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Olivetti

Global Bridges on a Standard Foundation

By Michael D. Millikin

COMPANIES HAVE personalities. In some cases, particularly when the company grows from an entrepreneurial start-up, it retains the distinctive imprint of its founders. (Digital Equipment and Sun Microsystems are good cases in point.) But other factors affect the corporate persona as well: a forceful leader or a national culture.

Olivetti, Europe's second-leading supplier of personal computers, has both. Guided by Carlo De Benedetti (who definitely is a mover), Olivetti is *(continued on page 3)*

• E D I T O R I A L •

Having It Both Ways

By Judith S. Hurwitz

IT IS THE best of times and the worst of times for the standards movement. On one hand, there has never been more momentum in favor of standards. Key vendors, ranging from top dogs IBM, Digital, and Hewlett-Packard to the mid-tier companies, such as Prime, Wang, and Data General, are betting their future success on Unix and a myriad of standards. On the other hand, there are troubles—AT&T's and Sun's control over Unix has been challenged. The euphoria over one unified version of Unix across all platforms has been subdued.

AT&T and Sun took a chance. The two business partners decided that since they had legal control over the operating system, they were in the position to control both the technical future as well as the financial future of this increasingly popular operating system. At the same time, they saw the opportunity to make Unix their strategic edge over competitors. But AT&T and Sun miscalculated. You can't have it both ways. You cannot have control over an operating system and have it afford you a competitive edge while, at the same time, have it considered an open standard. The world simply doesn't work that way. Therefore, no one should be surprised that the Open Systems Foundation (OSF) formed. Given the climate of the times, it was inevitable.

What will AT&T do now that its gamble has failed? It appears that it will try a new tack and spin off its Unix into a separate company. Of late, AT&T officials have been holding meetings with key value-added resellers (VARs) to see how they would react to such a proposal. Though we don't know the details of how the new company might operate, we are still not convinced that it would make too much difference at this point. If, for example, the new spin-off were to be a wholly-owned subsidiary of AT&T, there would be no immediate benefit to customers or developers. The same issues of control, licensing, and development would still persist. Of course, if AT&T were to divorce itself completely from Unix and let the Unix company have a life and control of its own, it might be a different story—one that would still be complicated by OSF.

It is interesting to speculate what might have happened if AT&T had decided to spin off Unix six months ago. If that scenario had emerged, it is likely that OSF would never have formed.

And what of Sun Microsystems? Sun has long prided itself as the champion of standards. Its revolutionary gesture of placing Network File System (NFS) in the public domain changed the standards movement forever. Sun clearly has superb technical know-how. AT&T made a good choice in a partner to help it move to the next generation of computer technology. If AT&T loses control of Unix and loses prominence in the standards arena, Sun is put in an awkward position. On one hand, it is partially owned by AT&T. On the other hand, its heart and soul is with the standards movement. Sun has some tough decisions to make as it struggles to come to terms with its obligations and its desires. Its next actions will be very telling. Did this emerging giant flex its muscles in the wrong direction? If so, what are its options? What choices will Sun be forced to make if its benefactor loses its position in the marketplace? Ironically, had AT&T chosen a different partner (perhaps Apollo?), Sun's position in the standards movement might have been very different. Perhaps Sun, not Apollo, would have been a founding member of OSF, out in front and leading the charge up the hill.

Indeed, we are at the crossroads of the Unix and standards movement. Over the next two years, many issues will be resolved, and alliances will be made and broken. Commercial users will slowly and cautiously begin to move towards Unix. More and more vendors will make Unix a key part of their strategies. OSF will begin to unveil its first specifications and concrete plans. At the same time, we will discover how AT&T intends to fight off its challengers. It is the best of times and the worst of times. ◐

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•OLIVETTI•

(continued from page 1) emerging from the refining fire of a market slump with a new strategy and a new product line. Olivetti, a well-established vendor that produced the first Italian mainframe back in the 1950s, is gaining entrepreneurial verve.

De Benedetti sees himself (as do many others) as an entrepreneurial leader, a sophisticated, global man of business. When De Benedetti introduced the LSX computers and then launched into a discussion on the strategy of the "new" Olivetti, he began with a quote from Etienne Bonnot de Condillac (Abbé de Condillac, an eighteenth-century French philosopher) explaining the nature of a system.

And, of course, Olivetti is quintessentially Italian. National stereotyping of computer companies (although it might seem a bit odd to readers in the United States) is a time-honored pastime in Europe. So, as an Italian computer company, Olivetti speaks of alliances in terms used for sex and romance, positions itself with flair, and conjures up graceful architectural metaphors to describe its plans.

Olivetti's (and De Benedetti's) plans are ambitious. The "new" Olivetti (using De Benedetti's adjective) plans to become a protagonist and a major player in providing global, integrated, information technology solutions built atop a platform of standards. This is a major strategic shift for Olivetti, and one that will carry it through the next decade.

Quintessentially Italian, Olivetti speaks of alliances in terms used for sex and romance, positions itself with flair, and conjures up graceful architectural metaphors to describe its plans.

Currently, 73 percent of Olivetti's revenues come from Europe; thus, its future thrust will continue to be there. Conventional wisdom deems that the three primary vendors within any given European country are—though not necessarily in order of market share—IBM, the resident national computer vendor, and a third (often Digital, these days). At a minimum, Olivetti would like to be able to become the consistent third member of that triad.

The new metaphor Olivetti has chosen to represent its strategy is that of the Bridge. The Bridge not only spans the equipment of different vendors, but it also links the departments and areas within companies as well as linking one company to another. And, because much of Olivetti's current strategy is built atop a new product line, the Bridge is also Olivetti's promise to its customers to link its past with its future. (Backward compatibility, in other words, for those with more prosaic minds.)

In short, Olivetti is defining an Open Systems Architecture based upon standard hardware (Intel and Motorola) platforms, operating systems (Unix, DOS, OS/2), communications (OSI, SNA), and services (some of Olivetti's added value).

Strategy: Open Systems Architecture

Open Systems Architecture (OSA) is Olivetti's conceptual framework for the creation of technology solutions that meet users' needs and requirements. This reference scheme allows Olivetti to select the technologies, services, and communications procedures best suited to meeting the application needs of a specific user, all the while retaining integration with the rest of the information processing architecture.

OSA, in other words, is designed to be able to meet customer needs in the most economical and efficient way, rather than to try to force the user into adapting to a predefined technological package.

With OSA, Olivetti wants to become the center of the network systems companies building upon the foundation of standards. It intends to become a full-range systems supplier that can exploit its interconnectivity to other standard platforms. ("Back to the future," as expressed by Elserino Piol, executive vice president of strategies and development, referring to Olivetti's growth away from concentration on the PC market.)

OSA has four basic product components at this time:

- A new family of Unix-based minicomputers (LSX 3000)
- A range of PC-based general purpose and specialized workstations and servers
- A choice of LAN/WAN architectures
- The appropriate software for the application requirement and a good set of programmers' tools

Wrapped around all this is the layer of service Olivetti intends to provide to its customers. Olivetti's service organization is one of the largest in the industry (more than 20,000 strong), and it is the largest in the European information technology market. Oliservice, as the organization is named, coordinates all the users' support services, such as standard and customized software, training and consulting, technical maintenance and system support, hot line assistance, add-on modules, supplies, auxiliary products, peripherals, and documentation.

So OSA is as much about marketing as it is about interconnect. OSA is not as complete nor as complex a set of specifications as is IBM's System Application Architecture (SAA—another scheme designed to provide transparent interconnection

and interoperability among a variety of hardware and software platforms). But it does provide the guidelines and a set of common structures to enable the creation of appropriate, interconnected systems at three levels of a company (or the integration into an existing, standards-based architecture).

Olivetti isn't just selling the technology. It is selling solutions (although this certainly is not a concept unique to Olivetti) and, above all, a framework that makes the "creation" part of providing a customer solution easier and faster.

The "Open" in OSA comes from Olivetti's adherence to standards. Its ideal is to be able to plug into existing information systems, even those that incorporate equipment from other vendors. And Olivetti adds its own value—in extensions to Unix, for example.

In many ways, Olivetti's OSA approach can serve as a model for vendors who are questioning whether or not they can establish competitive distinction in a marketplace built on standards. Olivetti is very clear in its understanding that such standards-based solutions are indeed the only way to thrive in the evolving market.

The theory is attractive—one that could almost be a textbook model for marketing in a standards-oriented world. How well it succeeds will, of course, depend on how close to the promised vision Olivetti's actual products and implementations come.

THE STRATEGY OF STANDARDS. Its approach to standards is a strategy Olivetti shares with a number of vendors, including, of course, AT&T and Sun.

