Covering Real-Time Solutions From Microware

PIPELINES

A FLOOD OF NEW PRODUCTS !

FasTrak

Atomic OS-9

OS-9 V. 3.0

Ultra C V. 1.1

OS-9000 X Windows

PIPELINES

Volume 8 Number 1

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On The Cover

THIS ISSUE OF *PIPELINES* FEATURES A FLOOD OF NEW products from Microware, in particular FasTrak and OS-9 Version 3.0. The release of these products sets Microware up to shake up the real-time world in terms of both target and development options.

Changes to PIPELINES

WE'VE MADE SOME CHANGES TO *PIPELINES*. BUT these changes weren't made just for the sake of change. The layout has been redesigned to provide readers with the information they need in a comfortable format. In addition to headlines, each story features a quick glimpse of its purpose. This helps you as a reader identify the stories that are of interest to you.

Our back page also offers something special for readers around the world. Depending on where you are reading this issue, you are reading news from Microware's corporate operations in the U.S., England or France. This allows our overseas operations to direct a particular message to their readers.

We appreciate any comments regarding *PIPELINES*. Please contact the editor at the location above.

A Flood of New Products from Des Moines

Ken Kaplan
Microware's President

THESE ARE EXCITING TIMES FOR MICROWARE. WE'VE spent the last year rolling out new product after new product. We started with our Ultra C ANSI C compiler, then into Version 1.3 of OS-9000. We moved deeper into digital multimedia and interactive TV with our ISDN and MPEG software.

That's just the beginning as you will see in this issue of *PIPELINES*. The next wave of new products is led by FasTrak and OS-9 Version 3.0. And it's followed by support for the latest microprocessors and delivery platforms.

FasTrak represents the culmination of more than two years of concentrated research and development. Microware set out to develop a set of sophisticated tools that eased the software development process and perfectly targeted our real-time operating systems. I'm extremely proud of the final product. And due to the diligent work of our engineers, they have introduced a new product that includes many features not found in competing products. This makes FasTrak the premier development toolset for real time.

Moving from the development end to the target end, Microware has released Version 3.0 of our OS-9 Real-Time Operating System. This new release introduces concepts to add even more power to hyper-embedded, hard real-time applications. One of the biggest changes in V3.0 is the introduction of Atomic OS-9, a compact microkernel aimed at embedded systems with stringent real-time requirements and limited I/O.

And there's more. Starting on page 14, we're announcing even more products and support.

This continued commitment to product innovation brings greater performance, functionality and support to all software environments. One of these areas in particular is the Intelligent Vehicle Highway System, where OS-9 is quickly becoming the standard in traffic control, management and guidance. A series of articles in this issue helps illustrate how Microware software is involved in these applications.

The high flood waters this summer made Des Moines an interesting place. But we hope the flood of new products in this issue shows you how our software "is on a higher level."

Ken Kaplan

Shakin' Up The Real-Time World!

Introducing FasTrak

Development environment sets new standards for real-time software engineering.

by Michael Burgher
Microware Systems Corporation

REAL-TIME SOFTWARE PROJECTS ARE RAPIDLY GROWING IN size and complexity. Increasing demands are being placed on individual programmers, as well as on software engineering managers. Delivering a software project on time requires increased individual productivity, greater group coordination and quality integration.

Putting Powerful Tools in the Hands of the Individual Programmer

To increase individual productivity, programmers need tools within their reach that are easy to use and that simplify implementation phases of software development. By using intuitive tools that decrease the time required to edit, compile and debug their code, productivity soars. These individual gains in turn contribute to total team productivity increases.

Managing Team Productivity

As the size and complexity of projects increase, so does the role of the software engineering manager. To maximize their effectiveness, managers need tools that

FasTrak
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Atomic OS-9 and OS-9 Version 3.0

OS-9 V3.0 introduces new kernels, new features and higher performance.

MICROWARE ANNOUNCES OS-9 VERSION 3.0, A STREAMlined implementation of the OS-9 Real-Time Operating System. Targeted at hyper-embedded, hard real-time applications, V3.0 features a preemptible kernel and provides significant enhancements in several key real-time services. Among these are

- Faster interrupt response and context switching.
- More efficient interprocess communications mechanisms.
- Improved determinism.
- Enhanced memory management facilities.
- Greater overall system call throughput.

The release of V3.0 brings an excellent migration path for existing OS-9 V2.4 systems and applications, and provides an exceptional, high-performance foundation for new 68XXX designs.

Two New Kernels: Standard OS-9 and Atomic OS-9

OS-9 Version 3.0 introduces two new kernels. The Standard OS-9 Kernel can be used for both resident development and target run-time systems. The complementary Atomic OS-9 Kernel is strictly for target run-time systems. Both offer higher performance and less system overhead than previous versions of OS-9.

Where the Standard OS-9 Kernel includes complete facilities for either run-time or development environments, Atomic OS-9 provides a subset of this functionality strictly for run-time embedded systems. Atomic OS-9 provides 100 percent compatibility with the Standard OS-9 Kernel so that code developed and debugged with the Standard Kernel can be dropped into an Atomic OS-9-based system.

