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CIRCLE 205
ENTER, STAGE LEFT: A NEW PC

If there is a quotation that suits the Comdex computer show held last month in Las Vegas, it is the familiar line from Shakespeare’s King Richard III: “Now is the winter of our discontent...” Nothing could more succinctly sum up the state of the personal computer industry today. The near-term strategy for most companies is to simply survive the big chill, says Stacy Lund, marketing manager at Seagate Technology in Scotts Valley, Calif. Companies are trying to anticipate the next hot segment and looking for relief from the cold reality of the recession.

Almost all the industry suppliers are betting that the notebook and subnotebook PC is the next major wave. But Al Shugart, president, CEO, and COO of Seagate, is skeptical about this assessment. The rapidity with which notebooks have advanced to higher-capacity disk drives suggests to him that most notebook customers are PC owners who want a portable version of their desktop system. The question is whether there are enough of these buyers to provide sustained market growth for more than a few quarters.

Just as living creatures go through metamorphosis, so too the PC business. The large installed base of computers is essentially serving a limited number of point solutions: spreadsheets, data bases, and word processing applications. Beyond the winter of its discontent, the industry belongs to a new breed of computing engine. One candidate for this new, transforming machine is the pen-based system. For the first time, it invites the user who has not been touched by the computer revolution to partake.

One company leading the way into pen-based computing is Go Corp. of Foster City, Calif. Unlike the desktop generation, pen-based systems will lead users by the hand, providing them with a table of contents from which to choose an appropriate application, says Atri Chatterjee, Go’s product marketing manager. Physically, the computer will resemble a notebook on which the user can, for example, create a hand-drawn sketch and then ask the machine to enhance it. For text, the user can enter data in block letters or script, and preserve the actual image as well as have it converted into alphanumeric text. The pen-based PC will also serve as the user’s appointment calendar, telephone, and fax machine. User-friendly, object-oriented operating systems will be standard.

But perhaps its biggest lure is that the user will be able to operate the pen-based computer intuitively—it bears a closer resemblance to pencil and paper than it does to a desktop PC. There is no need to learn to use a mouse, much less master the arcane commands that are now needed to interact with a DOS machine. In the new computing paradigm, the computer acts like a person and not the other way around.

Of all the seasons, winter demands the most resilience to survive its harsh extremes. For the PC industry, the companies that survive will be those willing to adapt to a new computing paradigm. Those less willing or able to do so will not. 

JONAH McLEOD
EDITOR
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LETTER FROM SINGAPORE

THE CITY-STATE, A MAGNET FOR MULTINATIONALS, HAS A NEW VISION
REALIGNING THE TARGETS FOR THE '90S

BY KRISTA CONLEY

When you think robust economic growth, political stability, and a veritable magnet for multinationals, the likely hot spot in Asia is Singapore, the city-state with a mission. But that mission is changing, as the pragmatic economic planners who have so carefully nurtured Singapore's growth in the past confront new challenges.

Singapore had been governed for decades by Prime Minister Lee Kuan Yew, a charismatic leader who carefully nurtured its development into a strategic operational node for multinational corporations. Yew decided to step down in 1990 and his successor, Goh Chok Tong, has his own vision, one demanding management of a tight labor market, new education priorities, emphasis on capital-intensive industries, and internationalization.

But what is already there is impressive. In 1990, Singapore's trade reached $120 billion, and per capita income $12,785—this for 2.7 million people living and working in just 250 square miles. And unemployment is not a problem, dipping to a record low rate of just 1.7% in 1990.

Yet parts of the machine need work. There is a chronic shortage of trained technical talent, and although the government allocates 20% of its budget to education, skill levels don't seem to match the needs of the next phase of industrial development. According to Jonathan Yuen, director of the New York office of the Singapore Economic Development Board, "We are also interested in overseas talent in the fields of research, science, engineering, and computer science because there is always a demand for these skills in Singapore. Unfortunately, the Singapore talent pool is quite finite."

The government hopes to defuse the labor issue that threatens to constrain economic growth by encouraging the growth of capital-intensive industries rather than traditional labor-intensive production. But that may only change the nature of the problem, requiring many new types of skilled labor, rather than reducing demand. Nevertheless, despite skill problems, the Singapore worker has been rated the most productive in the world for the 10th time by the Washington-based Business Environment Risk Intelligence. Switzerland was a close second, Japan third.

In addition, multinationals, which account for more than 90% of Singapore's manufacturing investment, have helped Singaporeans to expect ever higher wages and an improved standard of living, which is eroding its cheap-labor advantage. And unlike Taiwan and Hong Kong, whose economic growth depends on spirited entrepreneurship, Singaporeans tend to enjoy the security of working for foreign investors, and have little desire to risk new ventures.

Still, the place is "well-suited to be the electronics center for all of Asia," says one frequent traveler to Singapore, Michael K. Hsu, president of Asia Pacific Strategic Bioventures, a division of D. Blech & Co. based in New York. "They started early in the 1980s with the creation of the National Computer Board," he says. "That showed their neighbors, the U.S., and Europe that Singapore was making a commitment to being No. 1 in the region in telecommunications, computer software, and hardware."

One firm that noticed is Lotus Development Corp. The Cambridge, Mass., software giant weighed the possibilities and picked Singapore as its Asia-Pacific headquarters. Quite possibly the largest software R&D project in Singapore, situated on a 5,000-square-meter site in Chai Chee Industrial Park, the Lotus facility is dedicated to product R&D, manufacturing and distribution, and sales and service. The way Lotus's president and CEO, Jim Manzi, sees it, "We do believe strongly that local language products should have 'native personality,' which can only be supplied by people who really understand local business needs and local culture. In this respect Singapore will be the fulcrum of our Asian product development activities."

Manzi says the $4.3 million plant came on-line as a result of

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CIRCLE 187
the government's progressive attitude toward information technology development, excellent communications infrastructure, and the skilled work force. According to HsU, Lotus made a good choice: "Singapore is a great place for a research and development center," he says. "There are lots of incentives, infrastructure support, strong national company base, and large multinational bases for support."

Another multinational, Apple Computer Inc., has been operating in Singapore since 1981. The original plant produced Apple II products for the Pacific region and the U.S. Apple expanded its facility in 1988 and produces the Macintosh Classic and Macintosh LC, as well as all Apple II products—and laptops may be added. The plant operates 24 hours a day, with a staff of more than 500.

Singapore and the U.S. have a healthy history of trade and economic cooperation. This should improve in 1992 under the auspices of a Trade and Investment Framework Agreement with the U.S. signed in October 1990. The objectives of the agreement are to monitor trade and investment patterns and identify opportunities for expansion, to hold consultations on specific trade and investment matters, to negotiate agreements where necessary, and to identify and work toward the removal of impediments to trade and investment flows. In short, rather than meeting only when there's a problem to fix, U.S. and Singapore representatives will get together regularly to strengthen their bilateral ties.

For electronics and software companies, the agreement's so-called action agenda covers antidumping and countervailing duties, market access, services, and intellectual property rights. It also provides for advance warning when antidumping or countervailing duties are brought against Singapore's exports in the U.S., its largest export market. "It won't completely insulate us, but it is a commitment not to do damage to a friend," says Lee Hsien Loong, minister of trade and industry.

U.S. firms have been pretty comfort-
CERTAINTY

There's more to electronics industry management than counting beans - much more. The typical electronics CEO wouldn't be typical in any other field. Unlike his colleagues in traditional industries, a career crunching numbers didn't get him that corner office - and neither did smooth-talking salesmanship. 71% of electronics industry management got to the top through the engineering/technical side of the business - and once they've arrived they combine a current, experienced understanding of technology change with the analytical business skills of a seasoned pro. They run their companies hands-on - and you need to reach them in the pages of ELECTRONICS if you want your hill of beans to amount to something.
"END OF THE BEGINNING"

For object-oriented programming to become a commercial reality, there must be a standard software framework based on a way to make requests within the object-oriented environment—that is, a software road or bus enabling objects to interact over a network of different systems.

Now there is such a bus. Its development means the "end of the beginning of the development of object technology," says William Blunden, vice president of marketing at Object Design Inc. in Burlington, Mass., the developer of an object-oriented database-management system for both Unix and Microsoft Windows.