Second-tier companies can come together under the banner of Unix to offer a desktop-to-data center solution equivalent in function to that of either IBM or Digital (and one that certainly transcends the potential power of DOS-OS/2) with the added fillips of better price/performance and smooth integration into a multivendor environment.

Yet, in conjunction with such a move, any vendor, Olivetti included, must address two critical issues:

- How to support the installed proprietary base of machines and users
- How to integrate a variety of standard workstation and server platforms into the network architecture

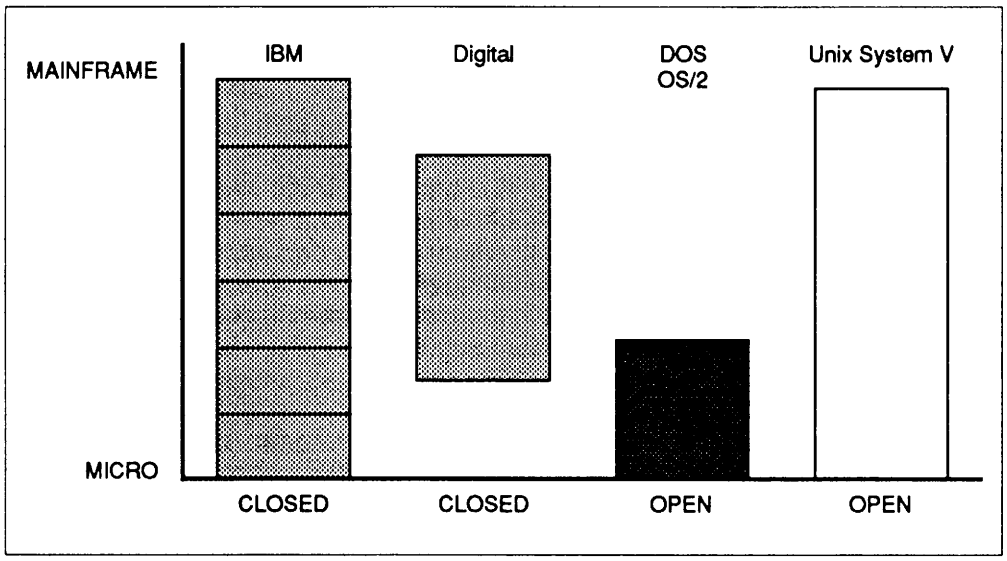
Olivetti must migrate an established base of 100,000 users over to Unix from its proprietary Multifunctional Operating System (MOS). This migration is one of the primary missions of the new LSX machines; they support both MOS and Unix.

Such a solution offers protection of an existing investment while also opening up the market of standards to the customer. Olivetti can provide a high-performance, standards-based information system to new buyers while still preserving its existing base.

This first issue is of the most immediate concern to the installed base. But Olivetti must provide a satisfactory answer for the second issue as well.

Olivetti hasn't spent much time discussing that problem—i.e., how to provide a distributed network computing environment supporting MOS; Unix and OS/2 servers; and OS/2, DOS, and perhaps Unix workstations (or even Macintoshes).

Yet the issue of migration to Distributed Network Computing (DNC) is of the greater long-term strategic significance. Olivetti has the pieces, but it must make the effort to assemble them in the proper pattern.



The Unix vendors' response to the Digital/IBM axis of functionality. Second-tier vendors banding together under the shield of Unix can, or so Olivetti's (and Sun's and AT&T's) argument goes, offer a comparable scale of functionality at a much better price than the more proprietary competition.

STRATEGIC PHILOSOPHY. Olivetti has a very well thought-out rationale behind its migration to openness and its accompanying entry into the larger minicomputer marketplace.

Fundamentally, Olivetti believes, it is adapting to what it sees as the new realities of the marketplace:

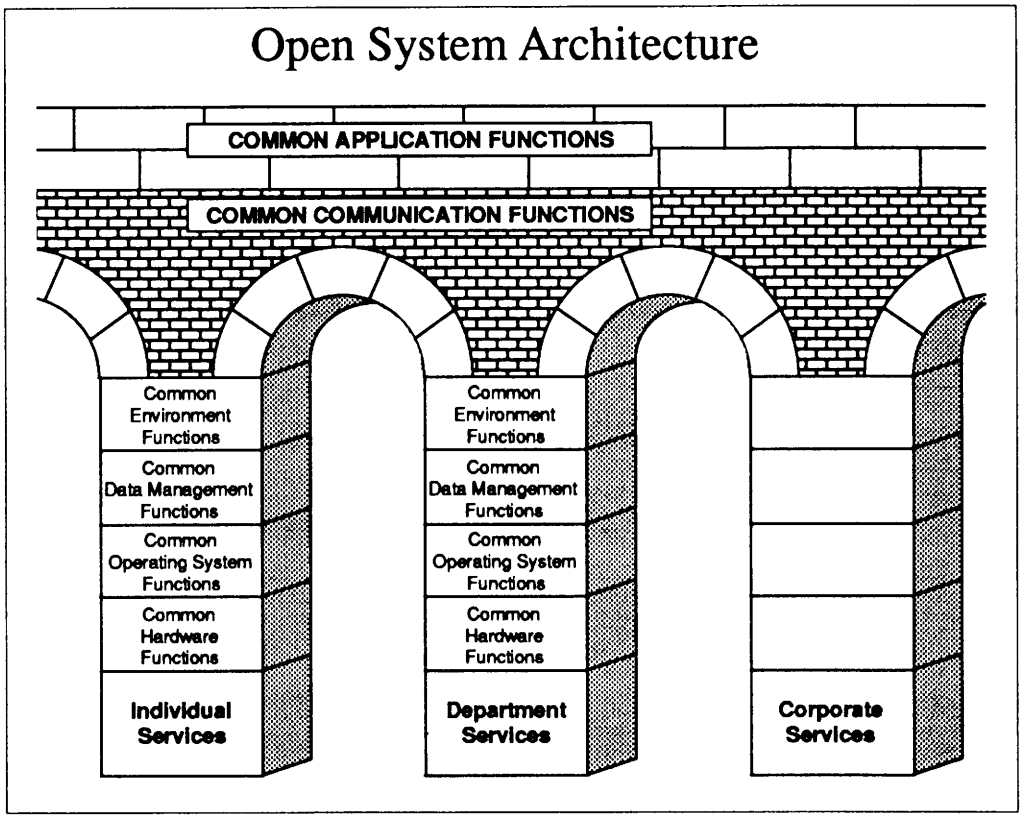
- An overwhelming base of PCs. Some 50 million plus, worldwide, plus an additional one million or so per month—again, worldwide.
- An accelerated rate of innovation in hardware and software, spurred, in part, by the increasing size of the technology base.

- Clamor in the marketplace. With so much technology and so many different approaches, users are swamped.

- The increasing role of standards. "Standards are, today, one of the main driving forces for change. Users are now requiring—even demanding—communications and systems standards with an open approach," notes De Benedetti.

- Organizational change, with the traditional hierarchy being replaced with a peer-to-peer heterarchy.

- An increased need for information circulation and distribution, not just processing. Information must flow from one area of the company to another smoothly and transparently.



Olivetti's OSA is a framework based upon common areas of functionality across different hardware and software environments.

"Managing and informing these decision networks is the most difficult task facing any company today. It is possible only if information circulates freely and efficiently throughout the corporate network, so that decisions and action can be taken in real time," according to De Benedetti.

With these market trends and requirements in mind, Olivetti set out to design a market approach that would respond to the real needs of users—i.e., OSA.

Olivetti is a vocal proponent of the bottom-up approach to information technology. The company sees, however, an increasing need for servers and machines functioning at the departmental level; hence, its creation of the LSX minis.

In short, the philosophy and market objectives of the new Olivetti are to accomplish a major advance from PCs to minicomputers for a new, global, integrated information technology.

OSA Foundations

OSA is built atop four common sets of functions and attributes:

- Common environment functions
- Common data management
- Common operating system functions
- Common hardware functions

For Olivetti, this means that the capabilities of each OSA system will be matched by those of the other members. Some systems may be better suited than another for a particular application, but a common thread of functionality will run through the various clients and servers on the network.

For example, Olivetti's proprietary MOS-based transaction processing solution—MTS—has a Unix-based analog in MTX, file system functions are comparable, and so on.

STRATEGIC RELATIONSHIPS. Olivetti is no newcomer to the market. It has been in the information processing business since the 1950s, and became a force in electronic typewriters and personal computers after that.

In ranking, Olivetti is approximately tenth in the world in information technology (second in Europe), third in PCs (second in Europe), and eighth in minis.

