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Fall 1989

microware®

PIPELINES

Covering the Full Spectrum of OS-9 News and Applications

SPECIAL OS-9000 ISSUE

ALSO IN THIS ISSUE:

PIPELINES

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A NOTE TO OUR READERS

Do your have news for **PIPELINES**? If you have OS-9 application articles, useful utility programs, comments, suggestions or letters, please submit them with your name, address, telephone number and date. Address all correspondence to the Editor of **PIPELINES**, c/o Microware Systems Corporation or call Steve Simpson at (515) 224-1929. ◆

NOTICE TO VENDORS

We've expanded the "New Vendor Products" section of **PIPELINES** (beginning on page 6 of this issue). If you have new hardware or software products **that run under OS-9**, please submit a press release and black & white photograph of the product for consideration. All materials should be sent to the Editor of **PIPELINES**, c/o Microware Systems Corporation or call Steve Simpson at (515) 224-1929. ◆

OUR EXCITING NEW REAL-TIME

Ken Kaplan, President

Since we started the OS-9000 development project almost two years ago, we have been speculating and guessing about some Big Questions. Such as: Were our design criteria assumptions correct? What will be the reaction of OS-9 users? Will diehard Motorola fans be offended by a portable O.S. (especially running on Intel processors!!)?

Now that OS-9000 has been formally announced, we have answers. The introduction has been received with almost universal enthusiasm and excitement. I don't think the term "overwhelming" is too strong. For example, at the recent OS-9000 seminar hosted by Microware U.K., we unfortunately had to turn away people after the hotel conference room was filled to capacity.

As you might expect, many functional features (such as high-bandwidth I/O, for example) are appreciated. But beyond any doubt, the most important feature is

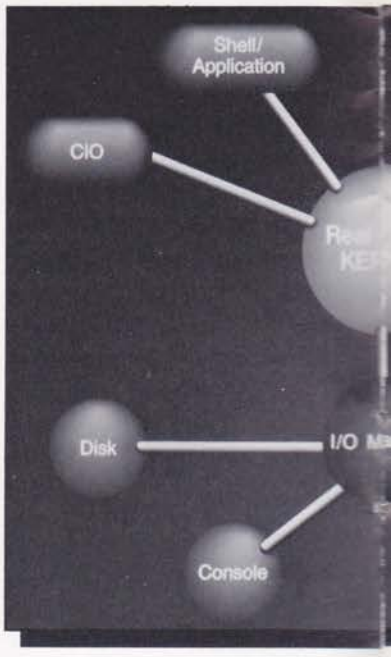
ANNOUNCING OS-9000: THE REAL-TIME

OS-9
Real-Time

At this year's BUSCON/East-'89, Microware introduced the OS-9000 Operating System. OS-9000 is the portable real-time operating system for both CISC and RISC processors.

OS-9000: Designed for Maximum Portability and Flexibility

Like OS-9, OS-9000 is a modular real-time operating system and total development environment that features a ROMable real-time kernel, file managers, utility functions and a variety of I/O and networking options. OS-9000, however, is designed for maximum portability to both Motorola and Intel families of CISC and RISC microprocessors. This portability to current and future microprocessors is part of Microware's goal to provide "total solution" software products that address the complete spectrum of computing needs.



The Modular Archi

Ninety-five percent of the OS-9000 kernel and 100 percent of the individual file managers and development tools are written in C to assure maximum portability to current and future processors. OS-9000 is currently available for Motorola's 68020 and 68030 and Intel's 80386. Future plans call for including Motorola's 68040, Intel's 80486 and selected RISC processors.

OS-9000's compact ROMable kernel makes it ideal for embedded applications, particularly the new genre of intelligent products. The sophisticated I/O system of

O.S. FOR THE NEXT DECADE

PORTABILITY. It means flexibility today and insurance for the future.

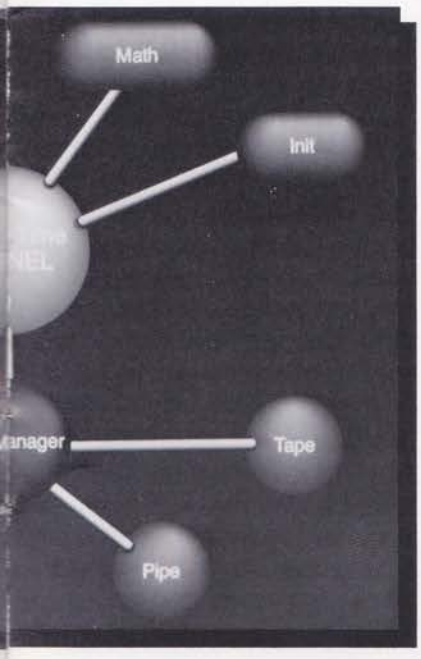
And to my surprise, the fact that OS-9000 runs on 386 PC clones has generated perhaps the most enthusiasm. As one long-time OS-9 user told me: "The PC is a fact of life we can't ignore. Now our company offers a low-end PC based product and a high-end VME based product. And they can both run the same basic application. This will make us much more competitive." I have heard this kind of comment many, many, times.

