the Yates Perspective

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# PC Market Stakeout—The Winners and Losers

1984 will be a year of mergers, acquisitions, bankruptcies, and incredible growth. Perhaps for the first time, the ubiquitous "shakeout" frequently foreseen in the trade press will actually occur, but perhaps in a different form than has been anticipated.

1984 will be the first year in the United States where virtually all major data processing vendors are fully behind their personal computer efforts. Formerly a *sideline* of the company, viewed as of limited value, the PC "toy" has become recognized as a major source of new revenues. For some major vendors, it may be too late. Major vendors of mainframes and minis watch IBM—its meteoric stock rises, five percent of revenues now coming from the PC line, and significantly, its inroads into large accounts that formerly were not IBM, where the IBM PC provides the wedge into formerly non-big blue shops.

Many of these data processing vendors will be too late. A few will succeed in providing IBM PC compatible personal computers to their installed base and will limit the IBM onslaught on their key accounts.

And even fewer major data processing companies will establish their product in retail and ISO channels of distribution.

### The Winners

The market is shaking out to four to six major vendors, probably;

- **IBM**
- **APPLE**
- maybe **Hewlett-Packard** or **DEC**
- one or two very low-cost-of-manufacture foreign firms

These companies will dominate an increasingly commodity personal computer hardware market. This is not to say that there are not niches in the marketplace for smaller companies, but the major players seem to be in place. Note that we have excluded home and game manufacturers. If we included them, we would have to include **Commodore** as a major contender.

### IBM The Dominant Force

IBM in the United States is the dominant force in personal computers today. The IBM PC has provided a data processing market opportunity for IBM that it has not had since the mainframe market. IBM *reacted* to minis, where DEC dominates today; *reacted* to Wang for word processing, and Wang dominates; there are other examples. But in the PC market, IBM is the dominant vendor, outstripping APPLE shipment rates in under three years.

### The Driving Forces

Both the data processing industry and endusers are driving much of the success of the IBM PC. The data processing industry is looking for a standard library of application software, and a general recognition of the defacto standards for PC to mainframe compatibility. Application software vendors are looking for the largest possible installed base so their potential market justifies the high dollar investment required for good software.

Endusers are looking for reliability, maintenance, and extremely important, the most likely standard providing the largest library of solution software. They require the most standard, most universal equipment to maximize access to printers, plotters, communications, mainframe data, etc. 1984 will be the year of the PC enduser moving from confusion to safety with IBM and a few other standard vendors.

### An Analogy to the Record Industry

An analogy can be made between the personal computer industry and the phonograph and record industries. Just as there are 33, 45, and 78 RPM of records, a BETA and VHS home video, there will inevitably be only a few standards for software. The market will drive the evolution of such a standard.

This standardization creates a new set of winners and losers—second tier hardware vendors will have a new set of problems, differentiating their product from the competition; more on them in a moment.

The *winners* are the software vendors. With 8 million estimated PCs in 1986, the market size allows multi-million dollar investments in application software that really serves endusers needs. The software technological invasion has lagged behind hardware innovations. For the next few years, software is the area where large scale technical innovation will occur providing many market opportunities for new and established companies.

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# PC Market Stakeout continued from page 1

### Turnkey Software

A vast, unaddressed market for specific "turnkey" applications on standard hardware exist today. There are vertical markets of multi-million dollar potential almost entirely untapped because the market size, until the advent of low cost personal computers, has not justified investment.

This vertical market "NICHEMANSHIP" is the salvation of the so-called second tier hardware vendors. The Onyx, Altos, Franklin, Convergent Technologies, Codata, Sumicom, Corona, Columbia, etc. vendors.

The second tier will always suffer from:

- a higher cost of manufacture
- having to react to a standard defined and changed by IBM or Apple
- trying to attract application software vendors to a hardware device that is "not quite 100% compatible"
- fight for floor space, ISO's, distribution channels
- lack of mainframe and minilines for upward mobility—having to offer IBM compatibility.

IBM plug compatibility is only possible as a mainline strategy if very low cost of manufacture is available and the company has existing marketing channels. The second tier to success lies in "nichemanship:" in serving a vertical market off the mainstream and offering solutions. Only major vendors like Hewlett-Packard or an offshore low cost of labor company can attack IBM on simple price characteristics.

### IBM's Next Moves In Personal Computers

Moving to a highly controversial view of what major factors will drive the market and effect the winners and losers, IBM's moves are the dominant factor.

It is possible that one major vendor may break through with a new standard other than IBM's if technologically very innovative. **Hewlett-Packard** and **Texas Instruments** are probably the front runners here. It is possible that **Apple** will open up its operating system in an attempt to attract software on their new generation of computers. They have already announced MS-DOS. They are differentiating their product from IBM's and resisting IBM PC compatibility which will be a continuing problem for them.

IBM's next generation, if IBM follows IBM's usual mode of doing business, will take advantage of the driving wedge the PC has put into the marketplace to support its mainframe, mini, and office equipment sales. This *theoretical* scenario is based on YATES VENTURES view of the market, IBM's past performance, and their logical market progression.

IBM was too late in minis and word processing, but if we look back at its mainframe strategy, there are definite parallels to its microcomputers. IBM has been the dominant vendor of mainframes since their initial development. The company has taken advantage of its dominance over the marketplace to drive standards and control the technological direction of the market. IBM's operating systems and hardware protocols have been copied by numerous companies with varying degrees of success. These mainframe plug compatible vendors (ironically called PCs in the mainframe market) have had a difficult time following IBM, although some have succeeded admirably. It is possible that IBM could take the same strategy with personal computers as it had with mainframes.

A major source of controversy is IBM's direction with its operating systems in the future. **Microsoft's** clout is formidable, based on its owning the operating system of the IBM personal computer. YATES VENTURES does not believe that Microsoft will hold this exclusive position much longer. Not only is it skewing the market in MS-DOS's favor, but MS-DOS does not meet some of the market needs of IBM in the future.

YATES VENTURES finds it not inconsistent to see IBM moving their operating systems towards compatibility with their proprietary mini and mainframe systems. IBM has publicized its thrust and intent to emphasize the VM operating system on mainframes, and we believe that some compatible and similar product will be made available in the next generation of personal computers. It just seems inevitable. This operating system would probably allow micro to mainframe communications, and would probably implement the "virtual machine" software architecture of VM.

In VM, different users can log into the computer and the system will look like different operating systems, although VM is actually controlling the computer's hardware. For example, one user could log into a virtual machine as UNIX and it would look like they were talking to UNIX, even to the extent of manipulating hardware devices. Another user could log in as VM and use that operating system concurrently.

This concept, brought down to micros, is the logical next generation for PCs. Today we have a closed application environment where multiple window user interfaces allow different applications to run within windows, usually only within one operating system and with fairly stringent limitations on third party products. The next generation should open this application environment up, and allow different operating system and application types to run within different windows transparently. This is the VM concept taken to the microcomputer.

### Conclusion

To conclude, the hardware winners will probably be IBM, Apple, one low cost of manufacture vendor with offshore labor, one to two innovative major data processing shops, six or so major data processing vendors selling personal computers to their installed base—they have a low enough cost to manufacture and an existing sales force to sell into that market but may have limited impact on the general retail marketplace.

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# WorkSlate:

# A New Microportable from Convergent Technology

*By Peter Marvit*

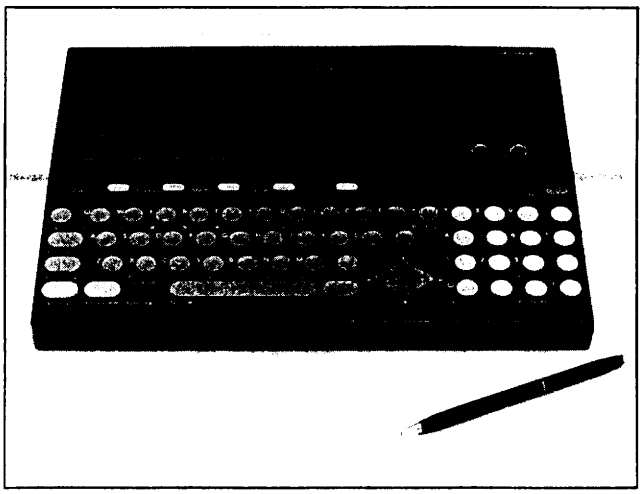
**Convergent Technology** (CT), traditionally an OEM oriented company, has entered the consumer market with a fanfare and a big boost from **American Express** by introducing *WorkSlate*, a microportable aimed at business executives. The result of over a year's design efforts by the newly created Advanced Information Products Division, WorkSlate is a dedicated function, "task-oriented" microportable which defies current wisdom of compatibility and general purpose computers yet fulfills our predictions of a "Visi-calculator" dream machine (see *PC Magazine*, August, 1982, page 145). YATES VENTURES visited Karen Toland, Director of Marketing for the AIP division and formerly of Savin Corporation, to discuss CT's radical change of direction and the future prospects for WorkSlate and its followers.

The notebook sized WorkSlate is battery operated and combines many desktop functions (running concurrently) around a spreadsheet format. In addition to the standard "*Visi-Calc*" functionality, WorkSlate can be used as a two week appointment calendar which will beep before scheduled meetings. It has a telephone number rolodex utility which can automatically dial someone, record the length of the call for billing and allows the caller to communicate by using the built-in speakerphone. A microcassette can record both voice and digital information, allowing the user to vocally annotate worksheets while in preparation. In a future article, YATES VENTURES will report the results of our hands on evaluation of WorkSlate.

WorkSlate is aimed at a target market of 30 million computerphobic businesspeople who need numerical manipulation and who want to spend less than $1000. The product has gone through 10 user interface iterations since the first testing last January. Sample users from many different industries were selected in San Francisco, Chicago and New York. Even Toland's father was part of the group. As a result of the consumer testing, the product design was frozen July 15 for announcement on August 22.