Yet, one characteristic of the standards-based axis of the computer market is the fundamental importance of strategic alliances. Olivetti, in its drive to become a global player in information processing, is going to have to rely heavily upon its partnerships and acquisitions.

THE AT&T RELATIONSHIP. Of the many relationships Olivetti has entered into with other vendors during the last few years, the most well-known—and probably the rockiest currently—is its relationship with AT&T.

Almost five years ago, in December 1983, AT&T agreed to buy up to 25 percent of Olivetti (100 million new shares) for $260

million, with an option to raise its stake to 40 percent beginning this year.

Having secured distribution for its 3B line of minis in Europe, AT&T acquiesced to selling Olivetti PCs in the United States.

AT&T was initially interested in Olivetti as a means of distribution for its 3B minis; much of AT&T's overseas strategy is built on such relationships with other vendors. According to AT&T, the agreement to distribute the Olivetti PCs in the States was spurred more by a desire to accede to De Benedetti's wishes and establish a strong relationship than by any burning desire for the PC. As a result of the deal, AT&T scuttled plans for its own PC.

By the following October (1986), AT&T and Olivetti renewed the alliance until 1996, and AT&T agreed not to raise its stake in Olivetti above 25 percent until October 1990. At this point, the charismatic Vittorio Cassoni, then head of Olivetti's U.S. business, jumped over to AT&T to become head of AT&T's Computer Systems unit.

Any further reduction in PC purchases from AT&T would continue nibbling away at Olivetti's global market share, not to mention exacerbating the tensions between the two companies.

One year later, in October 1987, Cassoni became the president of the Data Systems Group (the renamed Computer Systems unit) and gained control of its own computer sales force—a major breakthrough for AT&T systems marketing. Under Cassoni's leadership, AT&T announced its technology agreement with Sun Microsystems, which includes the plans for a converged Unix, the licensing of the Scalable Processor Architecture (SPARC) chip for future AT&T minis, and the creation of the Binary Programming Interface (BPI) for the upcoming converged Unix across selected platforms.

In November, Olivetti announced its new Linea 2 (L2) line of minicomputers—the LSX family. Olivetti swore continued fealty to the 3B minis, and Cassoni flew over to the London press announcement in a show of solidarity between AT&T and Olivetti.

By January of 1988, AT&T was putting increased emphasis on its new strategic partner, agreeing to buy up to 20 percent of Sun for as much as $350 million by purchasing newly issued shares over three years and the remaining 5 percent stake on the open market.

In February, the companies began negotiating a possible increase in AT&T's holding in Olivetti. Exactly who is requesting what from whom isn't very clear. Listen to De Benedetti, and you hear that he is Horatio, holding off a greedy American AT&T from engulfing doughty Italian Olivetti. Listen to AT&T, and you hear that De Benedetti initiated the negotiations, possibly to finance his battle for the acquisition of Societe Generale de Belgique.

But whatever the genesis of the request, the companies were unable to resolve the issue.

(While the dickering was going on, De Benedetti raised his cash through an agreement to sell his Buitoni S.P.A.'s assets to Switzerland's Nestle S.A. for 1.8 trillion lire, or $1.43 billion. Shareholders of Buitoni's French unit are challenging that sale in French court.)

Late in April 1988, after weeks of negotiation concerning AT&T's raising its stake in Olivetti, Cassoni abruptly announced that he was returning to Olivetti to become managing director, reporting directly to De Benedetti. The announcement came shortly after the sudden death of AT&T chairman Olson, adding to the uncertainty in the industry about AT&T's prospects.

Cassoni's announcement apparently surprised AT&T executives, although Cassoni said that it was clear to all parties that he had always planned to return to Olivetti. It also highlighted the current tension in the relationship between the two companies. Both sides, while saying that the relationship will continue, readily admitted that its structure could change drastically.

Olivetti has been none too happy about AT&T's U.S. distribution of its PCs (although Olivetti currently doesn't have an alternate distribution channel, outside of arrangements with other vendors such as Xerox).

Last year, AT&T sold only a reported 120,000 of the Olivetti PCs in the United States, many from inventory. AT&T's sharp reduction in the number of orders for PCs last year (from 180,000 in 1986 to 40,000 in 1987) pushed Olivetti's profits into a nose dive.

AT&T probably is a bit miffed about Olivetti's corresponding penetration into the European market with the 3Bs and phone equipment. However, if Olivetti would have a hard time finding another PC distributor in the States, AT&T would have a harder time finding a new 3B distributor in Europe.

In May, AT&T turned the tables and surprised Olivetti with a public statement from Robert Allen, the new chairman, stating bluntly that AT&T might stop buying PCs from Olivetti and go to another source. Allen said that AT&T was reexamining the entire PC distribution relationship, and that AT&T also was planning to take direct control of foreign operations. (Allen attributed the possible move to currency exchange rates.)

Any further reduction in PC purchases from AT&T would continue nibbling away at Olivetti's global market share, not to mention exacerbating the tensions between the two companies.

Allen did say that there were no plans to increase or decrease its 22 percent stake in Olivetti, however. And Allen also noted that Olivetti might stop distributing the 3B lines.

Any partnership like the one between AT&T and Olivetti is bound to have highs and lows. Recent events, however, point to increasing stress on the relationship. Given that AT&T now has another partner—and a U.S. partner, to boot—in Sun, it's all the more likely that it will decide to put Olivetti on hold.

And while it looks as if both companies would lose were the relationship to evaporate (Olivetti its U.S. PC distribution,

AT&T an entry point into the European marketplace), in fact, the duo hasn't worked all that well for either.

Thus, it's quite likely that Olivetti will strike out on its own, with the LSX providing mid-range computers and servers, and seek less stressful alliances. Even if they split, the two companies will remain on parallel strategic courses (particularly since the architect of AT&T's current stance with Sun, Cassoni, will be back at Olivetti).

Although Olivetti has done a very commendable job in creating the LSX family, its competitive positioning will not be based on the technology, but on how the technology meets the needs of the user.

DEAL WITH OTHERS. Despite its heritage and its once-heralded connection with AT&T, Olivetti happened upon some rough times recently. Low sales and falling profits marked Olivetti's course through much of 1987. It had an aging product line, and its sales of personal computers, once one of the company's great success stories, were faltering.

But De Benedetti has been continuing to push Olivetti's globalization on all fronts. After acquiring the West German typewriter-maker Triumph Adler, British computer-maker Acorn PLC, and the French computer company Logabax, he launched turnaround programs at all three. Olivetti also has struck a deal with Canon for the joint production of copiers in Europe (acquiring access to Canon's laser printer technology in the deal).

LSX: Foundation for an Olivetti Push

The LSX machines are critical to Olivetti for a number of reasons. First, they mark Olivetti's bid for recovery in the mid-range European market. Second, they allow current owners of proprietary Olivetti solutions to migrate over to the Unix world in a fairly painless manner. Third, and by no means least, the LSX offers a very solid alternative to AT&T's 3B line.

Olivetti's development of its LSX line of minicomputers is an aggressive move. Up to the LSX announcement, Olivetti had been distributing AT&T's 3B minicomputers as well as its own set of lesser Linea 1 minis. With those products, Olivetti managed to capture only a scant segment of the European marketplace for minis. But, with the LSX line, Olivetti has a very attractive alternative to the 3B and is now moving up to box with heavyweights Digital and IBM in the mid-range market.

Olivetti's LSX strategy has AT&T a bit miffed. The LSX and the 3B definitely overlap in performance and function. Olivetti, however, for political reasons, attempts to distinguish between the two based upon unspecified application differences.

So the 3B is definitely (for the moment) part of the OSA product family. Olivetti has budgeted no decrease in 3B sales, but it has definite plans for zooming LSX sales to increase its market share in Europe. (Olivetti will also sell the LSX in Canada, but not in the United States.)

Olivetti has focused its attention on maximizing the value of its chosen technology through its architectural approach for improved price/performance (multiprocessing and the Edge RISC implementations), its protection of user investment through standards (forward and backward with 680X0 instruction set compatibility), migration from MOS, and field upgrades.

In other words, although Olivetti has done a very commendable job in creating the LSX family (to the tune of investing some 500 billion lira in the process), its competitive positioning will be based not on the essence of the technology, but on how the technology meets the needs and concerns of the user (price/performance, compatibility, etc.). As De Benedetti says, "This is not a technical battle; this is a market battle."

The LSX family currently consists of seven different models, ranging from a desktop model to larger standalone configurations and spanning a price range from $17,000 to $500,000.

Where Olivetti's older Linea 1 (L1) minicomputers supported between 4 to 24 workstations on three models (54, 64, 70), the LSX family can handle from 4 to 192 users.

