS is used without such structural restraints. It starts off at ground zero and builds recursively into a comprehensive base of information. For example, a KBS designed to support military intelligence would begin with broad relationships about the strength of a combatant's forces. Using this preliminary information, the system provides knowledge about the range of each variable. Next, additional intelligence is made available (such as half the supplies being funneled from one battle sector to another). This new information is used by the system, along with the previous results, and the bounds on each variable are refined. Each time the process is repeated, the system builds on the knowledge base from the previous solutions.

Controversy and confusion over the distinction between the various types of information systems will undoubtedly continue. For example, the phrase knowledge based systems will most likely be misrepresented and promoted in the same manner that DSS has been misused. This does not deter from the value of a concept, but merely adds chaff and noise to the marketplace. The profession is hopefully mature enough to survive such fixations. ❋

Michael Davis has developed and applied over 25 DSS systems in the commercial, private, and military sectors. Readers interested in more information on the actual DSSs cited in this article may contact the author at Route 4, Box 4127, La Plata, MD 20646.

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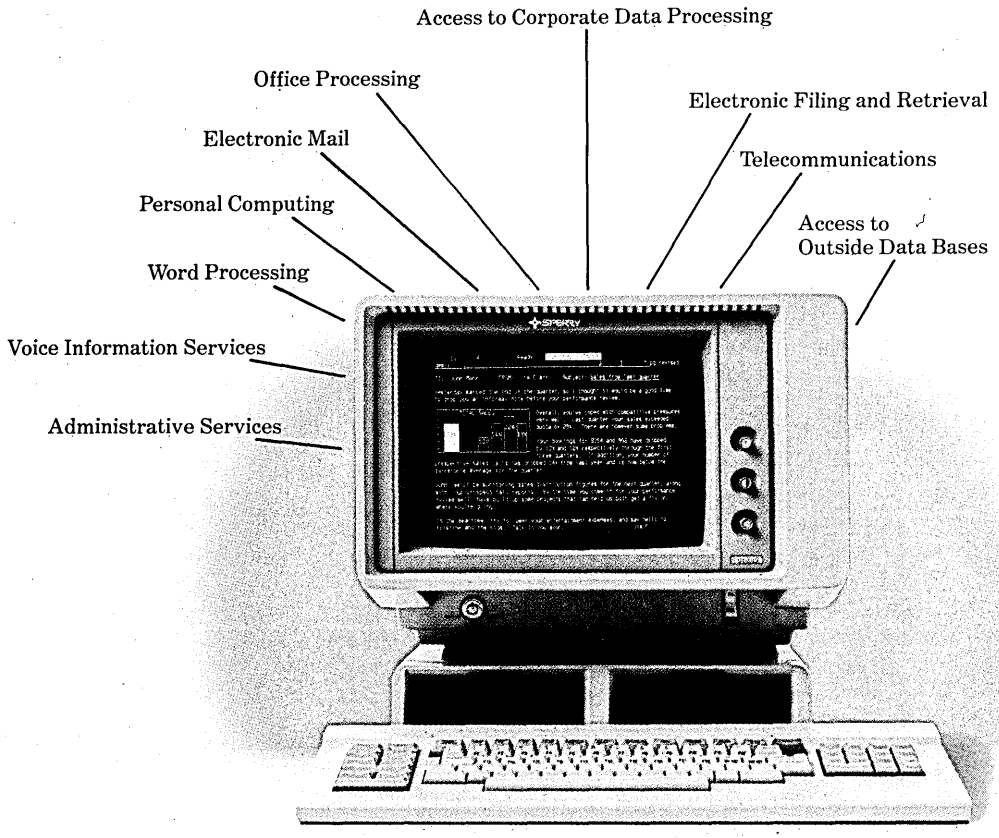

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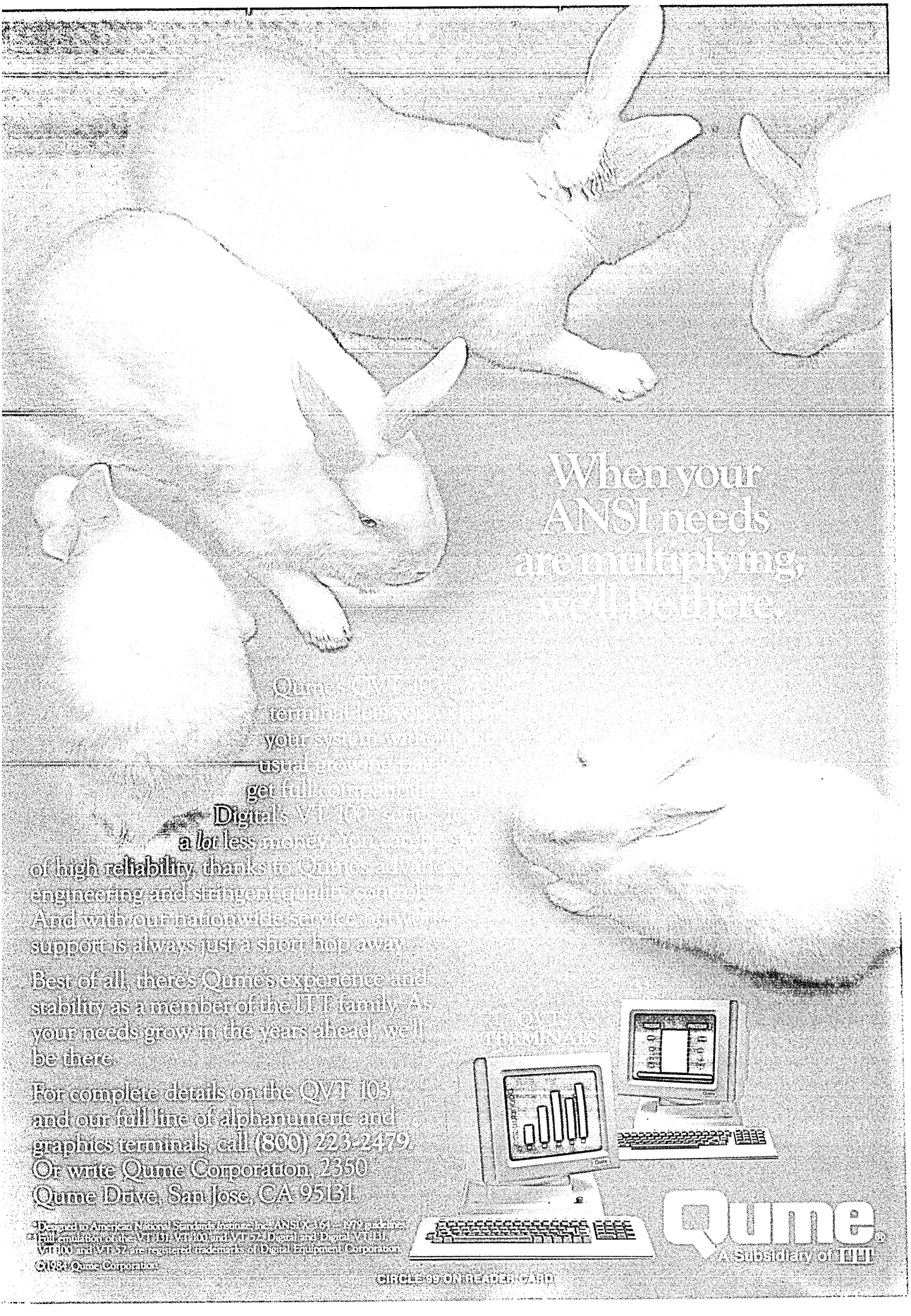
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HARDWARE

OFF-LINE

AT&T was a very late entrant into the digital PBX business when it announced the high-end System/85 a year and a half ago, and it was still late when the low-end Merlin was debuted several months later. The communications giant has finally rounded out its line with the System/75 midrange PBX, but the question now is whether anyone cares. Since the System/85 premiered, only 100 or so customers have signed up, AT&T Informaiton Systems president Frank Vigilante admits. Moreover, he concedes, only 5% to 10% of the traffic in the PBX is data of some sort; yet AT&T is selling these digital switches as much for their capabilities as data handlers as it is for their voice capabilities. Clearly, customers either are not getting the message or are consciously choosing alternative ways of sending data.

Either way, ATTIS execs are apparently concerned that potential users are dismissing the System/85, because at the press conference introducing the System/75 they held a formal contract signing session with William Gladstone, the managing partner at Arthur Young & Co., for 17 of the System/75 switches and one System/85. Gladstone would not divulge the value of the contract nor whether his firm had received any discount on the $600 to $900 per line price tag in return for promoting the PBX. The public signing struck some observers as indicative of the awkward and, in some cases, even embarrassing marketing tactics the firm has attempted in wooing customers.

AT&T also seems to be having trouble convincing the world that it is now truly an international company, but with good reason. When it announced the System/75, it stressed the international nature of the product; on closer questioning, however, Vigilante admitted that the only foreign country in which the product will be marketed in the near term is Canada. He noted that AT&T may eventually sell it through Olivetti in Europe if it decides to press for PTT approvals, and that it may sell it in the Far East if it can find a good distributor there. Even if AT&T ever does sell the System/85 in those two areas, clearly, "international" is not the same thing as "worldwide" in AT&T's jargon.

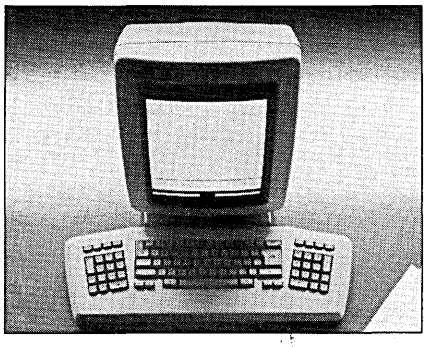
In the wake of IBM Corp.'s introduction of the 3480 magnetic tape subsystem (see Hardware Spotlight), Storage Technology Corp. has announced that it is "studying" the computer giant's product, and that it will soon be announcing its own future direction in the tape market. These rather conservative remarks are a far cry from StorageTek's usual responses to IBM products, namely, immediate product announcements of its own -- never mind that on occasion the products never materialized. StorageTek vice president of worldwide marketing Jack Scott says that the company has "developed the technology...[for] 18-track thin-film magnetic tape heads."

He adds that StorageTek is "pleased that this IBM announcement, which has been anticipated for more than three years, has finally appeared." Last fall, StorageTek vice president for product marketing Bob Williams said, "If IBM announced [an 18-track drive] tomorrow, I could look my customers in the eye and say I have something better today." If Storage Technology has been sitting on top of a 3480-type 18-track cartridge tape subsystem, the question that begs asking is simple: where is it? The press release should have been announcing StorageTek's look-alike, not just its look-see.

PROFESSIONAL WORKSTATION

The Phoenix system is a professional workstation that combines CPT word processing data and graphics applications. It is targeted for engineering, architectural, technical, and business applications.

Its system architecture uses a multiprocessing technique. Up to seven 8-bit and 16-bit microprocessors manage its bit-mapped display, keyboard, data storage options, peripherals, and software. The operator controls advanced system functions with eight soft keys. Key icons on the screen change to display the current operations. A



pair of two-sided, dual-density, 8-inch diskette drives are housed in the microframe along with the system electronics. Two keyboard and display units can be attached to each microframe.

The system supports many computer languages and communications protocols, according to the vendor. Applications packages include an integrated graphics editor, which is a free-form drawing package, and a scientific equation and formula editor. The CPT Phoenix System costs between $15,000 and $20,000 for a one- or two-screen configuration. Volume discounts are available. CPT CORP., Minneapolis, Minn.

FOR DATA CIRCLE 302 ON READER CARD

SUPERMINICOMPUTER

The VS 300 is a 32-bit superminicomputer with a new system architecture featuring a new processor, memory management system, and input/output system.

This unit is designed to meet the needs of intermediate and large customers requiring intensive cpu processing power and large storage capacities for heavy interactive transaction applications, distributed data processing, and advanced office automation functions, including word processing, decision support, electronic messaging, and integrated text, image, voice, and data processing.

The VS 300 uses a "pipelined" processor that features overlapped operation cycles. This technique enables the cpu to execute one instruction while simultaneously decoding a second and fetching a third in every 120-nanosecond processing cycle. The unit offers from 4MB to 16MB of main memory in 4MB increments, as well as a 32KB cache memory. Intelligent I/O controllers incorporate dedicated microprocessors that streamline I/O functions from serial workstations, printers, tape drives, disk drives, WangNet, and telecommunications links.

The VS 300 can perform up to 255 concurrent user tasks and support up to 192 workstations and printers. An optional floating point accelerator is available for the unit. It is supported by the VS operating system. It supports all Wang data processing, office automation, and communications software, as well as user applications that can be transported from any VS operating system. Pricing for the VS 300 starts at $170,000 for an entry level system consisting of the cpu with 4MB of main memory, the operating system, a console workstation, a serial I/O controller, and assembler. It will be available for shipment in January 1985. WANG LABORATORIES INC., Lowell, Mass.

FOR DATA CIRCLE 301 ON READER CARD

OFFICE INFORMATION SYSTEM

The 6000 series of 32-bit office information systems is based on the Motorola 68010 microprocessor. The series works in a multitasking office environment, and is intended to address the clerical back office as well as the secretarial and professional front office.

The 6000 systems run under a Unix-derived operating system. In addition to the Unix system, the vendor has developed Uniview, a user interface that provides menus and help screens. It also allows windowing up to eight tasks simultaneously, copying and moving information between windows, and for the experienced user, direct access to Unix commands.

Communications software includes the 2780/3780 bisynchronous remote job entry, 3770 SNA remote job entry, and 3270 BSC and 3270 interactive communications.

The 6300, which houses processor boards, disk drives, and the power supply in a 23 by 22½ by 10-inch enclosure, supports up to eight users. It has up to 2MB of main memory, removable storage, fixed mass storage of up to 37MB, printers, and a workstation.

The multiprocessor archictecture of the 6600 allows modular expansion so user support and processing power can be expanded to 128 concurrent users. The 6300, with two workstations, 20MB disk storage, printer, and 1MB memory, costs $15,200. The 6600, with eight workstations, 74MB disk storage, 1½MB memory, and printer, is priced at $70,650. FOUR-PHASE SYSTEMS, Cupertino, Calif.

FOR DATA CIRCLE 304 ON READER CARD

COLOR PLOTTER

The Model 410 is a multicolor plotter for the Apple II and Apple III personal computers and produces presentation-quality graphs, charts, drawings, and graphic designs on either paper or overhead transparencies. It is designed for anyone who gives presentations or needs to produce printed copies of multicolor graphics created with a personal computer.

The plotter is compatible with Apple Business graphics, Apple Logo, and other graphics software programs. The plotter has four color pens that are interchanged automatically during operation. It provides 0.004-inch resolution, 0.008-inch readability, and 3.94 ips plotting speed. The plotter can accept media sizes up to 11 inches by 17 inches. It uses an RS232C serial interface. An accessory kit and a multipen capper are included with the plotter. The kit contains a user's manual, installation manual, connector cables, one 50-sheet package of plotter paper, and eight pens. The Apple Color Plotter Model 410 costs $1,000. APPLE COMPUTER INC., Cupertino, Calif.

FOR DATA CIRCLE 303 ON READER CARD

UNIX DISK FOR PC

This vendor is offering a hard disk with a preloaded Unix operating system. The Sundown disk allows IBM PC owners to upgrade to IBM PC XT and run Venix/86. The 5¼-inch, 10MB Winchester hard disk plugs into a floppy slot on the IBM PC. With an interface board and cabling, the Sundown uses the PC's existing power supply.

Standard features include a hard disk partition to permit both Venix/86 and PC/DOS and MS/DOS files and programs, four editors, a C compiler and BASIC, document preparation postformatting, electronic mail, UC Berkeley enhancements, debugging capability, and file management utilities. The single-unit price for a Sundown disk with single-user Venix/86 is $2,100. UNISOURCE SOFTWARE CORP., Cambridge, Mass.

FOR DATA CIRCLE 307 ON READER CARD

MATRIX PRINTER

The Telex 387 matrix printer is designed for use as an IBM-compatible 3287 printer. It has a throughput of up to 400 cps and com-

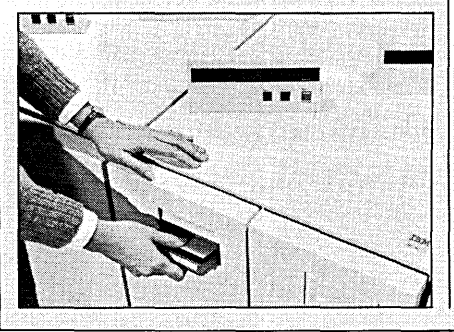
HARDWARE SPOTLIGHT

CARTRIDGE TAPE DRIVES

This generation of magnetic tape drives replaces the reel of tape with a cartridge that, according to the vendor, more than doubles the rate at which tape devices transfer information, and offers greater data reliability.

The cartridge used in the IBM 3480 tape subsystem is about one fourth the size of a standard 10½-inch reel of magnetic tape, and it stores up to 20% more data—a total of 200 million characters. Information from a central processor can be transferred to the drives or retrieved from them at rates up of up to 3 million cps. A thin-film recording head helps achieve the improved data rate.

The 4 by 5-inch cartridge is inserted into a slot in the tape drive. Two drives are contained in a cabinet that is about half the size and shape of a two-drawer office file. Contributing to the 3480's small size are microprocessors that control tape positioning during read and write operations and eliminate the need for the tall vaccuum columns.



The unit uses 18 recording tracks and achieves a linear data recording density of about 38,000 bytes per inch. There are separate microprocessors in the 3480 control unit model A22 and in each of the two tape drives in the model B22 tape unit. A 512KB memory in the controller buffers data as it is transferred. The Data Facility Hierarchical Storage Manager (DFHSM), version 2, lets users automatically manage data in the magnetic tape subsystems, as well as in the 3420 tape units, disk drives, mass storage devices, and the MVS/XA and MVS370 environments.

The purchase price of a typical IBM 3480 magnetic tape subsystem configuration consisting of one controller and eight drives is $238,000. The A22 control unit costs $65,400. The B22 tape unit, which contains two tape drives, sells for $43,100. Volume discounts are available. IBM CORP., Town of Rye, N.Y.

FOR DATA CIRCLE 300 ON READER CARD

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plete plug compatibility for attachment to an IBM 3274/3276 or Telex control unit.

It also features a letter-quality print option. The 387's standard print mechanism forms an 8 by 7 dot matrix capable of outputting high-quality print using up to six-part forms with a total thickness of .027 inches. An optional print head mechanism with staggered wires and a 16 by 14-dot matrix outputs near letter-quality print at reduced throughput. A bold print mode is also available.

A maximum of 136 print positions at 10 cpi and up to 233 print positions at 17.1 cpi are available as an operator configurable feature. Vertical spacing is also operator selectable from 3, 4, 6, or 8 lpi. Paper is fed from an adjustable forms tractor that accepts pin-feed forms from 3 inches to 16 inches in width. A choice of ASCII-B or EBCDIC sets are offered as well as an international character set. Users are offered buffer sizes of up to 3,564 characters. The Telex 387 costs $7,200. TELEX COMPUTER PRODUCTS INC., Tulsa, Okla.

FOR DATA CIRCLE 305 ON READER CARD

INTELLIGENT WORKSTATION

The WS-4004 is an intelligent workstation that can display both 80 and 132 columns. It comes with a 14-inch monitor and detachable keyboard, and is compatible with the vendor's existing network products and computers.

An 80-column format uses the entire 14-inch screen. The 132-column format displays characters in 9 by 13 pixel resolution. The P31 phosphor monitor produces 26 lines in either format. The keyboard has 101 keys and has a two-position tilt control.

The workstation has a 4MHz Z80A microprocessor with 64KB of RAM. The computer runs on the TurboDOS network operating system. The unit is equipped with two RS232 serial ports, one parallel printer port, one parallel hard disk interface, and an RS422 network interface. When used in the network configuration, it functions as a fully interactive, intelligent workstation providing access to all network resources. The WS-4004 costs $2,000. ALSPA COMPUTER INC., Campbell, Calif.

FOR DATA CIRCLE 306 ON READER CARD

DEC-COMPATIBLE MICRO

The Model 40 is a complete, Q-bus compatible, Winchester-based microcomputer system available in a wide variety of configurations. All versions are based on the SMS foundation architecture and include the system enclosure, a choice of fixed and removable peripherals, LSI-11 processors, and memory. Completely DEC-compatible, the Model 40 will run all system and application software developed for the LSI-11/23 or LSI-11/73 cpus without modification.

The hardware implementation of the SMS foundation architecture integrates the mass storage device controller, two serial communication ports, all backplane circuitry, and the support monitor subsystem on a single board, without requiring one of the backplane slots. The support monitor subsystem, also included in the foundation module, contains software and hardware used for system status analysis, system utilities, and diagnostics. Its user interface can be customized according to the user's level of understanding and can be operated from the Model 40's front panel or from a menu-driven console terminal.

The unit contains a quadwide 22-bit Q-bus backplane with six usable slots and emulates the DU handler/device driver via the mass storage control protocol. It is available in an upright or floor model. Single or dual 5¼-inch Winchester disk drives with capacities of 12MB to 70MB are available. An 8-inch floppy or two 5¼-inch floppy drives may be packaged with it.

The unit supports real-time and timesharing operating systems, including RT-11, RSX-11M, RSX-11M-Plus, RSTS/E, Unix, and TSX-Plus. The SMS Model 40 prices start at $5,800. SCIENTIFIC MICRO SYSTEMS INC., Mountain View, Calif.