WorkSlate is featured on the cover of the American Express Christmas catalog. Public response has been just short of phenomenal. Within the first week of the catalog's publication, American Express received 9000 orders for WorkSlate and related products (printers and TaskWare). **Sears** Business Centers and **Macy's** have also signed on as distributors. **E.F. Hutton** has signed an OEM contract to deliver WorkSlate to its *HuttonLine* subscribers. The subscribers would be able to access its database with the built in 300 baud modem and perform local information analysis. Other OEM and retail vendors are expected to be announced shortly.

Convergent expects its sales to outstrip **Radio Shack** (Tandy), the current market leader, by mid-1984. We wonder if the retail channels that Convergent is currently developing can really compete with the 500+ entrenched and widely scattered Radio Shack shops. Nonetheless, Convergent is planning to ship "several thousand" WorkSlates during the fourth quarter of 1983 and is building its first assembly line with a 20,000 units per month capacity. Toland would not comment on future production, but Advanced Systems Division recently relocated to a new building which has a great deal of room for production growth.



WorkSlate is the beginning of a new range of products for Convergent. A writer's version is rumoured to be introduced in the second quarter of 1984. By the following quarter, we'll probably see a 16 bit CMOS version designed around an **Intel** chip. Joint development ventures are likely, especially using Japanese technology. Since the liquid crystal display screen is bit-mapped (although of very low resolution), primitive graphics are not far away. "Gateway" software for communication and file transfer between WorkSlate and the **IBM** *PC, XT* or Convergent Technology workstation is expected by the first quarter of 1984. **Apple** communication will follow shortly thereafter. Convergent is also working on a "docking" station" into which WorkSlate will plug to be either a desktop terminal connected to another computer, or a standalone unit complete with battery recharger, disk drives, etc.

Convergent Technology's new product enters a market segment which **Sony's** *Typecorder* pioneered in 1980. The dedicated machine concept was ahead of its time then, but it seems that the market is ready now. YATES VENTURES anticipates Convergent will have a rash of competitive products to deal with and wonder if they will succeed in the retail/consumer marketplace. So far, however, they are off to a running start.

# Good Dirt

Some companies keep their ship rates private, but **Altos** is publicly announcing the 2500th ship of its XENIX based system. YATES VENTURES understands that Altos is shipping in excess of 1000 systems a month, and is gaining a high level of user acceptance. On the negative side, though, it appears that Altos is experiencing a higher cost to provide support for the *586* than it had originally anticipated. The company needs to add a friendly user interface for its computer, to cut down on telephone support costs.

Altos Marketing V.P. Bob Bozeman has spurred on the ASAP program to provide application software for the 586. His new program, *Altos Express*, provides more assistance to Altos vendors, as we described in the last issue of the *Yates Perspective*. We anticipate seeing something out of Altos in the *186* or *286* in the near future. Indeed, YATES VENTURES has been waiting for quite some time for the release of the low-cost 186 based system.

**Graphics Software Systems**, formerly supplier of *GSX* to **Digital Research**, has now assigned to distribute the product under MS-DOS in UNIX. The company is now developing device drivers that will allow any UNIX based or MS-DOS based system to place graphics products on their computers quickly. For more information contact Mark Williams at 503/682-1606.

Will Fortune go the same way as Osborne? Gary Friedman, one of the founders of **Fortune Systems**, resigned as chairman, president and CEO on Wednesday October 5th. According to *The Wall Street Journal* Friedman resigned due to "differences in management style." Fortune has also had to contend with other problems recently. The company posted a $3 million loss on revenues of $12 million for the 2nd quarter of 1983. David Caplan will replace Friedman as acting president and acting CEO.

Note that all the news on Fortune is not negative. Users of Fortune Systems enhanced *Fortune:Word* word processing software package now have access to a toll-free number for service and advice. This could be the start of a new trend, as Fortune Systems' hotline is the first toll-free direct-to-the-manufacturer line set up for endusers of microcomputers. Call 800/582-2603.

More inroads are being made into the medical/hospital vertical markets by UNIX based systems. In the last *Yates Perspective* issue we mentioned that the Wicat System is being used in a hospital. Well, an **Altos** microcomputer and *MED 2000 Medical Software* from **Ohio Microsystems**, of Kent, Ohio, is being used at the Suburban Medical Laboratory in Cuyahoga Falls, Ohio. The computer has simplified billing and collecting accounts procedures that were costing the laboratory a heck of a lot in outside service bureau costs. For more information contact Sandra Fishel at SML at 216/929-7992.

Don't write off the **Apple** *Lisa* yet: More than 3000 Lisas, worth upwards of $20 million, were shipped in the 2nd quarter of 1983 and at least 6000 Lisas worth $40 million are likely to be shipped during the 3rd quarter. Afterwards, quarterly shipped rates will probably level off at the 12,000 unit level, according to a Sears and American Express report. Moreover, Apple announced in late September that it is unbundling the software for Lisa applications from its hardware, and will be reducing the overall price of the product to $6,995. The six previously bundled productivity applications will be sold as a set for a $1,195. Applications will also be available separately. For example, LisaWrite, LisaCalc, and LisaGraph are each priced at $295.00, LisaProject and LisaDraw are each priced at $395.00, and LisaList is priced at $195.00. YATES VENTURES also sees a rapid growth for the Lisa dealer base, which numbered 134 in September. We would expect this base to reach at least 250 dealers by November 1, 1983. During a recent week-long 25-city briefing tour through the United States and Canada, Apple invited the nearly 1,500 dealers who participated in the series of sessions to apply for authorization to carry the Lisa line.

The Lisa isn't the only important card in Apple's hand. One of the company's biggest hole cards is *McIntosh*. It is likely that McIntosh will be released in January, 1984, at a retail price target of $2,500. Apple announced that McIntosh will use a **Motorola** 68000 processor chip that will be faster than the current chip on Lisa.

Naturally, the growth in these Apple products will lead to a reduced ship rate for the *Apple II*. In the 2nd quarter of 1983, Apple shipped over 150,000 Apple II's worth over $200 million. Sales are expected to decline in early 1984.

Note that the Lisa model has also been unexpectedly successful in the lower end CAD/CAM Sales Market. Perhaps they will take away some business from **Sun Microcomputer** with their XENIX implementation, if they ever get it done. We also recently announced MS-DOS will be incorporated into the Lisa line over the coming year. Development of these operating systems is crucial to Apple, in order to expand the availability of software for its curent products.

Apple's critical competitive weakness to date has been related to a lack of "family product planning" compatibility among its products, and of great ability between products. While Apple has taken 14% of mini micro subsector in 1982, they will have to work hard to maintain this margin against heavy competition from **Tandy** and **IBM**.

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## Good Dirt continued from page 4

Putting all the eggs into one basket: **Masscom** announced in late September that it has signed a joint-venture agreement with **Lanpar Technologies Inc.**, a Canadian computer equipment manufacturer. The agreement provides for the creation of a new company called Masscom Canada, Inc., which will have exclusive manufacturing and distribution rights in Canada for all present and future Masscom Computers Systems Products. The new venture will have offices in Lanpar's headquarters. Masscom hopes to penetrate the Canadian markets with its 32 bit UNIX based system. For more information contact, Allan Wallack at Masscom, courtesy of Simon/Public Relations, (Jim Buhrendorf) at 617/872-8878.

More electronic gadgets for gas stations: You may have thought that the new electronic gas pumps which measure your fuel down to 1/100 of a gallon were about all that gas stations could handle. Well now you can pull up to a **Gandy and Staley** fuel pump and pay for your gas with a special computer key card rather than a regular credit card. Fuel pumps have been computerized with a card reader that automatically records a sale by account number. Each evening, the information is downloaded to an **Altos** microcomputer. YATES VENTURES notes that the potential market size for this sytem is huge, with over 100,000 gas stations in the United States alone. For more information contact Chuck Staley at 916/934-3666.

Moving down from minis: **MCBA** announced recently that it is moving its minicomputer software packages to run on microcomputers. Special compilers, converters, and generators that are now available while MCBA packages to interface on IBM PCs, as well as Altos, Victor, Zilog, Televideo, LinePC, Alcyon, DEC Rainbow, and other systems. Clearly, MCBA will be hitting both the UNIX and MS-DOS markets. More information on UNIX applications, conversions from mini down in micros can be found in YATES VENTURES multiclient report entitled, Application Software for 16 Bit Systems: The UNIX Market. For more information on MCBA strategy, contact Julie Fretzin at 213/957-2900.

**Callan Data Systems** was one of the first vendors to demonstrate UNIX System V. The new version of UNIX was demonstrated on the 68000 based Callan *Unistar* system at the Usenix Association's Toronto conference. The System V version was ported to this desktop system by Unisoft of Berkeley, California. YATES VENTURES is benchmarking the product and will be releasing these figures in the UNIX encyclopedia, to be published in January of 1984. For more information contact Ken Morris at 213/991-9156.

Yet another new microcomputer: **CompuPro** released its *CompuPro 10* at the CP/M '83-East conference in Boston, Massachusetts. This multiuser system utilizes an 8088 processor and is priced at $4995, excluding terminals. CompuPro also announced that it will be adding concurrent CPM/86 as an option to its system 816 microcomputer product line. For more information contact Jeff Swartz at 415/786-0909.

**Century Analysis, Incorporated**, of Pacheco, California announced in September its introduction of *Officeware* Office Automation Software. The system consists of:

- *Script* word processing system
- *Plan* spreadsheet package
- *Graph* professional quality graphic system
- *Forms* record management system
- *Terminal* cluster host application link desk, personal functions creator (e.g. for reminders, phone lists, calendars, directories, etc.)
- *Network* electronic mail system

For more information contact Art Roberts at 415/680-7800.

As mentioned in the last issue of the *Yates Perspective* **Sorcim** announced a new version of *SuperCalc* at the Boston CP/M '83 convention in late September. SuperCalc 3 starts with a much improved version of SuperCalc 2, the noted spreadsheet system. The new system adds a fully integrated graphics function and a database management function. The initial release of SuperCalc 3 will be compatible with the IBM PC, XT, Compaq and Eagle computers. For more information about the latest version of this MS-DOS system contact Tom Ravizza at 408/942-1727.

## PC Market Stakeout continued from page 3

Smaller second tier hardware vendors with extremely innovative hardware products may find niches, but only until the major vendors duplicate their particular technological edge. Vertically oriented second tier firms who practice "NICHEMANSHIP" will be the most likely small hardware vendors to succeed.