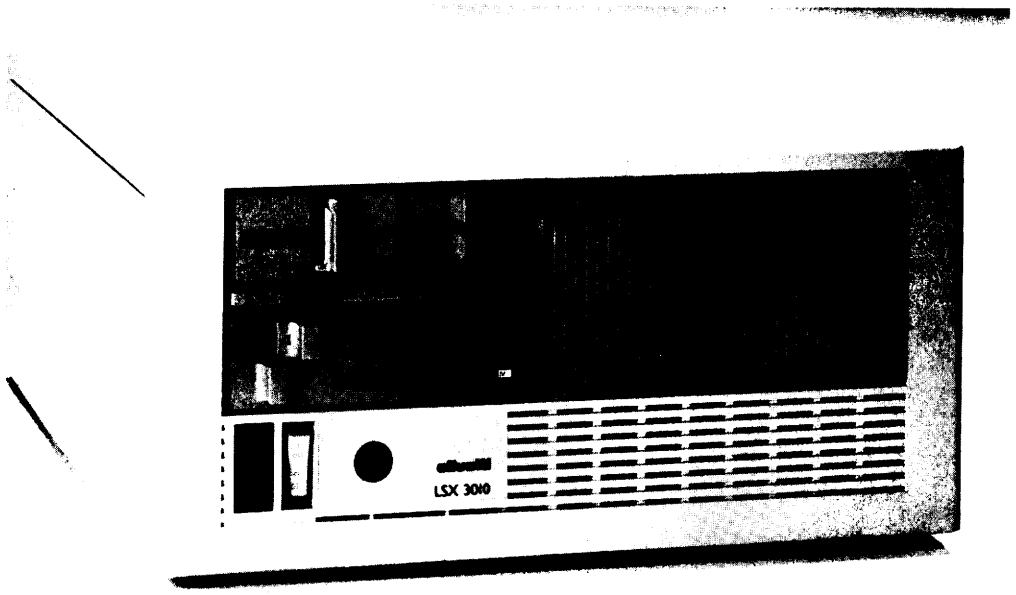
Desktop Machines: The LSX 3005 and 3010

The low end of the LSX family, the 3005, is an MOS machine, not a Unix system. It uses a 16 MHz 68020 with up to 4MB of RAM on the motherboard, and supports up to a total of 14MB RAM. Olivetti specs the system as supporting up to eight users (four, concurrently) and rates the chip's performance at 1.5 MIPS.

The 3005 supports a Motorola 68881 floating point processor, and uses an Olivetti proprietary 16-bit system bus that runs at 10.6 MBps. For storage, it supports either the use of ST506 or ESDI interfaces. ST506 disks range in size from 20 to 60MB with seek times ranging from 85 milliseconds (ms) for the 20MB disk to 30 ms for the 40 and 60MB disks. The ESDI disks, with their faster data transfer rates, come in 70, 140, and 315MB sizes, with 25 ms access times.

The 3005 uses an intelligent LAN controller (68000-based) with 512K RAM for StarLAN and Ethernet connection. It also offers an intelligent WAN controller (using the Intel 80186) with up to 1MB RAM on board, and features a dual channel. One channel offers V.24 communications, while the other is selectable from V.24, X.24, V.35, or V.36.

The LSX 3010 is the X/OS (Unix) counterpart to the 3005. In most of the internal hardware characteristics (processor, memory, bus), it is identical to the 3005. The 3010, however, uses a different hard disk interface, the SCSI ANSI X3 T9.2. Supported disks are 40, 80, and 140MB in size, and have seek



Olivetti squeezed a 68020-based multiuser system into a desktop form factor in the LSX 3010.

times from 30 to 25 ms. Too, the 3010 supports up to eight concurrent users, rather than the four of its MOS counterpart.

Both these systems are packaged compactly in a desktop configuration.

The Multiprocessors: LSX3020-3030-3040

The multiprocessing configurations of the LSX line also use the Motorola 68020 processor. The 3020 uses one CPU, the 3030 uses two, and the 3040 uses three. (Slightly off from the numbering schemata of other vendors, where an XX20 would represent two processors, but so what?)

All these mid-range systems run either the proprietary MOS or the Unix-based X/OS operating systems.

Olivetti rates the 3020 single processor at 2 MIPS. Under MOS, the 3020 supports 12 concurrent users; under X/OS, it supports 24. The 3030 dual processor weighs in at 3.5 MIPS. Under MOS, it supports 24 concurrent users; under X/OS, 40. The three-processor 3040 runs at 5 MIPS, with up to 56 concurrent users under X/OS, 40 under MOS.

As do the desktop versions, the mid-range LSX systems support from 2 to 14MB of memory. Where the desktop configurations use parity bit generation/checking at the byte level, the multiprocessor tower configurations use ECC protected memory array and control logic.

The system bus is quite different on these mid-range members of the family. The bus offers a 32-bit data path and a 28-bit address path with 16 MHz synchronous operation. Data transfer rate on this bus is 16 to 18 Mbps. The I/O bus runs at 4.5 Mbps.

For hard disks, the multiprocessors use the ESDI interface and disks in 40, 140, and 315MB sizes. The systems offer parallel access to several drives and support a data transfer speed of 15 Mbps.

These systems offer the same LAN and WAN controllers as their smaller cousins on the desk.

These uniprocessing and biprocessing models are both field upgradeable: the 3020 to both the 3030 or the 3040, and the 3030 only to the 3040.

The High-End RISC Machines: LSX 3070-3080

At the high end, Olivetti chose to adapt Edge Computer's particular brand of RISC CPU technology. The processors are RISC-based, but they use the Motorola 68010 instruction set for operating system and application compatibility.

Olivetti rates the 3070 at 5 MIPS, with up to 96 users, 80 concurrent. The 3080 (a biprocessor implementation using the 3070 CPU) runs at 9 MIPS, with up to 192 users, 140 concurrent. These systems only run X/OS.

Memory support is more robust in these high-end system, as they support from 8 to 64MB of RAM. The 3070 and 3080 use error-detecting and -correcting (EDAC) code.

These LSX models sport two buses: the engine system bus and the I/O bus. The engine system bus is asynchronous/synchronous with a proprietary dual bus Harward structure (again, an Edge-style implementation). Bus throughput is a zippy 61.5 Mbps.

The I/O bus is Olivetti proprietary and offers throughput towards main memory of 5 to 6 Mbps.

The high-end models support the same hard drives as do the multiprocessing mid-range systems, and support up to eight drives per system.

The 3070 is field upgradeable to the 3080.

Workstations: The New PCs

Olivetti offers basically two types of workstations for the X/OS environment: the WS 685 terminal and the Olivetti PC. The WS 685 is an asynchronous terminal that emulates the VT220 and comes in two versions: one for X/OS and one for MOS.

(Olivetti offers an MOS-specific terminal, the ELB 3684, which is designed for MOS transaction processing environments.)

It's on the PC side that things get a little more interesting. Olivetti, as mentioned above, is the number three producer of PCs in the world. Last September, before the LSX announcements, it rolled out the latest members of its PC family: the

M/280 and the M/380.

The M/280 uses a 12 MHz 80286 supporting up to 7MB of RAM. The M/380 series uses 16 MHz 80386 processors in a variety of configurations: two desktop models (differentiated only by space available for mass storage) and a tower configuration. Also, Olivetti has developed, on its own, enhanced configuration of standard DOS PCs that can operate as terminals for the LSX.

The Personal Computer for Business (PB) is designed especially for the transaction processing environment. Olivetti has layered software modules on top of MS-DOS to provide such application-specific functionality as:

- Multitasking/context switching between application programs. PB will support up to 10 applications.
- Management of disk archives when in transactional mode through the use of the Data Manipulation Language (DML).
- Management of specialized peripherals, such as badge readers.
- Additional security functions.
- Sequential, direct, and keyed file access and database protection through a "Commit" feature.
- A 3270 terminal emulator.
- Programming languages and communications protocols.

Olivetti has committed to supporting OS/2, and that, in turn, will have to affect the future of the PB.

Olivetti has designed the PB to work in a connected environment. Its primary role is that of a workstation where application programs are stored and executed. The PB connects to PB-based DOS servers, MOS-based servers, and X/OS-based servers. Olivetti defines typical PB applications as interactive teller applications, back office applications (terminal emulation, screen display programming, interactive/batch processing, word processing, spreadsheet), and commercial and counseling applications. The latter applications include managerial decision support, or support for specialized or professional personnel requiring a multifunctional workstation.

Olivetti has committed to supporting OS/2, and that, in turn, will have to affect the future of the PB. An OS/2-based workstation with some extra Olivetti Dynamic Link Libraries for customization would be a vastly more functional alternative to the PB. And, in many installations, OS/2 workstations will be performing the applications noted above as applicable for the PB.