FOR DATA CIRCLE 308 ON READER CARD

COMPUTER WITH WINDOWS

The IS-11 Consultant is a briefcase-sized computer designed for business use as both a portable, in the field and at home, and as a desktop unit in the office. It also has multiwindowing capability. The vendor developed the hardware and software for the machine.

The unit comes with integrated software in addition to the windowing capability. It has six function keys for data handling, calculation, word processing, communications, and help.

The Consultant has an RS232C interface. The bit-mapped LCD display has an angle adjustment. User memory is 32KB of RAM expandable to 64KB. ROM is 64KB. Mass data storage is provided by a recorder, which is supported by a tape operating system. Each tape can store in excess of 128KB of data.

CMOS technology permits the IS-11 to operate on internal, rechargable, NiCd batteries. The unit will operate up to eight hours on one charge. An AC adapter/battery charger is included with the unit. The IS-11 Consultant costs $1,000. An IS-11B version with built-in modem costs $1,100. SORD COMPUTER OF AMERICA INC., Los Angeles.

FOR DATA CIRCLE 312 ON READER CARD

PACKET SWITCHING NODES

Net 25 is a family of packet switching nodes based on Telematics Series 1 multiprocessor technology. It provides high packet throughput and high node availability. Compatible with CCITT X.25, the six-member family is designed to provide a set of tools to implement a full-function network.

The products include concentrator nodes, secondary nodes, and backbone nodes with throughput rates of up to 800 switched packets per second. Also available are supervisory nodes and switching PADS (packet assembler/disassemblers).

The Net 25/100 is an entry-level packet switching node with a throughput of up to 100 switched packets per second. The Net 25/200 has throughput of up to 200 switched packets per second. The Net 25/400 features up to four high-speed trunk channels and 1MB of memory. The Net 25/800 utilizes three parallel processors and features up to 12 high-speed trunk channels, 2MB of memory, and 5MB of local disk storage.

The Net 25/SP switching pad enables asynchronous terminals to communicate with hosts by accessing the packet switching node. The supervisory Node of the Net 25 system provides the network designer with the tools to accumulate network statistics in real-time and to control the network from a centralized facility. Prices for packet switching nodes range from $20,000 for an entry-level configuration to $300,000 for a full configuration. TELEMATICS INTERNATIONAL. Fort Lauderdale, Fla.

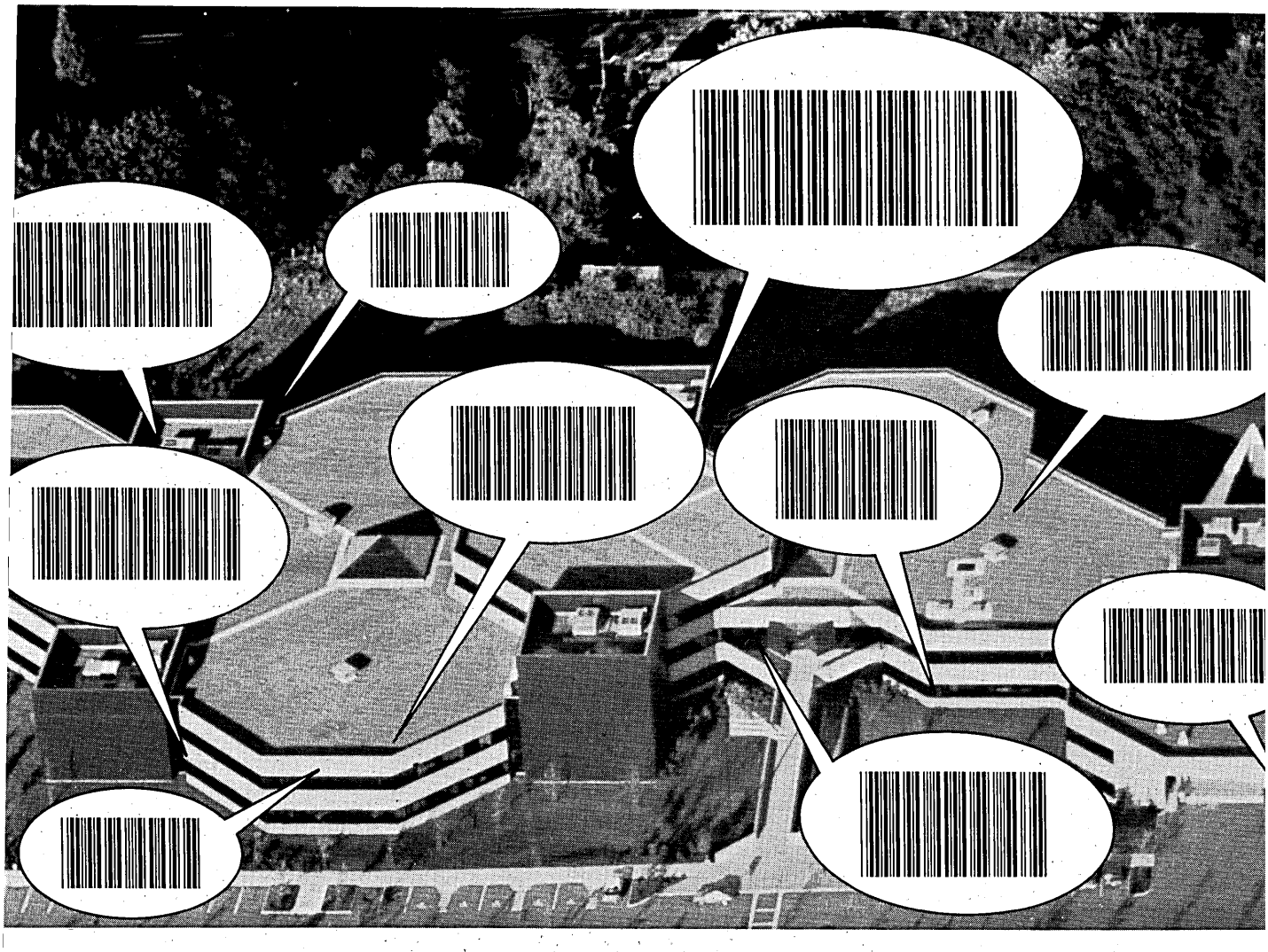
FOR DATA CIRCLE 309 ON READER CARD

DESKTOP LANGUAGE TRANSLATOR

The Translating Work Processor (TWP) is a desktop computer that is designed for language translation. The system has a multilingual keyboard design, large dictionary, and backup storage capabilities.

It translates documents under complete computer control and includes a multilingual word processor for polishing translated text. According to the vendor, no computer can turn out completely perfect translations, thus the need for word processing.

The initial product offering translates Spanish into English and vice versa. It includes a 25,000-word general dictionary, optional industry-specific glossaries, and a



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multilingual text editor for editing text in nine languages. Users can make their own additions to the dictionary and glossary.

In addition to business and industry, the vendor expects other markets to open to the product, in the fields of medicine, government, and education. The vendor also plans to introduce bidirectional dictionaries for French, German, and Italian, as well as other languages.

TWP equipment consists of dual microprocessors and three kinds of disk storage units: hard disk, cartridge, and floppy. Also included are a video display, multilingual letter-quality printer, and keyboard, customized to display, print, and type the entire Teletex international character set that supports Western European languages. The video unit produces a split-screen display of both languages while translation is taking place. In addition, a split print feature permits side-by-side, hardcopy printout of original and translated text. The TWP costs $25,000. CHALLENGE SYSTEMS INC., Richardson, Texas.

FOR DATA CIRCLE 311 ON READER CARD

SECURITY DEVICE

Transcryptor is a computer security device. It blocks unauthorized access to computers and terminals. It also encrypts messages upon transmission, decrypts upon receipt, and can be configured to provide managerial control over employee access to computer files.

According to the vendor, it is portable to allow employees to work anywhere and access company computers while still protecting data. The Z80A-based micro has two RS232C ports, and stands between a terminal or computer and between a modem or direct line. Encryption and decryption are automatic, requiring no special operator commands. The unit generates its own encryption keys, a different one each time. The encryption program is proprietary and provides roughly 2^{3000} times as many different possible ciphertexts as the data encryption standard.

It operates asynchronously and automatically adjusts to baud rates from 150 to 9600. An error detection feature causes automatic resynchronization when line noise errors occur. Transcryptor costs $950. CRYPTEXT CORP., Seattle, Wash.

FOR DATA CIRCLE 310 ON READER CARD

DAISYWHEEL PRINTER

The Diablo Series 80IF (integral feeder) provides extended character capability, integrated paper handling, speeds of up to 80 cps, and other features. The 200-character application printwheel allows the printer to be used in financial, accounting, legal document processing, business graphics, scientific and engineering documentation, and foreign language and currency applications.

It provides over 33 European languages on a single wheel. The legal application printwheel offers italics, 10 pitch gothic, and unique legal characters also on a single wheel. The vendor says that with its 240 horizontal positions and 96 vertical positions per inch, the Series 80IF can print truly round circles.

It has an integral double bin, cut sheet feeder. The printer also provides a snap-on envelope cassette as well a bidirectional tractor. The unit has an all-purpose interface, which combines three generic interfaces in one, eliminating the need for separate interface modules. The Series 80IF sells for $3,500. DIABLO SYSTEMS INC., Fremont, Calif.

FOR DATA CIRCLE 313 ON READER CARD

ERGONOMIC TERMINALS

The 6531 and 6532 are the newest terminals in this vendor's 653X line. The units feature voice recognition and 3270 emulation.

The units have low-profile keyboards, with palm rest and two-position tilt adjustment, nonglare screens, green phosphor characters, and low-contrast colors. Up to eight pages of memory are stored in block mode for high data throughput, or 300 lines in conversational mode for access to previous display screen.

All models display information in a 25-line by 80-column screen format, and have the capability to support 11 languages. It also has a tilt/swivel screen. These models have been designed to take up less space than other 653X terminals, according to the vendor. Both models have a detachable crt monitor which can be placed up to six feet away from the unit. The 6531 costs $2,100. The 6532 lists for $2,000. TANDEM COMPUTERS INC., Cupertino, Calif.

FOR DATA CIRCLE 314 ON READER CARD

GENERAL PURPOSE LAN

This general purpose local area network is the first member of the vendor's 4000 series of internetworking and network management products. This LAN is available in either broadband or baseband versions. The system also supports hybrid LANs that combine high-capacity broadband trunks with lower-capacity baseband feeders.

This LAN is compatible with Net/One from Ungermann-Bass. Data terminal device support includes interfaces like asynchronous and synchronous serial, asynchronous parallel, 32-bit parallel, and IEEE 488. The LAN provides high-speed digital bandwidth at low error rates, and in the case of broadband, also accommodates other types of communication, like video.

Compatible with Ethernet specifications, this LAN baseband transmits data at speeds up to 10MBps within a single facility or building. A basic LAN configuration consists of a network mamagement facility, transceivers, and entryways. In broadband, the cable may be up to 50,000 ft. in length.

The networking software provides virtual circuit capability allowing devices on the LAN to communicate and switch between one another without physically changing circuits. The Model 4002 Entryway can be configured with a variety of communications interfaces by means of a processor board and an attached I/O board arrangement that provides up to six connections. Transmissions can be asynchronous or synchronous. The 4001 can accommodate up to four processor boards and up to 24 ports. The typical Codex LAN configuration is priced between $450 and $750 per port. CODEX CORP., Mansfield, Mass.

FOR DATA CIRCLE 315 ON READER CARD

PERSONAL WORKSTATION

The AES Savin 7100 Personal Workstation is a standalone multifunction word processor that combines personal computing capabilities. The unit's four primary components are a video display terminal, keyboard, disk drives, and letter-quality printer. The 12-inch display screen shows 14 lines of 80 characters in green phosphor and can be tilted. Scrolling expands the screen capacity up to 99 lines vertically and 254 characters horizontally. A shadow cursor keeps track of the job, and two lines at the top of the screen provide format information, confirmation of commands, and screen prompts.

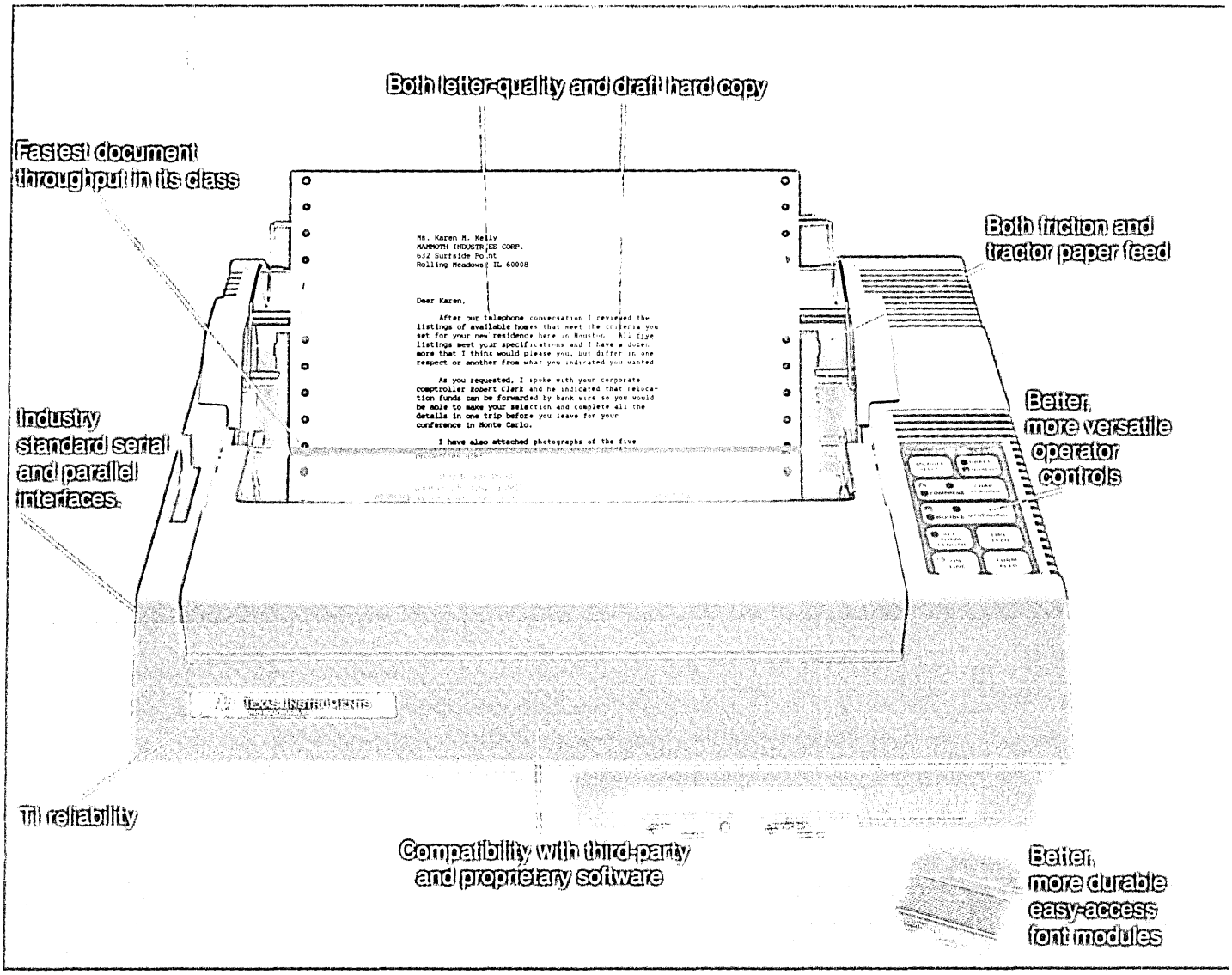
The 7100 is available with one or two 5¼-inch disk drives with one side single density or two sides double density. The unit supports a range of printers featuring bidirectional printing at speeds up to 45 cps and flexible line spacing. It can electronically transfer data between computers and other office equipment. Also available are tty-ASCII Teletype terminal emulation packages.

The system comes with word processing software and supports CP/M 2.2. The AES Savin 7100 prices start at $6,000. SAVIN CORP., Stamford, Conn.

FOR DATA CIRCLE 316 ON READER CARD

STORAGE DEVICES

This vendor has added two products to its 6000 Series Storage System. The 6380 storage product is a high-capacity direct storage



Introducing the TI 855 microprinter. No other printer says better so many ways.

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Hardware Compatible. The TI 855 microprinter is compatible with all major PC hardware. And it provides both serial RS232C subset and "Centronics-type" parallel as standard interfaces.

Software Compatible. The TI 855 uses industry standard escape sequences for compatibility with virtually all third-party software. And for those with proprietary software needs, a model is available with ANSI standard escape sequences.

Tough Font Modules For Quick Character Change. Three font modules can be inserted into the front of the printer at one time, and are accessed individually. Each contains both draft- and letter-quality character sets. They're easier to use, more reliable and more durable than traditional metal or plastic daisy wheels.

More Productivity Than Any Other Microprinter. The 855 offers both friction and tractor paper feed, to handle all types of word and data processing applications. A quick-change snap-in cartridge ribbon. Raster and mosaic graphics. And intelligent printing which maximizes document throughput — regardless of format.

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TEXAS INSTRUMENTS

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device. The cache controller feature (CCF) is an electronic memory. The 6380 storage product consists of a disk storage unit and a control unit. According to the vendor, this product improves performance and cost-per-megabyte on systems that process applications requiring large storage capacity. Four disk storage units of the subsystem provide 10GB of information in a total floor space of 23½ square feet.

Dynamic extended pathing (DXP), a standard feature on the 6380, improves throughput and channel use by allowing for two transfer paths to data. DXP provides the interface for dynamic path selection and supports dynamic reconnection when operating in a System/370 XA environment.

The CCF adds high-speed electronic memory, or cache, to the 6280 or 6380 storage products. By supplying data directly from the cache to the processor at maximum channel speed, the CCF can boost storage subsystem performance, the vendor says. The 6380 Storage Product, including 10GB of disk storage costs $315,000. The CCF varies in price from $61,000 to $207,000. AMDAHL CORP., Sunnyvale, Ca.

FOR DATA CIRCLE 317 ON READER CARD

INTEGRATED MODEM

The Tel-A-Modem is an intelligent modem device integrated into a two-line desk-type telephone. It is compatible with RS232C terminals and computers. The unit adds two-line capability and permits simultaneous voice/data communications. It can operate on a tone or pulse line. Other telephone features include audio/visual phone status, hold function for both lines, last number automatic redial, and a nine-number memory automatic dialer.

A direct connect capability is built into the unit. Modem coupling on either line is accomplished by pressing a button on the phone's keypad. Switches for setting modem configuration are located behind a snap-out panel on the unit's faceplate. Other modem features include 300 and 1200 baud data transmission rates, full-duplex operating mode, automatic answer and instant status indication, automatic selection of baud rate and answer/originate tone, and programmable signal interchange.

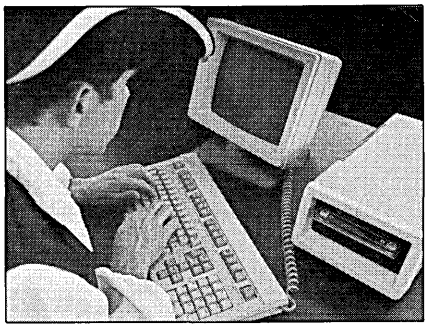
Five LEDs on the unit's faceplate provide modem status information. Tel-A-Modem costs $600. CODE-A-PHONE CORP., Portland, Ore.

FOR DATA CIRCLE 318 ON READER CARD

TOUCH SCREEN MONITOR

The VRTS1 DECtouch monitor is designed for use in place of the VR241 color monitor in a Professional 350 workstation. It is intended for applications in education, the office, laboratories, CAD/CAM, and other areas that can benefit from direct interaction with screen displays.

The monitor is a modified VR241 unit that uses resistive membrane technology to translate the position at which a finger touches the screen into data that can be understood by an application program such as IVIS interactive courseware. The resistive



membrane panel is mounted over the face of the crt display. The membrane can sense input position with a resolution of 1 mm.

A connector panel contains two serial and two parallel connectors for simultaneous attachment of alternate input devices such as one or two joysticks, a serial mouse, a quadrature mouse, or a graphics tablet. The DECtouch controller module, mounted inside the monitor cabinet, interfaces the screen, keyboard, and alternate positional devices to the Professional 350 workstation.

The controller also performs diagnostic, alignment, demonstration, and self-test procedures. The DECtouch monitor with connector panel and internal controller module is priced at $3,300. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 319 ON READER CARD

PROTOCOL ANALYZERS

These four protocol analyzers start at the entry level and progress through sophisticated models. The D 200, D 400, D 600, and D 800 all have automatic protocol analysis that isolate the fault and describe the nature of the malfunction in plain English on the crt screen.

These units are designed for both character- and bit-oriented protocols. The vendor says the equipment tells the operator what went wrong with the protocol, and which device in the network caused the problems. All the units have one-button set-up and remote control. Protocol problems can be analyzed in the field or shop.

The D 200, with prompt screens and a keyboard, is targeted at the small communications center or field service technician. The D 400 is targeted at the moderate size telecom center, field service engineer, or telephone company representative that needs 56Kbps operation. The D 600 is targeted at the large comm centers, field service depots, or engineering development possibilities. It is fully functional under program control at line speeds to 72Kbps. The D 800 has a color monitor and can simulate high-level protocols, displays, and interface graphics, memorizes line performance, and displays on-line statistics in color.