When To Use Atomic OS-9

Atomic OS-9 offers two very distinct advantages for OS-9 developers. First, Atomic OS-9 gives designers the ability to create smaller and faster OS-9 systems than has been previously possible. The Atomic Kernel is ideal for stand-alone kernel applications in hyper-

Atomic OS-9 and V3.0
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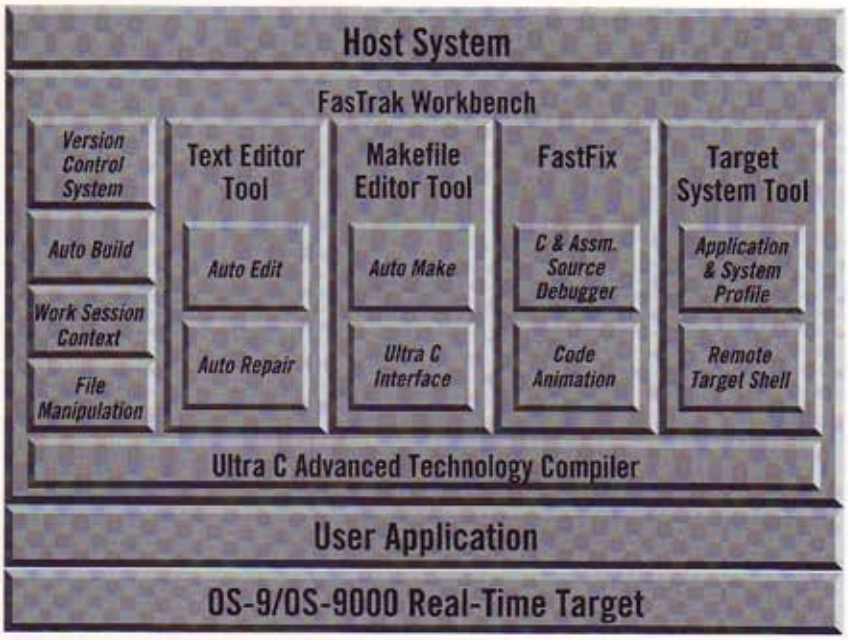
This issue of *PIPELINES* features more new products from Microware, starting with Ultra C Version 1.1,. See these new Microware products starting on page 14.



Complete and seamless integration of the FasTrak development environment with OS-9 and OS-9000 target systems means designers can focus on their application, not the development process.

FasTrak
Continued from page three

automate the tracking and coordination of development activities. They need intelligent tools that help them coordinate the design team to ensure software quality and timely delivery.

Targeting Real-Time Performance

Demanding real-time applications for Motorola 68XXX and Intel 386/486 systems need a powerful target environment. By working in integrated development and target environments, designers can focus on application development. They can spend their time developing and fine-tuning their application, rather than spending their time refitting their application for their target.

FasTrak Provides a Total Solution to Real-Time Software Engineering

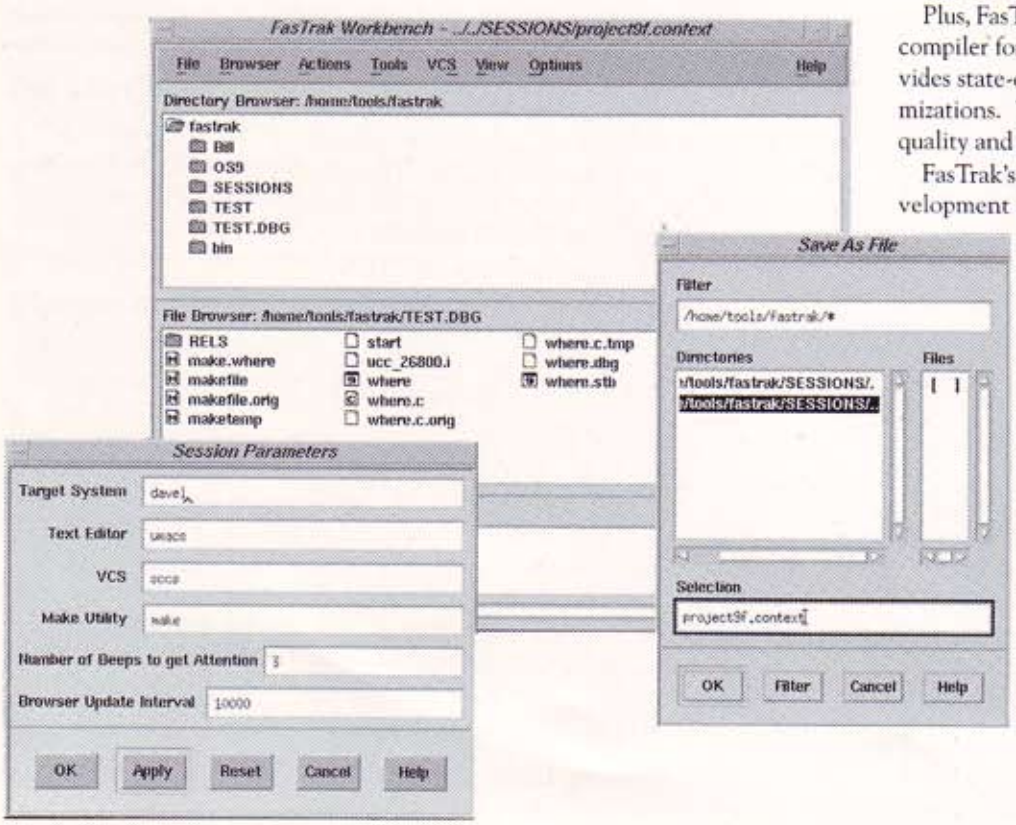
Microware has set the new standards for real-time development with FasTrak. Now, engineers have access to sophisticated tools specifically designed to target both OS-9/68XXX and OS-9000/386/486 real-time applications.

FasTrak assembles a powerful collection of tools that boost productivity and tracking during every implementation phase of development. These tools simplify the process of creating, building, managing and profiling real-time applications. And all FasTrak tools are built with industry-standard graphics for interfaces that are intuitive and easy to use.