The software winners are a happier bunch to predict since the market is expanding so rapidly and there are so many opportunities. There are many market niches. The industry will see two to five major multi-billion dollar software suppliers in the 1990's, companies that result from mergers, expansion, acquisitions, etc. The most likely companies involved in these multi-billion dollar enterprises, but not necessarily companies that maintain their individual integrity after merger are Microsoft, Digital Research, VisiCorp, and Micropro. It is entirely possible that major book and record publishers will enter the industry via new organizations and put multi-million dollar budgets into major publishing "labels."

The smaller software companies should do phenomenally well if they orient themselves to vertical solutions and connect themselves to one or two major hardware manufacturers' products, picking niches that the hardware manufacturer cannot go into without their software and solutions expertise.

# Hands On:
# What's New In UNIX System V

*by Lawrence Rogers*

*UNIX System V* as offered by the **Western Electric Company, Inc.**, means that there is yet another version of the popular operating system available to a marketplace already swamped with several different versions of UNIX. Big Deal! Big deal indeed, because UNIX System V marks the beginning of a new approach to the UNIX Operating System by Western Electric, an approach that is both aggressive and comprehensive. Still, little is known about System V except by those who have their copies of it and by those who have tried to keep up with the array of articles and books discussing UNIX in general and System V in particular.

What is System V then, and how does it differ from its immediate predecessor System III? We've finally gained some hands-on time with this elusive beast. Here's what seems to be different, and sometimes better. Succinctly stated, UNIX System V is an improved version of UNIX available from Western Electric. It is faster; it is more robust; the tools are better integrated than those in System III; and, there are more tools available to the user and the system administrator. Western Electric also offers two levels of support from their facility in Chicago and courses on how to use UNIX and UNIX internals in both Princeton, New Jersey, and in Chicago.

The differences between System V and System III can be divided into seven major areas:

- Supported Hardware Configurations—what hardware you should buy.
- Kernel Improvements and Changes—why System V is faster than System III.
- Operating System Improvements—what is new in the operating system.
- Languages and Library Improvements—why you may need to recompile systems and why they will compile faster when you do.
- Communication Improvements—how terminals can interface to UNIX and what changes have been made to communications subsystems.
- Command and Administrative Aids—what commands are new and how system administration has changed.
- Transition Aids—how you move from System III to System V without rewriting everything.

These areas are explained in the sections that follow.

### Supported Hardware Configurations

UNIX System V only supports **Digital Equipment Corporation's** *PDP-11/70, VAX 11/750,* and *VAX-11/780.* If you intend to buy a DEC machine to run UNIX System V, be aware that future versions of UNIX from Western Electric may not contain the same improvements for the PDP-11/70 that the VAX versions do. Given this, our recommendation is to purchase DEC VAX machines to run UNIX System V.

The peripherals supported on the VAX-11/750 and VAX-11/780 are shown in Table 1.

**Table 1**

| | |
|---|---|
| *DISK DRIVES* | |
| RM05 | 256 Mb Removable |
| RP06 | 176 Mb Removable |
| RL01/2 | 10/20 Mb Removable |
| RM80 | 121 Mb Winchester |
| RP07 | 516 Mb Winchester |
| *TAPE DRIVES* | |
| TE16 | 800/1600 BPI |
| TU77 | 800/1600 BPI |
| TS11 | 1600 BPI (VAX-11/750 only) |
| TU78 | 1600/6250 BPI (VAX-11/780 only) |
| *COMMUNICATIONS CONTROLLERS* | |
| DZ11 | Asynchronous line unit for 8 lines |
| KMC11B/KMS11 | Communications microprocessor |
| DMC11 | DDCMP Communication link |
| DM11BA | Modem control multiplexor |
| DN11 | Automatic call unit |
| PCL11B | High speed communication link |
| *SPECIAL DEVICES* | |
| LP11 | Line printer |
| Versatec | Printer/Plotter |

All other peripherals available from DEC are not supported by UNIX System V. This is not to say that they cannot be made to work with System V, but instead they require special integration into your system. Western Electric does offer courses on writing a device driver, and integrating a new device into UNIX is a straightforward task. Nonetheless, be aware of the devices supported when you plan your DEC system for UNIX System V.

### Kernel Improvements and Changes

UNIX System V contains several changes in the kernel proper that increase its performance. Among these are file system improvements, physical I/O changes, improved internal table management, and faster system calls.

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*FILE SYSTEM*

The file system in UNIX System V supports file systems with block sizes of 512 bytes and 1024 bytes whereas System III only supports 512 byte blocks in the file system. Further, the super block of each System V file system defines the file system's blocking factor, so you can mix 512 byte file systems with 1024 byte file systems. File systems moved to System V from System III are correctly recognized by System V.

In general, file systems with the larger block size will give better system performance, but they may waste disk space. Also, a 512 byte file system may contain enough files so that it cannot be successfully converted to a 1024 byte file system. A later section on transitions aids tells how to determine whether this conversion process will be successful.

UNIX System V also takes care to write information to the file system in a well-defined order so that the file system's integrity is not compromised in the event of a system crash. This is a new feature in System V. Remember though, UNIX only guarantees that the file system structure will be easily reparable after a crash.

Because of improved file system integrity, the **fsck** program recognizes a fast option, **-f**, that tells it to skip three of the more time consuming phases of file system auditing. This feature means that your system can be rapidly readied for use after a crash without compromising the file system.

System V also offers a new tool named **dcopy**. It lets you reorganize files in a file system to improve response. **Dcopy** reorganizes file systems by moving files that have not been referenced in a definable number of days to the end of the file system. This compacts a file system so that the often used sections, (i.e., recently accessed files and free blocks) are closer together in the file system. **Dcopy** also rearranges files and subdirectories in a directory so that the subdirectories are first. This reduces path name decoding time. Finally, **dcopy** compresses directories, potentially freeing unused directory blocks. This reduces both path name decoding time and file name searching time since subroutines in the kernel do not have as many empty entries to scan.

In System III, there are no automated tools that let you do the same job as **dcopy**. By copying one file system to another, you can compress unused directory entries, but System III provides no other tools for reorganizing file systems based on file access times.

Other system administration functions are eased by two additional tools in System V. **Fuser** helps the system administrator discover which users have control of certain system resources, for example, a file system. When the system administrator tries to unmount a file system and is greeted with the message *File System Busy*, **fuser** lets the administrator determine who is using the file system that prevented the unmount from completing successfully. **Fuser** can also log off those users and is useful in building shell procedures that do file system archiving on unmounted file systems. System III contains no such facility.

The system activity report, **sar**, is not new to System V, but it is more useful. **Sar** adapts to your hardware configuration to give you all statistics gathered by the kernel and device drivers. System III knows only a subset of devices supported and the System III kernel does not gather as many statistics as does System V.

*PHYSICAL I/O*

Physical I/O in UNIX means that information is transferred directly between a peripheral device and a processes address space, bypassing the buffer pool in the operating system. UNIX System III restricts the number of concurrent physical I/Os to one per device, meaning that programs that do physical I/O have to wait until the required device is available. One program that does physical I/O is **fsck**, and improvements to the way UNIX manages physical I/O reduce the time it takes to repair the file system when restarting UNIX.

System V maintains a pool of buffers to be used by device drivers when doing physical I/O. Because of this, several **fscks** can be run at the same time when checking file systems located on several drives. The command that controls these **fscks** is named **dfsck** and performance measurements indicate a 40 percent improvement when two **fscks** are run in parallel.

*KERNEL TABLE HANDLING*

System V dynamically adjusts the memory management data structures in the kernel that control the size of the kernel and the sizes of several internal tables used by the kernel. By contrast, System III predefines the maximum size of the kernel and the sizes of internal tables, leaving little freedom for experimenting to improve system performance. System V also uses more sophisticated algorithms for accessing table entries in the kernel, so the penalty for making large internal tables is reduced. System III uses simple algorithms, their performance peaks and then decreases as table size increases.

Because table sizes can be arbitrarily large and accessing them uses more efficient algorithms, several subsystems in the kernel benefit from these changes. The buffer pool manager is one example. With a larger buffer pool, the hit ratio, which defines the percentage of reads and writes that find the desired buffer in the buffer pool, increases. When the hit ratio increases, system performance improves as fewer actual I/O operations are needed.

File table access also benefits from better algorithms. This means that references to the file system are faster as a file table entry must be found or allocated when a file is opened.

File opens are faster too, as all accesses to the inode table in the kernel use more efficient algorithms. An inode is a data structure that defines the characteristics of a file (size, owner and group, permissions, access, modified, and create times, and where the file is located in the file system) and it is the key to file access in UNIX.

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Finally, synchronization in the kernel is improved because a hashing technique is applied to the sleep/wakeup queue. The kernel puts a process to sleep waiting for some event to occur, such as completion of an I/O operation or expiration of a timer. When the event occurs, the process is wakened and may then continue. System V improves this mechanism by managing the sleep/wakeup queue more efficiently.

### Operating System Improvements

The System V operating system also contains several new features beyond those in the kernel. Some features are available to programmers who must use System V for software development, and others are for system administrators who must manage System V based systems. Among the improvements are a new interprocess communication package, dynamic configuration of UNIX for different processors, improved **init** and **getty** system, a general disk and tape device driver, improvements in the use of terminal controller hardware, and several other changes for System V for the VAX.

### *INTERPROCESS COMMUNICATION*

System V provides three new ways for processes to communicate with each other, and these add to the pipe and fifo interprocess communication (IPC) features available in System III. Messages, semaphores, and shared memory are intended to satisfy some of the needs of applications that require more advanced IPC features to support database, real time, and transaction processing systems.

All new IPC functions use the same method for creating, manipulating, and destroying message queues, semaphores, and shared memory segments. This method lets you define the names of IPC elements, who can access them, and the set of operations available. System V supports both system calls for use in programs and shell level commands for operating on IPC data structure. These features eliminate the need to write a program. The system administrator has control over the amount of main memory that should be allocated to IPC features, and can also select any combination of IPC features when building a System V configuration. Furthermore, the IPC interfaces offered are general enough that those who must transport UNIX to different architectures can do so without disturbing the interface.