Announced at the end of October at the Unix Forum International show in New York and called the Object Request Broker (ORB), the bus is the first of three elements that will make up the Object Management Architecture being assembled by companies in the 180-member Object Management Group, which was started in 1989 to promote object technology. ORB's specs were hammered out by six members of the group—Digital Equipment, Hewlett-Packard, SunSoft, NCR, and Object Design. By making it easy for application software from different vendors to work together, ORB is a gateway to the goal of open distributed computing.

The payoff for independent software vendors is the ability to "harness ORB's power to bridge the differences and distances, empower the individual, and facilitate the group," declares HP's Robert Frankenberg, vice president and general manager for personal information products at the Palo Alto, Calif., firm.

The other two elements in the Object Management Architecture are promised next year. The Object Model (which is the "language" for conversing among objects) is due in the first quarter, and the Object Services (the common "topics") by the third quarter.

IBM-INTEL PROCESSOR CHIP DEAL SENDS COMPETITORS SCURRYING

Makers of PC clones and their chip suppliers had better start thinking about strategic alliances. That's one of the more important implications of last month's IBM-Inel chip accord, in which the two giants agreed to co-operate for the next decade in the design of central processors. The deal's potential synergy promises both parties a big advantage over their go-it-alone adversaries.

The work will be done by about 100 engineers from both companies at a facility to be established in Boca Raton, Fla.—which is where IBM Corp. designs and builds its PCs—called the Robert N. Noyce Development Center, after Intel Corp.'s late cofounder. According to the terms of the deal, both companies will have the right to make the microprocessors, and Intel will have exclusive rights to sell them to other computer manufacturers.

For Intel and IBM, the 50-50 arrangement means, among other things, that the staggering cost of developing chips and computers will be halved. Also, it gives IBM a head start on use of the newest Intel chips for example, a version of the 80486 is planned that will integrate more functions on-chip. IBM, which has been slower to develop PCs than its competitors, should be able to use the Intel alliance to react more quickly.

Finally, in a business where it is becoming difficult to tell one manufacturer's product from all the others, IBM now has the opportunity to differentiate itself more strongly from the rest of the pack. And the agreement will quiet speculation about what Intel and IBM planned to do after Intel invested $250 million in Intel nine years ago for 12% of the chip maker.

IT'S BACK TO COURT IN LCD DISPUTE

Apple Computer Inc. has fired the latest round in the bitter dispute over LCD tariffs. Last month, the Cupertino, Calif., company filed an appeal with the Court of International Trade in Washington asking it to reverse the 63% tariff imposed in August on active-matrix LCDs. At the same time, John F. Akers, the chairman of IBM Corp., threatened to move production of some of Big Blue's smallest computers out of the U.S. if the tariff on LCDs is not repealed.

Apple is the only U.S. computer maker that is now using active-matrix displays in its laptops, including the Macintosh PowerBook 170. But it wasn't the only firm to protest the antidumping suit brought by the Advanced Display Manufacturers of America, which argued before the International Trade Commission that unfair Japanese pricing had harmed business. IBM and Compaq Computer Corp. also testified that with the death of domestic LCDs, a tariff on imports would force U.S. laptop vendors to move manufacturing offshore. (Electronics, October 1991, p. 27).

"We feel very strongly that the finding of material injury in the ITC decision is factually incorrect and not supported by substantial evidence," says James Burger, Apple's manager for government.

ADMA, meanwhile, called the IBM move a "smokescreen." Threats by the computer makers to move offshore "are cynical attempts to pressure the U.S. Commerce Department to weaken its enforcement of the U.S. unfair trade laws," the group said.
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XILINX MAKES FPGA DESIGN A SNAP

In a move likely to enhance its dominance in field-programmable gate arrays, Xilinx Inc. has unveiled BLOX, a high-level synthesis tool that automates gate-level design for the San Jose, Calif., company's XC4000 family of FPGAs.

The BLOX library has 30 generic design modules that can be linked together using standard schematic design editors. Each generic module has an electronic parameter sheet for entering key specifications such as bus width or operating mode.

The widths and types of data on a data path are automatically carried through all levels of the design hierarchy. This means the size of a design can be modified by changing just a few fields on the schematic.

BLOX uses an expert-knowledge system to produce optimized designs. For example, it will automatically assign clocking for high fan-out signals to special buffers, or, move registers from the core to I/O blocks to maximize density. BLOX will be available in January priced at $2,995 for a PC version and $4,995 for workstations. It runs on the XACT 4000 development system. Versions for other families are scheduled for mid-1992.

AT&T SPEEDS FPGAS TO GATE ARRAYS

AT&T Microelectronics' SoftPath design tool speeds the migration of field-programmable gate array designs to CMOS gate arrays while preserving pin-to-pin and package-footprint compatibilities.

SoftPath converts AT&T and Xilinx Inc. FPGAs to AT&T's recently introduced ATT656 family of gate arrays. This capability makes the Berkeley Heights, N.J., chip maker the first to offer single-supplier support for this design migration.

Pricing for ATT656 Series gate arrays depends on design complexity, packaging type, and production volume. Nonrecurring engineering costs for low-end gate arrays start at $15,000 to $20,000. Unit prices range from less than $5 in thousands to more than $100 for circuits in large ceramic packages.

NCR CHIPS IMPLEMENT ETHERNET NETWORK MANAGEMENT

NCR Microelectronics has become the first vendor of Ethernet chip sets to deliver hardware-based network-management capability. The Fort Collins, Colo., company's EtherCore chips also offer the flexibility of designing to several popular personal-computer system buses.

Using the 92C105 network management chip, LAN vendors can now configure a complete Ethernet network including media-access-control-layer statistics. The chip traces and records all 37 network events specified by the IEEE 802.3 standard.

Another key differentiator is the flexibility of NCR's interface to the system bus. Instead of a single interface chip that the system designer has to design to, NCR has optimized an interface to each popular bus. The first is the 92C143 for the ISA bus. In the works are EISA, MCA and workstations.

CADENCE ENHANCES ITS VERIFICATION TOOL

Cadence Design Systems Inc., San Jose, Calif., is shipping a new version of its popular Dracula IC design-verification software. Version 4.0 includes a tool called InQuery, which is a probe between screen windows displaying the circuit netlist, layout, and schematic that Cadence says cuts layout-versus-schematic debug time in half.

In a multimillion-transistor IC, that reduction may be two weeks or more. Dracula 4.0 also includes a parasitic-resistance-extraction tool segment to locate unforeseen electrical resistance, which helps designers working with submicron features to achieve top clock speeds.

The per-seat price for Dracula, which runs on IBM and Sun Microsystems servers, begins at $118,000; InQuery sells for $15,000.

CIRRUS CHIP SET DOES DATA, FAX, VOICE

Cirrus Logic Inc. has squeezed lots of functionality into a two-chip modem that delivers data, facsimile, and voice capability to laptop and notebook computers.

The CI-MD1424 eliminates the external controller, host interface, and memory chips required by competing solutions, says the Fremont, Calif., company. This means a complete data/fax/voice modem can be created in an area smaller than a business card. On-chip firmware eliminates software development and debugging.

The chips will be available this month for $45.
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THE BLITZ OF NEW VAX MODELS COMES WITH A MESSAGE: THE COMPANY IS COMPETING ON PRICE

A NEW, AGGRESSIVE DEC

BY LAWRENCE CURRAN

You've got to admire Kenneth Olsen's dedication to his VAX computer family. The founder and president of Digital Equipment Corp. keeps the Maynard, Mass., firm pumping new energy into the 14-year-old VAX architecture. The latest infusion centers around a DEC-designed-and-built 83-MHz CMOS microprocessor, several aggressively priced systems that incorporate it, and new software that simplifies networking any other class of computer to a VAX.

The blitz of new systems and software means that Digital is able to offer one of the most extensive ranges of systems available. It also means that machines from the $13.9-billion company can link up with just about any other type of computer under perhaps the broadest open-system network umbrella in the industry. Finally, the October introductions carry price tags that signal Digital's newfound willingness to compete with the most aggressive on price.

"In 10 years of DEC watching, I don't think I've ever seen such an across-the-board price/performance improvement, from the top to the bottom of the [VAX] product line," says Terry Shannon, president of Gander Resources in Ashland, Mass., and former director of the DEC Advisory Service at International Data Corp., the Framingham, Mass., market-research firm.

Following DEC's relatively sluggish 1991 revenue growth of 7.5%—and the company's resultant downsizing (Electronics, September 1991, p. 32)—Shannon views the October broadside as evidence that "DEC is really serious about getting rolling again."