Plus, FasTrak includes Microware's Ultra C ANSI C compiler for OS-9 and OS-9000 targets. Ultra C provides state-of-the-art interprocedural and global optimizations. The result is final code of unequalled quality and performance.

FasTrak's approach goes beyond its rich set of development tools. It provides a total solution to real-time engineering including host communications for seamless networking, and a fully integrated interface targeting the OS-9/68XXX and OS-9000/386/486 Real-Time Operating Systems. This total solution approach speeds the time spent developing and managing your application code by offering perfectly matched development tools and real-time targets.

The Workbench (below) features a Browser for file and directory manipulation. Session parameters can be set to customize the work environment. Entire work sessions can be saved to allow moving between projects and work sessions without missing a beat.



Open Architecture for Today's Open Environments

FasTrak provides solutions across a wide variety of development schemes and computing platforms. Whether working alone or in a group, individual engineers will benefit from productivity

tools for editing, compiling and debugging their real-time applications.

And, if your job is to manage and coordinate larger development projects, you'll appreciate the integration with your version control system that automates the process of file access.

With the spectrum of computing platforms available today, you can look to FasTrak to provide a multi-platform solution for your software development.

The Workbench: It All Starts Here

The Workbench provides the starting point for projects. An icon-based file and directory browser lets you drag-and-drop files in and out of FasTrak's tools. User preferences and target system parameters are also set using the Workbench.

Managing Real-Time Development

The Workbench includes tools for increasing individual productivity and monitoring the progress of a development project. Entire development sessions can be saved in "context" files. You can switch between projects at the click of a button and pick up right where you left off.

The Workbench's autobuild facility lets you build, run and debug your applications using just your mouse. The Workbench also lets you set up automatic use of your version control system so that it is activated every time source files are referenced.

Enhancing the Capabilities of Your Text Editor

The Text Editor Tool puts a graphical face on your favorite text editor. Common commands are mapped to buttons. And, since it works with your editor, you're up and writing source code in no time.

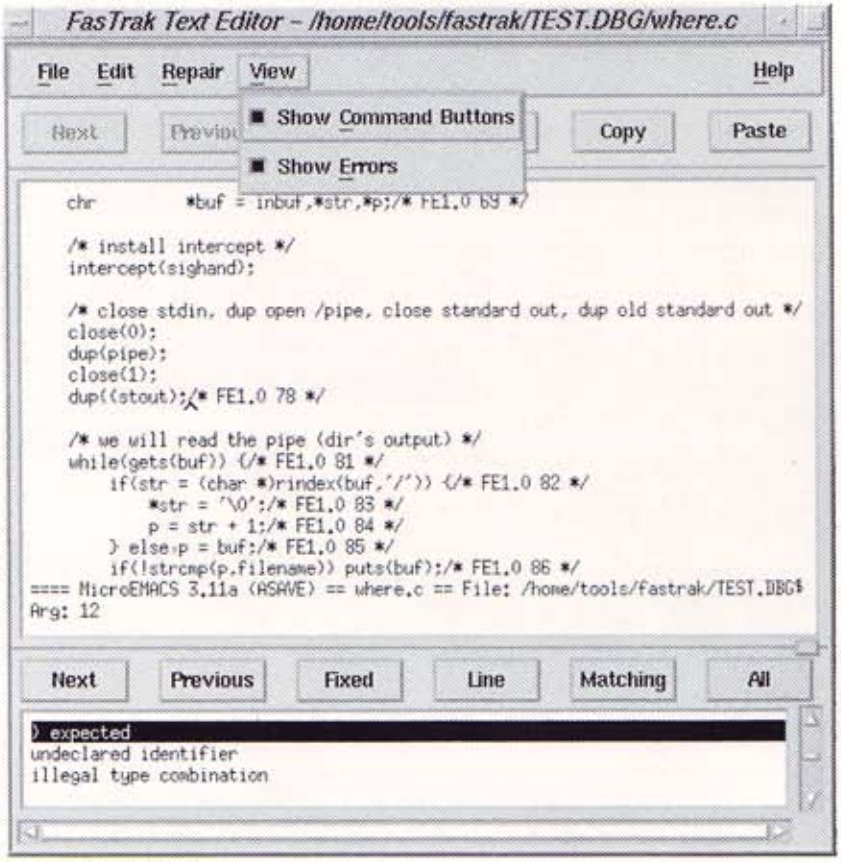
To open a file, drag the icon from the Workbench and drop it on the Text Editor Tool. Use command buttons for operations like copy, paste and delete.

Repair Your Source Code Automatically

The real power of the Text Editor Tool is its ability to identify and repair C source code errors. If the code builder encounters an error during a build, the associated C file is automatically opened under the Text Editor Tool. Lines of code with errors are identified graphically allowing quick correction with just the click of a button.