Our objective is simple. We want to establish OS-9000 as the de-facto standard real-time operating system, just as DOS is for PCs and UNIX is for workstations. And based on reactions from you, our users, we've started down the right road.

—Ken Kaplan
President,
Microware

OPERATING SYSTEM FOR THE 1990s

Operating System



itecture of OS-9000

OS-9000 is designed for maximum efficiency and is excellent for industrial automation. The tools available with the OS-9000 Operating System create an exceptional multi-platform application development environment.

Intelligent Products: Touching Our Lives Everyday

Intelligent products are changing the way the world lives, works and plays. Intelligent applications demand specialized features such as real-time response, compact size and ROMability. Like OS-9, OS-9000 provides a complete solution for intelligent products with a real-time kernel optimized for these demanding, embedded applications. The kernel features fast real-time interrupt response time and dynamic memory allocation/deallocation.

Industrial Automation Maximizes Profitability and Productivity

Today's highly integrated industrial environment requires sophisticated technology. Complex manufacturing processes depend on data being at a specific place at a specific time. OS-9000 is optimized for I/O intensive applications and supports sophisticated file sharing, secure archival procedures and transparent multi-node networking.

OS-9000
Please turn to Page Five

OS-9 VERSION 2.3 NOW AVAILABLE FROM MICROWARE

Microware announces Version 2.3 of OS-9 with support for Motorola's 68030 microprocessor and 68882 coprocessor. The new release is compatible with Version 2.2 boot ROMs and drivers.

Version 2.3 also provides support for Colored Memory which enables designers to specify the type of memory that a particular process must use when executing a program. For example, the user could specify that one process use on-board static RAM while another uses on-board dynamic RAM. The ability to associate a memory type with a particular process or task enables designers to optimize the price/performance of their memory substantially for a particular application.

This release of OS-9 also includes a number of additional system calls (one of which enables signals to be tied to time-based activities) and utility functions (such as Tsmon—which can monitor up to 28 terminals).

To simplify user configuration, Version 2.3 also adds autosize media support to its format utility. Rather than requiring the user to define SCSI device parameters (such as the number of tracks), the new utility enables format to request the device size from the device driver.

Contact Microware today to order OS-9 V2.3 or for more information. ◆

OS-9 Version 2.3

Q&A

FROM THE OS-9000 DESIGN TEAM

The editors of **PIPELINES** have assembled some questions and answers from the OS-9000 design team. For more information about OS-9000, contact Microware or your authorized Microware representative.

Q **OS-9000's I/O Manager is separate from the Kernel (see modular diagram on page 2). Why?**

A Microware separated IOMan from the OS-9000 kernel for two specific reason. First, the independent I/O Manager allows users to write their own I/O managers to meet any specific needs. For example, a user may wish to write a new I/O manager for customized I/O needs. Second, IOMan can easily be stripped to leave a compact, high-performance kernel. OS-9000 provides a kernel that is ideal for demanding embedded applications, as well as the tools for a total development environment.

Q **What measures have been taken to ensure C source compatibility between OS-9 and OS-9000?**

A OS-9000 contains library functions to mimic many OS-9 functions. Both OS-9 and OS-9000 C Compilers conform in large part to the proposed ANSI specification.

Q **What has been done to optimize RBF performance under OS-9000?**

A Significant enhancements have been made to RBF to optimize its performance under OS-9000. The allocation bit-map free-block information is maintained in memory for faster allocation of disk space. The information is also maintained on disk to prevent disk corruption.

There is no limit to the number of non-contiguous segments that may be allocated to a file.

No limits are placed on the number of disk sectors allowed for a file. This essentially creates a maximum file size of approximately four gigabyte, as well as increasing the efficiency of RBF under OS-9000.

Under OS-9000, RBF more efficiently allocates disk space by searching for the next available sector, rather than the next largest segment as with OS-9. This enhances disk performance by keeping fragments of files closer together on the disk.