The unit has a 10MB Winchester disk, nine soft function keys, and full operation of all capabilities at line speeds up to 256Kbps. The D 200 costs $5,000; the D 400 costs $7,500 (optional disk drive is $700); the D 600 costs $11,500; and the D 800 costs $18,500. DIGILOG NETWORK CONTROL DIVISION, Montgomeryville, Pa.

FOR DATA CIRCLE 321 ON READER CARD

LASER PRINTER

The B 9290-30 is a 30-page-per-minute intelligent laser printer. It is the first nonimpact page printer to be offered on-line to this vendor's mainframe system.

Operating in a continuous print mode, the printer produces high-quality printing under both host and printer software control allowing flexibility in the design of printed forms, the placement of data that appears on the forms, and in assembling completed reports.

Images are created by a laser diode with a resolution of 57,600 dots per square inch and can print on two sides of uncoated, 8½ by 11-inch plain bond paper in either the portrait or landscape format with no loss of speed and completely collate and stack completed reports in distribution order.

The laser printer is compatible with the vendor's mainframe systems, including the B 2900, B 3900, B 4900, B 6900, B 7900, and A9.

According to the vendor, the laser printer reduces paper costs over pin feed forms by having the ability to print logotypes and signatures and also design and store forms. The Burroughs B 9290-30 laser printer costs $65,000. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 320 ON READER CARD

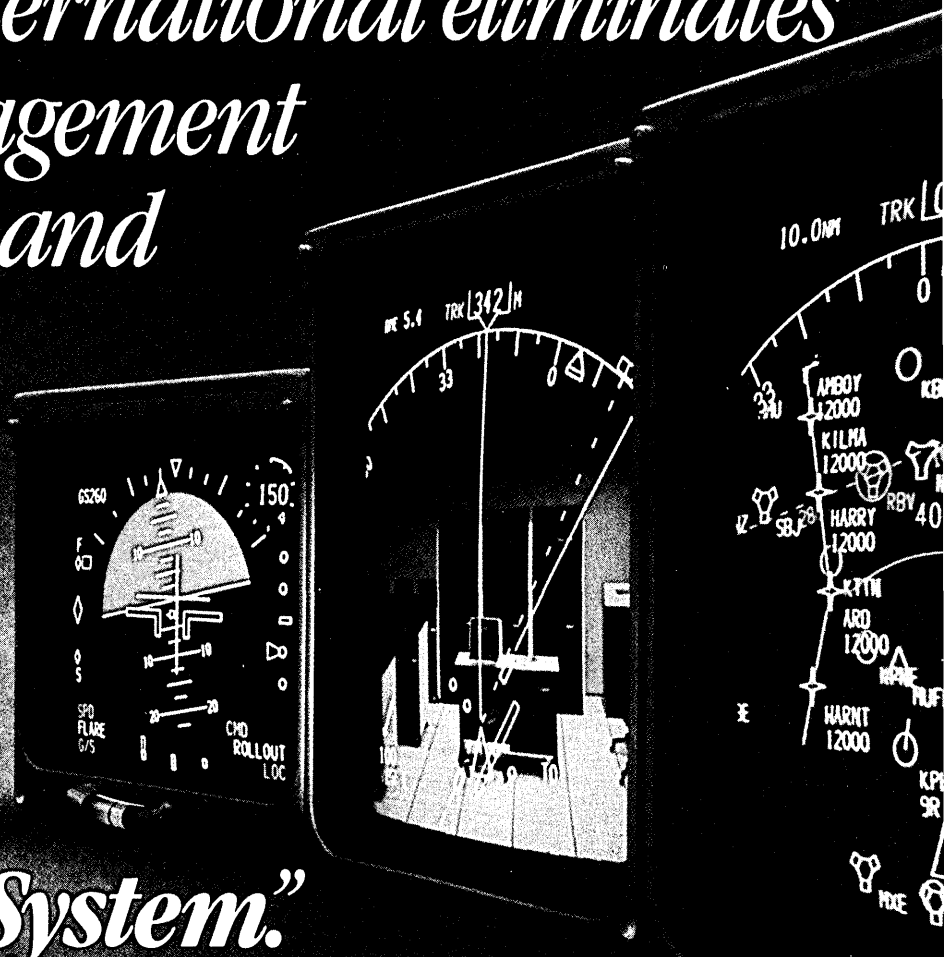
BUS-CENTERED ARCHITECTURE

The Nu Machine is a computer system implementing 32-bit NuBus technology developed at the Massachusetts Institute of Technology. The unit is based on the 37½ MBps NuBus. According to the vendor, the bus-centered architecture makes this machine suited for applications requiring multiple or special purpose processors.

The system can be configured with a 68010-based processor with cache memory and user-designed processors, Unix-based operating system, graphics display, mass storage peripherals, and a MultiBus subsystem. Programming languages include FORTRAN and C.

The system is supplied with a 10MHz 68010 processor with 4KB, 45-nanosecond cache memory. It supports 32-bit data transfer and addressing and can support future 32-bit microprocessors. The 800 by 1,024-pixel, 15-inch, 60Hz, noninterlaced black-and-white display and bit-

"Rockwell International eliminates order management paperwork and ships products faster with a Tandem NonStop™ Computer System."



Robert P. Marovich, VP and Controller
Avionics Group, *Rockwell International Corporation*

"Our Tandem NonStop computer helps us dramatically streamline order tracking for our broad line of products here at the Collins avionics facilities in Cedar Rapids. This has helped us ship our products faster, as well as respond to customer inquiries in a much more timely, accurate fashion.

"The Tandem system consolidates all data pertaining to the orders, from order entry right on down the line to shipping. It has eliminated the need for more than 300,000 reproduced documents annually, while at the same time saving us over $175,000 a year in internal freight charges.

"Our customer service has also benefited through better control of backorders, more accurate pricing information, and the ability to make detailed forecasts of market conditions for planning purposes. Overall, the Tandem system has helped us realize some very significant gains in plant productivity."

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TANDEM
NonStop Transaction Processing

CIRCLE 103 ON READER CARD

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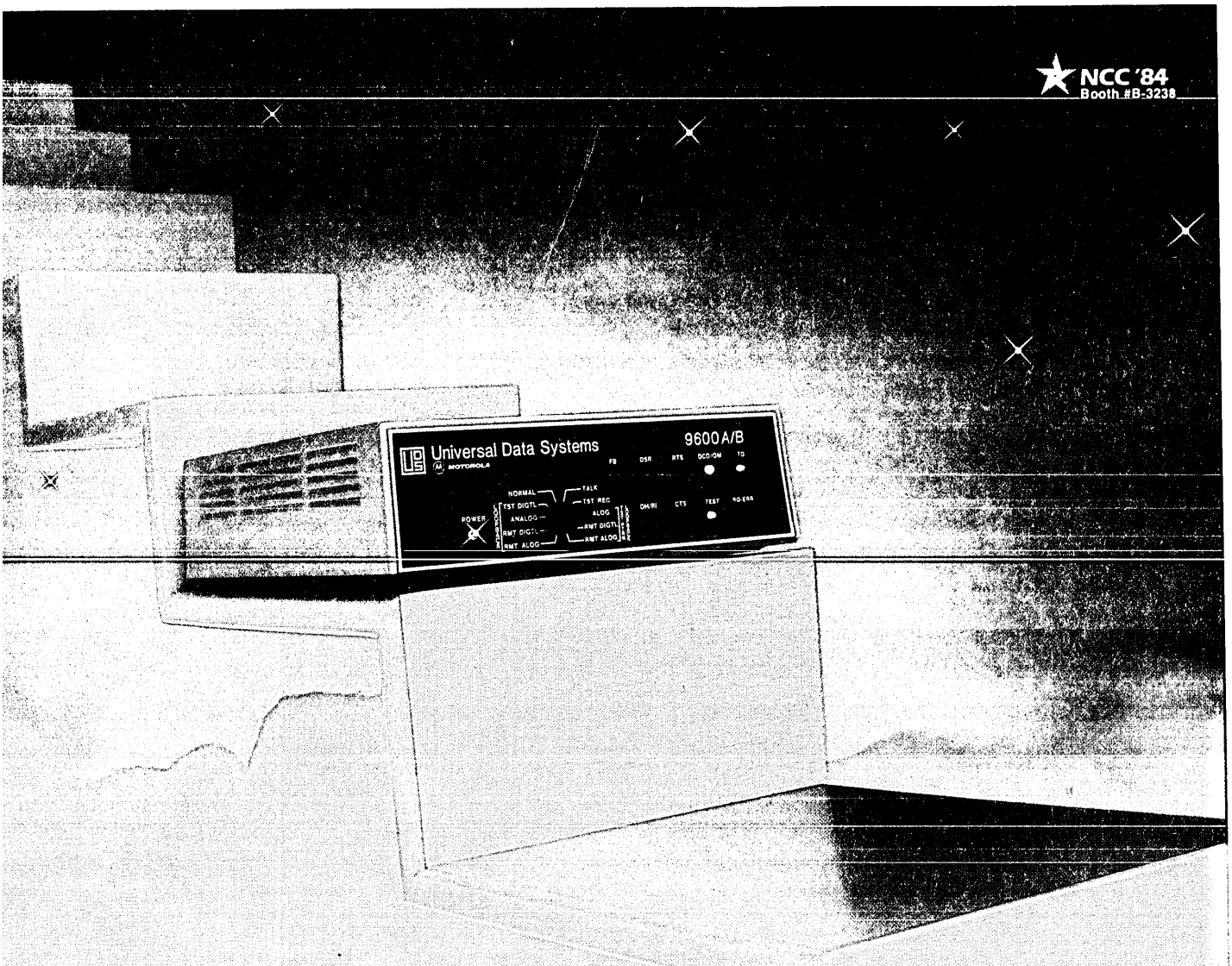

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CIRCLE 104 ON READER CARD

Created by Dayner/Hall, Inc., Winter Park, Florida

mapped graphics controller produce graphics and multifont text. Two Winchester disk storage systems are available, a 474MB and an 84MB disk.

The Nu Machine is offered in two configurations: a small office unit designed to operate in a quiet environment and a rackmount model that supports larger peripherals and is designed for computer room operations. The office model, configured with a 68010 cpu, 512KB memory, 84MB disk, ¼-inch cartridge tape, display, keyboard, and mouse is priced at $36,250. A similarly configured rackmount system with a 474MB disk and ½-inch streamer tape costs $53,500 in oem quantities of 25. TEXAS INSTRUMENTS INC., Austin, Texas.

FOR DATA CIRCLE 322 ON READER CARD

INTELLIGENT SCANNING SYSTEM

The Kurzweil 4000 can read either typeset or typewritten material and convert it to computer codes. This is made possible through new hardware and enhanced artificial intelligence, which, according to the vendor, goes beyond conventional optical character recognition software to intelligent character recognition (ICR). ICR stems from the system's ability to learn most fonts with minimal operator intervention. The processor is designed to handle high throughput requirements of the artificial intelligence software, which includes Autotrain. It allows the system to make intelligent decisions about character recognition that previously required operator intervention, and gives the system the capability to learn new fonts and resolve ambiguities of text.

According to the vendor, the scanning system has broad applications in the office automation, printing/publishing, and information services areas. The learning process has been developed so that artificial intelligence decides when learning is complete and production should begin. The operator interface has been revised so that menus and interactive prompts are totally consistent. The Kurzweil 4000 costs $34,500. KURZWEIL COMPUTER PRODUCTS INC., Cambridge, Mass.

FOR DATA CIRCLE 323 ON READER CARD

GRAPHICS PLOTTER

The HP 7550A is an 11 by 17-inch graphics plotter featuring 31½ ips plot speed and 6g acceleration. It is available with automatic cut-sheet paper feed. Other features include a liquid crystal display with function keys for reporting plotter status and program messages, and a replot feature that draws up to 99 copies of an original graph without rerunning the program.

Designed for applications in business, engineering, science, and manufacturing, the plotter offers users speed, ease of use, and the elimination of paper handling, the vendor says, adding that the plotter can be used anywhere hardcopy graphics are important and routine—in a computer room as a central source for hardcopy graphics, in CAD/CAM, in business as a peripheral to desktop computers, and in production for generating unattended plots for automatic test systems and process control.

The unit makes letters at eight to 10 characters per second, which is equivalent to drawing a full page of 10-point, single-spaced type in four minutes, at a pen speed of 31½ ips. It has an addressable resolution of 0.025mm and a mechanical resolution of 0.006mm. The plotter features 20 international character sets in two fonts, including Japanese katakana and most European languages. It also has a user-definable character set capability, and arc and circle generator, a line generator, polygon definition, and area fill commands. It has a built-in self test and block mode I/O error checking and recovery for RS232C. A 23KB I/O buffer speeds up system communication.

The HP 7550A has both the HP-IB (IEEE-488) and RS232C/CCITT V.24 interfaces. Using only one serial computer port, the plotter can be connected either directly to the computer or in series between a terminal and the computer. The HP 7550A costs $4,000. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 324 ON READER CARD

DISPLAY WORKSTATION

The WY-1000 × 10 is a graphics workstation designed to be configured with windowing software for business or CAD/CAM applications. According to the vendor, this workstation is designed specifically to enhance new window-type software, by allowing users to combine text and graphics in the same documents.

In addition to providing windowing capability, the system can be integrated with a laser, nonimpact printer to provide a typesetting computer system. The graphics operating system is by Digital Research Inc., and contains several subroutines including user selection of font styles. This workstation is essentially a WY-1000, but also includes a 15-inch monochrome monitor with a 1,000 by 800 bit-mapped display, the GSX operating system, and one serial I/O port. It is a 16-bit, 80186 microprocessor-based microcomputer that provides two 5¼-inch floppy disks, 128KB of RAM that is expandable to 256KB, and three I/O ports. The unit's operating system is MS/DOS.

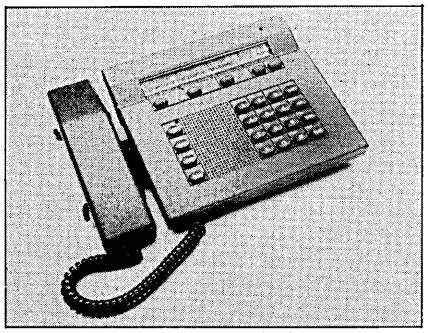
The WY1000 × 10 is priced at $5,000. WYSE TECHNOLOGY, San Jose, Calif.

FOR DATA CIRCLE 325 ON READER CARD

TELECOMMUNICATIONS

The Telenova 1 is an integrated voice-data office telecommunications and information services system designed for small businesses with from 10 to 100 users. The system is able to integrate a digital telephone system, local area network capabilities, and advanced information services with destop computers.

The system is based on a single module which can be used to carry voice and data over standard two-pair telephone lines while providing information services including phone active message service, speed directory, and data services. Personal



computers and data terminals can be connected via RS232C ports directly into a desktop Telenova 1 station set. The station set has a two-line, 40-character LCD display that guides users through the system and highlights only those services that are useful at a given time. A help button is built into the system with an on-line instruction manual.

The system has simultaneous voice and data capabilities, and its architecture is nonblocking. It can process 18.4 million bps and has assignable slots of 8KHz under software control. Data communication is handled up to 19.2Kbps asynchronous. An individual telephone set costs $700. The basic cpu costs $800 to $1,000. A typical small office configuration of 13 stations and 43 ports costs $45,000. TELENOVA INC., Los Gatos, Calif.

FOR DATA CIRCLE 326 ON READER CARD

FLAT PANEL DISPLAY

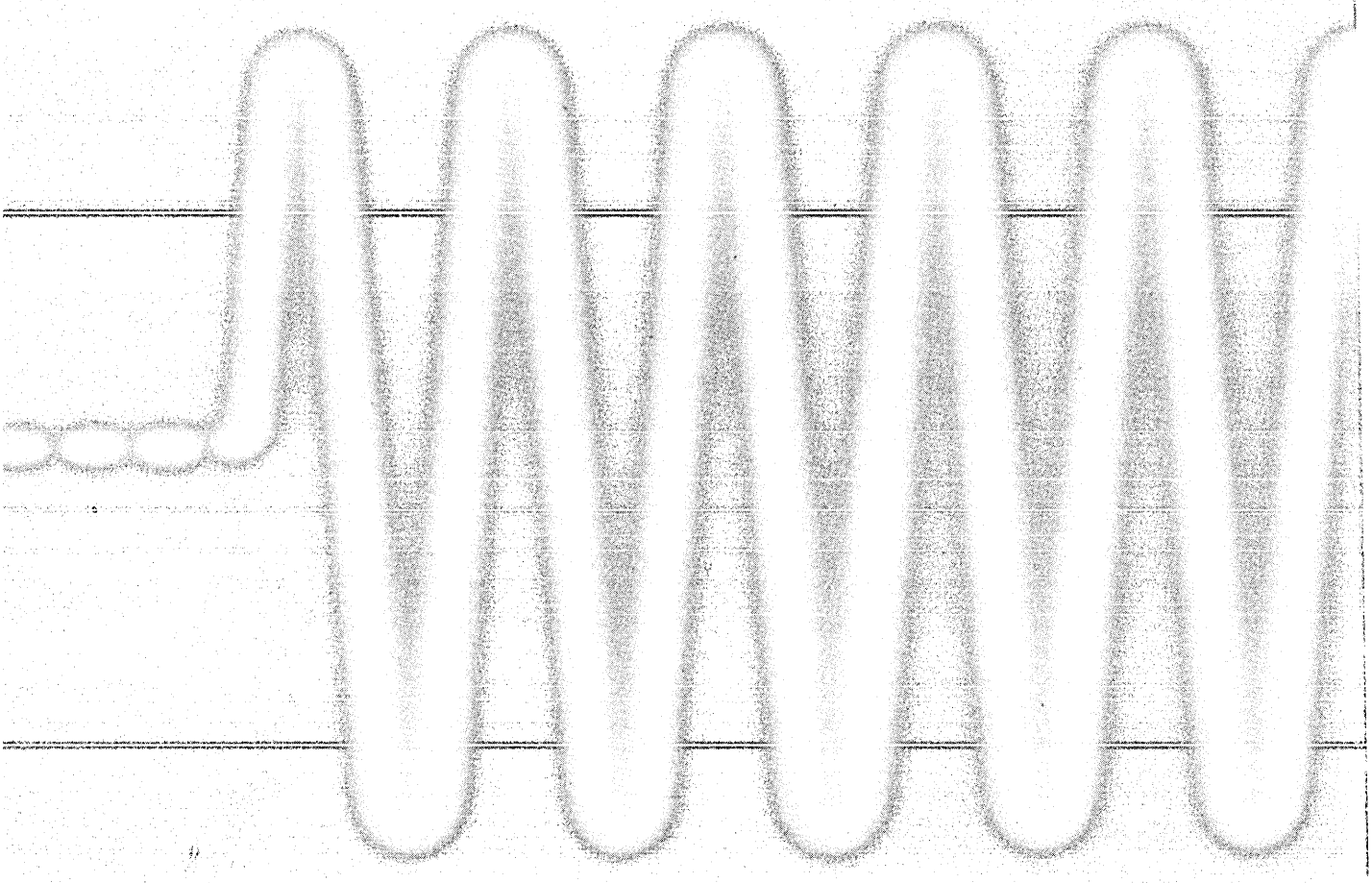
The PlasmaGraphics 120 is a 25-line by 80-character display that provides readability and graphics-quality resolution while housed in a slim casing.

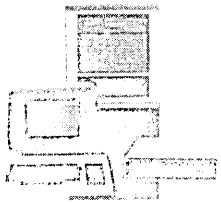
According to the vendor, AC and DC plasma discharge technologies have been combined, the AC to give the panel inherent memory, and the DC for high-efficiency addressing. The screen is a full 120,000 addressable pixels arranged in 480 columns by 250 rows. When addressed with a 5 by 7-character matrix, the panel can display 25 lines of 80 characters. The flat gas plasma display is housed in a 7 by 10-inch case. Evaluations of the PlasmaGraphics 120 display are available at $1,800. Sale prices will begin at $1,000 with substantial discounts available depending upon volume. The vendor is a joint venture of Burroughs Corp. and Telex Computer Products. PLASMAGRAPHICS CORP., Warren, N.J.