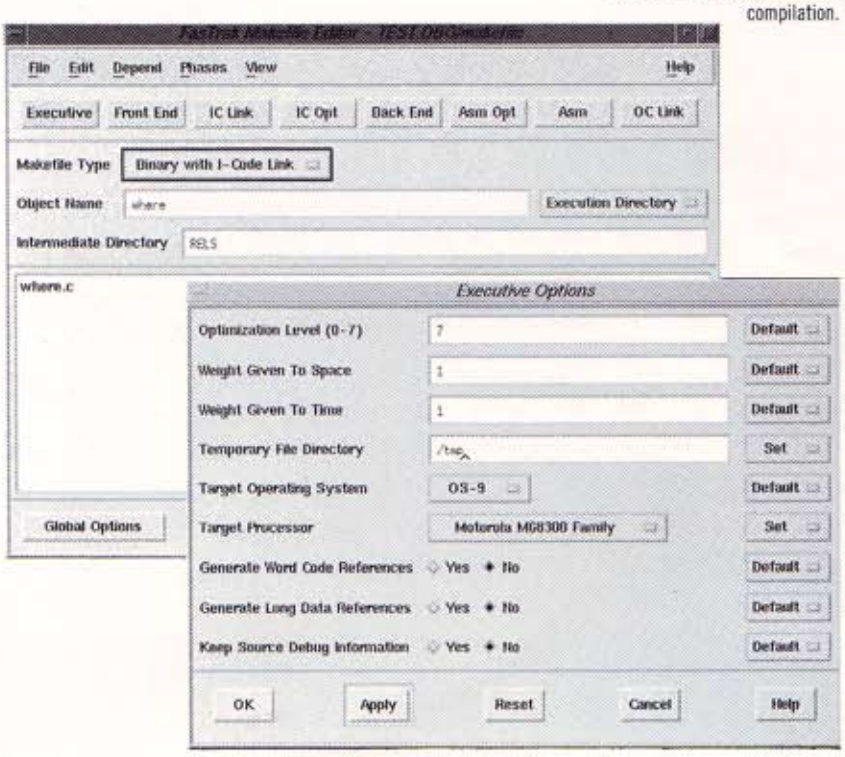
Automate the Creation of Makefiles for Ultra C

FasTrak's Makefile Editor Tool lets you point and click to create makefiles and dependency lists targeting Microware's Ultra C ANSI C compiler. Select interprocedural and global optimization strategies from



The Text Editor Tool (above) puts a mouse-driven interface on your favorite editor. A unique "repair" facility identifies errors found during a program build.

The Makefile Editor Tool (below) lets you point and click to create makefiles for Ultra C. Options can be set for all phases of Ultra C compilation.



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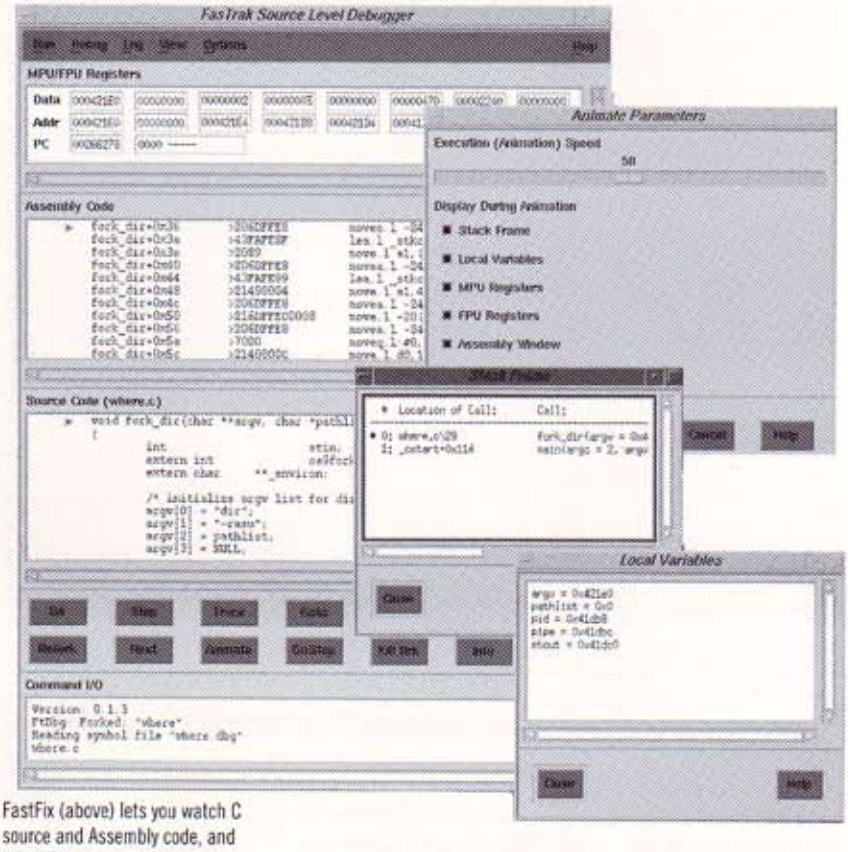
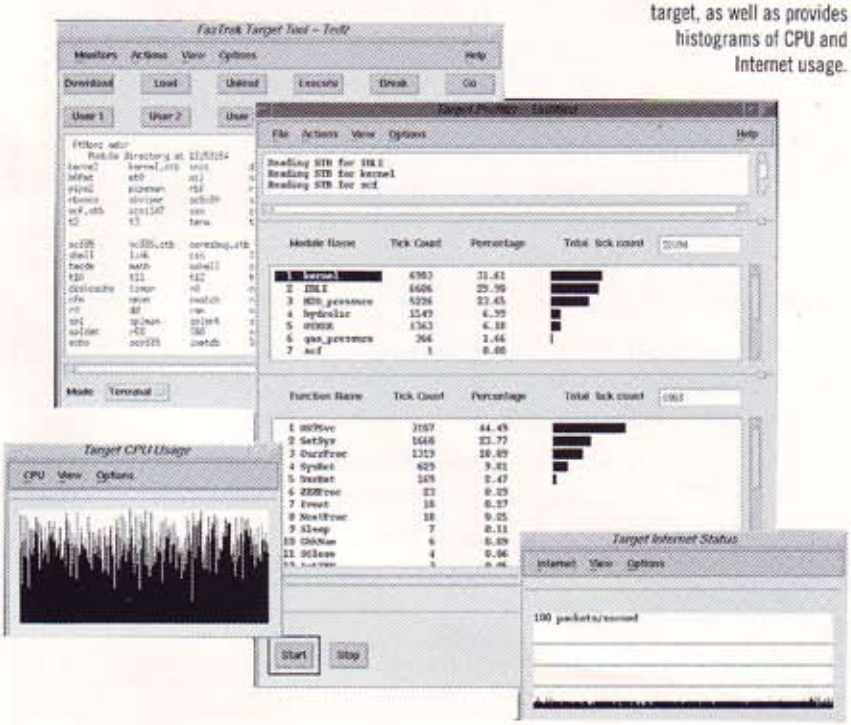


FastFix (above) lets you watch C source and Assembly code, and MPU/FPU registers as it steps through code. Stack frame and local variable displays are also updated as code is viewed.