### *PROCESSOR TYPE*

Support for the VAX-11/750 is new in System V and the operating system is built to run on both the VAX-11/750 and the VAX-11/780. The VAX architecture contains a system identification register that identifies the processor. UNIX uses this register to control its processor-specific operations in a way that is transparent to the UNIX user and administrator.

### *INIT AND GETTY*

New with System V are much improved versions of the **init** and **getty** commands that control terminal access to the UNIX system and move the system between its single user and multiuser states. The **init** command is the first command started by UNIX as part of its initialization process and **init** is charged with starting instances of the **getty** command that allow users to login and use the features of UNIX.

**Init** controls the software state of UNIX by information given to it in the *inittab* database. *Inittab* tells **init** what state it is to start at, what operations it must do at each state, and how to respond to power failures. The syntax of *inittab* is mnemonic-based, whereas System III was number driven. This syntax makes System V more readable than its predecessors. Furthermore, the administrator has more control over **init**'s operations through an expanded set of functions all conveyed to **init** via the *inittab* database.

One of **init**'s main functions is to create **getty** processes that eventually give rise to a shell that users operate to interact with UNIX. **Getty** also relies on a database as it has in the past, but the System V version of the database resides in a file named *gettydefs* rather than in each **getty** process. *Gettydefs* is also mnemonic-based, so the system administrator can more easily add new entries to it as the need arises. The database still provides the terminal speed select feature available in older versions of UNIX.

Also new in System V is the notion of a virtual console. The virtual console feature allows offsite administration of UNIX because **init** remembers that specifics about the terminal being used to control the software state of UNIX. When UNIX is shut down, **init** saves all information regarding the controlling terminal in a file. The new **init** process, which is created when UNIX is restarted, restores this information to let that terminal continue to control the UNIX software state. Because of this virtual console feature, any terminal can be used to control UNIX, even a dial-in terminal. In System III, only the system console can be used to control UNIX.

### *GENERAL DISK AND TAPE DRIVERS*

System V offers a general disk driver and a general tape driver that simplify system configuration. Instead of describing the specific disk and tape configuration to the configuration program, System V lets you select the general disk and tape devices in the configuration file, forcing UNIX to determine the specific devices available. This feature reduces errors and lets you distribute packaged systems independent of the disks and tapes on the target systems.

### *TERMINAL CONTROLLER HARDWARE*

System V makes more efficient use of the DZ11/KMC11B terminal controller hardware by batching characters sent to the VAX on input. System III sends single characters to the VAX, causing unnecessary interrupt overhead and reducing system throughput. The DZ11/KMC11B hybrid is the recommended hardware

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for terminal control, and performance studies show that data rates are increasd by a factor of 7 to 14 for output and by a factor of 2 on input followed by output on a VAX-11/780 when the KMC11B assists the DZ11. The input followed by output figure represents an order of magnitude increase over System III because of the changes made to the software loaded into the KMC11B.

*MISCELLANEOUS IMPROVEMENTS*

System V for the VAX offers five additional improvements to the operating system:

- A fully supported powerfail recovery system. Powerfail was not fully supported in System III.
- Expanded boot procedures that allow booting from both the RP06 and RM05. System III only allows booting from the RP06.
- Improved dump procedures that now dump memory to a tape at 1600 BPI. System III dumps at 800 BPI.
- A disk formatter, named **format**, for formatting RP06 and RM05 disks. System III only formats RP06 disks.
- A standalone configuration verifier, named **vcf**, that checks for agreement between the software configuration and the hardware configuration. System III provides no such command.

**Language and Library Improvements**

System V also contains several improvements for the software engineer who must use UNIX's tools for developing new systems. In addition to providing new commands, System V also addresses the performance of subroutine libraries. The areas affected by changes to the language and libraries are the C Programming Language, the new Software Generation System, libraries, and the FORTRAN language.

*THE C PROGRAMMING LANGUAGE*

The System V C compiler no longer accepts assignment operators of the form = op nor variable initializations that do not use the = operator. Programs that use either of these items will not compile. In contrast, the System III compiler does accept both but displays a warning message.

Several improvements have also been made to the environment in which C language programs are written. Specifically, system header files have been rewritten to remove duplicate definitions of types and manifest constants. This change may force you to change your source programs to include new header files and to remove unneeded ones.

Also, there is a new command in System V, named **cflow**, that examines C language programs and shows all external references. **Cflow** is a valuable aid when describing which modules call other modules and which external data structures are referenced.

After several versions of UNIX, the C language macro preprocessor finally has a separate manual page that describes its syntax and functions. System III has no such document and relies on experience with the preprocessor to use it correctly and effectively. System V also limits the use of the preprocessor by making it available only through the cc C compiler command. In System III, you can reference the preprocessor as a separate command apart from the compiler. You must use the **m4** command in System V when you need a general purpose macro processor.

Finally, the System V **cc** command gives you more control when compiling a program by letting you pass arguments directly to any phase of the compilation process. Some of the functions you can control are the way the assembler optimizes address resolution, whether it runs the **m4** macro preprocessor on assembly language files, and what the loader does with relocation information. In System III, the user can only pass specific arguments to specific phases, except that all unrecognized flags are passed to the loader.

*SOFTWARE GENERATION SYSTEM*

The Software Generation System (SGS) is the name for the System V tool kit used for software development. SGS contains the C compiler, the optimizer, the assembler, the loader, and those utilities that work with object and executable files. Special emphasis has been placed on reducing compilation time, achieved by improving the assembly and loader phases of the compiler.

With few exceptions, all file formats for object files, executable files, and library archives have changed in System V. If you must recompile any files in a system, then you must recompile all files in that system because the loader does not understand System III format object files.

New object and executable files use the Common Object File Format (COFF). COFF is a processor and operating system independent format that provides uniformity across different systems. The **convert** utility lets you convert System III objects and executables to COFF; however, recompilation is recommended in light of the other changes made to the tools in SGS.

To simplify the conversion of tools and utilities that work on object and executable files to the COFF standard, System V provides a set of subroutines that lets you do operations on object and executable files. These subroutines can be thought of as database primitives that operate on a database made of object and executable files. All access to the database should be made through these primitives to enhance the portability and longevity of the tools that use the database.

System V also uses a different file format for library archives. This new format resurrects the directory feature of Seventh Edition UNIX, and improves on it by combining the directory builder command **ranlib** into the archive maintainer. It is no longer necessary to topologically sort object file entries in a library archive to insure the correct order for the loader. As a result, the loading phase of the compilation process is faster because only those library entries needed by the loader are read.

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*LIBRARIES*

The performance of the Standard I/O library has been improved over that of System III by larger buffer sizes and line by line buffering of terminal output. System III uses a smaller buffer size and one **write** system call per character sent to the terminal. These library improvements can only be realized when programs are recompiled as copies of Standard I/O subroutines reside in each program that uses them.

System V also provides profiled versions of the standard C library and the math library. These versions are automatically selected by the **cc** command when you request that the compiler prepare your program for profiling. System III offers no such feature.

Users of the math library now have more control over the disposition of errors and unusual conditions detected by these subroutines. The math library lets you define your own exception handling subroutines that can treat errors appropriately for an application. System III cannot be customized with special handlers and often produces a memory dump or simply ignores errors and unusual conditions.

*THE FORTRAN LANGUAGE*

The FORTRAN language, conforming to the 1977 standard, is also included in System V and is faster in both compilation and execution speed than the System III version. Further, there are more support tools for software engineers who must use the FORTRAN language. New in System V are:

1. **asa**—a tool that reformats files with standard FORTRAN carriage control characters for printers that do not understand them.
2. **fsplit**—a tool for dividing a FORTRAN file with several procedures into several files each with one procedure.
3. **ratfor**—a preprocessor that converts a more C language-like version of FORTRAN into FORTRAN77.
4. **efl**—an extended FORTRAN language that contains structured programming constructs like those in the C language.

**Communication Improvements**

System V offers improvements in the areas of machine to machine and terminal to machine communications. This section highlights the changes made to the virtual Protocol Machine (**VPM**), UNIX-to-UNIX Copy (**UUCP**), terminal line disciplines, and the new virtual terminal interface.

*VIRTUAL PROTOCOL MACHINE*

**VPM** in System V also supports the KMS11 eight line synchronous interface in addition to the single line KMC11B. **VPM** lets you write, compile and download a protocol handler into these microprocessor based peripherals to enable your System V system to communicate

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# Legal Window

## IBM VARs Form Trade Association

*by John C. Yates, Esquire*

By request, this month's article in the Legal Window focuses on the organizational meeting of THE VALUE GROUP, INC. VALUE is a new non-profit association composed of existing and aspiring value-added remarketers of IBM, many of whom are also active in COMMON, an association of IBM endusers.

At the organizational meeting of VALUE in Toronto on August 13th and 14th, the participants had an open forum to ask questions of IBM representatives from the company's marketing and distribution division. Additionally, members of the group were given an opportunity to gaze into the IBM crystal ball as to the future marketing directions of Big Blue.

This column outlines the espoused goals and objectives of VALUE and gives an idea of the composition of the association. Also, it will provide some idea of the subjects covered at the organizational meeting and the future plans for the group.

Please keep in mind that the author attended the organizational meeting of VALUE at the invitation of its membership and is neither an officer nor director. However, in addition to attending the seminars and panel discussions, I was privileged to speak before the group on "Legal Issues in Computer Marketing and Distribution." Based on the enthusiasm and interest among the members present, the future of VALUE appears to be bright.

**Composition**

The acronym VALUE stands for *V*alue *A*dded *L*iaison & *U*ser *E*xchange. The group is composed of IBM resellers and remarketers, commonly referred to by IBM under an assortment of names and program titles. The IBM alphabet soup of marketing channels and programs includes the following:

- *CMO* — Complimentary Marketing Organization
- *DRM* — Direct Response Marketer
- *OEM* — Original Equipment Manufacturer
- *SSO* — Software and Service Organization
- *VAD* — Value Added Distributor
- *VAR* — Value Added Remarketer
- *VPA* — Volume Procurement Agreement

A description of these marketing channels and programs is beyond the scope of this article. Basically, these acronyms represent the designations for software developers and marketing organizations involved in varying degrees in close connection with IBM hardware sales efforts.