For his part, Olsen, always a semiconductor buff, trumpeted at the introduction that "we now have the fastest chip and machines at the lowest price per unit of computation in the industry." Even though DEC uses reduced-instruction-set-computing microprocessors from MIPS Computer Systems Inc. of Sunnyvale, Calif., in many of its workstations, Olsen seems to relish the blazing performance his engineers have extracted from the new DEC chip.

The so-called NVAX microprocessor is a hummer, especially for a complex-instruction-set device. Its 1.3 million transistors deliver a clock speed of 83 MHz. That's 20 to 30 MHz faster than both commercially available RISC processors and the 50-MHz Intel 80486, a leading CISC device.

Tom Willmott, vice president at the Aberdeen Group, a Boston-based mar-

CONNECTING TO A TERAFLOPS

The latest model in the Connection Machine family of massively parallel supercomputers from Thinking Machines Corp. has the Cambridge, Mass., company talking about 1 trillion floating-point operations per second—that's an impressive 1 teraflops.

The CM-5 is described by its first customer as "the first highly parallel supercomputer that can be seriously considered for commercial production environments." That's true in part because of a joint standard that lets users apply various classes of computers to solve a problem. The customer is John Sell, president of the Minnesota Supercomputer Center in Minneapolis, which in August installed the first CM-5 for the U.S. Army High-Performance Computing Research Center at the University of Minnesota in Minneapolis.

The joint standard will stem from an agreement among Thinking Machines, IBM Corp., and Sun Microsystems Inc to develop a common scalable programming standard for scientific computing. That means customers will be able to turn a mix of workstations, mainframes, and supercomputers loose on a problem, says Danny Hillis, Thinking Machines' chief scientist and also one of the founders of the eight-year-old company.

"Users will be able to run the same Fortran program on a Sun workstation, an IBM vector supercomputer, and a Connection Machine, and third-party software developers will be able to maintain a single source code for all types of machines," Hillis says.

Each node of the CM-5 is a 22-mips Sparc reduced-instruction-set-computing microprocessor. Each has four vector pipes, providing 128 megaflops of peak speed, and all components of the system's architecture—including software, input/output, and communications networks—scale in a balanced manner up to systems with 16,000 processor nodes. Prices of CM-5 systems begin at $1.4 million.—L.C.
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Whether you're testing one boundary-scan part or boundary-scan networks, VICTORY software automatically gives you 100% pin-level fault coverage. Using the IEEE 1149.1 and BSDL standards, it takes VICTORY only a minute or two to generate test patterns. It would take a programmer days, even weeks to deliver the same fault coverage for conventional designs.

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scan is a breakthrough board testing theory.

feedback you need to eliminate defects where it's most cost-effective—at the source.

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With boundary-scan design and VICTORY software, you won't need bed-of-nails access on nodes where boundary-scan parts are interconnected. That means fewer test pads. Fewer test probes.

That's a compelling advantage to board designers.

Which is why VICTORY's Access Analyzer was developed. With this concurrent engineering tool, designers get testability information early in the design process. They can easily see where test points are required for visibility and where they can be dropped, for optimized board layout without lowering fault coverage.

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Boundary scan is the design-for-test breakthrough that promises lower cost, higher quality board testing. But don't take our word for it. Call Daryl Layzer at (800) 225-2699, ext. 3808. We'll show you how, with VICTORY software and Teradyne board testers, you can test this theory for yourself.

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DEC says its new VAXstation 4000 outdistances any other company's computers.

IT'S BOUNDARY-SCAN TESTING OF BOARD-LEVEL PRODUCTS, AND THE CUSTOMERS DEMAND IT

THE SILENT ADVANTAGE

BY JACK SHANDLE

Apple, AST, and IBM demand it. Intel, Motorola, MIPS, and TI all do it, but for the most part quietly.

In the semiconductor industry, where product preannouncements are commonplace and vaporware is a salable commodity, the silent treatment for a technology can mean only one thing: it gives its users a strategic advantage that they would like to keep under their hats.

The technology—boundary-scan testing of board-level products using standards developed by the Joint Test Action Group (JTAG)—is certainly not unheard of. JTAG itself has been around since 1986, and the IEEE formalized its boundary-scan proposals into the 1149.1 standard in February 1990. But most industry observers are surprised to learn that Intel Corp. used JTAG boundary-scan to debug its 50-MHz 80486 module, or that Motorola Inc. added the four pins JTAG requires to its 68040, or that Texas Instruments Inc. did the same for its 320C30 digital signal processor. The relatively rapid adoption of JTAG by the major processor vendors has pleasantly surprised Doug Kostlan, product development manager for IT's general-purpose logic marketing group.

"Once the processors have boundary scan, the systems houses begin looking for more chips with it," he says. Kostlan, whose job it is to proselytize JTAG, says that a year ago he would have guessed Intel, Motorola, and MIPS Computer Systems Inc. would not find it cost-effective in testing their motherboards—"until they saw we were successful in the design and manufacturing phases. So they are pressing the chip makers to earmark the needed pins and real estate on their latest chips. Because the strategic advantage over non-
Oh no. Please, not now. Not with manufacturing release next week.

The Prototype Doesn't Work.

Six ASICs, fifteen PLDs and the whole thing's gone south. Maybe I should go south too. Yeah, hop a bus. Head for Mexico.

The Prototype Doesn't Work.

Software? Could be. Hardware? Might be. So where do I start? At the beginning, of course. And just where is that, smart guy?

The Prototype Doesn't Work.

And my performance review comes up next month. Maybe they'll just forget about all this, right? Yeah. Sure.

The Prototype Doesn't Work.

Wait. What about that glitch in the handshake on the first pass? Couldn't reproduce it. Maybe it just reproduced itself.

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WITH NO SEA CHANGE IN SIGHT, UNIX IS SWIMMING ALONG WITH THE BIG GUYS INTO THE MAINSTREAM

BY HOWARD WOLFF

IT has come to this with Unix: there is no major trend. That was the most striking impression among the industry movers, shakers, and watchers exploring the aisles and meeting rooms of New York's Jacob K. Javits Convention Center at this fall's Unix Expo. And as an indicator of the state of the industry, it is a positive one.

There are, to be sure, a healthy collection of what might be called trendlets—for example, in X terminals and computer-assisted software engineering (CASE)—as well as the potentially massive IBM-Apple-Motorola undertaking. But the absence of a single defining announcement or revelation is another indication that Unix and open systems have swum bravely into the mainstream. In short, the king of the mult-user networked systems seems secure in its domain.

Nevertheless, there were some interesting developments at the gathering of Unix club. On the X-terminal front, the move seems to be toward specialization for what just a year ago were merely inexpensive dumb terminals. So for users, the question is not merely "How cheap?", but "What can it do?" Manufacturers, looking for differentiation among their products, have begun to move some of the functions from the host server to the terminal—in fact, IBM Corp. has even added a local hard disk for image storage.

So products unveiled at the New York gathering ranged from Visual Technology Inc.'s monochrome model for the price conscious, all the way up to more sophisticated entries—some complete with color and others boasting their own operating systems. And they came from the likes of Hewlett-Packard, Network Computing Devices, and Human Designed Systems.

In the CASE-for-Unix area, the buzz phrase is "enterprise-wide." Interactive Development Environment of San Francisco, an eight-year-old company, showed off a system that is designed for the network, rather than for real-time or embedded use. Called Software through Pictures, it is available on SCO Open Desktop—one of the first integrated CASE products to be available for that environment, says Nobhy Akiha, Interactive Development's director of marketing communications. "This port will position Software through Pictures as the leading CASE solution for the Advanced Computing Environment," says Akiha.

But perhaps the Unix Forum event carrying the most important long-term implications was the joint appearance by executives from IBM, Apple, and Motorola to explain how and what they would support in their joint development effort.