The Target System Tool (below) lets you open a remote shell on a target system. The Target Profiler monitors the performance of application modules on the target, as well as provides histograms of CPU and Internet usage.



FasTrak
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point-and-click dialog boxes on a file-by-file or program basis. Choose source code files and target options quickly. Then let the Makefile Editor automatically generate your makefile for you. There's no more wrestling with the arcane syntax and rules of makefiles.

Ultra C: A New Generation Architecture

Ultra C is a highly-optimizing, ANSI-compliant C compiler. Ultra C is designed to meet your needs today, as well as accommodate new processors and programming languages in the future. This flexibility is due to Ultra C's unique architecture.

The Language Front End translates ANSI C source code into intermediate code, or I-code. The I-code Linker allows you to link your entire application for optimization by the I-code Optimizer. The Processor Back End translates optimized I-code into the target processors' assembly language for processing by the assembler and machine-specific optimizations by the Assembly Optimizer. Finally, the Object Code Linker links program object code to library object code.

Application-Wide Optimization

Ultra C is the real-time industry's first ANSI C compiler that allows you to link application, C library and target OS files prior to optimization. This unique feature accommodates true interprocedural and global optimizations across all functions. Your code is the fastest possible for your real-time target.

Ultra C supports a complete set of state-of-the-art optimizations that allow you to maximize your program logic for enhanced execution speed or reduced executable size.

While most compilers let you optimize your application on a file-by-file basis, Ultra C can see your entire application. Not only are individual files highly optimized, but the total interaction of your code is fine tuned for the tightest, fastest real-time applications.

And Ultra C lets you balance the speed versus size of your application. If you need emphasis placed on reducing the size of your application during compiling, simply select the relative weight for Ultra C to apply.

Plum Hall's Stamp of Approval

Ultra C has been fully validated by the Plum Hall ANSI Validation Suite. This validation ensures that Ultra C conforms to the ANSI X3.159-1989 and ISO/IEC 9899:1990 standards for the C language and helps ensure the quality of your final product. Code written to comply with these standards will compile under Ultra C and behave exactly as you expect it to.

Designed for Real Time

Ultra C goes beyond producing fast, tight real-time code. Ultra C targets the OS-9 and OS-9000 Real-

Time Operating Systems. And to take full advantage of these powerful operating systems, Ultra C provides complete C level bindings to the extensive system calls available under OS-9 and OS-9000.

Put Your Code In Motion

FastFix gives you a total view of your application by providing a graphical front end to Ultra C's powerful source level debugger. Select views of MPU/FPU registers, and C source and Assembly code. Open windows to view the stack frame, local variables and target system memory usage. Then select FastFix's "animate" feature and FastFix will automatically step through your application and put the views in motion.

FastFix also lets you set breakpoints graphically, while still permitting complex conditional breakpoints.

The ability to display multiple source files simultaneously makes it easy to refer to interrelated parts of your application.

FastFix puts these tools at your fingertips to allow you to easily debug multiple tasks and multiple targets simultaneously.

A Window To Your Real-Time Target

FasTrak's Target System Tool gives you a direct window to your OS-9 or OS-9000 target. The Target System Tool provides a seamless method to download and execute newly developed applications on your real-time target. You can also open a remote terminal to your system and enter commands directly on the target.

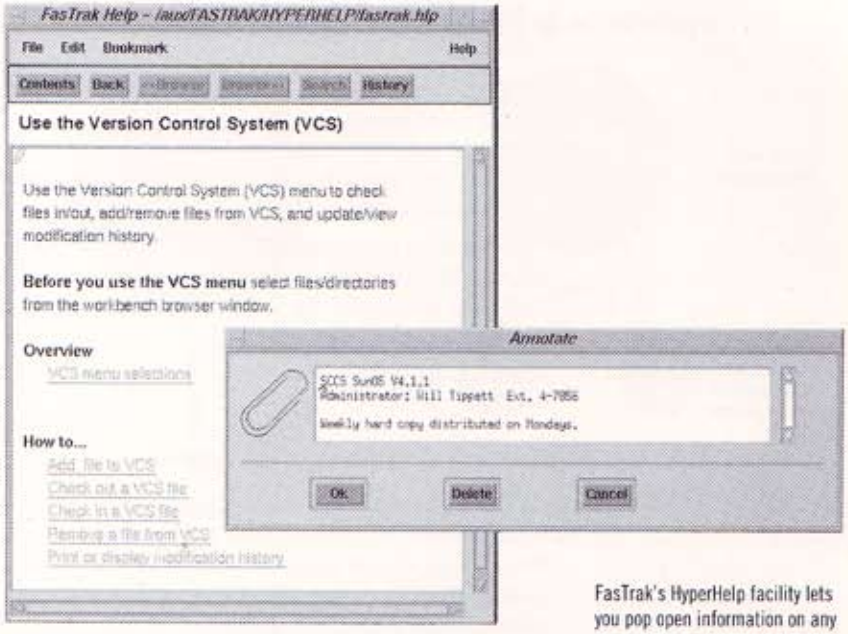
The power of the Target System Tool lies in its features for monitoring and profiling the performance of your target system and application. The Target System Profiler is a sophisticated tool that builds a timing analysis of applications running on the target. You get visual representations that let you optimize the performance of your application.