FOR DATA CIRCLE 327 ON READER CARD

—Robert J. Crutchfield

THE AT&T FAMILY OF DATAPHON





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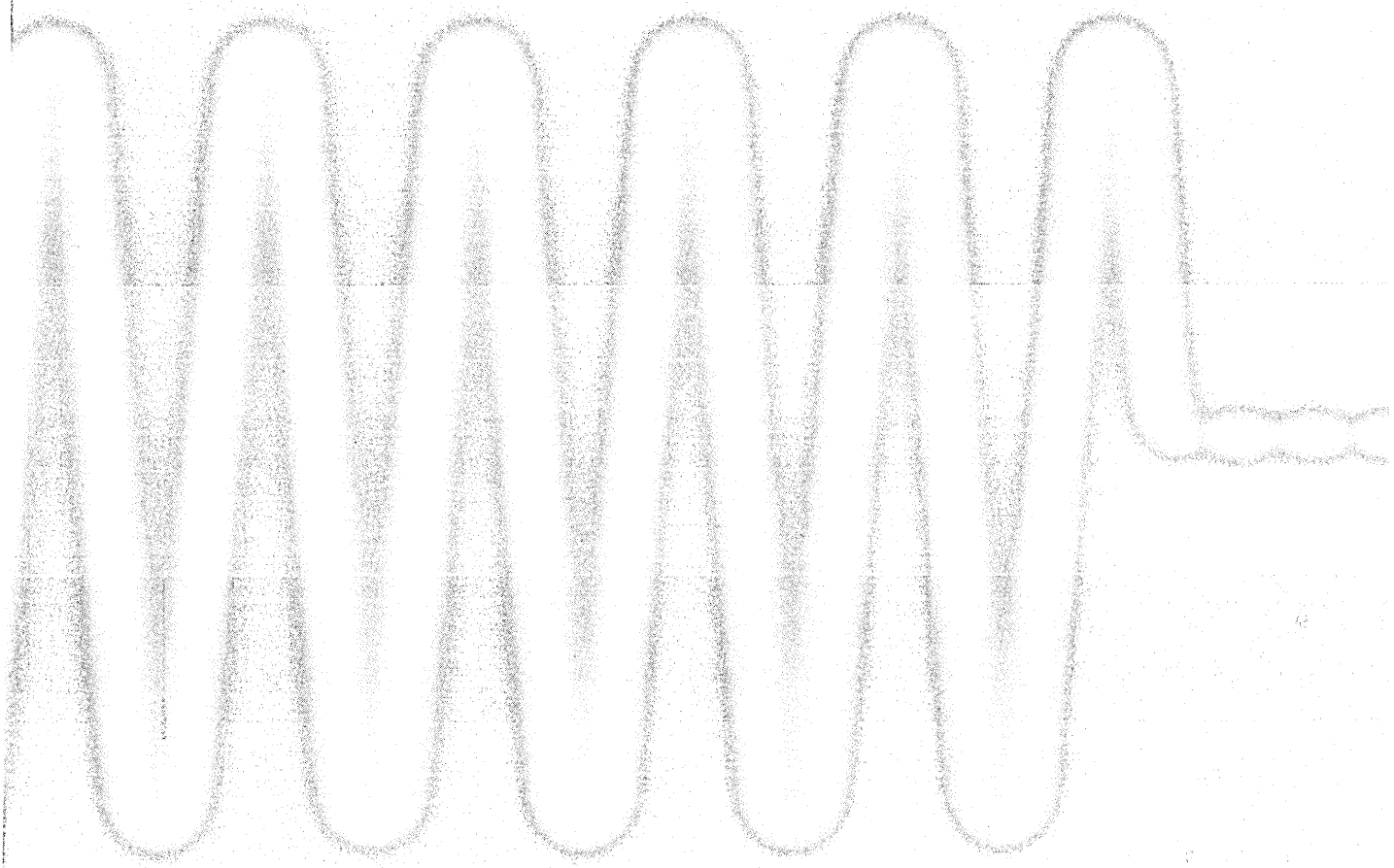

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INFORMATION Systems

CIRCLE 195 ON READER CARD

Security in VM

A Different Paradigm

Last night someone accessed the personnel database. Was this for a legitimate business need, or is your VM system wide open? Your computer holds the design plans for the company's hottest new product to be introduced next month. Who has seen, or even copied those plans?

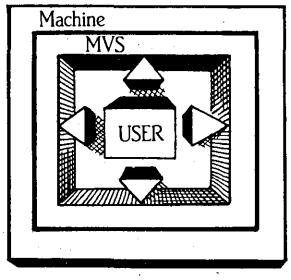
You need security for your system, and for the applications and data it supports. Meeting these security needs requires an entirely different approach in a VM environment than in any other environment.

THE SECURITY ENVIRONMENT

When most people think of security for an IBM mainframe, they have as a mental starting point one of IBM's batch operating systems. Given that DOS has been around since the 60's and MVS since the mid 70's, this is understandable.

So most people have a mindset that links a security system to an *operating system,* rather than a *machine.*

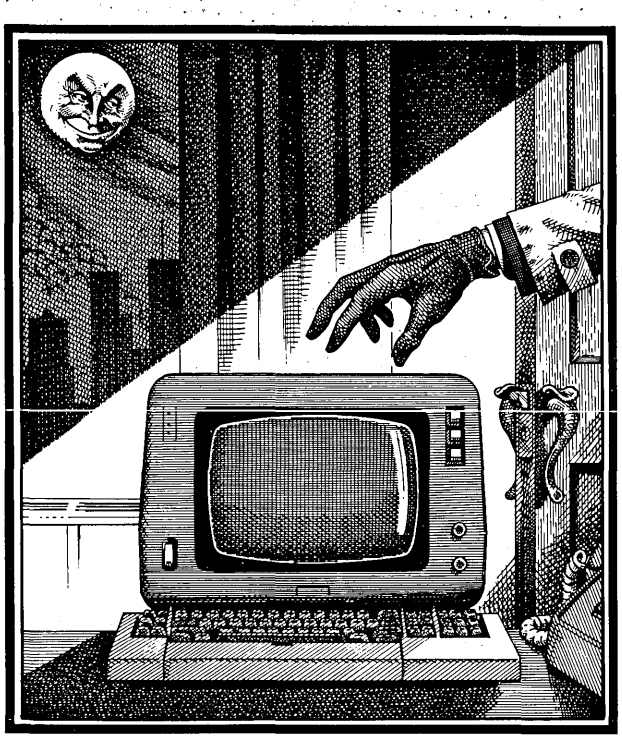
Traditionally, the operating system controls the user:



In fact, in MVS, it controls the user at a *logical* level. It ordinarily allows access only to datasets and other logical entities.

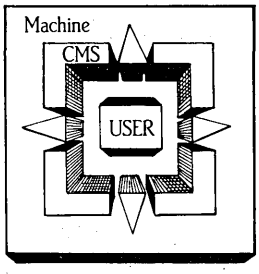
THE VM ENVIRONMENT

Under VM, multiple virtual machines can be run on one real machine. Inside these 'machines', various sets of instructions, or operating systems, can be run. For example, one virtual machine might run CMS, another DOS or MVS. A unique feature of VM is that each virtual machine (or user) is separated by hardware from other virtual machines on the same CPU. Each virtual machine functions independently of the others, making sharing of resources between machines difficult at best.



THE COMPARISON

In contrast to other IBM mainframe environments, such as MVS, the VM control program (CP) allows *physical* access to equipment. Thus, a user can access any logical piece of a physical entity in his virtual machine:



What this means for security is that a user in VM can *bypass* a logical system such as CMS and do physical access in his virtual machine. For example, a user in MVS cannot execute a privileged instruction, such as starting I/O to a device. He must ask MVS to do it. In VM, a user can do it easily.

THE MISCONCEPTION

The main liturgy of the security goes something like this: We must:

1) Define ownership of all resources (tape, disk, machine access, etc.),
2) Specify rules to access those resources (hence the buzzwords "resource access control"), and
3) Manage and monitor this effort.

This is what you get with a package from IBM such as RACF on MVS.

One might conveniently think that the low level commands from such an MVS security implementation could be 'moved' to VM, but this is a dangerous misconception.

Any security facility implemented in an operating system within VM, such as CMS, whose usage can be bypassed, is just smoke—not realistic at all. Think of a security system that modifies every possible CMS command to control logical access to files. Sounds good, but any programmer can write a program *outside* CMS to beat it, or copy an unaltered version of a command from one of 10,000 plus other VM systems.

The virtual machine is the only level at which a VM system can be secured.

THE SOLUTION

First, what does VM itself offer for security? The VM directory defines users (virtual machines) and maps virtual to physical resources for those users. It contains a password for each user to access the system, and an optional password for access to each user's disk by others. In fact, VM is relatively secure when users need not share. The simple reality though, is that programs and data must be shared among users.

To be effective, a security package must work within the constraints of, and address the vulnerabilities of VM. It must be implemented at the control program level of VM—where it cannot be bypassed in CMS. It must be built within the VM directory scheme, so that it becomes an integral part of the VM system, and it must not require modifications to any part of VM or CMS.

The issue of security in the VM environment cannot be approached in the same way as for batch operating systems. It requires a vendor who understands the intricacies of VM to develop a security package to meet the needs of the VM community. It requires a vendor with the creativity to implement a system that addresses the unique features of VM.

VM Software Inc. is the undisputed leader among vendors of system software for the VM environment. Our newest product, VMSECURE, was designed by our experienced staff of VM professionals. VMSECURE is a resource access control, directory management, and disk space management system designed specifically to address the security needs of VM users.

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CIRCLE 106 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Whether one agrees with Future Computing's estimate that microcomputer software sales will grow to $6 billion by 1989, or Creative Strategies' $6.5 billion growth figure by 1988, one thing is certain: the micro software market is expanding rapidly. Nonetheless, these firms are still much smaller than the hardware vendors. Apple, for example, is close to a billion-dollar company, while the largest software vendors, such as Lotus Development, Ashton-Tate, VisiCorp, and Microsoft, are at best in the $50 million range. As software prices increase relative to hardware prices, however, expect that the gap will be narrowed significantly. Looming shakeout or no, there is a lot of money to be made in the software business. John Imlay, chairman of Management Science America Inc. (MSA), said recently that he is optimistic that MSA's Peachtree division would continue to experience significant growth. He added that the company wasn't looking for a "hit record," (like Lotus 1-2-3 or dBASE II), but instead for less exciting, steadier growth. The Atlanta firm is so committed to the market that it rolled out 24 packages in one day, including its new integrated package, Decision Manager.

That package aims straight for the heart of the booming software market. Creative Strategies says that integrated packages, which it calls "new generation software," and "new operating environments" (read windows and mice) are the wave of the future and the product areas that will capture the lion's share of the $8 billion or so to be made. The San Jose, Calif., research firm also says that the market "will undergo rapid and substantial change during the forecast period as the technological pace of hardware opens up new power and capabilities for microcomputer software."

They go on to say that the pace of the current switch from 8-bit to 16-bit and larger microprocessors is being hindered by the large amount of software existing for 8-bit computers. They point out, however, that this could be mitigated by software emulators, allowing 8-bit applications to run on 16-bit machines. And, as if U.S. vendors don't have enough competition among each other, CSI says the Japanese will make major advances.

Closer to home, Future Computing estimates graphics software now ranks close behind word processing, financial analysis, and data management in popularity. In fact, the Dallas firm says, it has become the fourth "essential" micro software package.

Across the Atlantic, Alpha Software Corp. has disclosed that it has signed an agreement with Megelpha International S.A., a Paris-based publishing company, to market and distribute a fully translated version of its database manager, The Integrator. In France, it will be called (drum roll, please) L'Integrator. It will be available for the IBM Personal Computer and PC compatibles. The French translation will include all the features of its American counterpart. Alpha follows a number of U.S. companies that are trying to increase revenues by selling overseas and biding their time until they start reaping bigger shares of the worldwide $8 billion microcomputer software market.

Intel Corp. has rolled out MS/DOS for its 286/310 and 86/310 microprocessor-based systems. It is a full implementation of version 2.11. Users have a choice of iRMX/MS/DOS, alternate Xenix/MS/DOS, and MS/DOS operating systems.

N.Y. VENDOR DIRECTORY

The New York Metropolitan Directory of Computer Vendors contains a list of computer products and services offered by computer vendors and purchased by computer users. The 210-page directory focuses on the multibillion dollar metropolitan New York area, including most of New Jersey and Connecticut, as well as all of New York State.

The information within the directory is listed according to the company, division, address, main telephone number, contact's name, title, and direct telephone number or extension. It is divided into 17 different vendor categories. The directory includes advertisements in three forms: display ads, profiles including a description of 75 words, and a business card gallery.

The directory is available for $25 and is updated as of early 1984. COMPUTER MANAGEMENT RESEARCH INC., New York, N.Y.

FOR DATA CIRCLE 401 ON READER CARD

STATISTICAL SOFTWARE

Enhansys is a software package with heavy statistical overtones, oriented to data retrieval and reporting. This product is geared toward professionals who monitor the industrial processes, such as process engineers, quality control engineers, product line managers, production control and scheduling personnel, line technicians, research scientists, and operations managers. In addition, clerical workers, financial analysts, and users of factory floor data who are not computer literate but must interact with the computer can make use of Enhansys.

The product is designed to give users access and processing functions that are based on natural language requests and require no knowledge of the underlying computer system. According to the vendor, the aim is to have the user gain rapid access to process data without having to wade through datacom protocols, access languages, or file storage details. It provides integrated tools for data access, computer assisted analysis, and presentation.

The software is adaptable, expandable, and portable. The user interface offers natural language control over functions such as mathematics and statistics processing, inquiry and reporting, and graphics. The software also supports electronic mail, word processing, planning, and scheduling. Each of these functions can, in turn, access from different computers and operating systems. Data access includes the user's own data, corporate data, engineering data, and other databases in other networks.

The Enhansys system architecture is constructed of modular blocks, which together provide portability, data integration, and access to data without the user's being computer proficient. One such block is called Virtual Host Services (VHS). It buffers Enhansys from all underlying hardware dependencies while providing all system-dependent interfaces. The table-driven Language Support Block translates free-form input into precise internal representation. The Data Management Block offers access to data by name, regardless of where or how the data are stored. The Presentation Services Block serves as the interface to hardware.

Internal subprograms can be written in any major computer language, the vendor says. The Enhansys software product costs vary according to machine size, with a maximum charge of $5,250 per month. ENHANSYS INC., Cupertino, Calif.

FOR DATA CIRCLE 402 ON READER CARD

SECURITY SYSTEM

The Advanced Data Security system is a real-time security system that is tailored by security officers to meet corporate requirements. It was developed using Cullinet's IDMS-ADS/O program software.

The system is processed with ADS/O dialogs only, with all screens, programs, and work records residing in the Integrated Data Dictionary (IDD). It also offers users optional controls at seven function levels, including ranges within data elements. This system will be automatically included as an integrated application module for use in conjunction with the firm's IDMS-based human resources software.

Advanced Data Security retains the static checks of the vendor's predecessor security system for authorizing specified terminal use, performance of a function, or execution of a transaction by operators. In addition, the new system offers a number of checks that can restrict operator access to records of selected organizations and administrative units, as well as employee types and data elements, either on a mandatory or conditional (range) basis.

The system is delivered to the user at the highest security level. Screen prompts enable corporate security officers to distribute authorization parameters throughout an organization. Changes in the parameters are made on a menu-select basis by authorized officers, who can also authorize additional operators to the system, providing them functional level access no greater than their own.

Security-sensitive fields are darkened from a screen, prompting an "Illegal Transaction" display. Security reports provide information regarding security violations, tracking of all transactions for selected operators and statistical summaries by terminals, date/time, and error type. The Advanced Data Security System costs between $30,000 and $100,000. INTEGRAL SYSTEMS INC., Walnut Creek, Calif.

FOR DATA CIRCLE 403 ON READER CARD

SAS TRAINING COURSE

This video training course teaches SAS users how to display information by creating color maps with the SAS/GRAPH product.

In the Creating Maps with SAS/GRAPH Procedures course, users first take advantage of the map datasets that are provided with the SAS/GRAPH product, then create their own map datasets. Users will also learn how to devise different kinds of maps for display of the same type of information.

The course is divided into five modules, each with individual video segments. The course workbook, which is provided with the videotapes, contains segment reviews and text and computer exercises and their solutions. The course tape runs for approximately two and a half hours.

Video training courses from SAS Institute are licensed on a quarterly or annual basis. The first quarter rate for Creating Maps with SAS/GRAPH Procedures Course for corporate customers is $800. Each additional quarter is $300. Multiple copies of the same course are discounted. SAS INSTITUTE INC., Cray, North Carolina.

FOR DATA CIRCLE 404 ON READER CARD

TEXT PROCESSING

The text processing power of IBM Personal Computers was expanded with the introduction of PC versions of this vendor's Displaywriter programs and links to the company's office systems.

DisplayWrite 1 is a word processing program designed for the PCjr. DisplayWrite 2 is a program similar in function to Displaywriter Textpack 4 and is intended for light to moderate typing. It can run on a PC, PC XT, Portable PC, or 3270 PC. A specialized spelling aid of about 16,000 legal words, called DisplayWrite Legal Support, is also available. A diskette program, called DisplayComm, enables IBM PCs, PC XTs, and Portable PCs to send documents written in DisplayWrite 2 and information from other PC files to similarly equipped PCs, Displaywriters, and other office equipment. The documents can be transmitted at high speeds in binary synchronous communication form.

PCWriter is another text processing program, whose menus and commands are similar to those of the IBM 5520. It includes

SOFTWARE SPOTLIGHT

KNOWLEDGE ENGINEERING TOOL

The commercialization of artificial intelligence technology, most of which was developed in universities, has accelerated in recent months and drawn the interest of many large corporations. Much of this activity has focused on so-called knowledge-based systems, which are designed to mechanize scarce expertise and advice normally available only from a few specially trained individuals.

Hoping to whet the appetites of users interested in artificial intelligence but not sure of its feasibility, this aggressive vendor has built a small-scale knowledge engineering tool to get into the AI tool market quickly and preempt competitors. The software demonstrates some basic AI principles and provides a means of exploring the technology at low cost.

Running on an IBM PC with 128KB of main memory and a diskette drive, the M.1 software includes a knowledge base and a back-chaining inference mechanism, which are of sufficient power to enable small-scale, interactive advisory systems to be built for demonstration to management. From there, a user would be in a better position to determine whether a full-scale AI project should be undertaken with one of the more powerful knowledge-engineering tools becoming available, according to the vendor.

Knowledge about a particular subject is stored in the form of English-like if-then rules with associated "certainty factors." The rules are entered into a loosely formatted text file and edited by way of any standard pc word processor. M.1 automatically questions its user based on the information it needs to make inferences and can be asked to explain and justify its reasoning at any time. Interactive debugging features, including a multiwindowed tracing of inferences and conclusions, are designed to make the software's operation visible in real-time.

Also included in the M.1 package are three sample advisory systems that consult on California wines, consumer banking services, and use of a major structural analysis program.

Included in the system's $12,500 price, which holds only until Sept. 30, are four days of training, manuals, and the M.1 software. A second copy of the software, with training, is priced at $5,000. TEKNOWLEDGE INC., Palo Alto, Calif.

FOR DATA CIRCLE 400 ON READER CARD

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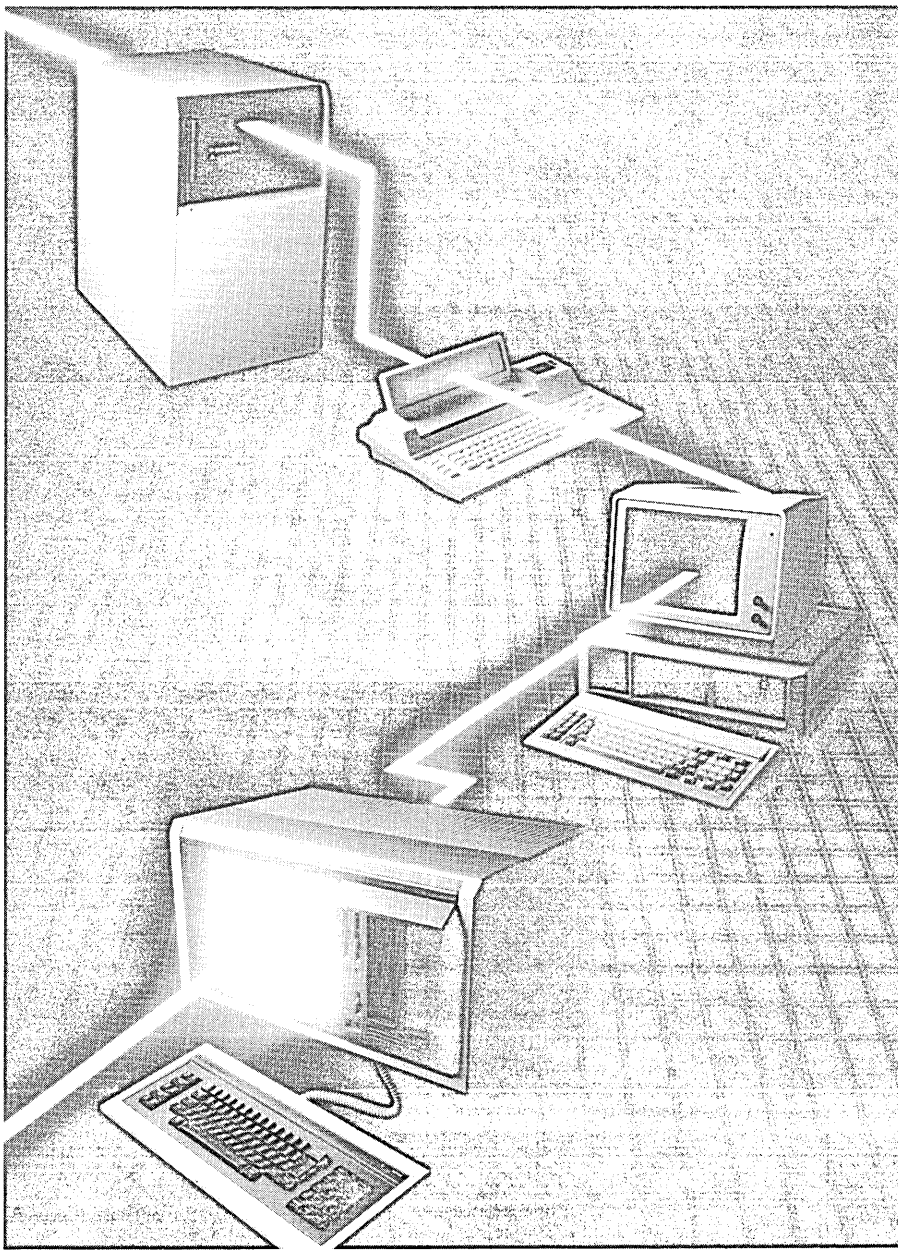

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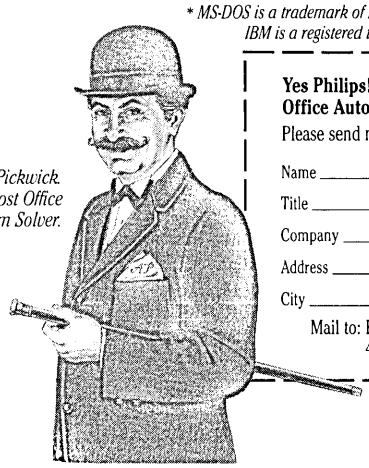

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text and word processing functions and a dictionary of about 120,000 words.