Finally, OS-9000's RBF introduces the concept of small and large files. Under OS-9, a file occupies at least two sectors; one for the file descriptor (FD) and one or more for the actual file. Now with OS-9000, a file is read as either a small file or a large file. A small file is small enough to fit in the same sector as the FD. A large file has separate sectors for its FD and actual file. RBF analyzes the file size and determines whether to allocate space as a small file or large file.

Q **Are there file limitations under OS-9000?**

A The maximum sizes for files under OS-9000 are large enough to reduce any limitations. Maximum addressable memory size is more than four gigabytes.

Q **For which machines can I currently purchase the OS-9000 Operating System?**

A OS-9000 Development Paks are currently available for the following:

- **IBM PC/AT(386) or compatible 80386 machines**
- **MVME 147 with OMTI boot and tape boot versions**
- **MVME 133 with 320 controller**

Q **What are the RAM requirements for OS-9000?**

A A minimum of 256K RAM is required to implement OS-9000 on a ROM-based system and 1M on a disk-based system.

Q **What languages are available under OS-9000?**

A Both C and Assembler are available for OS-9000.

Q **What network protocols are available under OS-9000?**

A Full implementation of the TCP/IP communication protocol is available for OS-9000. This will allow communication between your OS-9000 system and any other system running the TCP/IP protocol.

Q **What debugging facilities are available for OS-9000 development?**

A Both the Source Level Debugger and ROMBug are available under OS-9000. When you license OS-9000 Professional, you receive both of these debuggers at no additional charge. ◆

Continued from Page Three

OS-9000 Provides the Development Environments Preferred by Engineers

Many companies have committed to one or more specific development platforms to achieve their market goals. OS-9000 is designed to support a variety of development environments for both resident development and cross-development.

OS-9000 is the first real-time operating system that supports resident development, as well as UNIX and PC-DOS cross development, for both Motorola's 680X0 and Intel's 80386 microprocessors. Now, designers can edit, compile and debug their code directly on either 80386 or 680X0-based target hardware. This capability reduces the cost of the development hardware since designers do not have to purchase a development system separate from the target hardware. Even in a diskless environment, the entire OS-9000 operating system, C compiler and debugger can be ROMed.

Cross development support enables designers to develop their real-time code on a variety of UNIX and PC-DOS hosts, then cross compile and download their code to an 80386 or 680X0-based target.

Networking Support

OS-9000 supports a wide range of networking options for distributive development. The OS-9000 Internet Support Package (OS-9000/ISP) allows communications between any OS-9000-based host and any other system running the TCP/IP protocol. OS-9000/ISP allows you to connect an OS-9000 system with UNIX, VMS, DOS and other systems for distributive software development.

OS-9000/ISP supports the DARPA-specified File Transfer Protocol (FTP) and TELNET (virtual network terminal, also known as remote login). These protocols not only enable OS-9000 users to access other nodes on a network, but enable other nodes to access an OS-9000/ISP system as a server.

OS-9000 is the portable real-time operating system for CISC and RISC processors. Current support includes Motorola's 68020, 68030 and Intel's 80386.

Covering the Spectrum of Computer Technology

The OS-9000 Operating System is optimized with specific features for industry, office and engineering applications. OS-9000's modular architecture covers the complete spectrum from embedded real-time applications all the way to large time-sharing engineering platforms.

The ability to easily port OS-9000 to various processors makes it a powerful operating system for multiple development platforms.

OS-9000 is designed as a portable operating system; capable of addressing the design requirements of tomorrow's CPUs. OS-9000 will help keep your product on the cutting edge of today and position you for tomorrow.

OS-9000 Is Now Available

OS-9000 is available now from Microware and authorized Microware distributors. Currently, OS-9000 Development Paks are available for the MVME 147, the MVME 133 with a 320 controller and IBM 80386-based PC/ATs and compatibles. Both OMTI boot and tape boot versions are available for the MVME 147.

Call Microware or your authorized Microware distributor for additional information and pricing for the OS-9000 Operating System. ◆

NEW VENDOR PRODUCTS FOR OS-9

The following new products have recently been released by vendors that license the OS-9 Operating System. Please contact the particular vendors for additional information.