There will be five initiatives in hardware, software, and silicon: the Power PC, PowerOpen, enterprise networking, multimedia, and object-oriented technology. Taking them one at a time:

- The Power PC single-chip design will appear in 18 to 24 months. James Norling, president of Motorola Inc.'s Semiconductor Product Sector, says, "There will be 300-plus engineers in Austin developing four implementations in parallel—desktop, portable, laptop, and entry-level workstation. That will give users a wide variety of price points. Design rules for the CMOS chip will be 0.5 μm, the same as those for 16-Mbit DRAMs." The workstation will be based on RISC technology.
- PowerOpen is to be a standards-based Unix computing environment. It will be able to handle existing applications for Apple Computer Inc.'s Macintosh A/UX and System 7.0, as well as IBM's RS/6000 AIX workstation.
- The enterprise networking effort will be aimed at making it easy to integrate Apple Macintoshes and IBM PCs on the same network.
- Multimedia development will be undertaken by two independent companies to be set up by IBM and Apple. One, called Kaleida, will develop multimedia products; the other, Taligent, is to come up with an object-oriented software platform that will be based on the one, code-named Pink, under development at Apple.
- The object-oriented-programming initiative will be undertaken by Taligent. "The real promise of object-based systems," says Michael Spindler, Apple's president, "is to maintain applications over a variety of networks and add features. The promise is time to market, not complexity."

The work of the three companies is designed to take advantage of what Spindler sees as the underlying appeal of Unix: true scalable architecture. "We want to move Unix into volume desktop space," he adds, "and transit the Mac onto the RISC power platform."
Customized Networking Platform takes communications into the 21st century.

Described as the Olympics of Telecommunications because of its huge scale and worldwide audience, Telecom 91 was a highly competitive environment for new technology introductions. One of the highlights was NEC's announcement of the Customized Networking Platform (CNP), an advanced architectural concept designed to take telecommunications well into the 21st century.

CNP offers a total network solution for evolving communications requirements. Responding to the immediate needs of each operator and end-user with an optimum mix of services, CNP also provides exceptional flexibility for future growth.

An all-encompassing concept
As a world leader in integrated computer and communications (C & C) technology, NEC implements CNP with the broadest product line in the industry. Switching, transmission, radio, and computer systems are integrated with terminals in a seamless setup that leads to smooth network operation. Yet CNP also offers open-interface flexibility for today's multi-vendor environment.

CNP is an ambitious concept. A unified architecture able to cover all public, corporate and mobile communications networks, it provides both broadband transmission and intelligent capabilities. Visitors at Telecom 91 experienced a wide array of futuristic CNP services.
Global Multimedia Communication System
The Customized Networking Platform (CNP) creates an innovative, multi-party teleworking environment. People in remote locations can 'meet' via face-to-face desktop teleconferencing. In real time, they can share and process multimedia information—text, graphics, images and handwriting.

The new multimedia communication system links multiple hypermedia stations and a hypermedia database with a broadband ISDN and multimedia LANs.

These capabilities were demonstrated at Telecom 91 by a global teleconference. Linking two NEC booths at Palexpo, Geneva with offices in Munich and London, the conference focused on the preservation of planet earth.

CNP Transport Layer
The transport layer was demonstrated by a wide range of leading-edge equipment. A NEAX61 ATM service node and a photonic switching system displayed broadband switching capabilities.

A prototype photonic switch, with multi-gigabit capacity, performed HDTV switching.
Customized Networking Platform.

CNP Mobile Communications Network

To free users from cell restrictions, NEC integrates multiple mobile networks into one full-service mobile communications sphere. Each subscriber has a personal telecommunication number which can be accessed anywhere, at any time, and in any communications format — telephony, data, or fax. At Telecom 91, NEC displayed a wide variety of network elements, including cellular phones, cordless PCs, a base transceiver station, mobile satellite terminals, and car navigation systems.

Hypermedia Station

CNP Service Creation and Control Layer

The NEAX61 application service processor is a powerful core for advanced intelligent networks. Designed for fast start-up, it provides a wide range of innovative customer-programmable services.

CNP Network Management Layer

NEC's network operation and management systems are based on both the CCITT TMN and OSI protocols. ACTNET-X provides fully integrated management of next-generation networks, including SDH.
Automatic Speech-to-Speech Translation System

Because language is the ultimate communications barrier, NEC has developed an advanced automatic speech translation system. It allows continuous speech input by any (non-designated) speaker and provides simultaneous machine translation into multiple languages. An experimental system at Telecom 91 automatically interpreted from Japanese to English and from English to Japanese, with simultaneous translation and voice output in French and Spanish.

The NEC system features demi-syllable recognition and PIVOT Interlingua, a unique intermediary language for efficient machine translation.

Open Application Interface

NEC’s advanced PABX series can communicate with most general-purpose computers via our Open Application Interface. OAI is the key to a computer-controlled telephone system in which multi-function phones serve as handy data terminals. New services include order entry, inventory management, electronic telephone directory, and work-hour management. At Telecom 91, order transaction was demonstrated by a NEAX2400 IMS linked to an IBM S/370 in Japan.

SX-3 Series Supercomputers

The supercomputers of the SX-3 series are regarded as the fastest in the world, with performance up to 22 GFLOPS, or 5.5 GFLOPS per processor. The SX-3 series supports the UNIX-based SUPER-UX operating system. An on-line demonstration at Telecom 91 linked audiences with an SX-3 Model 12 installed at the National Aerospace Laboratory in the Netherlands.

64-bit RISC Microprocessor

The VR4000 is the world’s first 64-bit RISC microprocessor. On a single chip, it integrates all the functions necessary for 64-bit computing, including 64-bit integer unit, 64-bit floating point unit, 8K-byte instruction cache, and 8K-byte data cache. The 64-bit integer CPU features an 8-stage superpipelined architecture which executes two instructions in one clock cycle. Average performance is 60 SPECmark (50MHz).
LESS CASH, HIGHER PROFILE FOR JESSI

Jessi is going to have to tighten its belt. The Joint European Submicron Silicon Initiative will have to get by with 25% less money in 1992 because the contribution from the European Community will fall short of the financial support it promised last year. The program’s 1992 budget now checks in at about $500 million (roughly half of that coming from the project partners themselves). Jessi officials hope, however, the EC will later reconsider and restore the cut.

“We are pinning our hopes on a new direction for the Jessi program,” says Klaus Knapp, spokesman for the organization. The new approach aims to enhance the program’s effectiveness and give it more visibility so that the public gets a better understanding of how and on what the EC funds are spent.

So for the main phase, which begins in January—following the startup phase during which more than 70 projects were approved—the Jessi board has designated a set of highly visible “flagship projects” to catch the public’s eye.

Included are digital high-definition TV, audio broadcasting, and cellular phones. Also, advanced integrated services digital networks, fine-line lithography, and competitive manufacturing.

SIEMENS WILL EXPAND IN THE U.S. WITH AUTOMATION GEAR

Now that Siemens AG has acquired the industrial control sector of Dallas-based Texas Instruments Inc. and has set up a new company, Siemens Industrial Automation Inc., in Atlanta, the German electronics giant is poised to become a leader in the American market for automation systems and equipment. Executives figure that during Siemens Industrial Automation’s first fiscal year—it ends next Sept. 30—U.S. sales will approach $170 million. The Atlanta firm, which marries TI’s industrial control activities to Siemens’s former U.S. automation equipment business, already checks in as the fourth largest supplier of industrial automation gear to the $12 billion U.S. market.

Siemens is sanguine about its new company’s future. It expects an annual growth rate between 10% and 15%, which is better than double the 6% predicted for the overall U.S. market for electrical equipment.

For success, the company is banking on the large range of products resulting from the marriage of the Siemens and TI activities in the field. Another factor is the tight network of technical centers—these are located in Detroit, Chicago, Atlanta, and Johnson City, Tenn.—and more than 60 sales and service bases throughout the U.S. The company, which will eventually employ 1,200 people, is aiming its products at the American chemical, paper, plastics, oil and gas, and metal-processing industries.

Siemens did about $2 billion worth of business around the world in automation technology last year. In programmable controls, it is the world’s leader.

EUROPE REGAINS AUTONOMY IN GALLIUM ARSENIDE PRODUCTION

German—in fact, all European—makers of gallium arsenide ICs can breathe easier. Their independence from Japanese suppliers of the material seems assured now that a small firm in formerly Communist East Germany has ramped up production of GaAs wafers. That independence from outsiders was threatened when Germany’s Wacker Chemtronics GmbH earlier this year stopped production of GaAs substrates in the face of heavy Japanese competition and decided to concentrate on silicon (Electronics, May 1991, p. 41). Wacker, in Burghausen, had been Europe’s only native producer of high-purity GaAs crystals. Lobbying hard for autonomy were the German ministries for defense as well as research and technology, joined by the chip industry and the state of Saxony.