Never Open Another Manual

Take the manual out of your lap and put it away. FasTrak includes comprehensive point-and-click documentation that is readily available from any of the FasTrak tools. Quickly scan descriptions of the tools, dialog boxes and function keys. Need to jot a note on a manual page? HyperHelp lets you add notes that are "clipped" to the page. Or, set up bookmarks for sections that you reference often.

Real-Time Targets for High Performance and Real-Time Response

OS-9 and OS-9000 are modular operating systems that provide deterministic, high-performance operation for 68XXX- and 386/486-based applications. Their powerful features make OS-9 and OS-9000 optimum real-time targets for industrial, scientific, medical, telecommunication and consumer electronic applications. Real-time features include preemptive task switching, process execution control, flexible interrupt service routines and fast interprocess communications facilities. Plus, extensions to OS-9 and OS-9000 let you expand your system to include advanced graphics, networking and multimedia support.



FasTrak's HyperHelp facility lets you pop open information on any facet of FasTrak at the click of a button. Need to include notes? Use the "annotate" feature to clip personal notes to a manual page.

A Modular Architecture

For the greatest flexibility in hard real-time applications, OS-9 and OS-9000 feature scalable architecture built around powerful stand-alone microkernels. The operating systems can be scaled to fit small, ROM-based systems to large-scale network- and GUI-based systems by adding any of the wide variety of available system-level extensions. All extensions are ROMable, and can be dynamically loaded and linked to the system while the system is up and running.

The OS-9 and OS-9000 Kernels' multitasking services include priority-based, preemptive task scheduling, dynamic memory allocation, and complete interrupt, exception and task management facilities. Interprocess communications options include alarms, events, binary semaphores, data modules, signals, pipes and sockets.

Current Availability

Microware has released UNIX-hosted versions of FasTrak for Sun 3, Sun 4 and HP 9000 Series 700 UNIX workstations. All versions are available for either OS-9 and OS-9000 targets.

Contact Microware or your authorized Microware for complete details on ordering FasTrak.

For more infomation on Ultra C V1.1, see page 14. For more infoatmion on OS-9 Version 3.0, see the story that begins on page 3.

Mike Burgher is Microware's vice-president of research and development.

Atomic OS-9 and V3.0
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embedded systems where I/O functionality is minimal. By the same token, Atomic OS-9 can be combined with IOMan and standard OS-9 file managers in larger systems. This lets debugged applications and system code extract optimum performance from the system.

The second advantage OS-9 developers will find is Atomic OS-9's full compatibility with Standard OS-9. This gives developers the ability to develop and debug application and system code under the Standard OS-9 Kernel, then drop in the Atomic Kernel for deployment.

Kernels Are Fully Preemptible

One of the most significant enhancements in OS-9 V3.0 is support for system state preemption. In V3.0, kernel services can be preempted by higher priority tasks and interrupt handlers for improved determinism and faster interrupt response.

To further improve determinism, Microware has also added system state preemption to the Sequential Character (SCF) and Pipe File Managers. OS-9 also has available a new "buddy" system memory allocator, which allocates memory on a more predictable block-size bases, rather than on a "first-fit" basis.

Reducing Interrupt Latency

Both the Standard and Atomic OS-9 Kernels now support a new "fast" IRQ system call, ***F$FIRQ***. This new system call executes a partial register save reducing interrupt response to just 3 microseconds on a 68040 running at 25 MHz. The standard IRQ system call, ***F$IRQ***, has been boosted to 5.9 µsec. on the same hardware. This represents a 20 to 50 percent performance improvement over OS-9 V2.4.

New I/O Partitioning Streamlines Kernel

One of the key differences between OS-9 V3.0 and previous versions of OS-9 lies in its I/O partitioning, as illustrated in the diagram on the following page. In previous versions, IOMan functionality was bundled with the OS-9 Kernel. In V3.0, IOMan has been implemented as a separate re-entrant, position-independent module. This approach is ideal for resource-limited embedded applications in which designers don't need the full functionality of OS-9's I/O management services.

Separating kernel and I/O functions into distinct modules not only improves flexibility, but boosts kernel performance. Most deeply-embedded applications have minimal I/O requirements, often little more than a kernel and direct device drivers. By removing I/O management routines from the kernel, Microware is able to boost kernel performance and reduce kernel size while giving designers the flexibility to configure an I/O subsystem that is tailored to their application.

Improved IPC Performance

OS-9's interprocess communications (IPC) facilities have been optimized. Most facilities have seen performance increases of 20 to 30 percent.

Version 3.0 also adds a new IPC facility called binary semaphores. These are designed for simple synchronization operations like grant/release, and offer significant advantages over events for these operations.

New Pak for Porting and Distribution

In addition to a new release of the operating system, Microware also introduces a new development scheme for OEMs and integrators. The OS-9 Developer's Pak is a bundled package of OS-9 software for integration of any size systems, large to small. The Developer's Pak offers OEM and integrators several distinct advantages:

- Pay one Developer's Pak price for an entire CPU family. Choose from Motorola 16-bit, 32-bit and CPU32 microprocessors.
- One package contains all the software needed to development Atomic OS-9 or Standard OS-9 systems of any size. Add the I/O support you need for your system.
- The Developer's Pak can be used throughout your site network on an unlimited number of development workstations.
- Use the Developer's Pak on all your projects. The fee is for an unlimited number of projects.
- For distribution, you pay royalties after the development is done and you start shipping your target systems.