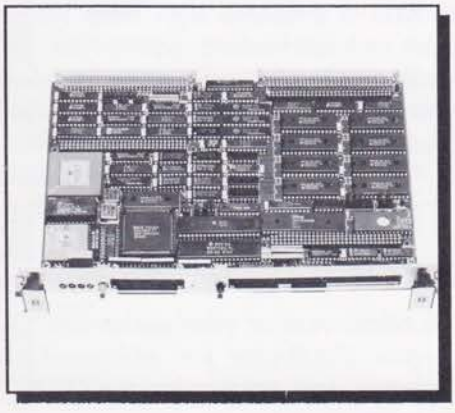
General Micro Systems Introduces 50 MHz 68030 CPU, Low-Cost 68030 SBC

General Micro Systems Incorporated, Montclair, California, introduces the **GMSV17-50M**, a 50 MHz 68030-based CPU capable of zero-wait-state performance. This VMEbus CPU features a 68882 FPCP, two multiprotocol RS232/422/285 serial ports and a location monitor/mailbox interrupt for real-time multiprocessing.

General Micro Systems also introduces a new low-cost 68030-based single board computer. The **GMSV37** provides DMA SCSI and flexible disk control, one printer port, two serial ports, up to 1M of zero-wait-state battery-backed RAM, up to 256K EPROM and a real-time clock.

Both the GMSV17-50M and GMSV37 accept SAM (Special Application Module) mezzanine modules for added I/O functions.

For more information, contact General Micro Systems at 4740 Brooks Street, Montclair, California 91763. Phone: (714) 625-5475.



General Micro Systems' GMSV37

EKF Offers Intelligent Controller for OS-9/ISP

EKF Elektronik GmbH of Hamm, West Germany, now offers the **VME 68570-LAN** intelligent controller for implementation of Microware's OS-9/ISP (Internet Support Package). This VMEbus slave includes a 68000 CPU, 512K buffer and a dual-ported RAM VMEbus interface. The VME 68570-LAN features a data transfer rate of 10M/sec. and allows a cable length of 590 ft. (180 meters) per network segment without transceivers or 1641 ft. (500 meters) per segment with transceivers and the Ethernet backbone.

For more information, contact B. Kleeburg, EKF Elektronik, Weidekampstrasse 1a, D-4700 Hamm 1, West Germany. Phone: (02381) 12630.

Ultrascience Introduces OS-9 for Mac Family

Ultrascience, a division of Gibbs Laboratories, Incorporated, recently introduced **Mac/OS-9**, a full implementation of OS-9 for Apple Computer's Macintosh family of personal computers. Mac/OS-9 allows installation of the OS-9 Operating System on any unmodified Mac, as well as reading and writing of Mac files by OS-9.

Mac/OS-9 also allows implementation of multi-user operation on Mac systems with as little as 1M of memory. Mac/OS-9 utilizes any Mac-compatible flexible and hard disk drives, as well as providing availability to Mac Toolbox calls, Quick Draw commands and the Apple Talk network.

For more information about Mac/OS-9, contact Ultrascience at 1824 Wilmette Avenue, Wilmette, IL 60091. Phone: (312) 256-0080.

Sculptor Version 2.0 Now Available

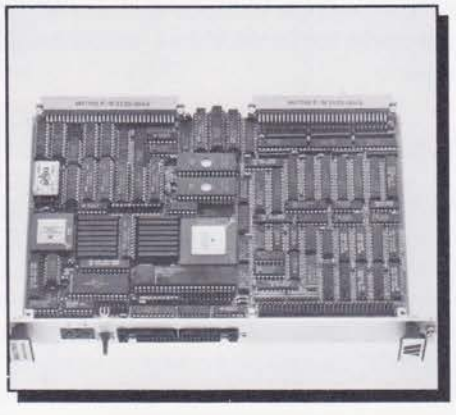
MPD International Incorporated announces the release of Version 2.0 of its **Sculptor 4GL+SQL**, a fourth generation development environment. This new version offers both enhancements of previous features and completely new features. New features include on-line help, multiple screens, serial I/O facilities and choice of user operating styles.

Sculptor 2.0 will run all programs and read data files from V1.6 without modification. A conversion utility is provided for V1.4 programs and files.

For more information on Sculptor 4GL+SQL, contact Kim Fleming, MPD International, Inc., 651 Blackburn Avenue, Cincinnati, Ohio 45014. Phone: (513) 844-2751.