Wacker has transferred its GaAs production gear to Freiberger Elektronik Werkstoffe GmbH in Freiberg, which is already making and marketing the material. Its standards in GaAs crystal growing are said to match those demanded by Western firms. The company now wants to perfect its skills in cutting and polishing GaAs wafers and increase their size from the present 3- and 4-in. diameter.

Experts are counting on a boom in GaAs devices for mobile telephones and satellite receivers to drop prices.
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QUICK-STEPPING COMPANIES ARE CHALLENGING
THE STALWARTS IN LUCRATIVE AUTO MARKET

OUT WITH THE OLD?

BY FRANCIS J. LAVOIE

The history of automotive electronics in the U.S. reveals an industry dominated by a well-established group of companies, mostly domestic. But the old order is changing as other manufacturers on three continents rev up their efforts to grab shares of what is becoming the world's most lucrative electronics market. A few cases in point:

• United Technologies Corp. is ready to transfer its vast storehouse of expertise in military electronics to the automotive sector. This is a major shift in marketing direction for the aerospace giant, as well as a serious challenge to the dominance of established automotive-electronics suppliers.

• Japan's TDK, long a force in entertainment electronics, is trying to gain a foothold for its chip sets in the auto business through its Santa Cruz, Calif., subsidiary, Silicon Systems Inc.

• VLSI Technology Inc. set up an Automotive Products Division in late 1989 and is busily staffing up to plunge into the fray.

The market potential is awesome. A report from the Freedonia Group in Cleveland puts the OEM electronics content of cars, light trucks, and vans at $1,800 per vehicle by 2000. And BIS Strategic Decisions, a Luton, UK, marketing firm, estimates the total value worldwide for systems controls in automobiles, excluding trucks and entertainment components, will reach $14.2 billion by 1995. The projections appear solid despite the well-publicized problems currently facing automakers in the U.S. and abroad. That's good news for suppliers, but with the new players in the game, only the most astute are likely to survive the stiffer competition.

They will be jostling in the near term for sales resulting from further penetration into areas already well established, at least in the U.S., say the analysts. For example, the Freedonia Group predicts that growth will focus mainly on engine and drive-train controls, navigational and instrumentation systems, comfort, convenience, and entertainment equipment.

Downward migration will be the dominant factor in the near-term growth in most categories, says Jeff Bartlett, director of product marketing for AVX Corp., a Great Neck, N.Y., components maker. “For example, a low-end car might have six engine and transmission control modules, while a high-end car might have over two dozen.” This heavier use of electronics will filter down to low-priced cars as time goes on and carmakers strive to meet more stringent fuel-economy and emission standards.

The increased use of these systems will expand beyond U.S. borders. Japan, for example, is expected to see greater use of air bags and antilock braking systems. This will be primarily to meet export needs, but more and more Japanese cars sold in the domestic marketplace will also have these safety features.

But it is Europe that will most likely show the greatest growth in the use of electronic subsystems. This will result primarily from the European Community's new emission regulations, scheduled to go into force at the end of 1992, which will apply to all engines up to 2 liters. To meet these new standards, manufacturers are expected to change from carburetors to electronically controlled fuel injection.

For suppliers, the most serious challenges may yet come from overseas. For example, at the recent Society of Automotive Engineers show in Detroit, Korea's giant Daewoo International announced its readiness to tackle "practi-
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*Subject to credit approval, beginning 10/23/92, for all qualifying purchases made on your Canon Credit Card. Finance charges will accrue at an Annual Percentage Rate of up to 17.88% with a minimum Finance Charge of 50 cents for any month in which a Finance Charge is due.
with the automotive sector. The company used the SAE show as a first step in getting the Daewoo name more closely associated with the automotive sector.

Some foreign suppliers are making their moves through their American arms. Siliconix Inc., the Santa Clara, Calif., chip maker that is 85% owned by Germany’s AEG AG, is aggressively marketing a line of power MOSFETs, which the company feels will be especially useful in chassis applications.

What are the chances of the ultimate nightmare coming true—that the Japanese or Koreans, for example, will take over the U.S. auto electronics market as they did consumer electronics?

"A lot has been written about that," says AVX's Bartlett, whose own company was recently bought by Kyocera of Japan. "But remember, many Japanese companies are already strong in this country, so we're already competing with them successfully. There's no reason for that to change if we keep our wits about us, and don't just surrender the market to them like we did in consumer electronics."

Bartlett does worry about the short-term mentality prevalent among U.S. suppliers. "It may seem as though we just naturally play by 'good-guy' rules, with everyone welcome to compete," he says. "In fact, we like competition because it provides lower prices. And American manufacturers will buy from anyone if they can get a better price. That could cost us in the long run."

One disappointment to U.S. suppliers has been the lack of activity resulting from foreign cannkers establishing manufacturing and assembly plants in the U.S. "The Japanese tend to bring their own infrastructure with them when they establish plants in this country," says Bartlett. "Also, they are far more loyal to their suppliers. They don’t tend to jump from one supplier to another, as American car manufacturers do, just to get a better price."

Bartlett feels that this reliance on an existing infrastructure is one way the Japanese skirt U.S. domestic-content laws. As for the chances of an American manufacturer breaking into this infrastructure in a big way, Bartlett says, "I just don't see a tidal wave of opportunity for U.S. manufacturers from the likes of Toyota and Honda."

But Bartlett doesn't write off completely the potential for exports to Japan and Europe. He believes the greatest opportunities lie in subsystems rather than components. "There's a lot more electronic content in our cars, particularly in engine controls and driver comfort and safety systems, and these systems are much more highly developed than those in, say, European cars," he says.

"Supplying subsystems to the overseas market is where the most promising opportunities lie. If the subsystems are developed there, they will use their own domestic suppliers."

At first glance, Eastern Europe would not seem to be a promising market for sophisticated automotive electronics. But that isn't the case, says Arie Brish, director of marketing for Motorola Inc.'s Advanced Microcontroller Division. "Many Eastern European countries import cars, and buyers are demanding the same kinds of embellishments as their Western European neighbors. It won't be long before what is considered a luxury today will be seen as a necessity," Brish believes that this trend will broaden to include Eastern European car manufacturers as their countries' standard of living improves.

Some believe the American companies' greatest potential lies in their unmatched software expertise: "Digital signal processing, for one, is a very software-intensive technology," says Matt Robinson, product line director for mobile communications for the DSP Group. "This favors a country like the U.S., which leads the world in software development, and is why this country is the acknowledged leader in digital signal processing. The Japanese have a shortage of software engineers that is likely to extend into the next decade."
GREEN IS GOOD FOR BUSINESS

SURPRISE! ENVIRONMENTALISM CAN PAY OFF IN BETTER MANUFACTURING, MORE EFFICIENT PROCESSES, AND SAVINGS

In the 1970s and early 1980s, the electronics industry suddenly found itself, along with the rest of American manufacturers, confronting a new and expensive wrinkle interfering with business as usual: the environmental movement. The mood was adversarial as wrathful activists and "not in my backyard" citizens' groups began questioning the impact large companies were having on the environment, and increasingly stringent government regulations demanded the control of air and water emissions—often at great cost.

Just a decade later, the face of industry environmentalism has radically changed. Across the board, virtually all the large electronics producers and many of the smaller ones have begun to go green. Companies have integrated environmentalism into their corporate cultures, forged environmental policies and practices, appointed "green managers" who oversee environmental initiatives and rank at the highest tier of the corporate hierarchy. No longer lurching from crisis to cleanup, the companies in the forefront of the movement have reaped substantial—and often unexpected—gains from their efforts, among them big cost savings and improved manufacturing processes. They have found that what's good for the environment can be good for business, too.

Intel Corp. is saving what it conservatively estimates to be $1 million a year by radically reducing its hazardous waste. Instead of carting the end products of the manufacturing cycle to increasingly scarce (and pricey) toxic-waste disposal sites, the Santa Clara, Calif., chip maker recycles much of the material that would otherwise be dumped—and retools processes so they don't generate waste in the first place. That means savings on chemical purchases as well as on disposal.

*Recycling and reuse of parts and metals saves one division of Hewlett-Packard Co. $17 million a year. Each month, the Support Materials Organization in Roseville, Calif., and Grenoble, France, refurbishes or recycles some 500,000 pounds of excess, scrap, and obsolete products returned by customers, creating fresh raw materials instead of solid waste.