In short, the PB is a bit similar to IBM's 3270 PC in that it was designed to operate as best it could as an intelligent workstation in a distributed, client/server architecture while being based on DOS. As the advent of OS/2 is scuttling the 3270 PC for IBM, so may OS/2 dim the future of PB implementations for Olivetti.

In the Personal Engineering PE28, Olivetti enhanced an industry-standard PC to create a Computer Aided Design (CAD) workstation. The PE28 builds on an 80286 with support for a maximum of 3MB RAM and offers a high-resolution color display driven by a 32-bit graphics processor. The PE28 can access directly more than 100 graphics commands provided by the controller for the fast construction of geometric elements, rotation and scaling, or three-dimensional transformation and projections. The PE28 Series PCs can also function as workstations on an LSX system.

Yet another potential workstation on the LSX is the Electronic Typewriting Video (ETV) System. The ETV secretarial workstation consists of a video display, an integrated CPU/printer unit, and a keyboard. Its three operating modes are WP mode for word processing, TP mode for use as a standard typewriter, and PC mode for full MS-DOS PC functions. In PC mode, the ETV can function as an LSX workstation.

Other PC-based workstations for the LSX systems include the Olivetti Retail System (ORS) workstations for point of sale transaction in retail outlets and the self service transaction (SST) terminals for banking applications.

FUTURES. Olivetti will face increasing competition from IBM and PS/2 clones in Europe.

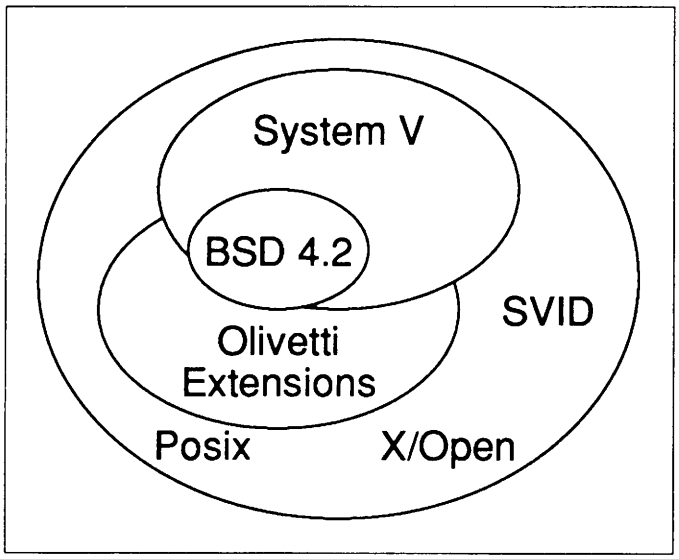
IBM recently announced an OEM pact with Ferranti for the PS/2. The Ferranti deal is probably only the first in a series. IBM will strike similar deals whenever they seem likely to help Big Blue crack a new market. Previously, IBM sold PS/2 entirely through its own sales force or through conventional computer distributors.

Such OEM agreements will push the traditional clone-makers to find some way to join the PS/2 parade. And that will begin to put pressure on Olivetti to come up with an answer. The vendor has been providing some differentiation through such configurations as the PB and the PE. But Olivetti, too, will have to find an answer not only for the technological capabilities of the MicroChannel, but also for the price/performance offered by the PS/2.

Application Directions

Olivetti will continue to concentrate its marketing efforts on four primary application areas:

- Banking
- Retail



The structure of X/OS.

- Government
- Manufacturing

OFFICE APPLICATIONS. On the office side, Olivetti currently offers an implementation of Q-Office from Quadratron. In keeping with its recognition of the importance of PCs, Olivetti plans a three-stage enhancement of the use of intelligent workstations in its network.

The first stage, the current one, is straight terminal emulation. In the second stage, Olivetti will move more of the processing to the intelligent workstation. This rudimentary coprocessing is what Olivetti currently is working toward in conjunction with the Linea 2 (LSX) machines. Stage three will be the full exploitation of the IWS with back-end function and network-based services—in other words, a full implementation of the client/server model with cooperative work between MOS/Unix servers and DOS-OS/2 clients.

Operating System X/OS

Olivetti's X/OS Unix implementation conforms to System V Interface Definition (SVID) and is compatible with the X/Open Portability Guide and the emerging Posix specifications.

X/OS consists of the standard kernel as well as bits of BSD 4.2 and some proprietary Olivetti extensions. The kernel offers the file system, virtual memory, demand paging, interprocess communications and networking with a socket interface, advisory file- and record-locking (adhering to the SVID Rel. 2 definition), and software interrupts.

Olivetti enhanced the standard Unix kernel in six primary areas:

Support for Transaction Processing with MTX (Modular Transactional System). MTX functions include a variety of end-user resources (including recovery/restart functions) that support the implementation of a distributed client/server online transaction processing (OLTP) environment. The library Olivetti provides for its DOS-based Personal Business workstation works with other server-based MTX functions.

Olivetti is keeping MTX in alignment with the proposed standards defined by European Computer Manufacturers Association (ECMA) and ISO. MTX is aligned with the X/Open reference model for OLTP.

Support for Multiprocessor Architectures. The kernel symmetrically manages both user and system processes across the processors with a synchronization and interrupt mechanism that considers the processor load.

Support for Real-Time Applications. Olivetti added a set of commands and system libraries to adapt X/OS to the real-time environment. Functions include a preemptive mechanism in the kernel for process management; privileges for memory blocking; and disk space preallocation, with consequent savings in allocations time and writing.

Support for National Languages. Olivetti adopted the X/Open National Language Support (NLS) product standard.

Improved File System and Memory Management. The X/OS file system is based upon the BSD 4.2 "Fast File System," which has an access time some 10 times faster than that of traditional Unix file systems. Additionally, it optimizes disk allocation by defining the partitions as a set of cylinders, each of which corresponds to one or more consecutive cylinders on the disk.

The i nodes that contain the file information are allocated in each cylinder, not at the start of the file system. This allocation scheme shortens disk search times.

Additionally, files belonging to the same directory live, whenever possible, in the same cylinder. X/OS allocates new data blocks in the same cylinder as the preceding blocks of the same file. This minimizes search and access times. X/OS can break blocks to optimize the disk for small files and provide better transfer speeds.

The robustness of the X/OS file system comes from its replication of "superblock" information on a number of cylinders. Such replication makes recovery easier in case of damage.

X/OS also uses demand paged virtual memory management. Another memory management enhancement is the sharing of libraries, resulting in reduced program occupation in memory and on disk. Additionally, users may modify shared libraries, thus avoiding the recompilation of the programs that use them.

Support for a Distributed Environment through the Implementation of NFS. Additionally, X/OS offers support for two types of networked interprocess communications (IPC) support: System V IPC (messages, semaphores, shared memory) and the Berkeley socket interface.

There are some minor structural differences between the X/OS system calls and software utilities for the 3070 and 3080 and X/OS for the other members of the LSX family. However, X/OS

on the 70 and 80 is completely compatible with the X/OS release for the other systems at the source code and physical data structure levels.

DATA MANAGEMENT UNDER X/OS. Olivetti offers three basic record-access methods with X/OS: C-ISAM (a standard method for accessing indexed sequential files); C-ISAM Plus (an Olivetti implementation of C-ISAM conforming to X/Open ISAM definitions); and RFAM Plus (an Olivetti proprietary access method for relative files).

Olivetti also offers a package called Commit. Commit offers recovery/restart functions through a mechanism that logs activity. Commit uses a client/server architecture and can thus operate in a mixed network of Unix systems and other PCs. Commit can link to MTX (the transaction processing solution) or operate as a standalone product.

For industry-standard relational database solutions, Olivetti offers Informix-SQL and Oracle. (Olivetti also offers Oracle on its MOS-based systems.)