MATRIX Offers VMEbus CPU Boards, Uses Public Domain Expansion Bus

The **MD-CPU320** from MATRIX Corporation offers a 16 to 33 MHz 68020 processor, up to 8M of DRAM, 30M/sec. VME transfer rate, and a full-featured expansion bus, the Dbus. The **MX-CPU320** offers the same features as the MD-CPU320 on a 16 to 25 MHz 68020 processor and functions in temperature ranges from -40° to 85° C. Both boards support multiprocessing with mailbox interrupts and software-programmable



MATRIX's MX-CPU320

memory addressing. They each also feature battery-backed SRAM and a time-of-day clock, two RS-232/422/485 serial ports, and software-readable front panel hex switches.

NEW VENDOR PRODUCTS

Please turn to Page Nine

Strengthening Our Commitment in Europe and Japan

Building on the Strength of French Market

France has long been an important market for Microware. Until recectly, however, Microware has operated in France through independent distributorships. In August, Microware Bureau Français was established to serve French customers.

According to Nick Rainey, manager of Microware France, "Microware needed a presence in France to better serve our customers. By establishing this office, we've sent a message to French customers that Microware is commited to serving them."

The first mission of the French office is to provide technical support for Microware's products. "Our presence has been very well received by our customers. We've instilled a sense of confidence that we're here for the long-term," commented Rainey.

As Microware further establishes the French office, Rainey and his staff will assume full responsibility for sales, as well as technical support, for French customers.

For the past four years, Nick Rainey has been designing hardware and software. Nick received his Engineering Diploma in electrical engineering from Bristol Polytechnical Institute, England.

Microware's French office may be contacted at:

Microware Bureau Français
Le Mercure C, B.P. 86
Z.I. d'Aix-en-Provence
13762 Les Milles Cédex
France
Phone: (33) 42 60 48 22
Fax: (33) 42 60 02 26

Nick Rainey, Microware France

Microware Reorganizes Japanese Operations and Acquires Japanese Software Firm

Microware has reorganized its Japanese operations to meet the needs our Japanese customers. Microware K.K., Microware's new wholly-owned Japanese subsidiary, has been opened to provide product development, as well as technical support and sales for customers in Japan.

Yoshio Yaguchi joins Microware K.K. as vice-president. Mr. Yaguchi was with Microware's former partnership, Microware Japan Ltd.

Microware Japan was established in 1984 as a joint venture between Microware, Microboards, Incorporated and Digital Computers Limited. Due to the success and continuing growth of Microware's business in Japan, the partners agreed that the business should become a wholly-owned subsidiary of Microware. As a result, Microware K.K. was established in Tokyo.

In addition to converting its Japanese operation, Microware has purchased 100 percent of Seikou Denshi Corporation, a software company based in Tokyo.

Seikou Denshi has specialized in developing and marketing application software for the OS-9 Operating System, as well as providing consulting and custom programming services to major Japanese companies. Mitsuyuki Hoshi, president of Seikou Denshi, now joins Microware K.K. as a vice-president. Microware has retained other staff and facilities of Seikou Denshi for the reorganized Japanese operation.

Microware's Japanese customers should direct all correspondence to our Microware K.K. office. Customers may contact our Japanese office at:

Microware Systems K.K.
6-5-11 Sotokanda
Chiyoda-Ku
Tokyo 101, Japan
Phone: (81) 3-839-9000
Fax: (81) 3-833-6100

BUSCON/East–'89 Successful for Microware

Microware made its mark at BUSCON/East–'89. At the trade show, held in Marlborough, Massachussets, Microware announced the release of OS-9000 and won an award for RAVE (Real-Time Audio/Video Environment).

At the BUSCON Bash, Microware's RAVE was awarded runner-up in the Product of the Year competition, sponsored by several computer trade publications. RAVE was the only software product receiving an award in this year's competition, with first place awarded to Tadpole and third to Ciprico.

BUSCON also served as the lauching point for Microware's new OS-9000 Real-Time Operating System. This highly portable operating system was the focal point of Microware's exhibition booth. See the related articles in this issue of **PIPELINES** for more information about OS-9000. ◆

At right, RAVE receives Runner-Up for BUSCON's Product of the Year. Microware's Lee Glenn (left) accepts the award from Convention Management Corporation's David Caplan.

RAVE
Real-Time Audio/Video Environment

Microware's RAVE Runner-Up Product of the Year BUSCON/East–'89

Join

microware®

at

BUSCON/West–'90
February 14–16, 1990
Long Beach Convention Center
Long Beach, California

For more details, call Microware.