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## Legal Window continued from page 10

These marketing channels have only recently been devised, and they currently represent a small part of IBM's business. As a result, many of the participants at VALUE were previously unaware or unfamiliar with the titles and programs. However, presentations by IBM representatives helped to clarify the legal and contractual parameters of the marketing programs and alerted the VALUE participants of the requirements for each program.

### Purpose

The stated purpose of VALUE is to provide a forum for the exchange of marketing and product knowledge between IBM and its resellers. Unlike other organizations in which technical knowledge is disseminated, VALUE focuses specifically on marketing. The concerns of the membership concentrate principally on business and legal issues associated with distribution, market exposure, and sales.

VALUE is organized to provide its members with a unique opportunity to hear directly from IBM representatives. At the organizational meeting, several hours were devoted solely to presentations by IBM of the multiple marketing channels recently created by the company. In addition to providing a profile of the various third-party participants in each program, the IBM representatives discussed the practical business arrangement and contractual terms of the relationships. Presentations were complemented with visual effects and an opportunity by the membershp to ask questions of the IBM personnel.

In addition to the IBM informational forum, VALUE was created to allow its members an opportunity to exchange software sagas and war stories among themselves. Although the participants at the organiztional meeting were from all over the United States and Canada, informal discussions among members were lively and highly informative. A number of the social gatherings provided third-party remarketers with a chance to ask specific questions of IBM representatives regarding a particular problem or concern with the IBM marketing channels and programs.

### The Meeting

The VALUE organizational meeting was held on a weekend in order to minimize the effect on the work week. Members arrived on Friday evening and met in informal surroundings with officers and directors of VALUE and IBM representatives.

The activities on Saturday were divided into four categories. First, officers and directors of VALUE presented their ideas regarding the organiztion and discussed the products and services offered by their companies. These included a presentation by the first IBM Complementary Marketing Organization (CMO) and a discussion of various marekting practices and success stories of this organization.

The second part of the meeting was devoted to professional development. A presentation on legal issues in the computer industry was presented by the author of this column, and marketing predictions and trends were discussed by a leading publisher in the industry. Members of VALUE were given an opportunity to ask questions throughout these sessions.

The entire afternoon (and part of the evening) was devoted to a presentation by IBM representatives of the third-party programming and marketing channels of the company. The presentation took the form of a classroom setting as the IBM reps walked the membership through some newly-revised and developing marketing programs and the maze of associated acronyms.

Finally, on Sunday, the VALUE membership discussed general organizational issues and concerns, including future meetings, program agendas, membership and an evaluation of the organizational meeting.

### The Future

As an outsider looking in, I was extremely impressed with the organizational meeting of VALUE. Unlike the typical computer user group, VALUE provided an opportunity for an open exchange of marketing and product information without the technical cloud that hangs over so many computer associations. Business, legal and distribution questions clearly dominated the discussions and overshadowed infrequent talk of bits, bytes, and multiplexers.

The pool of potential VALUE members will increase significantly over the next few months. With the rise in the numbers of resellers signing contracts with IBM, the potential for increased membership of VALUE is significant. It will be important, however, that participation in the organization include third-party remarketers from all levels of the IBM program and that members continue to display a willingness to share relevant marketing information.

If you would be interested in additional information regarding VALUE, please feel free to contact the author of this column at (404) 524-1000.

This column is presented for informational and educational purposes and is not intended to constitute legal advice. John C. Yates, Esquire is an attorney with the law firm of Asbill Porter Churchill & Nellis in Atlanta, Georgia. The firm specializes in business and legal concerns in the computer and telecommunications areas.

## Trademark Acknowledgements

X:Y = X is a trademark of Y.

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|---|---|
| UNIX: | Bell Laboratories |
| CP/M 86, CP/M 16, CP/M: | Digital Research Corp. |
| MS-DOS, Xenix; Multiplan: | Microsoft Corp. |
| APPLE DOS, Lisa: | Apple Computers |
| VENIX: | VentureCom |
| VAX, PDP-11: | Digital Equipment Corporation |
| VisiCalc N, Visi[on]: | VisiCorp |
| SuperCalc; SuperCalc 3: | Sorcim Corp. |
| 1-2-3: | Lotus |
| Ultra Calc: | Olympus Software |
| Viewcomp: | Unicorp |

# REVIEW: ULTRACALC

*by Peter Marvit*

Electronic spreadsheets, like word processing packages, have become ubiquitous on business and personal microcomputers. The enormously successful *VisiCalc* (with an estimated 500,000 copies sold) is usually considered to be responsible for the general acceptance of micros. Although that may be overstating the case, the legion of "Visi-clones" attests to the spreadsheet's importance in the software world.

The electronic spreadsheet's popularity can be traced to the tedious pencil and paper worksheets which provessionals used (and still use) to calculate financial and other numerical models. Computers offered the same capability in a structured visual environment which returns instant feedback to changing data. Changes in a complex model which previously required days of manual implementation and recalculation with pencil, paper and calculator can be accomplished in hours or minutes with spreadsheet software.

This is not to say that a spreadsheet program is a panacea for all numerical modeling woes. Problems which cannot be solved using a paper spreadsheet will not be appropriate for an electronic one. If users do not have a firm background in mathematical relationships or at least a set of predefined models from which to work, they will flounder in their attemps to build appropriate models. As one person quipped, electronic spreadsheets are tools, not crutches.

In today's computer industry, "integrated decision support" systems are the new buzzwords. With the advent of **Lotus's** *1-2-3* for the smaller computer and **Digital Equipment's** *All-in-1* for the larger machines, why should anyone purchase a single function program like an electronic spreadsheet? In the UNIX world, integrated packages (and, for that matter, other software packages) are not yet widely available. This market will certainly be flooded in the future. At the present, however, most software houses are concentrating on the lucrative high volume but low price market of the **IBM** *PC* and similar machines or the low volume, extremely high ticket market of large centralized computers.

Many programs running under UNIX, including *UltraCalc*, are capable of writing information to an external file. This information can then be read by other types of programs such as word processors or database management systems. However, transferring data from one program to another usually requires more computer expertise than the typical manager has or wants. Until a UNIX vendor develops a *LISA*-type integrated environment, users must content themselves with the good but separate application packages for a particular specialized need, and then contact their local guru to connect the pieces.

Over 50 spreadsheet packages exist for the popular MS-DOS and CP/M operating systems. The current choices for UNIX are much more limited. **Microsoft's** *Multiplan* is widely known and distributed on all three operating systems. *ViewComp* by **Unicorp** has a small but dedicated following. **Access Technology** sells *Supercomp-Twenty*, a well-received high-end product which has sold almost 4000 copies. *UniCalc*, distributed by **Lifeboat Associates,** is reputed to be a good "Visi-clone" which runs under UNIX, although we have not seen it.

We chose *UltraCalc* as a relatively high-end, low-priced package which was only recently widely released. It appeared to be extremely full functioned and well designed for the UNIX environment. We were also impressed by the relative success of the tiny company which developed and markets the electronic spreadsheet.

## COMPANY BACKGROUNDER

**Olympus Software**, 644 Elizabeth St., Salt Lake City, Utah, (801) 583-5202, is a corporation operated by Dick Kreutzer. Kreutzer does not have any other employees, and, until recently, has not contracted out for independent help except for documentation. Funding for his firm was derived solely from personal savings. Kreutzer founded Olympus Software in early 1982.

Kreutzer received his B.S. in Psychology and M.S. in Statistics from the University of Utah. After graduation, he spent eight years working at the University as a statistical programmer for the Department of Biological Statistics. Prior to founding Olympus Software, Kreutzer worked at Control Data Corporation for five years as a senior programmer and analyst. In this capacity, he developed a number of programming tools including a database management system for libraries. His interest in UNIX and C has prompted him to write several programming tools for the UNIX system. He has been working on an unreleased relational database management system since 1977.

Olympus' first product, UltraCalc, was released in March of 1982. UltraCalc is written in C and currently runs on a number of 68000 and Z8000 based computers running UNIX. The package also runs under the Regulus operating system by Alcyon (a UNIX-like operating system). The company reports that over 1000 copies of UltraCalc have been sold.

## MARKETING

Olympus sells UltraCalc resale licenses exclusively to OEMs and distributors and has no plans to change this strategy in the near future. UltraCalc version 2.0 first became commercially available under private label from **WICAT Systems**. The current version, 2.4, is available on all **Unisoft** UNIX ports as well as on 16-bit systems by **Alcyon, Auragen, CIE, Onyx, Plexus** and **Zilog**. A **Fortune** *16:32* port is reportedly in progress.

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Olympus holds OEM agreements with Alcyon, Auragen, CIE and WICAT. Recently, Olympus gained a major contract with **AT&T Information Services** (formerly American Bell) which should be a major boon to the software company. Two distributors, Unisoft and **Human Computing Resources**, may distribute the product for DEC *VAX's*. Major delays in the completion of UltraCalc documentation have severely limited distribution.

Olympus has done almost no advertising, preferring to let the distributors "spread the word." We wonder about the wisdom of this strategy and the lack of marketing personnel and effort, considering the well-financed campaigns of its many competitors.

### SUPPORT

We are concerned about the long-term stability of a one-man company. However, the success of the product, despite its lack of documentation, bodes well for its near term future. This is especially true since Kreutzer is technically rather than marketing oriented. Whether this company has the ability to "adequately support the product" is a question which can only be answered over time. Since the distributors will directly support endusers, the question may be moot. In our experience, questions about the program were handled by Olympus very promptly and courteously.

### FUTURE

Although the actual price is determined by the distributor, Olympus suggests a retail price of $295 for a single user computer version and $695 for multiuser computers. For the future, Olympus is considering integrating UltraCalc with graphics, and with a relational database system within a shell that is similar to **VisiCorp's** *VisiOn*. Olympus also plans to introduce a report generator.