DisplayWrite 1 costs $95; DisplayWrite 2, $300; DisplayComm, $375; PCWrite, $200; and DisplayWrite Legal Support, $165. IBM CORP., Town of Rye, N.Y.

FOR DATA CIRCLE 405 ON READER CARD

PC MAINTENANCE SERVICE

"Back-Up" Microcomputer Servicing is Control Data's third-party maintenance program for volume users of IBM PC and PC XT computers.

This vendor is offering a range of contract and noncontract services for users of PC products and mixed-vendor peripheral equipment in business, education, and government. Services include customer engineer exchange on-site in four hours; courier service deliveries with exchange of unit in 24 hours; unit shipped for exchange in 24 hours, plus shipping time; and unit shipped for repair in a time frame of current repair cycle for problem, plus shipping. Users can contact MCS through a single 800 number. A technical services representative will screen the problem with a user over the telephone and determine how to solve it, depending on the contract or user's urgency for restored service.

To complete on-site service calls in four hours, this vendor has established technical staffs and inventory in major metropolitan areas. Costs for Back-Up vary. There is an annual fee plan in which users pay about $200 per year to be assured of four-hour exchange service. If replacement is necessary, flexible fee customers pay an additional charge based on the type of unit and peripherals replaced. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 406 ON READER CARD

RETRIEVAL AND REPORTING SYSTEM

The Datascan Information Retrieval and Reporting System is for use with the vendor's Models 445, 503, 565, and 585 distributed data processing (ddp) systems.

The software package gives users of ddp systems the ability to produce concise reports, bar graphs, or histograms from information stored in databases. Reports can be formatted automatically by the Datascan system, or customized using an integrated report writer.

According to the vendor, the system uses simple English commands and menus in its operation, and most people can learn to use basic Datascan functions in a short period of time. It includes a special index access method for data retrieval.

Data may also be retrieved using inverted, indexed-sequential, direct, or sequential access methods. Also, common data files may be shared among databases. A security feature allows only authorized individuals access to specific data fields. Software licensing fees for the Datascan package vary from $1,000 to $2,500. NORTHERN TELECOM INC., Nashville, Tenn.

FOR DATA CIRCLE 407 ON READER CARD

X.25 HOST INTERFACE

This X.25 software host interface is designed to run with this vendor's Communications Server/1 (CS/1) Ethernet unit. According to Bridge Communications, this product increases data transfer rates between computer systems while reducing computer room cabling mazes.

The CS/1-X.25 serves as a front-end processor to connect X.25 protocol-equipped host systems to the Ethernet local area network, multiplexing up to 48 simultaneous sessions to and from the host over a single X.25 line. Any terminal can be linked to another CS/1 or CS/100 and access the host.

The CS/1 multiplexes data streams over one X.25 line to increase performance and reduce cabling cost and maintenance, according to the vendor. The unit is attached to the host computer via a single cable over which X.25 (HDLC) virtual circuits are multiplexed. It accommodates RS232C, RS422/449, and V.35. The CS/1-X.25 costs $13,500. BRIDGE COMMUNICATIONS INC. Cupertino, Calif.

FOR DATA CIRCLE 408 ON READER CARD

PROJECT MANAGEMENT SYSTEM

The APECS/8000 is an integrated project management system for computers ranging from supermicros through mainframes. It performs under the Unix operating system.

It incorporates a relational database management system, which provides a collection of data that can be used for calculations, reports, and graphs. The system includes earned value analysis, critical path analysis, application building techniques, work breakdown, organization structure consolidation, and a range of data entry screens, report writing, and graphics capabilities.

Facilitating the top-down/bottom-up approach to planning and control, the system summarizes information to different levels of detail as defined by the organization, work breakdown, or other management structure. The APECS/8000 costs $150,000, and can be leased for $7,500 per month. ADP NETWORK SERVICES INC., Ann Arbor, Mich.

FOR DATA CIRCLE 409 ON READER CARD

PERSONAL PRODUCTIVITY PACKAGE

Decision Manager is an integrated personal productivity package that turns the IBM PC, PC XT, or PC-compatible microcomputer into a desktop workstation.

The software uses the vendor's proprietary windowing program. According to the vendor, it is suited for the corporate or executive environment, and is menu driven and easy to use because it is not necessary to learn complex commands or memorize codes. The package requires a minimum of 256KB of internal memory.

Decision Manager combines a word processor, spreadsheet, telecommunications, data manager, presentation quality business graphics, and a micro-to-mainframe link in one integrated package. This product's files are compatible with the vendor's other office productivity software.

The windowing software allows users to move from one project to another without manually closing files and changing applications. Users can define up to 20 different windows or projects at any one time, and up to 10 different windows or projects can appear on the screen at one time, providing reference to other projects or multiple information on the current project. With a few keystrokes, information in different windows can be transferred from one application to another, or moved elsewhere within the same application.

The vendor is to offering registered users of Decision Manager the first enhanced version of the product that is released for free. For a period of five years thereafter, updates of Decision Manager will be available for a fixed fee of $150 per version. In addition, 90 days of free telephone support is included with each new version of this software. Decision Manager is being offered at an introductory price of $625. MANAGEMENT SCIENCE AMERICA INC., Peachtree Division, Atlanta, Ga.

FOR DATA CIRCLE 410 ON READER CARD

APPLICATION DEVELOPMENT SYSTEM

HIBOL is an interactive CICS application system that is designed to increase productivity by generating complete COBOL/CICS applications in a fraction of the time required by traditional methods, the vendor says.

HIBOL addresses coding, debugging, and documentation. By providing simple, structured specifications to the system, it generates 100% of the code required for COBOL/CICS programs.

The software provides COBOL source code portability. Programs generated are in modular form and follow consistent programming standards. The programs, in source code, can be transported, compiled, and executed on any compatible mainframe with or without HIBOL.

The system is menu driven and allows new applications to be developed by organizing programs and menus into understandable, complete systems. Application menus can be created with no programming involved. The menu function generates all code necessary to display the menu and to select the appropriate function. There is

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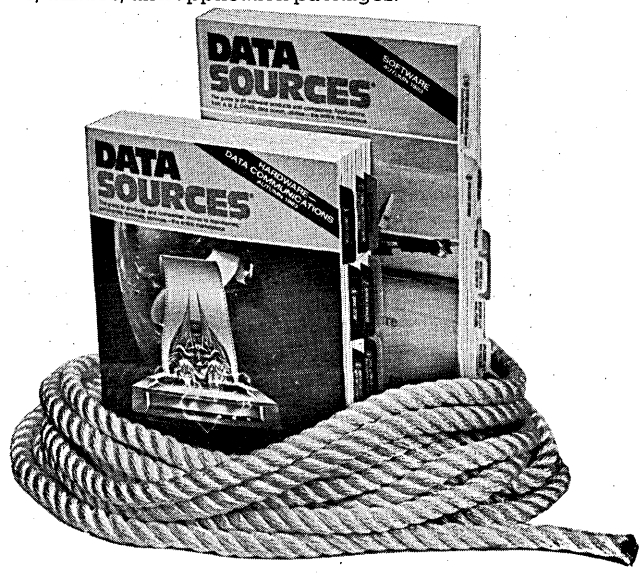

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also an interactive Help facility to aid programmers.

HIBOL runs under CICS/VS in DOS/VS(E), EDOS/VS(E), and OS operating systems. HIBOL under OS costs $30,000. Under DOS it sells for $20,000. NIXDORF COMPUTER SOFTWARE CO., Richmond, Va.

FOR DATA CIRCLE 411 ON READER CARD

MAINFRAME GRAPHING SYSTEM

MegaGraph is a graphing system designed for mainframe users in the MVS/TSO and VM/CMS operating environments and is completely interactive with the vendor's mainframe spreadsheet and other popular microcomputer spreadsheet packages.

Data can be graphed into line, bar, area, stacked bar, floating bar, histogram, pie, and Venn Diagram. One graph type can be reformatted to another by using a single command.

Single commands allow users to access MegaGraph, as well as any graph type. Additionally, a single command will provide more sophisticated users with access to the IBM GDDM Interactive Chart Utility for customization and advanced graphic specification, including variety of font, layout, color, and sizing.

The software handles legends, centering, and placement. Users requiring the ability to provide more input can override control of certain automatic functions. Colors are also assigned automatically. MegaGraph costs $5,000. It can be leased for $125 to $175 per month. THE MEGA GROUP INC., Irvine, Calif.

FOR DATA CIRCLE 412 ON READER CARD

LAN CONSULTANTS

This vendor offers feasibility studies, site survey, system engineering, system design, turnkey construction, and system maintenance.

A specialized department, called the Data Communications Group, provides assistance in all aspects of local area network (LAN) systems.

This vendor is offering a brochure that highlights its services in LAN design. ALLIED CABLE CONSTRUCTION, Data Communications Group, Stone Mountain, Ga.

FOR DATA CIRCLE 413 ON READER CARD

COMMUNICATIONS SOFTWARE

General Electric Information Services Co. has begun electronically distributing microcomputer software to its clients who use the IBM PC. The Mark III is the first in a series of products to be delivered in this way. The package provides an interface to GE Information Services' teleprocessing network.

To electronically receive software with the system, a user executes a BASIC program on any PC equiped with asynchronous communications software support to access the GE Mark III service. This then accesses the software download routine, which includes an asynchronous protocol designed to insure that the executable software will be received as sent.

The Mark III Professional Workstation will be available to GE clients for the cost of teleprocessing resources used in downloading. At 1200 baud, the software and on-line documentation can be distributed in less than 30 minutes, at a cost of approximately $50. GENERAL ELECTRIC INFORMATION SERVICES CO., Rockville, Md.

FOR DATA CIRCLE 414 ON READER CARD

CICS SECURITY SYSTEM

Alert/CICS is a product providing advanced security capabilities for installations using the CICS teleprocessing system. Without changing user programs, users can secure transaction files, programs, and maps.

The system will secure fields from being displayed, or, if display is authorized, from being changed by an operator. It has the ability to implement a complete security hierarchy throughout an on-line environment. Random passwords can be generated and automatically distributed by the system. It also has automatic clearing and sign-off of unattended terminals after a specific amount of time, and complete audit trail logging facilities.

Other controls handled in an on-line environment include system resource security to control transactions and inquiry/update of files; terminal and operator resource security to identify who is using the system, record usage, and record unauthorized activity; and facilities to customize the system.

The Alert/CICS is $12,200 for permanent license or $305 per month for a three-year renewable license under OS. Under DOS, the prices are $9,100 for a permanent license or $230 per month for a three-year renewable lease. GOAL SYSTEMS INTERNATIONAL INC, Columbus, Ohio.

FOR DATA CIRCLE 415 ON READER CARD

MICRO-TO-MAINFRAME LINK

Natural/Connection is a micro-to-mainframe software product that extends Natural, the vendor's integrated information system to the personal computer user. It runs on IBM Personal Computers and PC compatibles.

According to the vendor, this product meets the need for electronic access to corporate databases in the personal computer environment. The software can download data so that it can be used directly as input to most popular PC software products.

Natural/Connection features include 3270 terminal emulation, asynchronous communications support with automatic error detection and retransmission to ensure a logically error-free link, Hays Smartmodem support, and synchronous communications support with the IRMA board.

Users do not need a background in data processing. The product uses a direct menu approach for command selection, has on-line help information, and allows the user to log on to the mainframe host and run canned Natural programs.

Natural/Connection has an entry level price of $40,000, which includes mainframe software, documentation and software for 10 PCs, plus one year of support. Pricing for additional PCs range from $500 per PC down to $250 per PC, depending on quantity purchased. SOFTWARE AG SYSTEMS INC., Reston, Va.

FOR DATA CIRCLE 417 ON READER CARD

PC TUTORIAL

PC Expert is a comprehensive tutorial for the IBM Personal Computer. The first component of the software deals with how to use the PC. PC Expert consists of two training packages and one utility program.

The first component helps users learn to use PC/DOS commands and special keys on the PC keyboard. It also introduces users to other operating systems like CP/M and Unix as well as BASIC programming language and various types of applications software.

The utility program is called DOS Director. It allows users to perform a range of PC/DOS 2.0 commands and functions with a single keystroke. It stays in memory so users can work on other programs. PC Expert costs $140. CDEX CORP., Los Altos, Calif.

FOR DATA CIRCLE 416 ON READER CARD

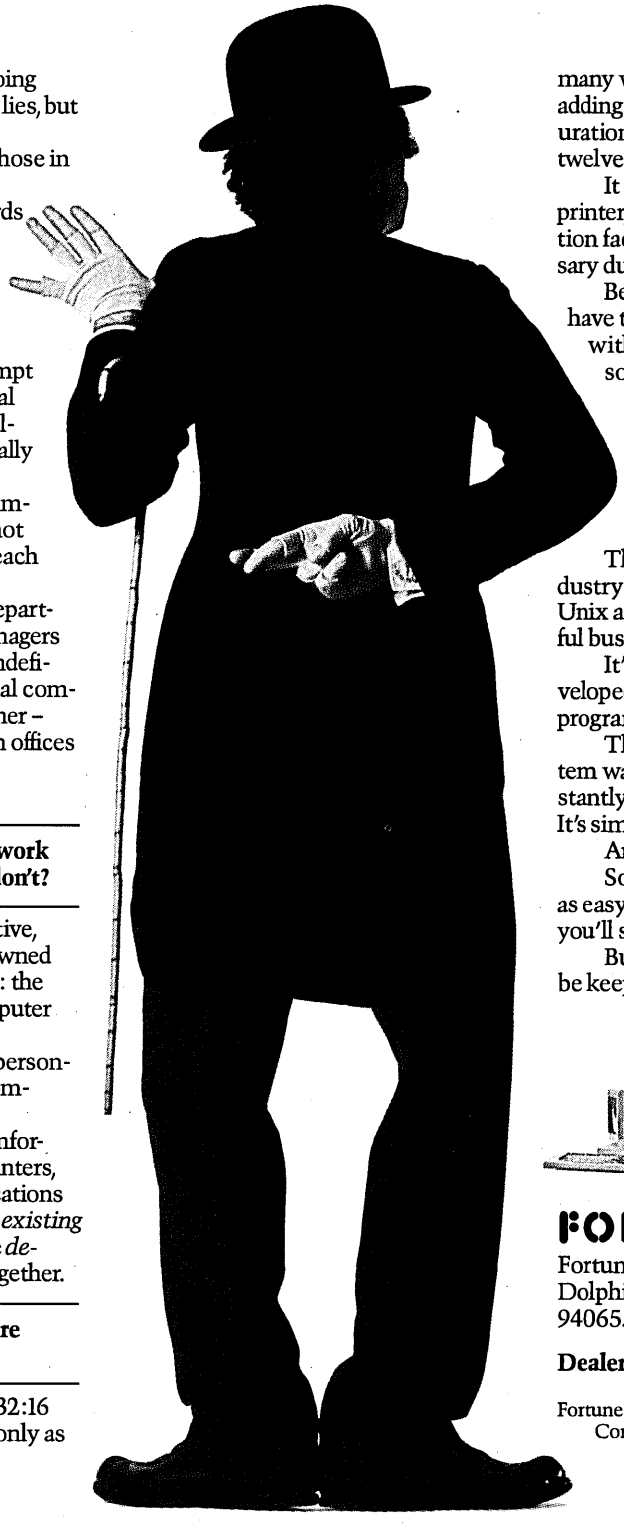
DATABASE MANAGEMENT

The VAX Rdb/VMS and VAX Rdb/ELN are relational database products. They are designed to simplify storage, retrieval, and updating of information for industrial firms, corporations, departments, offices, schools, and laboratories.

The VAX Rdb/VMS product runs on all VMS-based systems and is an integrated component of the VAX information architecture. VAX Rdb/ELN software is meant for small- and mid-sized VAX computers that use the dedicated or distributed VAXELN execution environment. VAX/Rdb/ELN is suited to dedicated applications requiring time-critical data manipulation and analysis.

The products use the Digital Standard Relational Interface (DSRI). The standard interface allows application programs written for either VAX relational database product to access data managed by the other. Both products also have an interactive query language to aid data manipulation and debugging of application program logic. Other features include a data definition language, data validation functions, transaction recovery features, and contention arbitration. Rdb/VMS software adds additional security to that provided by the VMS operating system. It also furnishes long-term journaling to preserve data integrity. Develop-

"...and trust me, when your information needs grow, you can always connect all your PCs together."



There's a lot of optimistic talk going on about networking today. Not lies, but perhaps wishful thinking.

Talk, in fact, that's making those in the know very nervous.

An alarming lack of standards among manufacturers has stalled the development of software applications packages for networked personal computers.

As a result, offices that attempt to connect their existing personal computers together find an appalling absence of programs that really share data.

Personal computers were simply designed for individual use, not for sharing information among each other within an office.

So, meanwhile, countless department heads, data processing managers and small business owners are indefinitely stuck with various personal computers that won't talk to each other – a predicament only acceptable in offices where no one works together.

But that's rarely the case.

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Economically, the Fortune 32:16 multi-user system lets you buy only as many workstations as you initially need, adding more later. Depending on configuration and application, it handles up to twelve users simultaneously.

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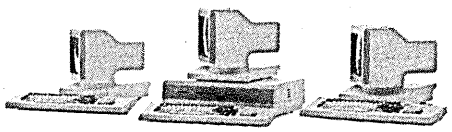
But until that day, a lot of people will be keeping their fingers crossed.



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ment license fees are $9,000 for the VAX Rdb/VMS and $7,500 for the VAX Rdb/ELN software. DIGITAL EQUIPMENT CORP., Maynard, Mass.
FOR DATA CIRCLE 418 ON READER CARD

HOME BROKERAGE SERVICE

Fidelity Investor's Express allows users to trade or obtain quotes on any stock or option listed in *The Wall Street Journal*, including over-the-counter stocks. The system can also be used to obtain current share prices of Fidelity mutual funds. According to the vendor, the system operates around the clock and can be accessed from anywhere in the world.

Other features of the service include on-line customer portfolio records, which are automatically updated as security prices, dividends, and holding periods change. Users can enter additional portfolio information and generate comprehensive tax reports.

Market and portfolio information can be used with most popular spreadsheet packages, and users can transfer up to 1,000 stocks to spreadsheet and graphics programs. Built-in buffering features minimize computer connection time during such transfers. Investors dial a public data network and enter a password to receive stock quotations. Screen selections are made from a series of numbered, multiple-choice menus. Users may examine individual stock profiles or call up a Stock Watch screen and view as many as 18 preselected stocks or options at one time. Users must enter a second security password before placing buy or sell orders through this vendor's central computer. FIDELITY BROKERAGE SERVICES INC., Boston, Mass.
FOR DATA CIRCLE 419 ON READER CARD

BUSINESS GRAPHICS

Microsoft Chart is a business graphics software program which allows users to prepare presentation quality charts from data generated by many spreadsheet and database software packages.

The product presents users with graphic examples of different chart formats on the screen in a visual gallery. They then select the format they want, and Chart automatically displays the data in graphic form. Variations on eight basic chart types provide users with a choice of 45 different chart forms. Changing from one chart format to another is accomplished in three key strokes. Users control the size, position, and appearance of each object in the chart. All changes are displayed on the screen so users can experiment until the chart suits individual tastes. Any object can be moved around on the screen with the direction keys.

An unlimited amount of text can be entered and moved anywhere on the screen. There is also the capability to edit and change different segment and line patterns, font sizes, grid patterns, explode piechart segments, and rotate pies.

Data can be analyzed using eight statistical functions. It is compatible with MS/DOS and runs on the IBM PC, IBM PC XT, IBM Portable PC and Compaq computers. Hardware requirements include 128KB of memory, one disk drive, an IBM color graphics card, and any graphics monitor. The vendor says approximately 20 printers and 10 color plotters will be fully supported with this release. Microsoft Chart costs $250. MICROSOFT CORP., Bellevue, Wash.
FOR DATA CIRCLE 330 ON READER CARD

NETWORKING SOFTWARE

Fusion is a networking software package interconnecting a wide variety of computer processors, operating systems, local area network hardware, and network interfaces with a goal of achieving "vendor interoperability." Fusion offers a choice of two LAN protocols, Xerox XNS and ArpaNet TCP/IP.

The package will network between single and multiprocessing systems; different operating systems; different processor types, and different LAN hardware and network interfaces. It disregards the location of the cpu, operating system, or network interface. It can be ported to any processor hosting an Ethernet controller and C language compiler. It runs on any operating system with a C compiler, and requires no modification of that operating system.

Virtual Circuit process-to-process transfers exceed 1 million bps. Process-to-process transfers of internet datagrams exceed 3 million bps. Fusion incorporates layers three through layers seven of the ISO reference model for open systems interconnection.

The system allows users to log in to a different system as a terminal to the remote host. It can also do file transfer, internet routing, interprocess communications, remote procedure calls, and run-time libraries to allow users to develop their own network-based application programs and utilities. Fusion software prices range from $750 to $6,000. Fusion (plus network hardware, which includes an Ethernet controller, transceiver, and transceiver cable) ranges in price from $1,500 to $7,500. NETWORK RESEARCH CORP., Los Angeles.
FOR DATA CIRCLE 331 ON READER CARD

DEVELOPMENT SYSTEM

JETIII is an integrated computer aided applications software development system and multi-user database. The package runs under most microcomputer operating systems, including CP/M, CCP/M, MP/M, PC/DOS, and MS/DOS.