Complete Package for All Systems

The Developer's Pak contains sets of both Atomic and Standard OS-9 Kernels allowing development and testing for the kernel that best matches your target environment. Seven variants of each of the Atomic and Standard Kernels — 28 variants total — have been developed, and are optimized for each of the microprocessors for maximum performance. The appro-

priate variants are shipped for the CPU family chosen for the Developer's Pak. For example, a CPU32 Developer's Pak includes Atomic and Standard OS-9 Kernels optimized for the 68332 and the 68340.

In addition to both the Standard and Atomic OS-9 Kernels, the Developer's Paks also include:

- IOMan
- PIPE file manager
- SCF serial/parallel file manager
- RBF disk file manager
- PCF DOS disk file manager
- SBF tape file manager
- Internet Support Package for TCP/IP communications
- ISP Multiprocessor Support Package (see below)
- SLIP/CSLIP package (see below)
- Network File System Client Only package
- OS-9 Utilities

Your Choice of Development Platforms

The OS-9 Developer's Pak is available for either resident or cross development. Options include:

- Resident OS-9 development on the target hardware using OS-9 hosted tools.
- UNIX cross development using Microware's FasTrak tools.
- DOS cross development using Microware's PCBridge.

Distribution Made Easy

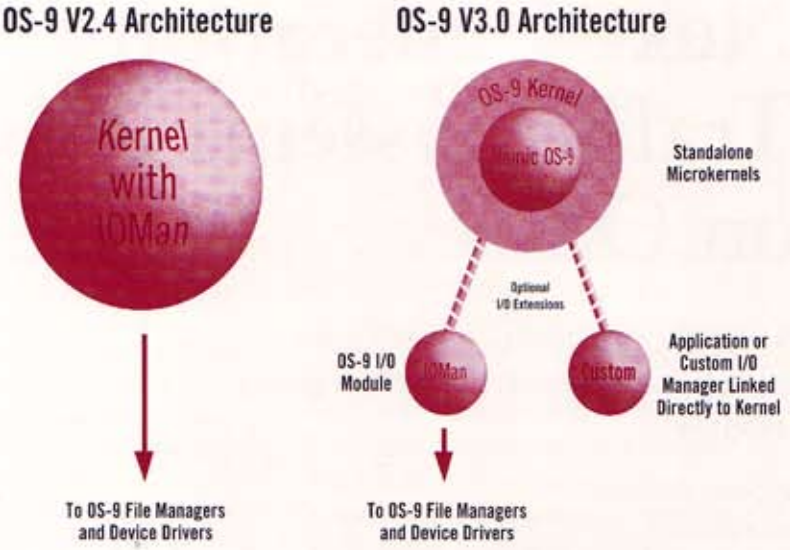
Once a development project has been completed, developer's can choose from one of six OS-9 target configurations. These configurations allow you to pay only for the Microware software you actually distribute.

Each of the six configurations build upon the previous one by adding a greater level of I/O functionality. These configurations are:

- Atomic OS-9 targets embedded, hard real-time systems supporting drivers that link directly into the Atomic OS-9 Kernel or IOMan.
- Atomic OS-9 Node is for network-based, hard real-time systems that boot OS-9 from ROM or over a TCP/IP network from a UNIX or OS-9 disk-based system (BootP). Atomic OS-9 Node can also be used to support Slave CPUs in OS-9 multiprocessor VMEbus systems. Includes SLIP/CSLIP communications support.
- Embedded OS-9 adds the Standard OS-9 Kernel, IOMan, PIPE, SCF and Shell for more robust OS-9 ROM-based systems.
- Embedded OS-9 Node targets networked diskless systems or multiprocessor Slaves. Includes SLIP/CSLIP communications support.
- Disk-Based OS-9 is designed for real-time systems that require local OS-9 magnetic disk (SCSI), RAM disk, DOS magnetic disk or tape. This is the minimum configuration to support the OS-9 Tool Kit for resident development.
- Extended OS-9 adds TCP/IP and N.F.S. to Disk-Based OS-9 for a complete workstation configuration. Supports Master or Slave CPU operation. Includes SLIP/CSLIP support.

Adding New Features

Microware offers a number of optional I/O extension modules and file managers that can be added to any of the distribution configurations listed above. For example, an OEM may wish to include ISDN support in an Embedded OS-9 ROM-based telecommunications system. ISDN and other options are added simply by executing a supplement to the Developer's Pak agreement and paying the appropriate Option Fee. For distribution, the appropriate per copy fee for the optional software is paid.



OS-9 Version 3.0 separates I/O managements facilities from the kernel for increased performance.

OS-9 Multiprocessor Support

The OS-9 Developer's Pak also includes Microware's new OS-9 ISP Backplane Driver. This multiprocessor package includes sample backplane drivers for transparent TCP/IP communications between SBCs over the VMEbus in any Master/Slave combination. Up to 14 Slave CPUs are supported on the VMEbus connected to one Master CPU.

SLIP/CSLIP Support

OS-9 V3.0 also marks the release of the OS-9 SLIP Support Package. This package contains SLIP and CSLIP protocols supporting TCP/IP communications through standard OS-9 serial device drivers under SCF.