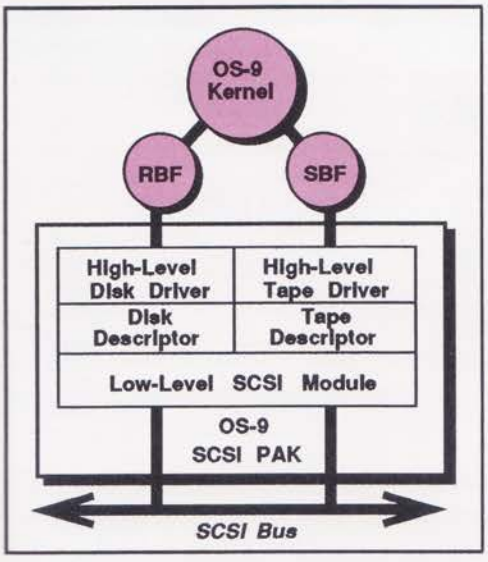
New SCSI Pak and PCFM File Manager Now Available

The OS-9/680X0 SCSI Driver Pak and the PCFM File Manager provide powerful productivity tools for OS-9 user.

New SCSI Driver

The OS-9/680X0 SCSI Driver Pak is a universal support package for a wide variety of SCSI flexible disk, hard disk and tape drives. SCSI Pak fits directly under OS-9's Random Block File Manager (RBF) and Sequential Block File Manager (SBF) to support standard OS-9 I/O system calls and shell utilities.

SCSI Pak achieves its high flexibility through its unique modular design. By separating SCSI drivers into high-level and low-level functional areas, various file managers and drivers can efficiently communicate with their respective devices on the SCSI bus.



SCSI Pak's Modular Design

SCSI Pak consists of three modules: High-Level Device Drivers, Device Descriptors and Common Low-Level SCSI Module. These modules logically fit into the OS-9 unified I/O system to service user requests from the OS-9 Kernel to respective devices on the SCSI bus.

The High-Level Device Driver module is provided in source form for both RBF and SBF embedded SCSI disk and tape devices. This module is called directly by either RBF or SBF file managers, prepares command packets for the SCSI device and passes the packets to the "low-level" subroutine module. Drivers deal with all controller-specific and device-class issues, and are written in C for maximum portability.

The Device Descriptor module contains the name strings for linking the modules together. The File Manager and Device Driver names are specified in the same way all OS-9 names are specified.

The Common Low-Level SCSI Module is provided in source form with low-level routines for SCSI controllers. The Common Low-Level SCSI Module passes command packets and data to the target devices on the SCSI bus and performs requests on behalf of the high-level driver. This module is also responsible for coordinating all communication requests between the various high-level drivers and itself. The low-level module is often CPU specific and can be written as an optimized module for the target system.

Transporting PC-DOS Files

The PCFM File Manager is a means for transporting files betwen PC-DOS systems and OS-9 systems. PCFM is included in the VME Driver Pak and allows users to perform a number of OS-9 utilities on disks formatted under PC-DOS. The following utilities are available:

BINEX	**BUILD**	**CFP**
CHD	**CHX**	**CMP**
COMPRESS	**COPY**	**COUNT**
DEINIZ	**DEL**	**DIR**
DUMP	**ECHO**	**EDT**
EXBIN	**EXPAND**	**FIXMOD**
GREP	**IDENT**	**INIZ**
LIST	**LOAD**	**MAKDIR**
MAKE	**MERGE**	**QSORT**
RENAME	**SAVE**	**TOUCH**

To order SCSI Pak or PCFM File Manager, contact Microware or your authorized Microware distributor. ◆

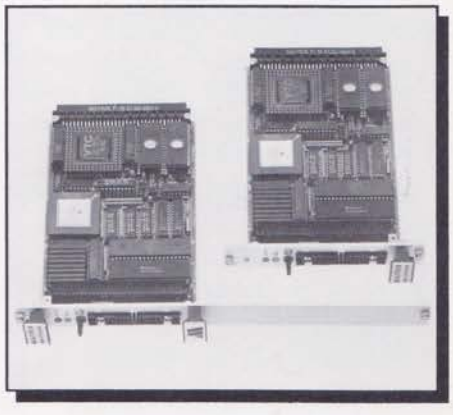
NEW VENDOR PRODUCTS

Continued from Page Six

The **MS-CPU220** offers a 16 MHz 68020 CPU, 1 or 4M of DRAM and a full-featured Dbus expansion. The **MX-CPU220** offers the same features as the MS-CPU220 and functions in temperature ranges from -40° to 85° C. Both boards support peer-level multiprocessing, software-programmable resource mapping, battery-backed time-of-day clock, optional 68882 FPCP and two EIA-232 serial ports.