Tektronix Inc. is saving 30% per square foot in its metal-painting operation since switching to an environmentally safer low-solvent paint. The paint itself is more expensive but the Beaverton, Ore., company's new system uses 40% less of it, which means less hazardous waste generated and less money spent on disposal.

*And 3M Co., which is singled out by environmentalists and the business community alike for its longstanding embrace of environmentally friendly manufacturing (see p. 46), has saved $537 million since instituting its groundbreaking Pollution Prevention Pays program in 1975. That's a lowball figure, taking into account only first-year savings from any new process implemented. The sum would be much higher if computed over product lifetime.

"It really does turn out to be a practice of corporate improvement," says Art Kleiner, a journalist who follows corporate environmentalism for Garbage magazine. "That very definitely came as a surprise, just as quality came as a surprise" to U.S. business, he says. "People used to engineer to a spec; now they engineer for continual improvement. And that's a perfect kind of way to apply environmentalism," as well as quality, to an operation.

However, despite the many success stories, a host of questions remains for managers who are striving to make their businesses environmentally responsible. For starters, just how green is green? There is little consensus at the managerial level. Some companies are satisfied to simply meet federal, state, and local regulations, which grow tougher every day. Others try to second-guess the regulators, cutting back today on the chemicals most likely to be limited or banned in the future. Some are folding environmentalism into their quality programs, aiming for "zero emissions" in the same way that they strive for "zero defects."

Today's approach to green issues has its roots in the failures and limitations of the 1970s, says Mark Haveman, a staffer at the National Wildlife Federation's Corporate Conservation Council in Washington. After installing all man-
Haveman says, companies soon found that these "command and control" solutions were self-limiting. They made a dent in pollutants released, but to get further improvements would mean spending outlandish sums on bigger and better scrubbers, wastewater treatment facilities, and other trapping devices. Benefits realized per dollar spent took a nosedive after the initial, first-level installations.

So companies were "forced to look at more creative ways to reduce toxics or use resources more effectively," Haveman says. "Black boxes as 'fixits' are getting more and more difficult to come by." The solution, for many, was the equivalent of a thorough spring cleaning: a "cradle-to-grave assessment," Haveman says, of manufacturing processes, materials used, and even seemingly trivial matters as packaging and recycling in an effort not to control pollution after it's created but to prevent it from being created in the first place. The new approach is called "pollution prevention" to distinguish it from the old-style "pollution control."

"Large companies in particular are embracing the pollution prevention concept," says Gordon Rands, who co-taught the National Wildlife Federation's pilot, MBA-level business-and-the-environment course last year at the University of Minnesota. "They have found from experience—for example, 3M—that they can reformulate, or trap and recycle, or modify a process so that a certain chemical isn't necessary...so that waste that needs to be disposed of simply isn't generated." However, says Rands, while "pollution prevention has picked up a lot of steam in the past two or three years, it hasn't yet become the paradigm" for large portions of U.S. industry. Many companies, he says, are still scrambling for after-the-fact cleanups.

But the cost of that approach is skyrocketing, as any company implicated in a Superfund site or a major groundwater cleanup can attest. Simply being listed as liable in a Superfund cleanup costs a company $500,000, says Gary Burke, president of the Santa Clara County Manufacturing Group (SCCMG). Intel's green manager, Terry McManus, says the cleanup itself averages $30 million. And mopping up 60 Silicon Valley groundwater cleanup sites has cost the companies involved $300 million since 1982, says Burke.

A less extreme example, but one that is being addressed by virtually every company in the electronics industry, is disposal of everyday toxic waste—the chemicals and other substances used to manufacture semiconductors, printed-circuit boards, and other products. Back in 1985, when Intel began an aggressive program to cut back on its hazardous waste, it cost about $200 to manage a ton of such material, says McManus, who is corporate manager of environment, health, and safety and is based in Chandler, Ariz. By 1989, with ever tighter restrictions on where toxic waste could be transported and dumped, the cost had soared to $1,300, he says, and by 1990, it hit $2,000. "For certain solvents," says McManus, "it costs more to dispose of them than to buy them."

Intel is just one of many electronics producers that is cutting back. Apple,
CFCs: A DEFINING MOMENT

Some industry watchers point to the chlorofluorocarbon crisis as the defining moment in the electronics industry's environmental education. The industry mobilized swiftly when, in 1987, the world's governments set an international deadline of 2000 for eliminating this ozone-depleting class of chemical. "It helped turn the big ship," says Dan Bartosh, the green manager at Texas Instruments Inc. in Dallas. "It galvanized the industry.

Through seminars, workshops, the Industry Cooperative for Ozone Layer Protection, even a computer bulletin board called "Ozone Net," companies have freely shared methods of coping with the need to suddenly replace CFCs, which are used for cleaning and other tasks in a wide range of electronics production. The result: a drop in CFC use and near deadlines for their ban.

By 1995, in advance of international deadlines, most electronics firms will have banned CFC use. AT&T, HP, IBM, Motorola, and Texas Instruments are among others that have made significant reductions in the past few years—but not so dramatic as Intel's 80% drop. Of the remaining 20%, says McManus, "most goes to recycling," leaving just a fraction to be sent to a landfill.

To get such sharp cutbacks requires a constant rethinking of manufacturing processes in which green issues are factored into the equation alongside the traditional cost, yield, and throughput considerations. "We see environmental issues, health, and safety—all three—as part of our overall quality picture," McManus says. "An employee accident or injury, or an emission to the environment, is a defect in the system.

Some companies resist tinkering with their manufacturing processes—if it ain't broke, don't fix it. But for others, environmentalism offers a new handle on manufacturing efficiencies, just as quality did a decade ago. One small example: 3M's Electronic Products Division in Columbia, Mo., installed a decenter system to distill wastewater and recycle solvents used in one process. The system cost $4,000 but saved $3,100 the first year on solvent purchases and kept sewer discharges within limits, averting a substantial expenditure for a wastewater treatment facility.

"Any company that's going to compete in high technology is looking at input into the process as well as the output," says Burke of the SCCMG, an industry organization that numbers among its 110 members most of the Silicon Valley electronics concerns. "The concept is embraced by every company out here. It's an ongoing product-cost-engineering process.

But it's a process that gets increasingly complex as more and more substances come under environmental scrutiny. "We are really at a dead run all the time" to meet current and emerging goals, says Dan Bartosh, manager of environment, health, safety, and energy at Texas Instruments Inc. in Dallas. For example, the Federal Environmental Protection Agency recently asked 600 U.S. companies—including some of the biggest electronics producers—to voluntarily cut emissions of 17 toxic substances including such metals as nickel, cadmium, mercury, and lead. The goal is a 33% cutback by 1992 and a 50% drop by 1995.

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companies must track and report. The EPA compiles the data in its Toxics Release Inventory, and environmentalists say the very act of reporting is a powerful tool for getting cutbacks. “Companies are more conscious of their use of chemicals because of it,” says Burke. Burke’s group publishes its own compilation of releases by members, and this year found that discharges of the 37 chemicals measured (including CFCs; see p. 44) declined 74% since 1987.

Besides consciousness-raising, the Toxics Release Inventory affects businesses in other ways. Activist groups analyze the EPA data and publicize the results, listing which companies are the biggest polluters. Large investors—such as those running pension funds—are starting to use such data in considering whether to put their money into a company’s stock, says Intel’s McManus.

The new EPA initiative is a large hint that metals are fast joining chemicals in the regulatory parade. “I think the metals problem is going to be a real stickler for the electronics industry,” says Terry Foeke, president of the Waste Reduction Institute, a nonprofit Minneapolis group that works with companies on toxic-waste problems. Organic solvents and metals, he says, are found “across all waste streams. So you just won’t be able to dispose of some of this stuff.” In some places, says Foeke, “local limits on metals and organics in the water-waste stream are incredibly tight. And they’re about to take a nosedive” across the board.

Indeed, the industry can see the writing on the wall, says TI’s Bartosh. At one point, he says, TI was planning to make a device with a mercury switch. Even though safeguards had been incorporated to deal with the mercury, which showed up on the EPA’s new hit list, Bartosh says the firm redid the design using steel balls instead. With environmental concerns now firmly entrenched in product planning, says Bartosh, “you go through those kinds of scenarios constantly.”