MOS

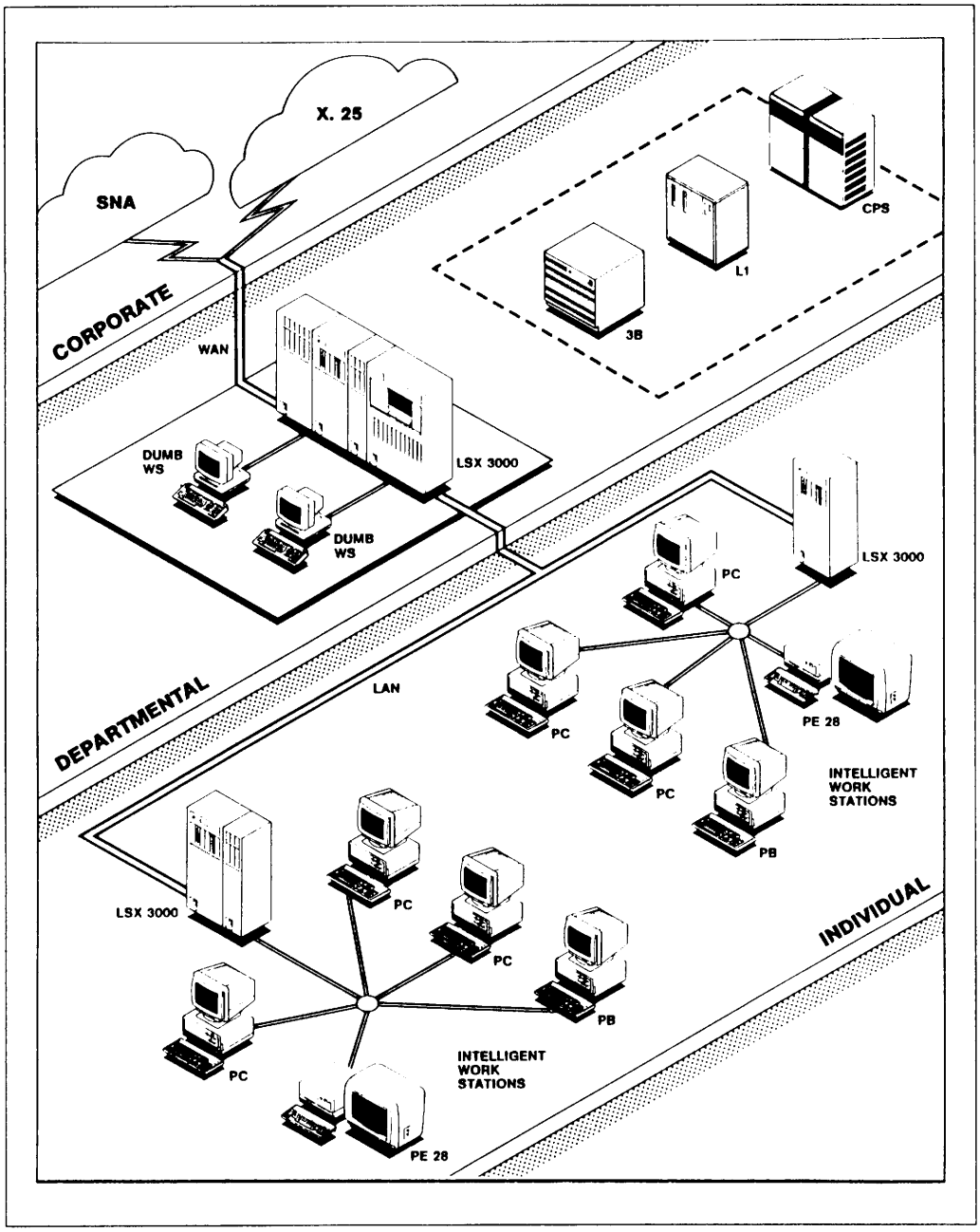
Multifunctional Operating System (MOS) is Olivetti's proprietary operating system designed for the Zilog-based Linea 1 minicomputers. Olivetti first released MOS in 1982 and has continued to enhance it since.

MOS is a multitasking, multiuser operating system supporting execution either interactively or in batch mode. MOS handles several processes active simultaneously on the video display. A virtual terminal facility supports up to four active application programs per terminal.

MOS consists of an operating system nucleus and a series of subsystems: the file system, the shell environment, the workstation management subsystem, the communication subsystem, a background monitor, a spooling system, Video Interface System Analyzer (VISA), and UGP modules. VISA handles the workstation interface for applications, while the Unified Graphics Package (UGP) offers graphics facilities specially designed for CAD/CAM applications.

MOS now comes in two versions—one for uniprocessor machines, the other providing support for the bi/triprocessing 3030 and 3040 systems.

MOS also runs in distributed environments (D-MOS), supporting application transparency for local resource allocation among different interactive MOS-based systems.



An example of Olivetti Open System Architecture in a three-tier information system: individual, departmental, and corporate. Besides the new LSX 3000, other minis currently in the Olivetti range can be connected at departmental level—L1, 3Bs, CPS.

The LSX 3000/MOS systems can use all the files and applications of the older L1 MOS systems. Users wishing to migrate to the LSX platform can use a transformation kit supplied by Olivetti, or they can integrate the LSX MOS systems with the L1 MOS systems transparently over the network, retaining the distributed environment.

Olinet

Olivetti envisions a three-tier architecture, with workgroup clusters using an LSX server networked into departmental minicomputers over a LAN, and then with a WAN SNA or X.25 connection to corporate hosts.

Consequently, Olivetti offers both LAN and WAN products in its Olinet networking family. Its standards, like those of many vendors, are TCP/IP, with a migration already underway to OSI and SNA.

OLINET-LAN. The Olinet-LAN is MS-Net based (on top of Ethernet or StarLAN—no surprise there), offering NETBIOS compatibility among its workstations and minis. The PB currently sits as a particularly attractive workstation in this environment, offering DOS enhanced with multitasking. As we mentioned above, however, the advent of OS/2 may send the PB the way of the 3270 PC.

Olivetti has read the market correctly in many ways. It does need to offer solutions rather than technology in order to survive. To offer better solutions, it needs the LSX family.

Olinet-LAN uses four primary LSX-based servers: the base server, the boot server, the DME server, and the LAN Manager (not the Microsoft OS/2 LAN Manager).

The base server offers resource-sharing with printers, disks, and external communications lines for all PCs in a LAN. The Boot server can load the operating system and applications onto PCs in a local network. The LAN Manager collects all the administrative data of PCs in the LAN, providing a centralized point for management information. And the DME server functions as the disk server for all PBs connected in a LAN. (PBs, being more application-specific solutions than generic, require more capability—according to OSA—on the file server side).

Olinet-LAN also supports the creation of a distributed Unix network or a distributed MOS network.

OLINET-WAN. Although Olivetti bows to the market presence of Microsoft in adhering to MS-Net standards on the PC side, for its WAN products, it is OSI all the way. The ONE ISO WAN connects LSX 3000 with multivendor architectures using OSI specifications.

ONE ISO uses Ethernet, StarLAN, private switched lines, HDLC, and X.25 to connect to other systems. The ONE Transport package includes the first four layers of the OSI model for connection to X.25 networks.

ONE SNA provides the connection into SNA architectures (either with SNA/SDLC or SNA/X.25). A batch server will support file transfer from various LSX systems connected in ONE ISO or ONE SNA networks.

Through its Network Monitoring System (NMS) resident on LAN nodes and then the corresponding Central Monitoring System (CMS), Olivetti provides management and administrative data that can also be integrated with an IBM network management solution.

One issue that Olivetti will have to address soon is the role of high-performance PCs running OS/2 as servers within the Olinet-LAN networks. Clearly, Olivetti will have to provide an OSA-compliant comparable set of network services running under OS/2 as is available under MOS and X/OS.

Conclusion

Olivetti has read the market correctly in many ways. It does need to offer solutions rather than technology in order to survive. To offer better solutions, it needs the LSX family. Olivetti is also quite correct in recognizing that vendor differentiation in today's market requires heavy investment on the service and support side.

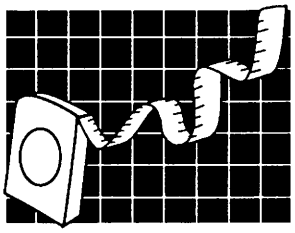
While Olivetti now has a very good story to tell about the Unix market, particularly to its current base of users, it must begin to concentrate more and more on providing the networking tools that will bring DOS, OS/2, Unix, and MOS together in a transparent network.

Olivetti also has a good PC story to tell. It should leverage that into positioning itself as a leading vendor of mixed, distributed networks. Doing that will require adopting more standards—MS OS/2 LAN Manager and LM/X, for example.

By doing this, Olivetti will not be doing anything radically different from much of the marketplace. However, Olivetti (and De Benedetti) knows that there is plenty of room for competitive distinction on top of a standard foundation. And there is always the issue of how well you build your foundation to begin with. Working from the same set of blueprints, two different engineers can create bridges of vastly different quality.