A menu-driven program generator enables programmers to write remarked and structured code. According to the vendor, it automatically generates code for many standard functions such as file maintenance, transaction processing, and reporting. The software also offers an ability to accommodate relational, hierarchical, and network database structures and the facility to integrate applications software with the company's BizWiz modules.

A report writer program is also included in the software. Designed to generate a variety of reports and delimited files from the database, the report writer is menu-driven. Other functions include menu and forms creation capabilities, file maintenance, and system security. During 1984, spreadsheet, word processing, and graphics enhancements are scheduled.

Programs and packages developed with this software are operating system-independent and transportable to most microcomputers. JETIII is available for a single copy, six-user cost of $40,000. JETSOFT INC., East Falmouth, Mass.
FOR DATA CIRCLE 332 ON READER CARD

DIRECT SATELLITE ACCESS

This vendor plans to offer international satellite communications of high-speed, digital transmissions. The service offers local, direct access to international satellites, providing users with high-quality, secure, and cost-effective telecom capabilities for voice, data, and video transmissions.

Called Direct Satellite Access, the service will initially be available between the northeastern and mid-Atlantic regions of the U.S. and U.K. In its application to the FCC, this vendor has requested the authority to construct an earth station for this service, to be located on the rooftop in the center of Washington, D.C. The earth station will be directed at a geostationary INTELSAT communications satellite over the Atlantic, providing a link between the U.S. and Europe.

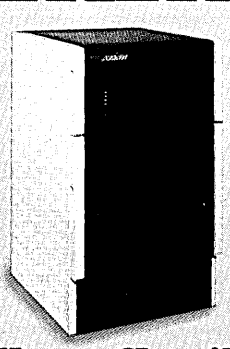
According to the vendor, in the past, access in the continental United States to international satellites has been limited to four earth stations, none of which is located near major cities. Users have to haul transmissions over land lines to these stations. DSA plans to circumvent land lines and offer direct access to the earth station.

DSA provides transmission capability in all the standard digital channels, as well as providing special services for nonstandard speeds. Among the applications which will be available are high-speed computer-to-computer transmission, secure (encrypted) voice, teleconferencing, and high-speed digital facsimile. TRT COMMUNICATIONS INC. Washington, D.C.
FOR DATA CIRCLE 333 ON READER CARD

MICRO AND MAINFRAME SPREADSHEET

Supercomp-Twenty on the IBM mainframe is a spreadsheet combining the familiarity of micro spreadsheets with the power of the

Save 50% on your communications cost.



Avanti's new T1 UltraMux.

It lets you take maximum financial advantage of low-cost T1 tariffs. Using UltraMux, you can replace up to 128 lines with one T1 line. Plus, you can have additional voice circuits, increased data transmission rates and more capabilities, too.

The UltraMux sends voice, data and video in any combination. That means the UltraMux can handle your telephone communications, data transfers and video teleconferencing. The system's high bandwidth, up to 10 Mbps, means you can use satellite, private microwave and fiber optic communications links now and T1C and T2 links as they become available.

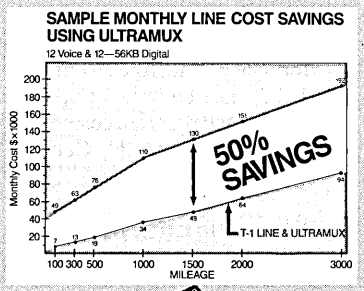
Ultra flexible.

Select the exact channel configuration you need; up to 64 synchronous or voice channels; 128 asynchronous channels. Maximum channel speed can go as high as 8.2 Mbps, and you can digitize voice at 16 or 32 Kbps.

If your communications mix changes at different times of the day or night, UltraMux can automatically change to match your required configuration. And for maximum utility, dynamic channel allocation assigns bandwidths only when needed.

The UltraMux has centralized point-to-point or network-wide control. So, from anywhere in the system you can monitor and test the entire system or its individual components, perform complete reconfiguration or change any operating parameter.

The UltraMux is flexible enough to expand as you do. Its modular interface works with whatever communications equipment you now use, and can easily adapt to future needs as well.

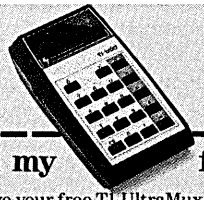


Ultrafast payback.

This graph shows some typical monthly line cost savings using Avanti's T1 UltraMux. Depending on your usage you can easily save up to 50% or more.

We'd like to show you exactly how much Avanti's UltraMux can save your company. Just complete the coupon below. We'll send you a free, customized T1 UltraMux Cost Savings Analysis.

Send coupon to Avanti Communications Corp., Aquidneck Industrial Park, Newport, RI 02840, or call (401) 849-4660.



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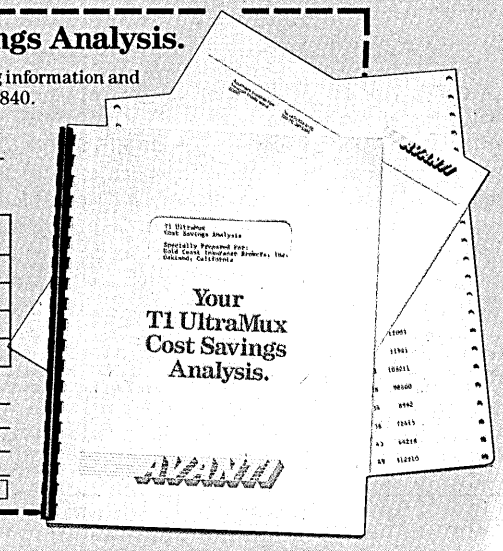
(If you need more space, or have more locations, use a separate sheet of paper.)

Transmission, current or planned between _____ (Location A) and _____ (Location B)

Mileage (if known) _____

Type of circuit	Speed	Number of circuits	Monthly cost *(if known)*
Voice	XXXXX		
Data Sync ☐ Async ☐			
Sync ☐ Async ☐			
Video			

Name _____ Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Have a representative call ☐



CIRCLE 110 ON READER CARD

mainframe. This electronic spreadsheet runs on VM/CMS with complete 3270 support and the IBM PC running under PC/DOS.

On the PC, the software is called 20/20. According to the vendor, the product is twice integrated, first, by combining graphics, data management, and a spreadsheet into the same program; on a second level, the software is integrated into the corporation by giving users access to central databases working with other application programs and running on an extensive variety of computers, from micro to mainframe.

Corporate MIS may use the mainframe version as a central node in a distributed decision support system. Standardized models may be distributed as templates throughout the personal computing environment.

For the novice user, the software on VM/CMS has English language commands, menu selection, prompting, programmed functioned keys, and on-line help. For users needing less assistance, it has command files such as data import/export commands. It also has a 1,000 by 1,000 cell matrix, menu, and security provisions. Supercomp-Twenty costs $12,500 for one VM/CMS license. ACCESS TECHNOLOGY INC., South Natick, Mass.

FOR DATA CIRCLE 334 ON READER CARD

APPLICATION DEVELOPMENT

MultiPro Application Development System aids the VM/CMS or TSO installation with software system development. It combines a software package with an enhanced IBM PC XT workstation to create a tool for all levels of program and system design.

According to the vendor, the system improves the efficiency of program development and program maintenance capabilities. It also conserves mainframe resources by allowing the downloading of systems design and programming tasks to the PC XT workstations.

All systems components, including flowcharts, user documentation, design specifications, and record layouts are stored in electronic libraries right along with the source code. The structured graphics facility allows the same level of editing capabilities for graphics and flowcharts as program statements or text. Also, any number of windows of various sizes can be displayed and manipulated at one time, with all of them able to access different components of the application system simultaneously.

When implementing a system modification, all of the documentation can be edited in the same session as the program. Transfer between windows is achieved with a cut-and-paste facility. MultiPro can emulate a 3270 or DEC VT100 terminal in one of the windows. MultiPro costs $24,000 for the mainframe package, and $1,900 for the workstation software. CAP GEMINI, Dallas.

FOR DATA CIRCLE 335 ON READER CARD

SPECIALIZED SOFTWARE

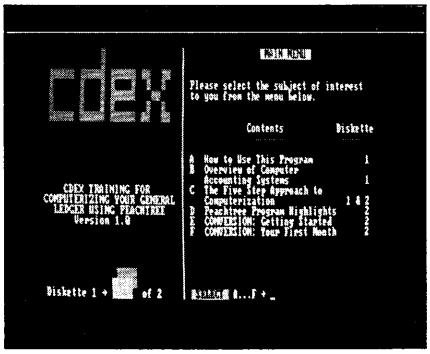
This vendor provides large corporations with personal computer software and support. Among the services are presale advice, selected product line, technical support, and end-user training. The company recently began shipping its products to major companies and banks. According to the vendor, it aids the corporate MIS manager to control personal computers and ensure compatibility with existing hardware and long-range dp requirements. This vendor's products are targeted for personal computer users in the corporate environment. It can offer products to meet each company's software application needs and personal computer policies.

Initially, 75 programs will be available. By 1985, more than 200 programs are scheduled to be offered. All available software is presented in a guide that is updated quarterly. The guide is divided into categories for types of software, such as communications, spreadsheets, graphics, statistics, executive systems, decision support, engineering, technical, word processing, and data management. Prices and services vary. CORPORATE SOFTWARE INC., Waltham, Mass.

FOR DATA CIRCLE 336 ON READER CARD

ACCOUNTING TUTORIALS

These tutorial programs are designed to help a small business convert its manual general ledger to a computerized one. The programs are available for Peachtree and State of the Art general ledger software on the IBM PC and IBM PC XT.



The software provides step-by-step instruction in how to convert from a paper-based accounting system to a computerized one. A five-step methodology gives the user a structure for the conversion process. Methodology includes learning the computerized general ledger components; preparing for conversion; converting the manual system; continuing manual operations; and reviewing the computerized system.

Users receive a detailed explanation of how to implement each step in terms of their particular brand of general ledger package. The software requires 64KB of memory and one single- or double-sided disk drive. A reference guide containing a glossary of accounting terminology and exercises is included with the package. The vendor plans to release similar products for business systems like accounts receivable, inventory control, and accounts payable later this year. The accounting tutorial costs $70. CDEX CORP., Los Altos, Calif.

FOR DATA CIRCLE 339 ON READER CARD

LOTUS BRIDGE

OptionWare provides end-user applications for Lotus 1-2-3. It is targeted at professional businesspeople and managers. According to the vendor, this product enhances Lotus 1-2-3 and bridges the gap between the spreadsheet and end user. Working with the integrated environment, the system has applications in financial statistics, sales and marketing, organization, cash management, and personal financial management.

There is a standard menu throughout all 52 integrated software applications. There are five principal key strokes: Enter, review, display, print, and graph. Each of those functions can be activated by depressing the E, R, D, P, or G keys. All the products have designed screens, graphs, and printouts.

According to the vendor, it takes only a short time for users to be up and manipulating data once the basic commands are learned. Its structure can be tailored to the users' requirements; to import or export data; and to include subanalysis. Full Lotus 1-2-3 capabilities are retained.

There are three types of applications: annual history, current monthly performance, and forecast/projections. Lotus 1-2-3 must be brought up to run this software. Each program costs $130. DSS DEVELOPMENT, Bloomfield, Conn.

FOR DATA CIRCLE 337 ON READER CARD

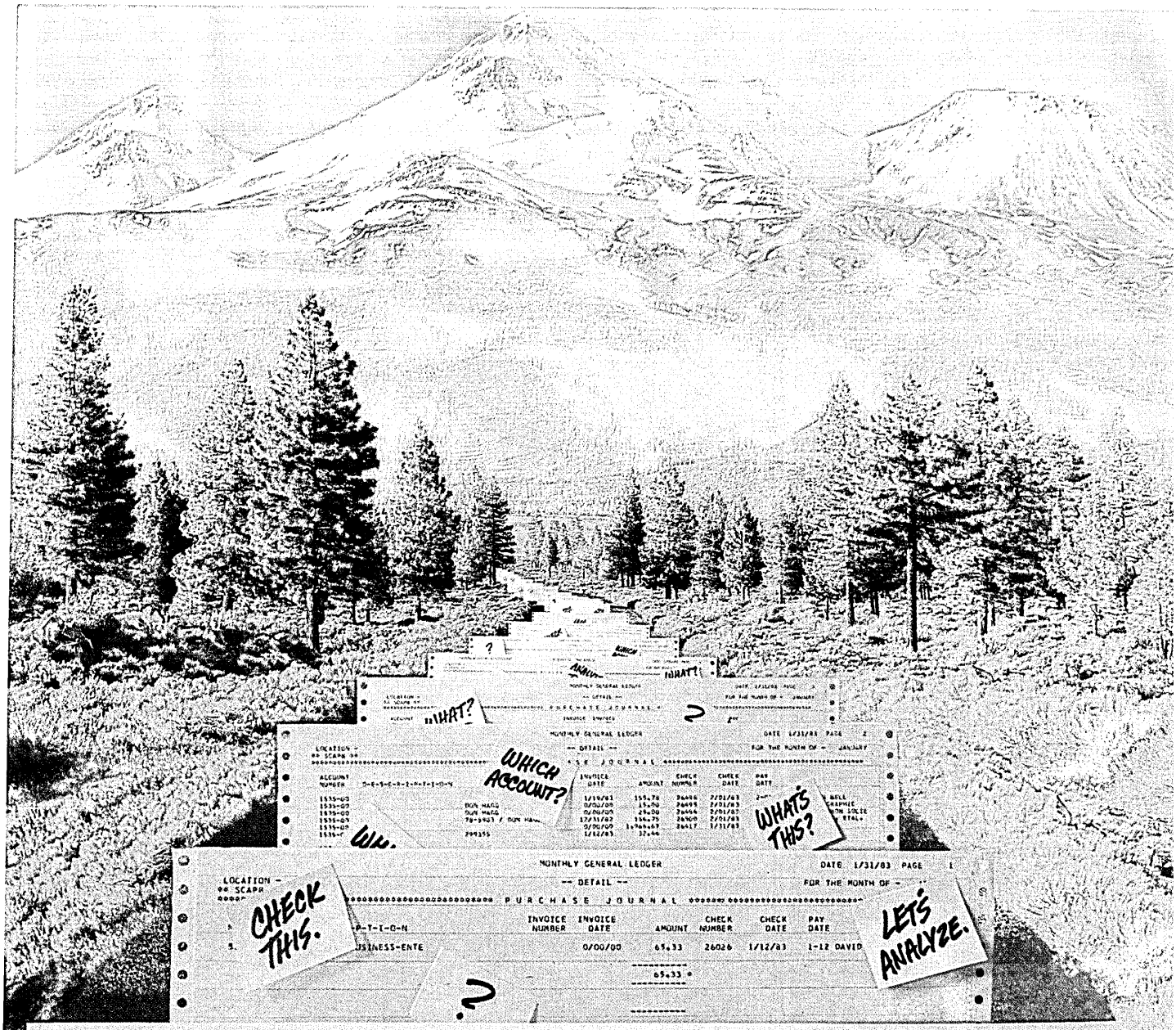
HUNG USER COMMAND

V/Force solves the problem of the hung user or virtual machine for the VM/SP installation. It removes the hung or stuck user while allowing normal system operation to continue, thus avoiding the necessity of shutting the system down.

According to the vendor, a VM user can be hung because the end of an I/O operation isn't signaled correctly, which often happens with tape drives, for example. The user can't do anything because normal operator commands won't free the user to continue work. The system operator command provided by V/Force clears the problem user ID, even when the system thinks the user is waiting for something to happen. In most cases, the user's I/O device will have been freed and the user will be able to get back on the system and begin work right away. V/Force costs $2,050 per year, with maintenance included. VM SYSTEMS GROUP INC., Arlington, Va.

FOR DATA CIRCLE 338 ON READER CARD

—Robert J. Crutchfield



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SECOND ANNUAL

Software User Survey Forecasts Prosperity and Problems for Major Vendors

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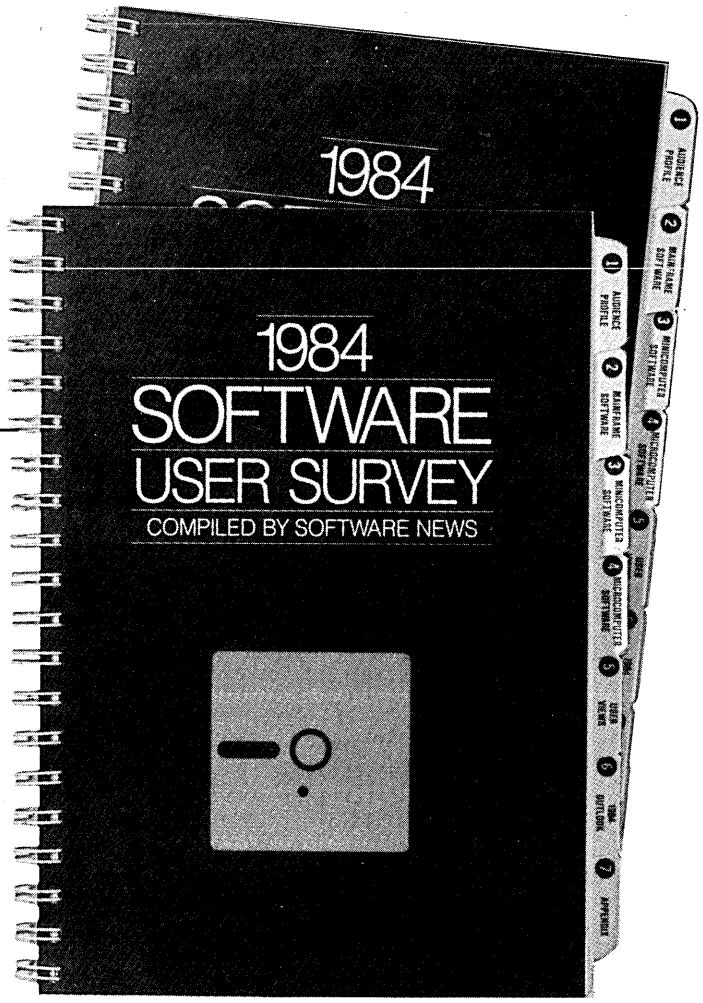

The results are now in from the second annual Software User Survey conducted by Software News. Over 2000 major national accounts participated.

Virtually every sector of the U.S. economy was polled...banks, insurance firms, manufacturers, distributors, medical and legal groups, educational institutions, systems

ouses, process industries, c. The respondents iden- fied the software ackages they are now sing and what they plan buy in 1984. The main- ames, minis and micro- omputers currently in use nd those planned for pur- hase in 1984 are also dentified.

The 200-page report of ne survey results ranks ne leading software endors by their relative narket shares. The xpected increases in 1984 oftware expenditures are nalyzed separately for nainframes, minis and nicros. Twenty-seven pecific categories of pplications and systems oftware were studied to dentify the fastest growing egments. Examine the Table of Contents for more letails.

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   b. Minicomputer software vendors
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7. **How users rank the various selection criteria when choosing a software vendor.**
8. **An assessment of lagging programmer productivity and what users cite as the most viable solutions for easing the backlog of applications awaiting development.**

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DP MARKETPLACE

REQUEST FOR INFORMATION

The Washington Metropolitan Area Transit Authority (WMATA) is seeking submittals, in response to this RFI, to provide the information outlined relative to the implementation of a Computerized Electronic Passenger Information and Advertising Display system in Metrorail passenger stations.

The Authority is seeking to discover system suppliers or manufacturers interested in assisting WMATA in better serving its passengers by providing consistently accurate information within the rail stations. It is hoped that the cost of these improvements can be defrayed by providing the medium for dynamic and/or static advertising on the displays.

The RFI Package will be available on May 1, 1984 and may be obtained by calling WMATA at (202) 637-1327. Responses to the request must be received by WMATA no later than July 2, 1984. For further information, please contact:

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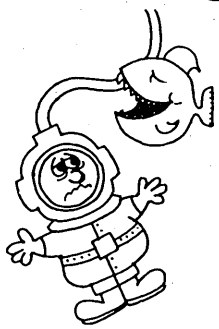

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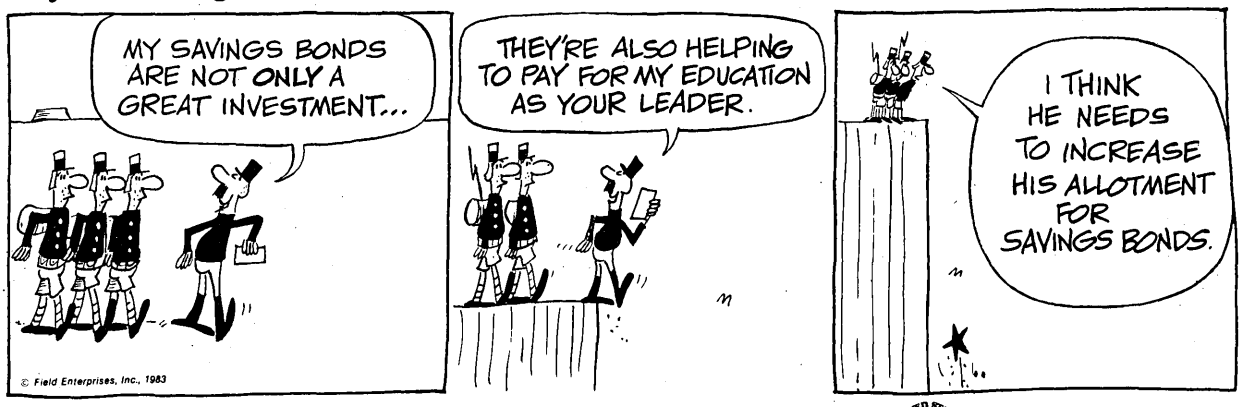

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ON THE JOB

THE GREATEST SHOW ON EARTH

Generally recognized as the largest information processing event in the U.S., NCC has indeed grown to massive proportions—in both the number of attendees and exhibitors. This year's show takes place in the Nevada desert, in Las Vegas, July 9 through 12.