Noting the success and utility of multiple function packages like Lotus 1-2-3 and **Context** *MBA*, we look forward to seeing broad functionality as part of Olympus' future product line. UltraCalc seems to have the versatility and "hooks" to provide a keystone around which an OEM can develop its own integrated packages.

### STARTING UP

We tested UltraCalc Vesion 2.4 on an **Onyx** *C8002M* computer running UNIX System III. Our configuration has 40 million bytes of hard disk storage, 512 thousand bytes of memory and a 17 million byte 1/4" cartridge tape. We received a release tape from Olympus Software which contained all the necessary modules. It included demonstration files and the required UNIX ".profile" which is used to set system variables such as type of terminal and computer limits to spreadsheet size. Installation was extremely easy since each module on the tape had the full directory pathname and correct access permissions! We merely loaded the tape and started up. Since UltraCalc has both "business graphics" and color capabilities, we used **TAB** *132/15* and **DataMedia** *Co-Scan 10* terminals to exercise these features.

### DOCUMENTATION

After numerous delays, we received the first edition of the users' guide "hot off the photocopy machine" with a red "preliminary" stamp on the cover. It should be noted that Olympus' distributors might decide to repackage or reformat the documentaiton, and that Olympus is planning a new version in the first quarter of 1984. Our comments are based on the copy sent directly to us.

The manual is not typeset and the text suffers from visual confusion between section and paragraph headings, commands and instructions, and explanatory information. Good visual layout of a manual, which this one sorely lacks, can aid users both in learning and later quick reference. The addition of different type fonts and sectional tabs or even boldface and underlining would help differentiate sections and make searching for particular information significantly easier. On the other hand, we especially liked the numerous examples of screen displays sprinkled throughout the manual. Each figure is a black rectangle with rounded corners and white letters, looking much like an actual CRT screen.

Although lacking an index and a reference card "cheat sheet," the 179 page manual has an unusually complete table of contents. In the reference section of the manual, topics and commands are interleaved in alphabetical order which we found to be very handy after we first got used to it. However, the conventions used to describe the commands (like quotes around required actions) tended to be misleading. We were also impressed with the multilevel on-line help facility (described in detail later) which provided as much if not more information than the reference manual.

The style of the manual is terse and direct. The tone of the writing is clear and not condescending. This style is greatly appreciated, after wading through many other manuals' flowery, "user-friendly" pages. UltraCalc was designed as a mathematical modeling tool rather than as a finished application program and the documentation reflects this philosophy. The manual assumes the user is knowledgeable in modeling techniques and merely needs to know how the program will perform various functions. Naive or occasional users might find this to be a liability. They would be well advised to purchase a book which covers applications more thoroughly before attempting sophisticated models.

### READER'S INTRODUCTION

The first three chapters of the manual introduce procedures and concepts of UltraCalc and guide a user through several hands-on tutorials of increasing complexity. The first chapter provides a brief overview of the program and orients a user to special keys on the keyboard (e.g., control, delete, and arrow keys). A continuous tutorial in the second chapter provides background for entering commands, specifying cells and groups of cells, and moving around the spreadsheet. The third chapter introduces the most commonly used functions

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and commands by using three sample worksheets. Although these tutorials adequately prepare users for a majority of applications, we would like to see some of the more advanced features (e.g., sorting, graphing, linking two or more spreadsheets) incorporated into the examples to show their use in a real-life context.

## AT THE KEYBOARD

After logging onto the computer, a user simply types "uc" to invoke UltraCalc. The system then displays the main menu (see figure) through which a user can create, delete and change the size of his spreadsheets. Spreadsheet names are limited to 10 characters (combinations of letters, numbers and underscores) and must reside in a user's personal directory. When loading an old worksheet or creating a new one by typing "uc budget" or "uc amort rows=50 cols=20", you can bypass the main menu and go directly to a worksheet.

Theoretically, a worksheet's size is limited by the amount of disk available. Due to an unexplained oddity of the Onyx system, the total number of rows plus columns could not exceed 2200 (potentially over 1 million cells) which is still large enough for all but the most complex models. We ran into disk space problems with a 2000 x 200 worksheet which we attempted to fill, but had great success with a partially filled 750 x 300 worksheet.

In the main menu, you can move the cursor to the proper selection either pressing the arrow keys or typing the first letter of the choice. The backspace key will bring you back to the previous selection or undo a choice. For example, typing "l" will serially list the spreadsheets you have in your directory. Pressing a return will display the name of the next spreadsheet and pressing backspace will back up through the list. The one by one listing is fine when a small number of spreadsheets exist, but we would prefer to see the entire directory at one time and use the arrow keys to pick the spreadsheet. To retrieve a spreadsheet, you must type an "o" and UltraCalc will return you to the exact spot where you left off in the spreadsheet.

## IN THE SPREADSHEET

After creating a spreadsheet from the main menu, UltraCalc loads the workspace (which can take up to 30 seconds for a 500 x 500 spreadsheet). The familiar grid of rows (designated by numbers) and columns (designated by letters) then appears with the cell pointer in the upper left corner (cell a1). In our version, the current cell is indicated by reverse video. Brackets will appear on terminals which do not support video attributes. The worksheet itself fills all but the last three lines on the screen.

The first line below the grid is the entry which displays data, formulas and commands as they are typed. Up to 132 characters can be entered and edited; backspace deletes the character before the cursor, the down arrow deletes the character upon which the cursor rests, and the left and right arrow keys merely move the cursor in that direction.

The next line down is the prompt line. Here UltraCalc displays error messages, helpful prompts and suggested information that is needed to carry out a task. This line can be turned off by experienced users or people using a low speed computer line to improve response time. We found the prompts to be very helpful as a reminder of the various options for a particular command.

The bottom line is the status line. From left to right, it shows the current cell's coordinates, the cell's format, the cell's video attributes, the cell's contents (if it contains a formula) and the name of the current spreadsheet.

As with most spreadsheets, cells in UltraCalc can be identified by a combination of row and column coordinates (e.g., c2, fi497). In addition, individual cells or a range of cells can be given "names" to be used in formulas. This feature is especially useful in large spreadsheets, when it may be difficult to remember exact location of a cell. Naming cells or groups of cells also makes formulas much more meaningful. For example, you might want to add a salesperson's commission to totals in several parts of a worksheet. By naming each of the total cells "cost total," you can add the commission amount to "cost total" in a formula, and UltraCalc will automatically adjust the appropriate cells. Named cells are also used for "linking" different spreadsheets. For example, data entered on an itemized deduction sheet will be made to automatically appear on a Form 1040.

## MOVING AROUND

The easiest method of getting from one cell to another on the spreadsheet is by using the arrow keys. Pressing an arrow key moves the cell pointer in the desired direction cell by cell. In general, UltraCalc uses the first four function keys for paging around the spreadsheet. That is, the F1 key will move the cell pointer up one entire screenfull, the F2 down a screenfull, and so on.

A cell's data entry may be terminated by pressing either a return or an arrow key (which simultaneously completes the entry and moves to the next cell). Since terminals with a numeric keypad usually have a return in a more convenient location than the arrow keys, data entry can be speeded up by typing ">a". This turns the auto advance switch on and makes the cell pointer move in the direction of the last arrow key when a return is used to terminate an entry.

The arrows and functions perform slightly different tasks when editing a cell's contents. Edit mode may be entered during data entry by typing "control-e." The keys perform the following functions:

- *left arrow* moves the edit cursor left one position
- *right arrow* moves the edit cursor right one position
- *up arrow* inserts characters before the edit cursor
- *down arrow* deletes the character under the edit cursor
- *F1* clears the entire line
- *F2* clears from the edit cursor to the end of the line
- *F3* moves the edit cursor to the start of the entry line

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- *F4* moves the cursor to the end of the contents to be edited
- *backspace* erases the character to the left of the cursor

Windows in traditional spreadsheets are used to show different parts of a large workspace at the same time. Usually you can move the cell pointer from one window to another and independently scroll different parts of the screen. UltraCalc does not support windowing per se. Instead, you can display non-adjacent rows and columns in any order. Although you can move the cursor within the screen's perimeters, unexpected and sometimes bizarre results will occur when trying to scroll to another part of the worksheet. In addition, when we tried this procedure, row zero mysteriously appeared at the top of our screen filled with errors.

Windows can be simulated by freezing certain rows and/or columns so they remain in view when you scroll to different parts of the worksheet. We found windows very useful on other spreadsheets and frequently caught ourselves wishing they existed in UltraCalc.

### ENTERING DATA

Each cell can contain one of three types of data: text (which UltraCalc misleadingly calls "labels"), numbers (also called "values") and formulas. Cells can be from 1 to 127 characters wide and can display their contents in a variety of formats.

Textual information can be typed directly into a cell without a special character preceding the data, provided the text will not be confused with a name of a cell, cell coordinate or function. Left justified is the default display, but text can also be right justified or centered with a cell by typing a grave accent (`) or double quote (") before the text respectively. If the text is too large to fit within its cell's width, the next cell to the right is overlapped and any information is partially obscured. We used this feature frequently when building titles for different parts of the spreadsheet.

Numeric data can also be entered directly and will be accurate up to 15 digits. When a cell is formatted to display a certain number of decimal palces, UltraCalc rounds the display but retains the accurate figure internally. Dollar format affects both the input and display. On input, the decimal point is implicit or can be overridden by manually typing a decimal point. Commas are inserted at each multiple of 1000 and negative numbers are enclosed in parentheses. Fixed point, percent, integer and exponential formats are also available. Unlike text, numbers larger than their cell width show as asterisks.

Video attributes (bold, blinking, colors) can be used in conjunction with any formatting option. Thus, you might specify that all totals should appear in bright video, all negative numbers in red, or a particular title in reverse video for visual clarity. Using a color terminal, we found the effects are most dramatic. UltraCalc associates each video attribute and color with a user specified number which can then be used in formulas to produce dynamic video assignments.