With the LSX family, and with concomitant enhancements on the PC side, Olivetti could be building on a strong foundation. ◐

•STANDARDS•



The Soul of a "New" OS

By Patricia B. Seybold

Many pundits are missing the point when they complain about the dissension created in the Unix marketplace by the emergence of the Open Software Foundation (OSF). It is true that OSF was formed in reaction to the perception that AT&T was "taking Unix private" by giving Sun Microsystems early access to new Unix code to migrate onto its SPARC chip. It was this lack of a "level playing field" for Unix that caused Digital, Apollo, Hewlett-Packard, and IBM to band together along with Groupe Bull, Nixdorf, and Siemens. It is also true that OSF was formed at a time when it seemed that Unix was gaining momentum outside its traditional strongholds in the government and technical/academic computing environments precisely because a "unified Unix" was in sight. The OSF gang may appear to be the gate-crashers who spoiled a harmonious merger, but we predict that OSF will successfully take over and redirect the Unix party. And AT&T will find itself grudgingly joining in.

At the minimum, success of the OSF will insure a more commercially viable Unix, since it will deliver not only a core Unix that is compatible with AT&T's System V Unix, but also a set of standardized extensions to address network management, user interface, transaction processing, and file management enhancements. Beyond that base level of cross-platform standardization, we think OSF may have a significant role to play in the shaping of the next generation operating system for the 1990s and into the next century.

We all know that the technological imperative is moving us inexorably towards distributed network computing, object-oriented applications, distributed object databases, distributed file systems, multiprocessor architectures, and shared memory across networks. In the past, one computer systems company or another would have attempted to leapfrog the competition by being the first to market with the most elegant computer systems architecture to embody all these characteristics. But the market imperative now dictates an open, cross-platform solution to satisfy customer requirements and to ensure a sufficiently large market to attract third-party developers.

At the same time, the task of developing a true next-generation networked operating systems architecture is truly daunting. No single company, despite massive resources, can afford to go it alone. Each systems vendor needs to see an incremental payback for the R&D efforts it expends. No longer can companies afford the luxury of locking hundreds of developers in a lab for five years in the hopes that they will emerge with a salable product that beats the competition. The next generation of distributed object-oriented applications requires a common software platform that will leverage customers' current and continued investments in heterogeneous systems.

Unix may be an old-fashioned platform on which to fashion this new-fangled set of software underpinnings. But it has two major virtues: It is the only open "standard" that exists today, and it has considerable momentum behind it. Can you imagine any other operating system gaining universal, cross-platform currency within the next five years? Certainly OS/2 is a possible contender, but, as we all know, OS/2 is in the first year of a five-year evolution towards being a complete, robust, and well-accepted product, and it is apparently wedded to the Intel hardware platform.

So, 10-year-old Unix becomes the de facto starting point for the evolution towards the next generation distributed operating system, and OSF becomes one of the key players in that evolutionary process. While taking Unix as its starting point, OSF will tackle the important issues surrounding a standardized Remote Procedure Call (RPC) mechanism that allows application subroutines to be distributed across heterogeneous processors on a network.

OSF is committed to adhering to industry standards as they evolve in the user interface arena. Over the next two years, the purview of user interfaces is guaranteed to extend well below the cosmetic surface embodied in AT&T's OpenLook or IBM/Microsoft's Presentation Manager, to encompass object-orientation as exemplified by Hewlett-Packard's NewWave or Metaphor's Workstation Environment (now being co-opted by IBM for its next generation interface).

OSF is also keeping a close eye on Mach, a new operating system developed at Carnegie Mellon by Richard Rashid with DARPA funding. Mach is a Unix derivative which supports Unix system calls. Unlike Unix, Mach is designed to exploit multiprocessor envi-

ronments by using multiple threads to share all physical resources, including files and memory. Mach also supports virtual memory for multiprocessors.

At the same time, IBM, which has contributed its AIX version of Unix as the starting point for the OSF offering, has made considerable progress in implementing a distributed file system using its AIX-based Transparent Computing Facility (TCF) to create the illusion of a single, hierarchical file system for a distributed, networked cluster of processors.

So the seeds exist within the Open Software Foundation and its "cousin" organizations, X/Open and Posix, to begin the migration towards the next-generation cross-vendor operating system. Working together, vendors in the computer industry may be able to make a transition in 2 to 3 years towards distributed network computing that would take a single vendor 5 to 10 years to accomplish.

NEWS ANALYSIS

PRODUCTS • TRENDS • ISSUES • ANALYSIS

• INSIDE •

• UNIFY •

Coprocessing Unix Style

Unify, which claims to be the leader in the mid-sized systems database marketplace, has developed an extension to its Accell 4GL development system by adding support for Microsoft Windows. Unify's approach is to offload presentation processing from the Unix host to MS-DOS PCs. The company believes that by offloading these services from the host, the host will be able to handle between two and three times as many users.

The product, which will begin shipping during the fourth quarter, will use the characteristics of Microsoft Windows, including pull-down menus, scroll bars, icons, and mouse support. An Accell Unix application can run in one window while a DOS application can run in another window under DOS.

Unify decided to go with the coprocessing approach because its own research has indicated that up to 75 percent of total CPU time is used for tasks such as formatting new queries and reports—what they call presentation processing. Therefore, it follows that, by offloading these functions to the PC, performance is enhanced. To encourage developers to switch to the windowing environment, Unify is offering a trial copy of Accell/CP for MS-Windows free of charge.

When the Microsoft Windows library is linked to Accell/CP, Unify is able to add some features to the product. These features include:

- Allowing Accell to run as one of many tasks
- Buttons to execute Accell functions such as "next form" and "zoom"
- Pull-down menus to execute all Accell functions
- Mouse support

Unify has taken a good step forward by establishing a coprocessing relationship between its host product and DOS PCs. The marriage between MS-DOS and Unix is perfect for the type of front-end processing that most end users do with databases. While OS/2 looms on the horizon, there is still an important role for DOS in most organizations. In fact, we expect DOS to have an important presence for the next five years. DOS and Unix make good partners. Both are clearly standards in their markets, and DOS works very nicely as a task under Unix. Unix servers provide an excellent environment for single-user DOS applications. Making DOS-based MS-Windows an integral part of the database environment takes this union to the next logical step. The coprocessing between DOS and the Unix host has been implemented seamlessly. This incremental move to MS-Windows will give the company good experience for moving to the OS/2-Presentation Manager environment in the future. —*J. Hurwitz*

• USENIX •

OSF Put to the Test

While Uniforum has become the quintessential marketing conference for the Unix industry, Usenix remains the place where the next generation operating systems and user interfaces are discussed and, in some cases, argued. This year's summer Usenix reflected many of the debates and controversy surrounding the Unix operating system.

BIRDS OF A FEATHER. It was an interesting reflection on the state of the industry that discussions about System V.4 were muted. Most attention was focused on the newly formed Open Software *(continued on page 18)*

A N N O U N C I N G

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Hands-On:
- **Workshops in Teamwork & Technology**
  Action Technologies, Digital Equipment Corp., Insight Consulting Group

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Panel Discussions:
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- **Stategic Applications of CSCW**
  User Organizations
- **The Payoffs from EDI**
  User Organizations
- **Building the Communications Infrastructure:** *Planning for ISDN*
  NYNEX, Northern Telecom, Nippon T & T, Siemens
- **Platforms for the Future**
  Sun Microsystems, Next Computer, On Technology

(continued from page 15) Foundation (OSF). This was, in fact, an important test for the newly formed alliance. At a Birds of a Feather (BOF) session, OSF spoke to more than 500 Unix developers about its intentions and plans.

There is no doubt that OSF has thrown the Unix technical community into a state of confusion. Many developers had concluded that, with such powerful vendors as IBM and DEC leading the OSF charge, their input would be excluded. Others were simply suspicious of the motivations of the new alliance. The BOF was an important event for OSF. If OSF is to become a credible organization within the Unix community, its first test will be how well it is able to rally the technical community. Without their support, OSF's task will be difficult.

A CLASH OF CULTURES. The BOF was interesting for several reasons. First, the technical community was able to meet the management of the new organization. Initially, there appeared to be a clash of cultures: the suited OSF management versus the denim-clad technical community. Slowly, through carefully chosen phrases selected to demonstrate that the OSF management team was, in fact, filled with technical heavyweights, the group told its story.

Although we expected to see some very heated debates, the meeting was benign. The main concern of the technocrats was that there needed to be a mechanism for including their input into the new operating system. In addition, many small companies, that often carry the seeds of important innovation, felt that a $25,000 entrance fee would prohibit them from joining. Other participants wanted a membership category for individual participants. A key concern of many participants was licensing fees. Many developers felt that licensing fees paid to AT&T were already exorbitant. They wondered what type of licensing fees OSF would impose. In addition, they questioned whether they would be hit for both AT&T fees (if the new operating system would be based on System V) and from OSF. Others expressed worry that OSF might put the same type of restrictions on verification that AT&T has; developers are frustrated with AT&T's requirement that development under System V.3 must incorporate all features of the new version and cannot, under terms of the license, go back to System V.2.