You already know it's going to be hot. How hot? Well, according to the National Climatic Data Center, Ashville, N.C., the average high for this time of year is 104 degrees and the comfortably cool low is 75. AFIPS is prepared for extreme heat, though. They've brought in special air conditioning consultants to ensure that exhibit halls and surrounding areas are adequately cooled. At present, they expect no burning issues to arise. If one does, though, you might consider using cornstarch to beat the heat rash (true techies may prefer talcum powder).

No worry about rain in Las Vegas. The count is generally under 0.44 inches during July, but thunderstorms (some rather dry) are a possibility. Show-goers should be aware of one natural phenomenon: high velocity winds of up to 64 miles an hour have been clocked in gamblers' paradise through the summer months.

There are some obvious ways to prep for the big show, like packing clothing that's light in both weight and color. One veteran Vegas conventioneer says to pack a bare minimum, and don't bring too many shirts because you're bound to lose them anyway. The same fellow also advises not to plan your NCC agenda in advance because you won't accomplish any of it. "No one gets any sleep during the first two days of the show, and nothing gets done after that because everyone is walking around in a fog." Incidentally, he says you can eat free of charge during your entire stay in Las Vegas, since there's plenty of free food

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In order to implement this strategy they are seeking to recruit a number of highly qualified systems designers to provide a practical input to the project teams working within this area. These various projects are international in scope, and both facility in languages and a background in a multi-national environment would be a distinct advantage.

The positions would be based in modern facilities in Reading and would command an attractive salary and benefits package. Candidates should send a full resume (which would be treated in the strictest confidence) to the consultants advising on the appointments at: The Welbeck Group Limited, Panton House, 25 Haymarket, London SW1Y 4EN, England. 01-839 3874/5.

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UNIVAC We require 2-4 years' experience in a UNIVAC 1100 environment, specifically in OS1100/DMS, TIP, MAPPER, IRU/MUB/QLP with either Assembler, PL1 or COBOL proficiency.

VM/CMS Your background must include 2-5 years' experience in VM/CMS and FORTRAN languages. Demonstrated capabilities in interactions with technical and non-technical work groups also required.

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CIRCLE 101 ON READER CARD

at hospitality suites and cocktail parties.

Preregistration is a big advantage, as is early arrival, which helps guarantee your reservation isn't given to someone else. Keep in mind, too, that there are no clocks in public places in Las Vegas; the casino owners want your mind on the slots, not on the fact that it's 3 a.m.

Cynicism aside, it can be useful to plan beforehand who and what you want to see at the show. Start with the booths at the back of the hall. The ones at the front are mobbed during the first couple of days—make your way to them later on.

Eating can also be difficult in Las Vegas during NCC. If your hotel permits breakfast orders to be placed the night before, be sure to do so because room service, coffee shops, and dining rooms are all frantic in the morning. And a good breakfast is essential, because the lunch facilities at the show hall will be jammed. Exotic lunches outside the hall are probably not a good idea because of the midday heat. So eat well in the morning and be prepared to skip lunch. Any reservations for hotels, cars, restaurants, or shows would best be made even before you get to Vegas.

Since most people tend to eat and drink too much at these events, don't forget to bring some form of medicinal relief. You'll also need a pair of comfortable shoes and a watch.

THERE'S MORE AT THE STORE

Last month we listed a few books on the how and where of getting a job in the computer industry. Here's one volume we missed:

Computer Careers: Where the Jobs Are and How to Get Them, by the editors of *Consumer Guide,* is both a directory and a guide. It contains a vast amount of information, which is divided into eight major sections: What the Jobs Are, Planning Your Career, Focusing Your Skills, Salary, Where the Jobs Are, Who's Hiring Computer Workers, The Outlook for Computer Employment, and How to Get a Job.

The appendix lists 150 major employers of computer personnel, along with their addresses and phone numbers.

The book was originally published in 1981, but has been updated and revised for the 1984 issuance. *Computer Careers: Where the Jobs Are and How to Get Them* is a Fawcett Columbine book, published by Ballantine Books (New York, 1984, $6.95).

SEMINARS SOAR

The number of dp seminars being offered around the country is growing in leaps and bounds. Cathy Belizzi, cofounder of Seminar Information Service (SIS), New York, N.Y., and editor of the *SIS Workbook,* says that 18% of the seminars they listed in 1982 were dp-oriented. That number grew to 19% in 1983, and 1984's listings are up over 25%. Belizzi attributes this growth to the phenomenal increase in personal computer courses.

NO MORE PENCILS, NO MORE BOOKS . . .

LeMoyne Anderson, Colorado State University's libraries director, claims that "in the near future, the typical high school or college student may carry a full semester's collection of textbooks and notes in a coat pocket or purse."

Anderson predicts that "as books join forces with silicon chips and miniature integrated circuits, the textbook of the future may be a handheld electronic 'microbook.' "

He says the electronic book will probably look like " a thin, durable paperback, yet it will have a programmable silicon chip to store and access the contents of one or more works. In place of pages, it will use a wafer-thin crystal display [LCD] to show a page of text or sections of that text."

—Lauren D'Attilo

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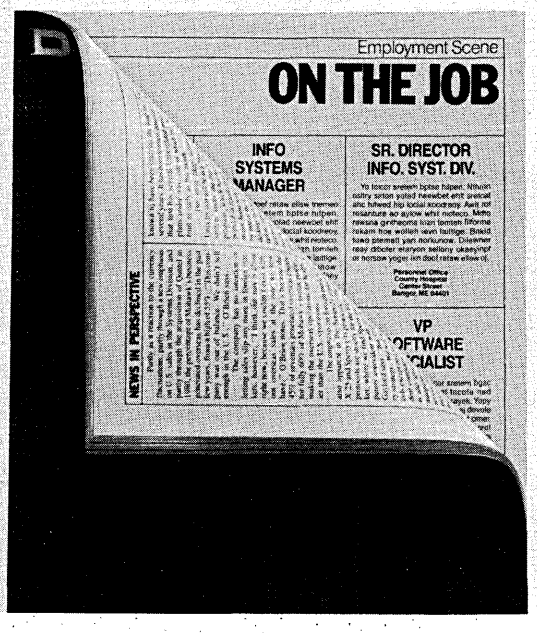

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READERS' FORUM

DP ROLE PLAYING

While much has been written about the formal contractual arrangements between the data processing manager and the outside consultant, little attention has been paid to the roles and attitudes each plays in relationship to the other. These roles, and those of surrounding players, must be fully understood for each to make the most of the relationship.

In most cases, contractual work has a solid foundation in need. Valid reasons are cited for the procurement of outside assistance. But when it comes to higher order consulting work, where reviews of the dp shop's performance are concerned, there tends to be suspicion on the part of senior management that the dp staff isn't performing effectively. There may or may not be any solid evidence for this suspicion, but senior management can have its own reasons:

- *Martinmas* — attendance at a James Martin seminar for top executives. Perhaps a consultant's prospect list should always include these companies.
- *Snowed White* — attendance at an IBM seminar for chief executives.
- *Fireman's Lunch* — a luncheon meeting at a club with a top executive (visiting fireman) from a consulting firm, probably one who has just flown in from overseas and therefore is fully unaware of the local situation.
- *Me too* — a luncheon at the club with a top executive of a company that has recently initiated such a review.
- *The catalyst* — two or more groups (e.g., a user and the dp department) are obviously not on good speaking terms and the consultant is needed to draw things together.
- *Justice being seen* — senior management believes a project needs an independent assessor to lend credibility to a difficult political situation.
- *Real trouble* — more tangible evidence such as a mounting backlog of user requests that remain unsatisfied, consistent missing of project deadlines, overexpenditure of resources, etc., or a general feeling within the organization that the scale of information systems activity needs to be increased in order to avail of the opportunities provided by an emerging technology.

Although the dp manager usually finds it difficult to influence whether or not the consultancy will proceed, he or she normally has much more control over the choice of consultant. This usually seals the issue effectively. Faced with the inevitablility of employing someone, the choice then devolves to an assessment of selecting the most ineffectual yes-man who appears to have the requisite paper qualifications.

It is very much in the interest of the dp manager to minimize the amount of time available for the project. This lessens the time the consultant has to unearth any skeletons in the closet and also, of course, means the consultant will be more dependent on the opinions and ideas of the dp manager since there won't be enough time to formulate independent views. Hence the dp manager should procrastinate as much as possible during the selection process and then require that the chosen consultant should start work "tomorrow" and have the project completed "within two weeks." This businesslike display of efficiency usually wins the approval of cost-conscious top managers as well.

The dp manager should ensure that he or she is fully aware of the consultant's activities and particularly of the views being formulated as the project proceeds. This should be done through the requesting of draft reports and even the placement of a "grass" in the project team to ensure that information on current thinking is constantly available.

The dp manager has a binary choice when the consultant moves in to commence the project. Either cooperation or confrontation is possible, but not both (at least not both at the same time).

Cooperative techniques include:

- *Kill them with kindness* — Deluge the consultant with almost daily lunches provided by the company and any allies such as the incumbent supplier, who will usually have a vested interest in maintaining the credibility of the dp department. Additional time can be taken with friendly chats, cocktail parties, going to the pub after work — anything that wastes time and ingratiates the dp section with the consultant.
- *The carrot* — This is probably the most effective technique because the dp manager is able to place all kinds of enticement before the consultant. These usually take the form of potentially large consulting projects within the gift of the dp manager, such as data analysis and contract programming work. Indication that "long-term associations" with the company are favoured should be enough to bring the consultant into line with the dp manager's thinking.
- *Marco Polo* — Require that the consultant engage in extensive and extended visits to country centers, or better, overseas, to observe the "real operations of the organization." This lessens the time available to consider the real issues, and generates physical and mental confusion and fatigue.

Confrontation techniques include:

- *The mushroom* — Tell the consultant as little as possible, providing evasive, nonsensical, meaningless answers. Always wait to be asked, never volunteer any pertinent information.
- *Red tape* — Refer all requests to a committee, preferably one that isn't going to meet for a few weeks.
- *Disinformation* — Provide the consulting team with "disinformation" type feedback — preferably soft gossip that is erroneous or misleading.
- *Jesuitical responses* — Follow the famous practice of always answering a question with a question, challenging the basic premises of any position taken by the consultant. Hence, in response to the question "What do you believe are the most important management information systems in the company?," you should respond "Could you please give me a full definition of the term 'management information systems in the company?," you should respond,
- *White-anting* — Sow seeds of doubt in management's ears concerning the real qualifications and ability of the consultant.
- *The neutron bomb* — Just as the neutron bomb leaves all structures standing while removing all people, try and arrange that the appropriate people required by the consultant are never available at the right time. "He's at a meeting," "gone on vacation," "at lunch," etc.
- *The scorched-earth policy* — All documents associated with the project are never to be found. Files seem to be missing all the time and important letters are always on someone else's desk.

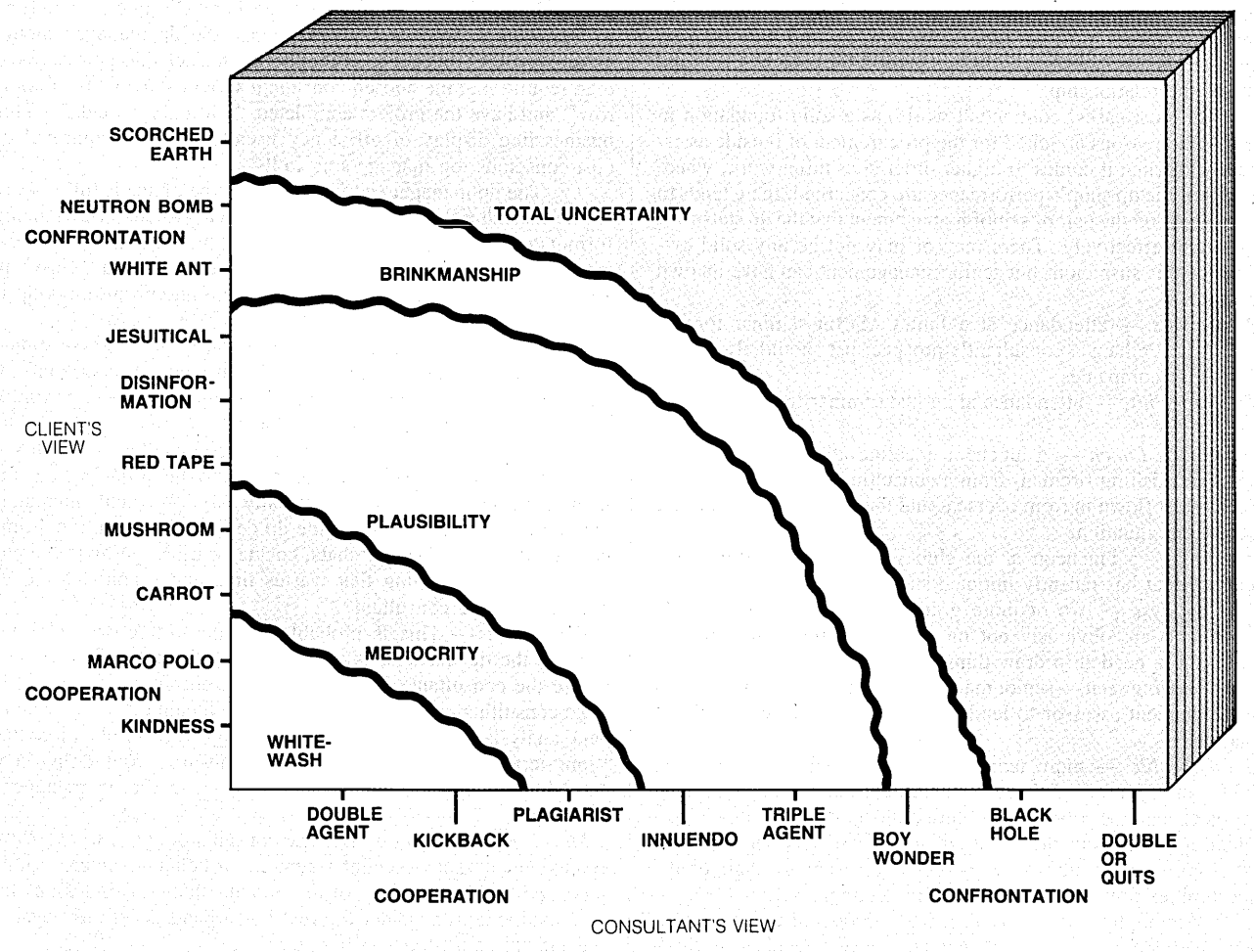
From the consultant's side of the fence there is a range of similar issues. Business success from a consultant's view is totally related to the concept of chargeable hours. Since marketing tends to be unprofitable time, maximum use must be made of marketing effort invested in existing clients. Hence, small projects should be expanded wherever possible into larger projects. Basic techniques for enlarging this base include:

- Suggesting that overseas associate organizations can provide reports on experience in other countries.
- Suggesting that you prepare specifications that can subsequently be put out to tender for more detailed work, potential tenderers including your own organization.
- Dropping the audit "bomb-shell" by suggesting that the client is at grave risk due to inadquate audit or security procedures.

It is important for the consultant to identify the project's "initiator" at an early stage so that his or her objective can be adequately assessed and included within the scope of work. Similar attention must be paid to the person who will be approving the expenditure on the project. This is usually the same person.

It is desirable to perform both risk and sensitivity analyses on the various participating departments from the client organization. These analyses should identify the downside and upside risk for each department, depending on the various possible outcomes of the project. In particular, close attention should be paid to identifying people who will lose most through the implementation of the most likely solution. The principle of "no surprises" is also important to the consulting organization since it is in its interest to ensure that the report is likely to be accepted readily by those closely

THE CONSULTANCY-COOPERATION GRID



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associated with the management of the project.

It is essential to form an assessment of the overall management style and competence of the client organization. In particular, this is important from the point of view of determining the ability of the organization to handle the post-project era. For example, if a decentralized organization is likely to result from the project it will be necessary to implement a wide range of new standards to limit user autonomy. If the organization has such poor discipline that standards are unlikely to be followed, then the decentralist approach is unlikely to be workable in the medium or longer term. Further, it is likely that a choice of supplier ought to depend on the type of management support available. Where the organization is largely self-sufficient, there will be little need to worry about this, but a weak or end-user dominated management is likely to require a stronger supplier.

One persistent nightmare of the consultant is the fear that no clear issues will emerge as a result of the assignment and, hence, the final report is likely to be very bland. In order to avoid this, the following "issue generators" are available:

- *The off-balance principle* — If the organization is decentralized, then suggest it centralize and vice versa.
- *The socialist ideal* — User participation in systems development, computer operations, and data management, can be raised or lowered. Nearly always you will find an area for change here.
- *The bomb scare* — The edp audit, security, controls areas are always deficient in some respect or another.
- *Potential technical incompetence* — Although the organization is likely to be technically competent at the present time, it is always possible to imply that trends in database, systems development methodology, communications, etc., will lead to the existing management being deficient unless action is taken.
- *Blame the accountants*—The accounting interface with dp is always likely to be weak, in areas such as charge-out for development and operations, capital approval procedures, etc.
- *Technology anticipation*—There are always areas in which technology is moving for which the organization is unlikely to have appropriate strategic plans in place. Current examples include microcomputers and the information center concept.
- *Keeping up with the Joneses* — Overseas experience, the activities of competitors, will always throw up differences that need investigation.

In a manner analagous with that of the client's position, the consultant also has a binary choice between cooperation and confrontation with the client. Set out below are some techniques to follow in each of these situations.

Cooperation

- *Double agent* — Make dp think you are on their side and that jointly you can achieve all those hidden agendas that have been unable to be satisfied without your help.
- *The kickback* — Provide lunches, etc., drawing on the exorbitant fee you are charging, to involve the client's dp department completely within your project orientation.
- *The plagiarist* — Usually with the dp manager's acquiescence, make use of data processing and other middle-management ideas to form the basis of the report. This is probably the most common consulting technique available.

Confrontation

- *The innuendo* — Sow seeds of doubt in management's ears concerning the competence of the dp manager and his or her senior staff.
- *The triple agent* — While convincing the dp department that you are working as a double agent, start appraising management of the deficiencies that you perceive exist within the dp structure.
- *The boy wonder* — Suddenly there appears a super, and high-priced, executive who is available to take over the dp situation on contract for a short time while things get sorted out (usually a follow-up to "the innuendo").
- *The black hole* — Always absorb information, reports, minutes, etc., but never divulge anything or exhibit any human emotion that gives a clue as to your views.
- *Double or quits (or the big bang)* — Having assembled evidence of deficiencies within dp, call a conference of executives to release an interim finding that is likely to have a sizable adverse impact. If you win, then you are likely to double the size of your current contracts, since it will be necessary to pick up the pieces — possibly bringing in a "boy-wonder." On the other hand, if you lose, the only viable option is to quit the project.

The Result. Depending on the chosen attitudes of client and consultant, the final report may be characterized as follows (see figure):

- *A whitewash* — everyone is so nice to one another no useful analysis is possible.
- *Mediocrity* — a half-hearted attempt to get serious toward the project.
- *Plausibility* — a good or bad result may be obtained depending on the abilities of the people involved.
- *Brinkmanship* — the relationships will be so strained that effective work is difficult.
- *Disaster* — total uncertainty!

—C.H.P. Brooks
New South Wales, Australia

THE THREE FACES OF LEADERSHIP

Leadership, at its best, is a subtle process. A leader may motivate through inspiration, example, or command. Leadership can be subtle and oblique, or direct and forceful. It can be spontaneous and enthusiastic, or cold and calculating. It must be all of these in the managing of a sophisticated software development project.

The normal software project is usually divided into three broad and, often, overlapping cycles: design, programming, and total system integration (complete system testing and debugging). The project manager must be able to show a distinctive set of leadership characteristics during each cycle. That is, he or she must be able to show three faces or attributes of leadership if the project is really to succeed.

In the design cycle, the project manager must lead obliquely. He must share the initial enthusiasm of his staff and must act as a willing catalyst for all forms of idea and suggestion. He must realize that he doesn't know all the answers yet must also be able very tactfully to reject ideas and suggestions which he feels will not benefit the project, carefully doing this in a manner that will not severely damage the feelings of those making the suggestions.

While he is an integral part of the design discussions, he must also be above them at the same time, carefully guiding them toward a reasonable culmination. He must closely observe the attitudes of his staff and try to be aware of individual strengths and weaknesses. He must also note any extreme foible or bias that could affect the project. He may be able to create the actual working structure for the programming cycle based on what he is observing. Perhaps a loose structure is best if his staff is reasonably sophisticated and self-motivating. Possibly a more rigid structure would be beneficial if the staff is less technically sophisticated or self-motivating. With some thought, the project manager may also begin to determine the structure he wishes to implement during the system integration cycle. This, too, is based on what is observed in the design cycle.