A formula in a cell tells UltraCalc to perform some sort of calculation based on existing information within the spreadsheet without manually entering new data and then display the result in that cell. Neither formulas nor functions require a preceding special character; UltraCalc generally interprets an entry correctly as a label, function or formula based on context and usage. A formula can be a simple addition of two cells, e.g.,

bal2+j67

You can also make a formula with named cells and functions, using parentheses to force calculation order, e.g.,

sum(sales,(expenses/100),avg(a4 . . a35))

As you can see, formulas can get somewhat complex, but are at the heart of electronic spreadsheets.

### GRAPHICS

UltraCalc supports histograms and both vertical and horizontal bar graphs. It can also use a terminal's "business graphics" capability to produce line drawings for visual templates. Horizontal graphs are easy to produce by specifying a cell's format to "h" (for histogram). The default character for horizontal graphs is an asterisk or, if the terminal supports it, a reverse video bar, although any character can be specified. The length of the graph in that cell depends on the value in that cell. That is, if a cell has a value of 5, the cell will display a horizontal bar of reverse video five characters long.

Vertical bar graph construction is more complex since you must use formulas to control the height and width of the graph. Above/below graphs can be built for bar graphs with negative numbers. Again, bar graphs using color and other video attributes provide professional and meaningful results. We hope that improved graphing (such as pie, line and scatter charts) will be included in future releases. We found that setting up graphs required some ingenuity and patience, although the results often justified the effort.

### COMMAND STRUCTURE

Commands instruct UltraCalc to perform various tasks and consist of a semicolon (";") followed by a single letter which was thankfully mnemonic (e.g., C-opy, I-nsert, e-X-ecute). In fact, after typing the letter, the full name of the command itself appears on the screen's entry line. We enjoyed seeing and using the options and reminders which appeared on the prompt line as they were not obtrusive.

Commands act on the current cell by default. The default can be overridden by typing a cell list before the semicolon. A cell list can consist of a single cell or a combination of cells, rows, columns, blocks or ranges of cells and names separated by columns. This all may seem a bit overwhelming at first but it should underscore the generality of the command syntax. For example,

g12,8,cost;b

will blank cell "g12," all columns in row 8 and all cells named "cost." Likewise, when a destination for a move or copy is needed, cell lists may be entered after the command as in,

dept;c a 4 . . d4

which copies the cell named "dept" to cells a4, b4, c4 and d4. continued on page 16

# ULTRACALC continued from page 15

That generality which makes the commands so powerful can also cause problems. For example, typing the command

hl . . jl;c 2 . . v2

will copy all the cells between h1 and j1 to a2 through c2 and then v2 only. That is, if you forget to type the column letter, UltraCalc will take your command literally. It cannot check the logic of your statement to verify your intentions. This can be particularly devastating if you are working on an established worksheet. We would like to see an "Are you sure?" message, although it might be impractical considering the design of the program.

## ON-LINE HELP

UltraCalc's interactive on-line help facility turned out to be one of the most useful (and addictive) "extra" features in the package. The concept is simple. If you have a problem or the program beeps at you and gives a nasty error message, just type a question mark ("?"). The program then gives immediate access to the appropriate documentation for the situation at hand. The help screens are arranged hierarchically with active cross referencing. UltraCalc remembers the sequence of help panels so you can back up to a previous screen or go forward to receive further explanations. The help screens themselves are complete enough that a user could learn all the functionality of the program from them.

Suppose you entered a formula using the function "avg" but UltraCalc tells you that you have a "cell list error." By typing a "?" a help panel decribing "avg" appears with highlighted cross references to "," for information on cell lists. After you have read the first panel, you can type "," to get information on how to properly construct a cell list. By typing backspace, you can return to the explanation of "avg" to review your problem. Typing a space at any time will return you to where you left the worksheet so you may correct the problem and continue.

## RECOVERY

While working on a large spreadsheet (750 rows by 60 columns), we found that the data became corrupted and UltraCalc became stuck in an infinite loop, requiring us to kill the program from a master system console (thank heaven for multiuser systems!). We reported the problem to Olympus who informed us of a method to "disassemble" and then reconstruct the spreadsheet—something which is not mentioned in any of the documentation.

Although the entire process of rebuilding our spreadsheet took close to 40 minutes and required some small bit of technical UNIX expertise, we were amazed that this "rollback" feature, generally present only on sophisticated database packages, even existed at all. The first stage in this procedure is to create a file which contains all the commands used to originally create the spreadsheet. You can subsequently edit this file, but it may become somewhat tedious to wade through all the commands which UltraCalc performs "in the background" while you normally enter worksheet data (our file had over 14,000 lines). Calling up a shell script will then instruct UltraCalc to actually rebuild the original worksheet. After we finished this step, we found the new worksheet intact, without the troublesome data corruption. Olympus has since issued an update fixing the infinite loop problem.

## DATA TRANSFER IN AND OUT

Producing a printed version of your spreadsheet is required to present your information to other people, check your formulas, retain a hard copy of your painstaking efforts and simply to take a break from the video display. UltraCalc uses the ";o" (output) command to accomplish this. To print the entire worksheet, you simply type the command and the results appear on your system's standard printer. By specifying a call list before the ";o", a selected portion can be printed—useful for large spreadsheets which may not fit on a standard page.

To display formulas instead of values, both on the screen and in the printed output, typing "<f" (for Formulae OFF) or ">f" (for Formulae ON) on the entry line. Typing the output command with the formulas on will then print the spreadsheet showing the formulas.

The worksheet may also be "printed" on a disk file. This file will then contain the same information as a printed copy but in a form accessible to other programs (e.g., word processors). Other options of the output command include printing unprotected cells only (useful for printing on pre-printed forms), printing video attributes (to produce continuous lines and other graphic characters on a printer), and appending output to an existing disk file.

UltraCalc addresses the issue of software integration as well as any other standalone package. Frequently, for example, you might want to transfer data between a database and a spreadsheet. Although no direct integration exists, data can be "imported" and "exported" through intermediate files in standard ASCII format. A "d" option for the output command is used to create files from worksheet data with a user-specified delimiter separating each cell's contents. Many other programs have "hooks" to accept this type of input, providing the recipient program has been told the sequence and format of that input. By typing ";x import emp-salaries", you can reverse the procedure and load externally created data into a worksheet from the file named "emp_salaries." As noted earlier, most managers will probably not want to spend the time building data transfer bridges. On the other hand, inhouse system administrators or OEMs and other value added resellers can take advantage of this mechanism to affect relatively simple, albeit primitive, integration.

## EXECUTION FILES

The ";x" (e-X-ecute) command is a general and powerful one which takes advantage of the UNIX environment. This command effectively steps outside the bounds of UltraCalc to execute an operating system command, run another program, or execute an UltraCalc command file. In the case of "importing" information described

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# ULTRACALC continued from page 16

above, UltraCalc actually ran a program called "import" which processed the data file and subsequently inserted values into the appropriate spreadsheet cells.

A command file may contain any set of valid UltraCalc entries (i.e., commands, switch settings, data, etc.) which can be typed at the keyboard; if the file is executed, the spreadsheet will look the same as if each line entry were typed manually. This is useful for creating spreadsheet templates, command streams to transfer data in and out of the program, "macro" lists of frequently used keystrokes, etc. A command file can also be used for an interactive spreadsheet which displays messages (as for demonstrations), prompts for input, and/or chains to other command files. Thus, dialogues with users can be created with multiple branch points as command files can be nested to a level of ten deep.

UltraCalc will interrupt an executing command file when you press the delete key or if it encounters an invalid entry in the file. Once interrupted, control will return to the keyboard. The execution cannot then be resumed where it left off and the entire file must be re-executed. We believe that the utility of the execute command would greatly improve if it could continue from a break. The more something can be made "idiot proof" in this error prone world, the better.

"Profiles" are special command files which are automatically executed as a spreadsheet is loaded. The ".ucx" profile is executed when any worksheet is loaded, regardless of its name or location. This file could be used, for example, to set up standard video attributes and title areas. A profile with the name of the spreadsheet appended by ".ucx" will be executed only when the associated spreadsheet is loaded. These profiles can be used to minimize the amount of technical knowledge and user intervention necessary to operate the spreadsheet. Thus the program could even be used for data entry by computer naive clerks.

## CONCLUSION

As a product, we found UltraCalc to be fully featured, extremely easy to learn and use, and well designed for the UNIX environment. We were disappointed with the printed documentation but were told that these lacks will be addressed in the next edition. We certainly hope so since documentation is so crucial both to sales and use.

The commands were generally mnemonic and followed a consistent format. We especially liked the interactive on-line help facility. We would have liked to see more built in financial and numerical analysis functions like standard deviation, internal rate of return, least squares, or depreciation. Nonetheless, for an initial product offering, we were very impressed with UltraCalc.

We are concerned about the company itself and its ability to simultaneously support UltraCalc, maintain marketing, and continue product development. In this highly competitive industry, ongoing enhancements and new product offerings are mandatory for success. UltraCalc certainly has the potential to be part of an integrated set of applications, either developed in conjunction with a third party or with packages from Olympus. We look forward to the database management system and graphics packages which are reportedly "in the works." However, considering the track record for the rest of the industry for product delivery, we will not hold our breath.

In sum, UltraCalc is a highly impressive package which has few equals in the micro or mini world. Its price makes it highly competitive. If Olympus develops a strong marketing strategy and can prove itself as a viable company, we predict that UltraCalc will offer considerable competition to many of the more established and well-known spreadsheets.