The questions raised by developers revealed the unpopularity of AT&T's licensing policies. But they also showed that developers are open to change if they are included in the change process. Some developers would like to see public domain software have a role in the new Unix standards organization. It will be important for OSF to listen carefully and respond quickly to the concerns and expressed needs of this group.

TESTING THE WATERS. Usenix was an important test for OSF. It was the first real opportunity that the fledgling organization had to speak directly to the core of the Unix technical community. On one hand, OSF served its cause well. Its management spent many hours speaking with developers to understand their concerns and issues. The management spent an equal amount of time explaining what OSF's goals and aspirations are for the future of open systems. How developers will feel about OSF in the long run is not yet clear. Ironically, one of the biggest hurdles that OSF has to overcome in the short run is to remind developers and users that the organization is only a few months old. OSF has organized itself quickly, and, therefore, developers expect it to have already come up with answers and proposals before the ink is dry on sponsorship agreements.

AT&T, WHERE ARE YOU? At past Usenix conferences, AT&T has been very visible, usually throwing one of the largest hospitality gatherings for developers. However, this year, AT&T was remarkably quiet, holding no events (with the exception of its exhibit). With so many changes internally at AT&T (including the resignation of Cassoni and the death of chairman Olson), combined with the emergence of OSF, we would have expected some statement from AT&T. Its silence is indeed puzzling. ◐ *—J. Hurwitz*

• SUN •

Sun Targets Graphics Market

With the introduction of a standards-based 3-D graphics interface and two new RISC-based graphics and imaging workstations, Sun Microsystems is seeking to strengthen its position in the hotly contested graphics workstation market.

SunPHIGS. Sun introduced a 3-D graphics interface based on ANSI/ISO Programmer's Hierarchical Interactive Graphics System (PHIGS) which will run on all Sun hardware, other than the 386i, including the Sun-2, Sun-3, and Sun-4 families, and Sun's line of CXP graphics-accelerated workstations. Dubbed SunPHIGS, the interface provides functionality such as 3-D definition and modeling of graphics objects, structure editing, multiple views, input, and storage of non-graphic application data.

Since SunPHIGS is ANSI/ISO PHIGS-compliant, graphics applications developers will find it easy to port to the Sun workstations. According to Sun graphics product manager Jim Fitzpatrick, SunPHIGS delivers the performance and functionality required for mechanical computer-aided design (MCAD) applications such as interactive modeling, simulation, and robotics; for architectural, engineering, and construction (AEC) applications such as architectural simulation; for molecular modeling; and for 3-D visualization. "Until now, the logical choice in the performance-sensitive workstation mar-

ket has been proprietary graphics libraries, which delivered much faster drawing speeds than graphics standards. By accelerating PHIGS, Sun provides comparable performance to that of proprietary libraries with the added advantage of portability." An example, according to Fitzpatrick, is the new Sun-4/150CPX workstation (see below) running SunPHIGS, which delivers 85 to 95 percent of the maximum throughput of the hardware accelerator.

SunPHIGS is available immediately for $3000. Future releases of SunPHIGS, which will include support for the 386i workstation family, PHIGS+ (lighting and shading extensions to PHIGS), and PEX (3-D graphics in a networked window system), will be available in early 1989.

NEW WORKSTATIONS. Sun is expanding its Sun-4 family of Scalable Processor Architecture (SPARC) technology-based workstations with the introduction of two new graphics and imaging workstations: the Sun-4/150CPX and the Sun-4/150TAAC.

The Sun-4/150CPX is aimed primarily at the MCAD and AEC markets, providing sufficient vector and drawing speeds and polygon rendering rates to allow users to interact with and manipulate 3-D models in real time. The system integrates Sun's GP2 geometry accelerator into a 6-slot, VME deskside package. The host processor in the 150CXP is rated at 7 MIPS and .8 MFLOPS. It is tightly coupled with the GP2 geometry accelerator, which can transform and draw 150,000 10-pixel 3-D vectors per second and render 20,000 smooth-shaded, 100-pixel triangles per second with hidden-surface removal.

The base configuration of the Sun-4/150CPX system, priced at $44,900, includes 8MB of memory, 16 bitplanes (8 bits, double-buffered) for dynamic graphics with 256 colors, a 16-bit Z-buffer for fast hidden-surface removal, and a 19-inch color monitor with 1152 by 900 pixel resolution.

The Sun-4/150TAAC workstation is targeted at imaging and scientific visualization applications, such as medical imaging, remote sensing, earth resources, oil exploration, signal processing, and scientific research. The heart of the system is the fully-programmable TAAC-1 accelerator, which, according to Sun, is capable of near real-time image processing, photorealistic rendering, and volumetric data display, as well as interactive 3-D graphics. To simplify application porting, the TAAC-1 software includes a C compiler and libraries of basic applications functions.

Base configuration, similar to that of the CPX, is priced at $63,400. A typical configuration, including a 327MB disk drive and a 60MB cartridge tape drive, lists at $72,800.

Traditionally, Sun has not been one of the performance leaders at the high end of the graphics workstation market. Despite these new products, Sun may still fall short as the price/performance ante is continually upped by its competitors. For instance, Hewlett-Packard's new RISC-based HP 9000 Model 835 delivers 14 MIPS and 2.02 MFLOPS at a price under $60,000. ◐

—D. Marshak

•HEWLETT-PACKARD•

Unix Documentation on CD-ROM

The wonder of a Compact Disc-Read Only Memory (CD-ROM) is the vast amount of information that it can hold. This twin brother of the popular audio compact disc can store nearly 650 megabytes of information, the rough equivalent of 1,800 floppy disks.

Hewlett-Packard is taking advantage of CD-ROM to provide its customers with easy access to large amounts of product documentation and customer support material with its LaserROM services. The latest service, the third in the series, is a CD-ROM for the HP 9000 Series 800 HP-UX computers which features the equivalent of over 10,000 printed pages in electronic form.

EVERYTHING YOU WANTED TO KNOW. The new service enables users to electronically search and retrieve Unix-system-related information ranging from user manuals to programming guides. HP LaserROM for HP-UX consists of the following information:

- HP-UX General Users' Manuals
- HP-UX Programmers' Manuals
- Data Communication Manuals
- Information Management Manuals
- Language Manuals
- Migration Manuals
- Native Language Support Manuals
- System Administrator Manuals
- Peripheral Configuration Guide
- Software Status Bulletins
- Product Catalog

Search Capabilities. The major benefits of putting in all of this information are not simply space savings and neatness. More important is the degree and speed of access to the information which the medium provides. Rather than leafing through numerous indexes, tables of contents, illustration lists, etc., the user can apply sophisticated search techniques to obtain the needed information. According to HP, each significant word on the disc is indexed, permitting the user to instantly locate specific information within thousands of pages by using keywords, phrases, or topics of interest. The user can then go directly to the correct place in the documentation (if there is only one), or browse through the "hits" by bringing up a brief summary of each. Boolean searching using *and*, *or*, and *not* is supported.

SPECIFICATIONS. HP LaserROM HP-UX is a DOS product delivered on a single CD-ROM that runs on a CD-ROM drive which occupies a standard half-height slot in a PC AT or equivalent. It uses a graphical interface based on MS-Windows.

The 12-month subscription price is $1,800. The service can also be ordered

with a starter kit that includes the CD-ROM drive. HP is offering the starter kit free with any subscription purchased in 1988. The service is expected to begin monthly delivery in December 1988.

GENERAL UNIX USE. Although HP LaserROM for HP-UX is targeted for the HP 9000 Series 800 computer environment, the service is applicable to the broader Unix-system marketplace. According to Marc Hoff, general manager of HP's Application Support Division (ASD), "Because HP-UX adheres to AT&T's Unix System V standard, this CD-ROM service can enhance the support of Unix-based systems that fall outside of the HP arena."

The LaserROM for HP-UX is intimately tied in with HP's Unix strategy. According to the company, the service is the first in a product line of CD-ROM-based support tools for the Unix environment. AS HP-UX evolves toward the standards embraced by the Open Software Foundation (OSF), these tools will evolve in a parallel fashion.

CD-ROM IMPLICATIONS. In the CD-ROM world, there is a great debate on which applications are appropriate for the medium. Most products fall into the vertical database category (legal, financial, medical) and are targeted at very specific types of enterprise. Computer documentation and support (and, eventually, program code) on CD-ROM will be a very important area in itself (Digital is distributing the current release of VMS as well as the documentation on CD-ROM). In addition, the power of companies such as Hewlett-Packard and Digital could provide the critical mass of penetration of CD-ROM drives which would allow the general CD-ROM industry to take off. ◐

—D. Marshak