Beyond metals regulation, Foeke sees the environmental impetus shifting from waste and its disposal to how toxics are used upfront. “We’re still pretty concentrated on waste, the back end of the system,” he says. “What’s going to build is use: employee health and safety issues will drive people from whole classes of chemistry.” Another trend, he says, is stricter regulation of smaller companies, some of which now escape the regulatory net. In compiling its Toxics Release Inventory, for example, the EPA requires reporting only by companies releasing at least 10,000 pounds of emissions. Now, says Foeke, Minnesota regulates every outfit “that generates even a molecule of waste—and that’s the direction it’s going [everywhere].”

Small companies are pressured as well by their customers. “Many of the [smaller firms] are suppliers to bigger companies, so it’s almost impossible to not be aware” of green engineering, says Burke. Intel, for example, has environmental guidelines for the production equipment it buys, and convinced SEMI—the equipment-makers’ trade group—to adopt them, says McManus.

All these factors will conspire to make the greenness of American industry a more urgent goal for a wider range of companies—a goal that’s a moving target. “These changes that they’re making [now] are simply process engineering, good common sense,” says Foeke. “Many companies were overdue to look at their processes, and once they did, they found ‘process efficiencies beyond their wildest dreams. But the gut-wrenching changes are still to come.”

For example, he asks, how will companies respond if the new equipment they install for reducing toxics at the source is difficult to operate and thus demands more highly skilled, higher-paid employees? What if a scheme that seemed promising in R&D bombs out in manufacturing? Suppose a customer wants a high-risk process that runs counter to a company’s environmental policy but promises a big short-term profit? “They may decide to go on with the emissions and eat the disposal cost,” Foeke says. “We’re very early in the scheme, and all these things are just starting to ripple out.”

For all of that, Foeke pronounces himself optimistic about the future. “We have finally got the right people out there doing the innovating,” he says. “I’ve really seen a sea change in that way of thinking.”

And the electronics industry is well-positioned for the next green wave, says Intel’s McManus. “We are used to change, and therefore to go in and say ‘we need to do it differently’ is not as big a deal as it is in other industries that are locked into World War II technology. The industry is more adaptable—it’s what we’re used to doing in the marketplace.”
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COMING IN 1993: EUROPE’S COMMUNITY PATENT

JUST ONE APPLICATION OPENS THE WAY TO A PATENT THAT’S VALID THROUGHOUT THE SINGLE MARKET

BY JOHN GOSCH

When the Single Market becomes a reality on Jan. 1, 1993, Western Europe will be a region that statesmen, financiers, business executives, and engineering managers have long yearned for: a deregulated market with no trade barriers among countries, a continent with common industry standards and where people, goods, and capital move freely across national borders. Such a Europe is now in the making, at least for the 12 countries that form the European Community. It will also bring something new in the field of patents.

The Community Patent, slated for introduction also on Jan. 1, 1993, will complement the existing European Patent, which has been around for the past 13 years. The Community Patent will be issued on the basis of a single application and unified grant procedure, yet it protects an invention or intellectual property in the 15 countries that are members of the European Patent Organization (EPO). It will be valid in EC countries and a few non-EC nations that are members of the organization and have ratified the Community Patent Convention.

U.S. companies intent on doing business in the single-market Europe are likely to benefit from the Community Patent. Perhaps its prime advantage is in providing a solid basis for business decisions on investments and licensing. In addition, there’s the lower cost stemming from a single application, a special boon to small and medium-size firms with limited resources. For them, the Community Patent is a relatively inexpensive tool for gaining access to the potentially lucrative European market.

With the advent of the Community Patent, U.S. and other non-European companies and inventors will have four options for getting their inventions patented outside their home market. First, they can apply for a national patent in any European country in which they want to do business. Second, companies can seek an international patent in any of the 49 countries (including European ones) that are members of the Patent Cooperation Treaty, which comes under the auspices of the Geneva-based World Intellectual Property Organization. Third, they can apply for the European Patent and, lastly, go after the new Community Patent.

The major difference between the European and the Community Patents is that the latter will be a truly supranational industrial property right, conferring uniform protection in all member countries and transferrable or revocable only unitarily. The European Patent, on the other hand, is effectively a national patent in each country for which it is granted, and the protection it confers is limited to that country’s territory.

The sole body to process applications and grant Community Patents will be the EPO in Munich, Germany, with its branch in The Hague, the Netherlands, and suboffices in Berlin and Vienna (see p. 50). This means that applicants will be dealing with a single authority instead of a number of national patent offices.

Understandably, one of the prime proponents of the Community Patent is Europe’s industry. Why? It offers companies and inventors three basic advantages: simplicity, economy, and legal safety. “It’s simple, because a single application in just one language opens the way to a patent that’s valid virtually throughout West Europe,” says Rainer Osterwalder, spokesman for the EPO in Munich. As for economy, getting a
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Community Patent granted will cost less than seeking patent protection in, say, three countries separately.

Legal safety enters the mix because the new patent is granted only after an extensive search of a database that now contains information on some 26 million documents. (Some countries issue national patents after a cursory search, and very often it turns out that these patents do not suit markets other than their home market.)

The Community Patent and the EPO will also generate what Osterwalder calls a "fallout benefit." The unitary patent information policy, as well as the EPO's enormous resources in data processing, will not only speed up patent searches but also help reduce the industry's duplication of development efforts. According to EC sources in Brussels, reinventions cost the continent's industry between $18 billion and $24 billion a year. "That waste of money and engineering resources must be cut," Osterwalder declares.

Europe's patent organization is structured very much like many democratic, three-branch governments in the West. The legislative branch is the Administrative Council in Munich—it approves the budget and amends rules and regulations relating to patent fees. Constituting the executive branch is the EPO as it examines applications and grants the patents. Still to come is the judicial branch, a central European court—the Community Patents Appeals Court, or Copac—which will decide litigation on infringements and validity of Community Patents and ensure that the provisions of the European patent conventions are uniformly applied. Copac will most likely be located in Luxembourg.

Patent experts at European companies are very much in favor of the Community Patent. "With the granting of patents, checking for their validity, and the legal processes involved all being in one hand makes it much easier for a company," says Hermann Reichel, an executive in the patents department of Intermetall GmbH in Freiburg, Germany. Indeed, "it will considerably simplify the administrative tasks involved and all but do away with the need for patent lawyers," says Hans Goldrian of Siemens AG's patent department in Munich. Goldrian also points to the advantages of having a single appeals court.

Some in the industry have mixed

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**THE EPO POWERHOUSE**

Founded in 1977, the European Patent Office now employs about 3,700 people, roughly 1,700 at its Munich headquarters, 1,700 at its branch in The Hague, the Netherlands, and the remainder at the Berlin and Vienna suboffices. Half of the employees are patent examiners, all with an academic background and most with advanced degrees in the natural sciences. They are supported by 80 lawyers. And starting in January 1993, when Europe's new Community Patent takes effect, this organization will be command central for the European Community's patent activity.

Not surprisingly, the EPO goes all should be filed—are English, French, and German.

Headed by the Swiss-born lawyer Paul Braendli, the EPO is an autonomous body, financing itself exclusively from income generated by procedural and patent-renewal fees. When it was founded, the EPO expected the number of patent applications to peak at an annual 30,000 within a few years and then level off, says spokesman Rainer Osterwalder. But in 1990, the agency's 13th year, the number exceeded 62,000. Since 1982, applications rose between 12% and 15% a year, and Osterwalder thinks the number will hit 100,000 by 2000.

**This office building in Munich, Germany, houses the European Patent Organization, which will administer the Community Patent.**

Globally, about 80% of all inventions are registered at the world's three major patent offices—the U.S. Patents and Trademarks Office, the Japanese Patent Office, and the EPO. In 1983, these agencies embarked on an active program of cooperation that now encompasses 18 projects.

Among them are automating patent search and paperwork, and establishing and exploiting computer data bases containing the core of the world's technical information. One important cooperative goal is a uniform application and patent grant procedure. So far, agreement has already been reached on what information and codes the first page of an application form should contain, according to Osterwalder.—J.G.
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MORE CHOICES, MORE ANSWERS for data acquisition and instrument control
feelings about the Community Patent, however. "Conceptually, we welcome the idea of having a single patent covering all of the Common Market and granting uniformly defined rights to applicants," says Knud Schulte, European patent counsel at Hewlett-Packard Co. in Böblingen, Germany. "We also appreciate the establishment of Copac, the common appeals courts."