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## APPENDIX 1: FUNCTIONS IN ULTRACALC

Data Summary Functions:

sum(cell list)
min(cell list)
max(cell list)
avg(cell list)
count(cell list)

Numeric Conversion Functions

int(variable)
round(variable)
abs(variable)

Table Manipulation Functions

find(cell list, target[, offset])
lookup(cell list, target[, offset])
choose(cell list, index)

Financial and Mathematical Functions:

npv(cell list, discount)
sqrt(variable)
log(variable)
ln(variable)
exp(variable)

TRIGONOMETRIC FUNCTIONS:

sin(variable)
cos(variable)
tan(variable)
asin(variable)
acos(variable)
atan(variable)

Constant Functions:

E
PI
ROW
COL
WIDTH

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Miscellaneous Functions:

iserror(cell)
isna(cell)

## APPENDIX 2:
## COMMANDS AND SYNTAX IN ULTRACALC

| | | |
|---|---|---|
| \|target\| | ;Auto Link \|WS\| \|source\| +- | Link NAMED cells from another worksheet |
| \|list\| | ;Blank | Clears the contents of cell(s) |
| \|source\| | ;Copy \|target +- | Make copies of cells |
| \|list\| | ;Delete r c \|#\| | Delete a number of entire rows or columns |
| \|list\| | ;Edit | Modify the contents of a cell |
| \|list\| | ;Format \|format\|@\|#\| | Set cell formats and/or video attributes |
| \|list\| | ;Gets \|expression\| | Sets cell to VALUE, LABEL or FORMULA |
| \|list\| | ;Hold constant h v b c | Do not adjust formula references |
| \|list\| | ;Insert r c \|#\| | Insert number of entire rows or columns |
| \|list\| | ;Justify l r c | Space cell contents left, right or cursor |
| \|names\| | ;Kill name \|name\| | Use \|names\| or \|name\| to remove cell names |
| \|target\| | ;Load \|WS\| \|source\| +- | Load cells from \|WS\| int \|target cell list\| |
| \|list\| | ;Move \|cell\| | Move entire rows or columns to \|cell\| |
| \|list\| | ;Name \|name\| | Ties \|name\| to cells in \|list\| |
| \|list\| | ;Output \|file\| u > d"c" | Output cells to \|file\|, unprotected, with attributes, appended, separated by "c" |
| \|list\| | ;Protect | Protect cells against modification |
| | ;Quit | Quit session, return to menu, no save |
| | ;Reorder n r c | Chance recalculation order |
| \|list\| | ;Save \|WS\| | Save cells to worksheet \|WS\| |
| | ;Title h v b c | Freeze title area on screen |
| \|list\| | ;Unprotect | Disable protection set by ;Protect |
| \|source\| | ;Vacate \|target\| +- | Move and blank cell contents, cell by cell |
| \|list\| | ;Width + - \|#\| | Change the width of columns |
| | ;eXecute \|file\| | Execute command file/operating system call |
| \|list\| | ;Yield Sort \|key list\| + - | Sort rows or columns by \|key list\| |
| \|list\| | ;Zap | Unconditionally clear cells |
| \|list\| | ; | Recalculate Formulae in cells |

## APPENDIX 3:
## SWITCHES IN ULTRACALC

| *Switches* | *Comments* |
|---|---|
| a Auto Advance | Moves cell pointer automatically on pressing return |
| b Border | remove or display spreadsheet window border |
| e Echo | Echo characters from executable command files |
| f Formulae | Display formulae in place of values |
| h Help | Suppress or display prompting |
| n Display NA | Suppress or display "NA" when data Not Available |
| r Auto Recalc | Automatic or manual recalculation of formulae |
| s Scroll | Inhibit or allow arrow key scrolling in window |

Note: To turn switch ON or OFF, type > or < respectively before the letter of the switch.

# UNIX System V continued from page 10

with other UNIX and non-UNIX based systems. System V's **VPM** also supports powerfail/restart. System III's **VPM** only supports the KMC11B and not powerfail/restart.

*UNIX-TO-UNIX COPY*

**UUCP** in System V provides more features than does the System III version and also contains several bug fixes to well known problems. When **UUCP** must use an autodialer to make a connection with another system, it will be successful more often in System V than in System III because of improvements in the dialing algorithms. System V's **UUCP** also attaches an identifier to each job that can be used to inquire about the status of the job and/or to cancel a job.

*LINE DISCIPLINES*

System III provides the framework for multiple line disciplines in UNIX but offers only the standard full duplex line discipline. System V improves on System III by fully integrating multiple line disciplines into the operating system and offers both full and half duplex support. With System V, the task of supporting specialty termi-

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## UNIX System V continued from page 18

nals such as point-of-sale terminals and automatic teller machines is eased because of this new line discipline feature.

### *VIRTUAL TERMINAL INTERFACE*

System V provides a new feature called the *virtual terminal interface.* This feature lets applications software communicate with terminals in a terminal independent fashion because terminal specifics are handled by subroutines in the operating system. Communication between an application and the operating system is coordinated by a new header file distributed with System V. This file defines the set of operations allowed, such as cursor positioning and inverse video control. The virtual terminal interface is an alternative to the **termcap** database and the **curses** subroutine library which are also available in System V.

### Commands and Administrative Aids

System V provides new tools for the system administrator to simply file backups and to control line printers attached to a system. System V also provides a full-screen editor and an improved line printer tool set for the UNIX user.

### *FILE BACKUPS*

New in System V are three commands that reduce the time spent saving and restoring files on tape. The **ff** command does the same job as the **find** command, that is, selecting files from a file system based on a specified criteria, but **ff** is faster.

Next is the **finc** command. **Finc** duplicates the job done by **find** and **cpio**, that is, locating and archiving files based on a certain criteria, and **finc**, too, is faster. Complementing **finc** is the **frec** command. **Frec** restores files selected by inode number from **finc** and **volcopy** format tapes.

To use **finc** and **frec** for file backups, you must first run **ff** to build a file relating file names to inode numbers for the files you must archive. Then, use **finc** to archive the inode-to-filename relation file on the same tape with the archived files. To restore files, first restore the file-name-to-inode relation, then use that file to restore the files needed.

### *LINE PRINTER SPOOLER*

The LP Spooling System new in System V let system administrators control line printers attached to a UNIX system. The functions available to the administrator are selective enabling and disabling of line printers, canceling print jobs, rerouting print jobs from one printer to another, adding line printers to the system, changing line printer characteristics, and checking line printer and queue status. In addition, the LP Spooling System lets the UNIX user select the line printer to be used for printing. Users can also examine print job status and can cancel jobs in the print queue. System III offers the **lpr** command for queueing jobs, but provides no command for job monitoring or canceling, or line printer control.

### *FULL SCREEN TEXT EDITOR*

System V offers the **vi** and **ex** full screen text editors written at the University of California at Berkeley, and the **curses** subroutine library and **termcap** database. **Vi** is tailored to text and program entry and uses **curses** and **termcap** to achieve terminal independence. The System V documentation also describes how to add descriptions to **termcap** to support new terminals.

### Transition Aids

System V offers significant improvements that tempt the System III user community to migrate to System V. However, some of the improvements require a great deal of effort to achieve, so the migration activity may be considered too costly. System V addresses this transition problem by providing aids that encourage the user community to move to System V.

The first transition aid is the **fsba** command that analyzes a 512 byte file system and shows how much space will be available in a new 1024 byte file system containing the same files. Because System V supports both 512 byte and 1024 byte file systems, **fsba** can tell you which file systems you can safely convert and which you should leave as is. For those file systems that can be converted, use **find** and **cpio** or **finc** and **frec** for file save and restoration.

C language source programs must be changed by hand to adapt to the new header file arrangement and compiler changes. However, executable files are correctly recognized by the System V kernel, and object files and library archives can be reformatted with **convert**.

Finally, the System III *inittab* database must be manually converted to the new *inittab* format previously described. Affected by this conversion is the */etc/rc* shell procedure. */etc/rc* defines which commands are to be run when the system moves between software states, when UNIX is booted, and when the system experiences a power failure. Because System V's **init** command recognizes two auxiliary files, */etc/brc* and */etc/powerfail*, whose contents are executed only when UNIX is booted and after a power failure respectively, converting *inittab* and */etc/rc* is easy and straightforward.

### Summary

UNIX System V is the latest version of UNIX available from Western Electric. Overall, it is 26 percent faster than its immediate predecessor, System III. System V contains changes made at all levels, from the kernel to the C language and libraries. System V also offers both the software engineer and the system administrator several new tools as well as transition aids to simplify the move from System III to System V.

# YATES VENTURES

Yates Ventures is a San Francisco Bay area based firm specializing in market research and documentation on standard system and application software. The founder, Jean Yates, is an author of *A User Guide to the UNIX System,* (1982, Osborne/McGraw-Hill). Yates Ventures has several more books under development on UNIX and 16-bit operating systems, and is a frequent contributor to the computer trade press.

The experience of the staff of Yates Ventures ranges from technical documentation to research expertise to technical backgrounds in mainframes, minicomputers and microcomputers.

Jean Yates, founder, is a featured speaker at NCC, COMDEX, UNIX User Group meetings, and IEEE, among others, and is regarded industrywide as a top expert on UNIX and small systems. Yates has managed numerous major studies on markets and strategies in the software and small system areas. She was previously manager of Gnostic Concept's UNIX Information Service and has performed custom studies on markets and strategies.

Melinda Rowe has over ten years of experience in managing large market research studies requiring massive data collection. Her expertise encompasses telecommunications, semiconductors, software, and mainframe systems. Rowe was formerly with Gnostic Concepts, and had several years of product planning and marketing experience with Amdahl Corporation previously.

Joann Andrushko is manager of Market Research at Yates Ventures. Her responsibilities include the production and coordination of major multi-client studies. Andrushko formerly worked at Gnostic Concepts where she managed a component pricing service. She has had experience in various phases of the electronics industry both in the component and system level.

Eileen Skrabutenas has conducted primary and secondary research on a number of industry topics in support of new product development. In her position as Senior Analyst, Skrabutenas is responsible for strategic analysis on the standard system and application software markets. She was program manager for Yates Ventures recent study entitled *Application Software for 16 Bit Systems: The UNIX Market.*

Kevin Gross serves as editor of the *Yates Perspective.* His background includes work in financial services and journalism. He has assisted in the preparation of research reports for the Department of Economics at Stanford University, and was previously engaged as a market research consultant at Yates Ventures. He is currently pursuing an economics degree at Stanford University.

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# *The Yates Perspective*



*Publisher, Jean Yates; Editor, Kevin Gross; Managing Editor, Melinda Rowe; Production and Subscription: Sylvia Washington, Linda Erickson, Susan Finley; Contributors: Joann Andrushko, Eileen Skrabutenas, Peter Marvit, John Yates, William Franzosa, Lawrence Rogers.*

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Address all correspondence to:

**Yates Ventures**
4962 El Camino Real, Suite 111
Los Altos, California 94022
(415) 964-0130