Many significant items should be settled during the design

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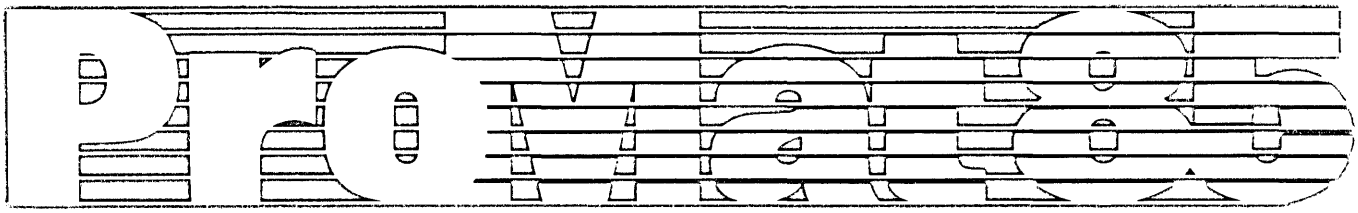

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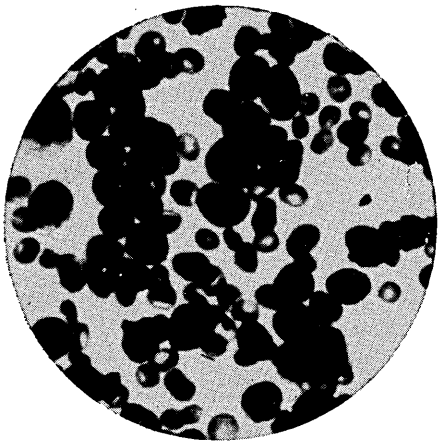

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cycle. Some are technical, others administrative. In the technical area, the overall system flow must obviously be determined and major specific components should be identified and isolated. The choice of programming language should be limited to a high-level, self-documenting, structured language. The project manager should be especially observant of the attitudes of his staff in the design of the overall system, since designers or programmers may show a specific interest in or aptitude for a particular part of the system, and may not be overly interested in other components. Here an effort should be made to match people and interests; this will benefit the entire project.

A formal checklist for designing the system should also be created. Certainly, an on-line user's guide, tutorials, and HELP facility should be considered for large and complex systems, as should an easy-to-use algorithm for periodic updating to reflect ongoing changes that will be implemented in the programming and system integration cycles. Other factors that merit consideration are overall system security, very significant in a multi-user system, and meaningful and easy-to-use error recovery procedures.

Especially important is the entire range of human factors. Are messages standardized and easy to read and understand? Is the vocabulary consistent? In an on-line query/response system, can data be entered by "filling in the blanks"? Does an entire large transaction have to be reentered if only a small part of the entry is in error? Is a predetermined and fixed part of the visual display screen set aside for a human/machine dialog? Is it easy for the user to get in and out of the HELP mode in the middle of a complicated transaction without destroying what has been completed so far? There are many such design questions. All of them should be considered and studied before a single line of code is written.

In the administrative area, the actual structure of the programming cycle should evolve logically from the design phase, as should an overall monitoring structure. Both of these should be a natural outgrowth of the design responsibilities and perceived interests identified in the design cycle. Project milestones and deadlines should be defined as should a preliminary cost estimate and algorithms for monitoring both the work of the people on the project and the ongoing project costs. A meaningful structure for reporting to senior management should also be defined.

All of the above are well-known managerial topics and can be analyzed to one degree or another through study and research, but a real problem for the project manager is to determine when exactly to "freeze the specs," that is, when to halt part or all of the design cycle.

Timing here can be critical. Cut the design phase too soon and you risk losing many potential product enhancements; let the design phase go too long and you risk either the designers going stale or too little time being left for programming and system integration. Here, unfortunately, there are no cut and dried rules, but the responsibility and decision must be that of the project manager alone.

The project manager must generally adopt a less oblique and more controlled style of leadership during the programming cycle. The formal programming structure should be established before coding begins. Responsibility must be delegated and agreed to, and the project manager must begin the constant task of being generally aware of everything going on in the project. He must try to sense potential problem areas, either technical or human, as soon as possible and act immediately to deal with them. Sometimes this may mean a situation involving personal conflict. There may be no way around this, but such problems must be dealt with before they are allowed to expand and perhaps damage the entire project.

In addition, a regular and formal structure for reporting to senior management should be put into place as early as possible in the life of the project. The method for doing this may vary from a simple weekly point outline to monthly, in-depth reports, depending on the size and complexity of the project. Reasonably accurate resource utilization and cost reports should also be a regular part of

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the reporting structure. These latter items should also be made available to the staff involved in the project. There should be no secrets; an open attitude on the part of the project manager is critical. The staff must feel absolutely free to communicate without fear of censure on all aspects of the project.

In addition to the above, the project manager must be aware of the strengths and weaknesses in the organizational structure he has created for the programming cycle and must be coldly capable of altering it should conditions warrant this. The project manager must also consider personnel turnover, everything from training new and inexperienced personnel to a "worse case scenario," in which many key people are lost to the project within a very short time for whatever reasons.

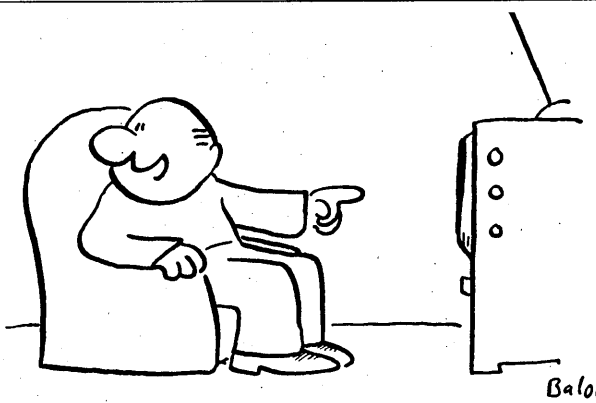
Yet true leadership involves the leader taking on something of leadership's complementary opposite, servitude. The project manager must also be a servant of the project and his staff. If the project manager monitors the work of his staff, he must also attend to their physical comfort and well-being. If he insists on a high caliber of work, he must be willing to accept and shoulder the full blame if that standard is not met. If he reports to senior management, he must also shield his staff from disruptive influences like office politics and departmental rivalries. He must never be "too busy" for anything that may affect the project or his staff. He must be everywhere involved in the project yet attached to no particular part at the expense of any other part. The manager should overlook nothing, yet at the same time should attempt to keep his presence from becoming oppressive. In short, during the programming cycle a good project leader must have many of the characteristics of a fine butler or valet.

The project manager must present yet a different face in the system integration cycle of the project. If he was enthusiastic during the design phase and patient and encouraging in the programming cycle, he must now plan a cold-blooded, indeed almost ruthless, testing and integration program against the product he has worked so patiently to create. The bottom line is that the system has to work, but there are several things to consider that may make this last stage easier to handle.

To begin, the user's guide, tutorials, and HELP package must be available. All three should be updated to reflect changes or meaningful suggestions during the testing that will be taking place. Testing should be done by typical users in a typical work situation as soon as is feasible. A formal method of receiving and monitoring comments or problems should be put in place. Obviously not all suggestions for improvement can be acted on initially, but they may be saved for future versions of the software, should this be planned.

At this point, the project may be thought of as near termination, but there is one important item that is often ignored that has yet to be considered: the formal post-project review.

A rigorous post-project implementation review is very significant in many ways. Here, too, as at the beginning of the project,



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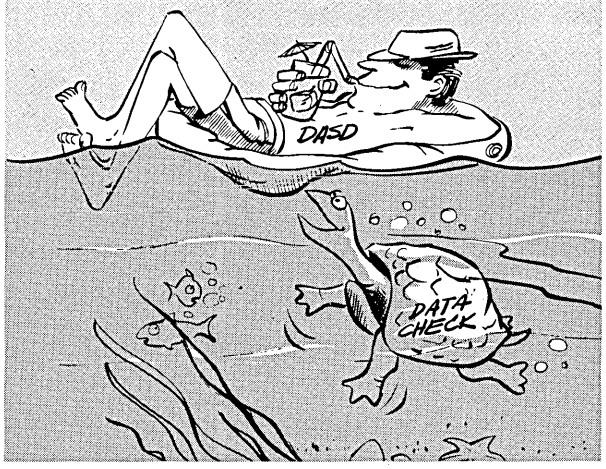

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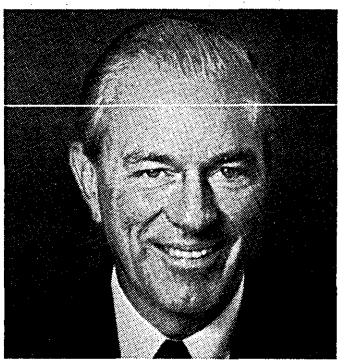

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a checklist should be created. There are many critical questions that should be asked: was the system implemented within projected cost and time estimates? If not, why not? Is performance acceptable? Were all the planned-for systems features actually implemented? Any area in which there was a significant variation between planning and delivery should be investigated in detail.

So-called "user oriented" questions must be carefully examined. Is the system stable? Does there seem to be a high degree of user dependency on the data processing professionals? What do the users think of the documentation? And so on. Many such questions need to be asked and then answered, often in considerable detail.

Another set of questions must be asked. These can be delicate since they have to do with the project manager, but they are important. Was the project properly planned and managed? What were the strong points in the management of the project? What were the weak points? (This latter, though critically important, can be especially difficult if the project manager is actively involved in the post-implementation review, something that is usually the case. He is, in essence, forced into the position of objectively trying to review his own leadership skills, a rather delicate process at best, yet an important one.)

Many questions about the project can be formalized, but problem areas should be looked at candidly and corrective actions taken when needed. Certainly there will be errors and difficulties, but everyone may learn from this review if the results can be made available with tact and discretion and in a constructive manner. This can benefit everyone in the project, both currently and in the future.

—Herbert Kugel
Toronto, Ontario

CREDIT WHERE IT'S DUE

About a decade ago, I remember reading several prominently published articles describing the ideal characteristics for "computer maintenance programmers." In those long-ago days, if my memory serves me, the industry was looking for individuals with small amounts of innovation coupled with a great quantity of perseverance. Maintenance programmers were expected to patiently trace processing failures through program sequences in order to locate coding errors. Once the errors were identified, only the simplest of corrections was expected or permitted.

In the years since then, the complexity of the work performed by computers has increased markedly. At the same time, the industry perception of software maintenance, as we now call it, has changed. No longer is it considered merely the correction of errors induced during coding. While a certain amount of straightforward "bug" removal still remains, software maintenance of the mid-1980s is acknowledged to include a significant portion of program upgrades and enhancements, many times major. In addition, it has become widely accepted that initial software development requires only 40% of the total costs that will be expended throughout a project's complete life span. The remaining 60% is spent on maintenance.

In terms of commitment to a software product, this means that once the initial, presumably well-padded, development budgets are established, one and one half times these amounts will be required to sustain that product. The bigger and more complex the product, the more critical this becomes. This results from what can euphemistically be called "requirements evolution." No matter what the state of the requirements when a project is begun, significant changes will occur. This is due to two causes: the changing of

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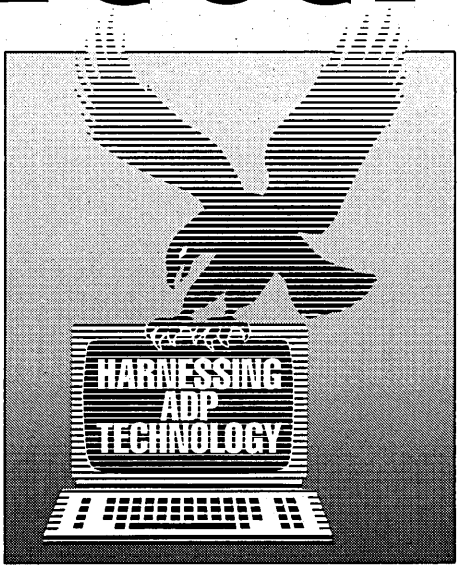

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And they're all someone's children.

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READERS' FORUM

the product's operating constraints and environment between the time the first set of requirements are finalized and the initial system is delivered, plus the requests for improvements, adjustments, and new capabilities generated by users' "better ideas" based on actual usage.

At the same time the need for innovative and creative individuals to sustain a product has grown, programmer perception of this function remains firmly focused on the decade-old computer maintenance programmer concept. Ask virtually any software engineer his or her preferences for project assignments and the all-but-unanimous response will be to "work on that new [fill in the blank] system." For a variety of reasons, many of them valid, nobody wants to be associated with a product that is already operational, regardless of the complexity or challenge involved in continuing its viability.

The stigma of working on an already operational product is real. For one possible illustration, look at the personnel assignments for projects in your own organization. How many junior staff members are assigned to systems undergoing initial development? How many of the senior staff are working on existing software, other than consulting? What are the working conditions for individuals working on existing software versus those for the new program developers (e.g., office space/assignments, computer time availability, keypunch support)? When recognition (raises, awards, mention in the newsletter, etc.) is passed around, which projects and individuals are visible? Which aren't?

Without belaboring the point, in most computing organizations, the attention, recognition, and perquisites tend to be highly biased in favor of those working on new projects. Systems that are already operational almost naturally sink into the background. This is, unfortunately, normal.

Management must, of necessity, spend the majority of its time on new issues: selling them to senior executives, coordinating budgets and schedules, reporting progress, solving success-impacting problems, and so forth. "Minor" tune-ups to existing code really don't demand the same attention. Or do they?

I've routinely seen cases where a system upgrade is as complex as the original development effort. Not only that, but even if the upgrade experiences early difficulties, the pre-existing capabilities are expected to continue working without a flaw. Coordination of budgets and schedules, progress reporting, and solving critical problems are as important in an enhancement as in the original development. Yet the management attention paid to such work is usually minimal in comparison. Add to that the fact that product improvements continue to be categorized and labeled as merely maintenance.

A twofold solution is proposed. First, let's find a better term for the latter 60% of the life span of a computer product. "Maintenance" just doesn't cut it! A new, more accurate term is called for. Possible titles could be "sustenance," "enhancement," "evolution," or perhaps, best of all, "beta development." As virtually any amateur psychologist knows, an appropriate change in name can do wonders for all sorts of ills.

Then, let's "projectize" all but the simple error-correcting portions of product evolution. The complexity and value of this work is high and it should be treated accordingly.

By implementing these solutions, a gain in ongoing development productivity should be realized. In addition, the recruiting and retention of qualified software personnel will be improved, to the benefit of them, our customers, and, in fact, all of us.

—David A. Feinberg
Seattle, Wash.

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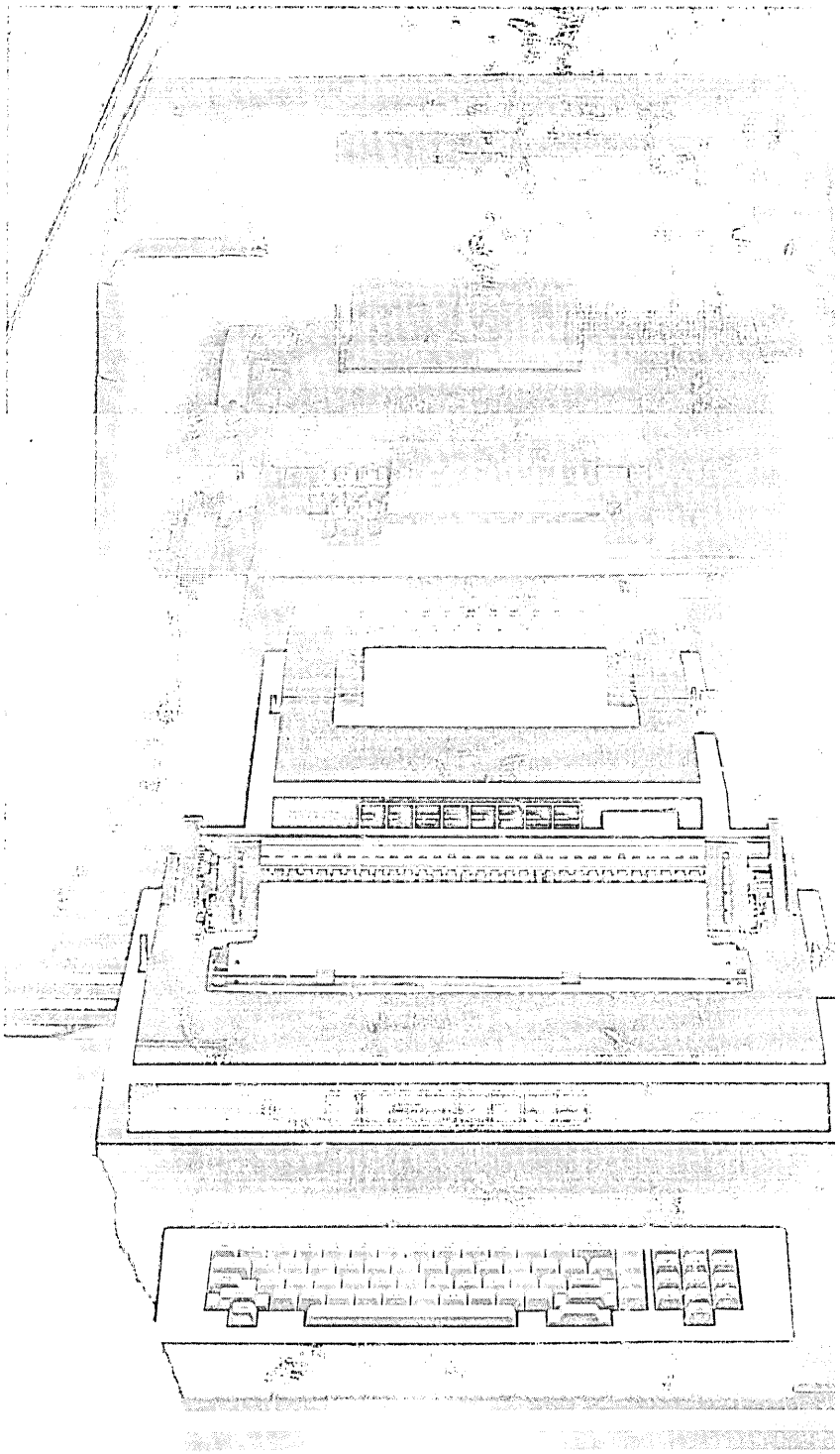

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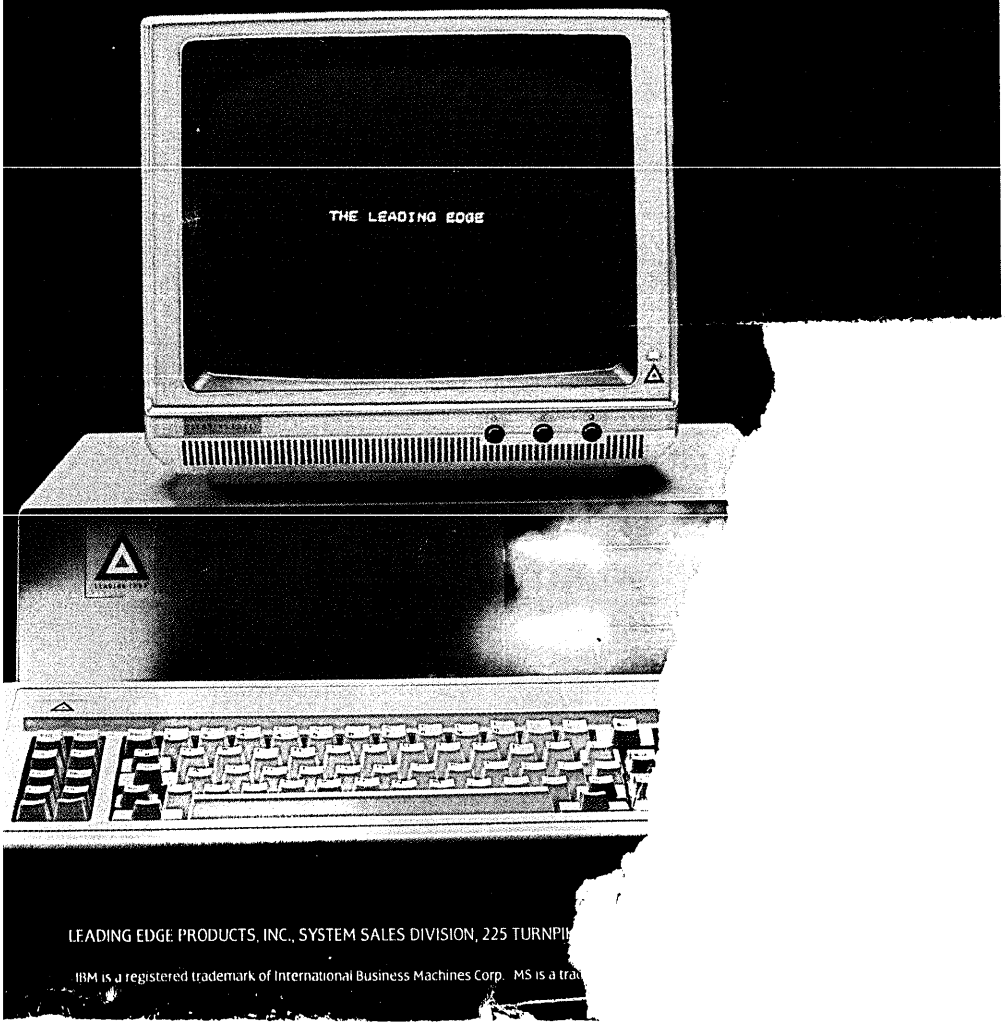

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