MATRIX's **Dbus** features full 32-bit address and data paths with master and slave operation for both the VMEbus and the Dbus. It supports standard Dbus personality modules like Ethernet and SCSI, and simplifies the design of application specific personality modules. The specification has been submitted to VITA for consideration as an open standard for VMEbus manufacturers and users.

For more information, contact Laurent Meilleur, MATRIX Corporation, 1203 New Hope Road, Raleigh, NC 27610. Phone (919) 833-2000. ◆



MATRIX's MX-CPU220

microware

Growth for the Coming Decade

Microware's staff continues to grow as we introduce new products and strengthen our markets. The following people have joined us since the last issue of **PIPELINES**.

Yeongleh Lee comes to us with extensive network and data communication experience. He has worked with ISDN, Ethernet, TCP/IP and X.25 communication protocols. Yeongleh's other work includes programmer/system engineer for Sigma Computer Company in Taipei, Taiwan R.O.C. and microcomputer instructor for the R.O.C.'s Navy Navigation School. Yeongleh received his Master of Science in computer science from the University of Minnesota in July of this year.

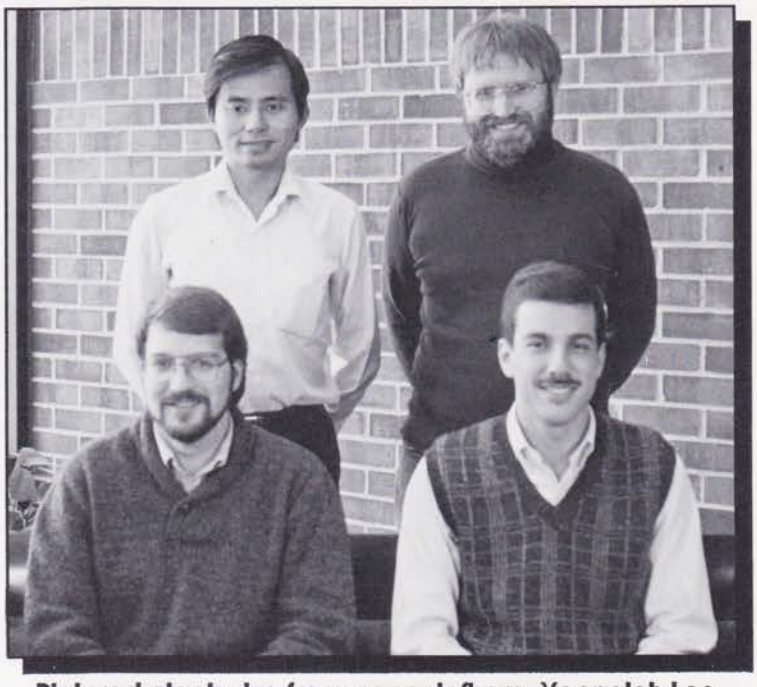
Mark Millard joins Microware as a multi-media software engineer with our Compact Disc-Interactive group. Mark comes to us from Hewlett-Packard's Design Technology Center where he designed user interfaces for an electrical CAD system used internally at Hewlett-Packard. Mark received his Bachelor of Science in computer engineering from Iowa State University in addition to studying film and animation.

Microware's Western Regional Office welcomes **Bill Sheppard** as a technical sales representative. Bill comes to us from IBM/Rolm Systems where he coordinated and supported field trials of PhoneMail voice messaging products. Bill earned his Bachelor of Science in computer engineering from Iowa State University.

The name **Peter Dibble** is familiar to many OS-9 users. Peter has authored or co-authored four books about the OS-9 Operating System including his latest, *OS-9 Insights: An Advanced Programmer's Guide to OS-9/68000*. Peter recently received his Ph.D. in computer science from the University of Rochester and joins Microware as a Computer Scientist.

Stephen Montgomery (not pictured) joins Microware's U.K. office as Technical Sales Manager. Previously, Steve was a product manager for an electronic display company that specializes in hardware and software for aircraft navigation systems. Steve has a degree in electrical/electronic engineering and is a chartered engineer.

Martin Long (not pictured), software engineer for Microware U.K., comes to us from Syntel Microsystems. Martin has experience in programming in C, as well as Assembler under OS-9. Martin holds a Bachelor of Science (Honors) degree in electrical/electronic engineering from the University of Manchester's Institute of Science and Technology (UMIST). ◆



Pictured clockwise from upper left are: Yeongleh Lee, Peter Dibble, Bill Sheppard and Mark Millard.