However, Schulte points out that "obtaining patent protection in all countries rather than a few of them under the older European Patent Convention would not justify the filing of a high number of translations, nor the payment of excessive annual patent renewal fees to each country."

The issue of translating a patent into another language spoken in the EC is a political one; each country is eager to have patents published in its own language. The EPO is working to resolve this problem. It is also working on fees, which have yet to be determined. The agency wants to come up with a formula that takes into account the size of various countries and other factors. As regards patent protection in all countries, if a company objects to it, the older European Patent Convention gives protection only in countries the company chooses.

For its part, the EPO thinks that U.S. firms will take to the Community Patent, and bases its optimism on the experience it has gained with the European Patent. The rate of increase of applications by U.S. firms is much higher than it is for European companies, an EPO official says. He sees no reason why it should be different with the Community Patent.

The 15 member states of Europe's patent organization are Austria, Belgium, Denmark, France, Germany, Greece, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Spain, Sweden, Switzerland, and the UK: a market of 350 million. It now takes 44 months to get a European Patent, but "with the Community Patent we hope the process will take substantially less," Osterwalder says. But even the new process can't compare with the speed of patent practice in the U.S., where it takes 18 to 24 months, the EPO says.

The 15 EPO MEMBERS

Austria, Belgium, Denmark, France, Germany, Greece, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Spain, Sweden, Switzerland, and the UK: a market of 350 million.

THE 15 EPO MEMBERS

Austria, Belgium, Denmark, France, Germany, Greece, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Spain, Sweden, Switzerland, and the UK: a market of 350 million.

If the number of applications filed by the country of origin is any yardstick for measuring technological prowess, then Western Europe does not stack up too well compared with the U.S. and Japan. Of the 62,778 patent applications that the EPO received last year, 17,152 came from the U.S. and 12,407 from Japan. These two countries' total of 29,559 applications came close to the number of applications—30,627—filed by EPO countries in Western Europe (whose population is bigger than that of the U.S. and about three times that of Japan).

Taking a look at Europe, the three major applicant countries last year were Germany, with 12,605 filings; France, with 4,909; and the UK, with 3,722.

The idea of a common European patent has been a long time coming. Plans date to 1949, when a proposal for establishing a European patent office was submitted to the Council of Europe. Years of meetings and conventions produced no concrete results until December 1975, when the EC, then numbering nine countries, agreed on a common patent. But political differences and certain flaws in the agreement prevented the accord from becoming effective. Renewed efforts at a conference in Luxembourg in December 1985 achieved only partial success. The final details weren't hammered out until December 1989.

For the Eurocrats, the Community Patent marks another step toward the Single Market. As industry observers see it, the new patent should help create a truly European technological community while establishing a better basis for exploiting and enforcing patents in Europe.
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When the subject of enhancing U.S. high-tech competitiveness arises in Washington, the debate tends to be misfocused. The talk usually centers around the pros and cons of an "industrial policy"—whether government should favor one particular industry over another. What we should be focusing on is what industry itself emphasizes over and over: reducing the cost of capital. To make capital more affordable, we must eliminate our huge federal budget deficit and cut the capital gains tax.

Government funding for basic research in high-tech fields can improve the state of U.S. competitiveness. But the amount of money the federal government can devote to R&D is relatively small; to add a few government dollars to the pool of available resources is only to dance around the periphery of our competitiveness problem.

The bill currently in the forefront of congressional debate authorizes $1 billion over three years to promote research and commercialization of new technologies. Compare that $1 billion to the tens of billions of dollars of new investment a capital-gains tax reduction would stimulate—or to the $600 billion of investment capital swallowed up by our federal budget deficit over the past three years. Granted, a portion of that $600 billion has been reinvested productively, but not as productively as it would have been had it been left for private capital markets. The money the government took by borrowing would have been used much more wisely and efficiently by the private sector.

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CIRCLE 128
GOOD NEWS FOR MANUFACTURERS, BUT WHERE ARE BUYERS?

There's some good news—but there's also some that's not so good. Good: industry is beginning to benefit from lower capital costs and better access to equity markets. Combined with the dramatic productivity enhancements and renewed competitive strengths garnered over the past decade, U.S. industrial might is once again on the upswing. Not so good: the missing ingredient is end demand. Good: September saw a continual modest improvement in new orders. Not so good: computers and office equipment are a glaring exception, with orders plunging to make the month the worst since the 1985 electronics recession.

But automotive orders are gaining momentum, helping to fuel a recovery in overall durable demand. Most automotive suppliers experienced very strong order momentum through mid-November. However, production significantly exceeds selling rates: unless there is a major pick-up in auto sales by January, production will likely drop significantly.

Order trends in other areas improved considerably in September. Component companies gained normally during September to November, but inventories are tight. Also, weakness in Europe and Japan is essentially offsetting the modest domestic gains. In computers, inventory productivity continued to improve despite depressed orders.

Concern in Washington in an election year could lead to some consumption incentives by early 1992. The dollar has weakened in recent months after strengthening sharply during the war. However, the trade-weighted dollar still remains well above year-earlier levels, which could mean increasingly lower exchange rates through the first quarter of 1992. Finally, the lowest interest rates in more than a decade appear to be forcing investors back into the stock market for the first time since 1987.

By Mark Parr, McDonald Securities Inc., Cleveland (216-443-2379)
Taxes will be cut, but just how?

The most likely political/economic forecast for 1992 calls for higher spending and lower taxes," I concluded last July. Since then, the economy has weakened even further, shortening the odds on a tax cut as each month ticked past. By now, it's a foregone conclusion. Of course, that doesn't answer the question of what kind would be best for the economy, and there are two issues involved here.

The first is that the combination of federal, state, and local tax increases in 1991 amounted to $30 billion pulled out of consumers' pocketbooks. Raising taxes during a recession is one of the world's dumbest ideas. In fact, the last time it was tried was 1932, when the results weren't so hot either. The second is the anemic rate of productivity growth in this economy—down to 1% per year. The cause is not that mysterious: the ratio of GNP devoted to saving and investment is the lowest of any major country.

That is why a tax cut to spur savings, such as expanding IRAs, makes some sense. However, it is not the best choice. Since most of the investing in plant equipment is done by businesses, it follows that if the aim is to stimulate investment and productivity, tax incentives ought to be restored for capital formation, such as the time-tested investment tax credit and accelerated depreciation.

However, there has not been a murmur of interest on Capitol Hill in this direction. So although the short-term issue of reversing the tax mugging that took place this year is being correctly addressed, the longer-term issue of stimulating productivity growth is not. But half a loaf is better than none at all, and at least Bush isn't talking about raising taxes in an election year.

As far as the type of individual tax cut that is being promoted, some voices have been raised indicating that a cut in marginal rates would have a more positive long-run effect on the economy than a tax credit. From an economic viewpoint, it is difficult to argue with that. On the other hand, any such bill would end up in a political swamp, releasing all of the pent-up hatred for the Reagan Administration's tax cut from the liberal side of the aisle.

Considering that the economic situation these days is relatively serious, the main aim ought to be to get the money back into consumer pockets as soon as possible instead of arguing all year about whether the "rich" benefit disproportionately.

Will the tax cut do what it is supposed to do, namely pull the economy out of recession? Absolutely. Tax cuts always work in the short run. Most middle-class consumers are up against the wall; their wages are not keeping pace with inflation, many of them have lost high-paying jobs and have had to take more menial employment, and virtually everyone faces higher taxes. So almost all of the tax cut will be spent, and the stimulus will have an unusually large multiplier effect. The side effect of this will be to increase the deficit somewhat, but that's too bad.

This might be construed as a rather cavalier attitude to take about the deficit, which was expected to be $362 billion in fiscal year 1992 even before the tax cuts were proposed. The tax proposal has already caused long-term interest rates to back up slightly, although that may be because bond markets realize the tax cut will signal the end of the recession and the related concern over a bigger deficit. This isn't a perfect world; if it were, the deficit would be balanced in nonrecession years. But the damage caused by a tax cut in 1992 will be far less than leaving consumers dangling and prolonging the recession indefinitely.

As tax-cut bills move toward passage, the Bush Administration will try to tack on a modified capital gains tax cut. I favor such a move, but the most important thing now is to rescind the ill-advised series of tax increases and get the economy back on its feet again.

Michael K. Evans is the president of Evans Economic Inc. and Evans Investment Advisors in Washington.
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