Training & Education:
Adding Value to Microware Products

Training helps users get the most of their investment in Microware's real-time operating system and associated tools. Microware regularly conducts training seminars at our Des Moines location.

Our regular two-day sessions are divided into Intermediate and Advanced levels and are tailored to meet the needs of the individual participants. Seminars cover a wide variety of topics and are a combination of lecture, example implementations and hands-on lab exercises.

The fee for these sessions is $750 and includes a manual set, additional application notes, special course materials and three meals. Corporate rates are available through Microware at several local hotels.

An Intermediate Topics session is scheduled for January 16-17, 1990, and Advance Topics Sessions are scheduled for January 23-24 and February 20-21, 1990.

Call Mike Ahrens, Microware's Training and Education Coordinator, at (515) 224-1929 to register for training or for more information. ◆

OS-9/68000 VERSION 2.3
UPDATES AND EDITION NUMBERS

Microware provides this product update and edition number information to assist OS-9 users in determining whether or not they have the latest update or edition of a software product.

You can use the **ident** utility to check your software against this list. If you don't have the latest editions or updates, call your system manufacturer or Microware for information on updating your software.

System Utilities

Module	Edition	Module	Edition
attr	#19	login	#22
backup	#13	mail	#11
binex	#15	makdir	#14
break	#1	make	#37
build	#13	maketerm	#8
cfp	#21	maps	#14
cio	#6	math	#13
cio020	#6	math881	#6
cmp	#13	mdir	#18
code	#13	merge	#13
com	#7	mfree	#14
compress	#14	moded	#11
copy	#25	ndir	#43
count	#13	nmon	#43
date	#16	nwatch	#43
dcheck	#21	os9gen	#17
debug	#46	pd	#15
deiniz	#14	pr	#22
del	#14	printenv	#4
deldir	#18	procs	#19
devs	#2	qsort	#16
dir	#34	querymail	#10
dsave	#24	rdump	#12
dump	#19	rename	#19
echo	#16	romsplit	#1
edt	#13	save	#14
events	#3	scred	#58
exbin	#16	setime	#21
expand	#16	shell	#48
fixmod	#14	sleep	#11
format	#22	spl	#20
free	#16	splman	#20
frestore	#15	splprt	#20
fsave	#13	srcdbg	#37
grep	#15	sysdbg	#70
help	#2	tape	#6
ident	#19	tee	#10
iniz	#13	tmode	#19
irqs	#1	touch	#11
kermit	#7	tr	#17
link	#13	tsmon	#16
list	#13	uMacs	#16
lmm	#7	unibug	#37
load	#14	unlink	#13
		xmode	#17

Operating System Modules

Module	Edition
kernel	#66
kernel020	#66
nfm	#43
null	#1
pipeman	#32
ram	#12
rbf	#65
sbf	#7
scf	#29
ssm451	#27
ssm851	#26
syscache020	#10
syscache030	#10
tm1000	#8
tm3000	#4

Language Modules

Module	Edition
cc	#40
cpp	#37
c68	#321
c68020	#321
o68	#19
fort	#21
fortp1	#24
fortp2	#159
fortp220	#159
r68	#67
r68020	#94
l68	#62
pc68	#12
pp68	#12
pt68	#12
basic	#22
runb	#22

OS-9 Version 2.3 Updated Products

The following software products have been updated with OS-9 Version 2.3. The products and their currect version numbers are shown.

Product	Current Version
Advanced Utilities Pak	2.3
Assembler/Linker/ Debugger	2.3
Atari/OS-9	2.1
Basic Runtime Module	2.2
Cross C Compilers (all)	3.1
DevPaks	2.3
Inlcudes MVME 147, 133, 133XT, 131, 130, 121 and 107	
Diskpak	2.3
Driverpaks (all)	2.3
Ethernet Support Pak	1.3
Electronic Mail	1.0
Fortran Compiler	1.2
Internet Support Pak	1.2
Microware Basic	2.3
Network File Manger/ Netpak	3.0
Pascal Compiler	1.1
PCBridge	1.1
Print Spooler	1.0
RAVE	1.0
Resident C Compiler	3.1
SCRED Screen Editor	4.0
SmartWare	3.1
Source Level Debugger	2.0
System Security Module/ Securitypak	1.1
System State Debugger	1.2
Tape File Manager/ Tapepak	2.3
uMacs Screen Editor	1.1
UniBridge	1.0

Happy Holidays and A Joyous New Year
From Everyone at Microware

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