OS-9 Version 3.0 Ready For You

OS-9 V3.0 offers OS-9 users, OEMs and integrators a powerful combination of:

- New products including Atomic OS-9, development tools and I/O extensions.
- Increased performance that meets or exceeds other kernels and OSs.
- Greater flexibility and functionality in both development and target environments.
- Straightforward licensing with no strings attached.

We think you'll agree that OS-9 is the right choice to upgrade your existing designs and start new ones. Contact Microware or your authorized Microware representative for pricing and ordering information for OS-9 Version 3.0

The *OS-9 V3.0 and Atomic OS-9 White Paper* provides an overview of new features, packaging and licensing of OS-9 introduced with the Version 3.0 release. The *OS-9 V3.0 Performance Brief* details timings for the new release of OS-9, as well as performance figures for Ultra C V1.1. To order these publications or for more information, contact Microware or your authorized Microware representative.

Next-Generation Traffic Systems Rely on OS-9

As traffic increases, the need for more powerful control systems grows stronger.

by Steve Johnson
Microware Systems Corporation

WITH TRAFFIC CONSTANTLY INCREASING, ENGINEERS AT state highway departments nationwide are rushing plans to develop and deploy next-generation traffic control systems. The new systems will use controllers based on industry standards such as the VMEbus and state-of-the-art processors such as the Motorola 68040. And general-purpose real-time operating systems such as OS-9 will provide local control nodes and neighborhood area controllers with the preemptive multitasking and communications facilities necessary to keep traffic moving smoothly.

New control systems are also needed for specialized applications such as truck scales, as well as the freeway ramp meters that are becoming popular for spacing rush hour traffic. Historically, traffic control systems have been based on centralized minicomputers that were expensive to buy, operate and maintain. Local intersection control node designs have varied from hard-wired state machines to direct control from a minicomputer to the Type 170 and 179 controllers that the states of California and New York standardized in the late 1970s.

Updating Old Systems

Traffic engineers are recognizing the need to harness processor and communications power to keep ahead of the growth in traffic.

A good example of the movement to more modern control systems—and perhaps standardization—is the effort that Caltrans in California has underway to develop a controller that the industry has dubbed the ATC (advanced transportation controller). Caltrans has also discussed its plans with other states such as New York, and other countries such as Canada, Great Britain and Australia to try and develop a standard controller specification that can be widely used.

Terry Quinlan, Caltrans associate electronic engineer, has been working on the development effort and reports that the ATC will be based on a VMEbus CPU board. ATCs will most likely use a compact 3U VMEbus backplane and chassis. Caltrans is committed to using the Motorola 68XXX family of microprocessors supporting OS-9. The final standard may specify a specific processor such as the 68040, or more likely will offer a choice of 68XXX family members. The final standard will probably offer a choice of an integrated user interface or a laptop computer interface port. For I/O, the ATC will include an interface to the "C1" connector widely used to connect with and control traffic signals. Communication options will likely include a choice of simple RS-232C ports and low-cost Ethernet links.

Standards Speed New Development

Choosing a standard bus and providing a choice among processors in the same software-compatible family will allow traffic engineers to develop controllers with the computing power and I/O features that meet the requirements of a specific application. The engineers will also be able to choose from off-the-shelf products offered by the multitude of VMEbus vendors.

Furthermore, a standard base for software development would ensure that the engineers can quickly develop software for a specific application without starting from scratch on each project. Quinlan is working to establish OS-9 as the standard operating system for ATCs to simplify the development process.

Intersection controllers, for example, based on the VMEbus, a 68XXX processor and OS-9 will also offer potential advantage in communication links between intersections, as well as between intersections and a local area controller. The powerful combination makes it feasible that intersections could communicate using LAN technology and therefore make it possible to use more elaborate control schemes.

ATC Performs Weigh-In-Motion

Caltrans has developed and tested two ATC applications. One of the tests involved developing a high-speed weigh-in-motion system to automate freeway truck scales. Existing Caltrans high-speed weigh-in-motion truck scale installations use proprietary controllers that cost around $30,000 to purchase and maintenance costs can run more than $100,000 per year.

Caltrans installed an ATC based on a OS-9 68020 system in the new weigh-in-motion system that has far more capabilities than the older proprietary designs. The system includes 11 digital sensors for axle sensing, and two analog sensors for pads that measure the weight. All sensing is performed as the truck moves across the pads at freeway speed.

Caltrans was able to program the ATC to detect the number of axles for each vehicle and measure the weight. Furthermore, the computer can determine the vehicle type from this information and decide whether the vehicle meets weight requirements. Quinlan estimates that an ATC controller will cost less than $5,000. And Caltrans can maintain the ATC-based stations with agency maintenance personnel, avoid-

ing expensive service contracts for proprietary systems.

Automating Code Development

Caltrans also has an interest in simplifying software development for ATCs. The prototype used in the weigh-in-motion application was coded by hand. But Caltrans used an automatic C code generator to develop the software for a ramp-metering application.

Developed by Carnegie-Mellon University for Caltrans, the development system generates C code for OS-9. The system uses a Microsoft Excel spreadsheet on a PC as the front end. Engineers enter tables of information that describe the desired control system. The development system turns the spreadsheet into usable code.

While these hardware and software efforts promise to modernize field applications, busy geographical areas also need master control systems. Most big cities have some kind of minicomputer- or mainframe-based system in place that needs to be upgraded from a processing power view point, and with modern graphics technology that enhances the usability.

Under contract to Caltrans, Unicon Inc. has just such an effort underway in San Diego county. According to company president Paul Cadaret, Unicon is developing a new central control system that will monitor traffic flow on freeways and on busy streets near freeway entrances and exits. The system will control freeway ramp meters, HOV (high-occupancy vehicle) lanes, and the displays on changeable message signs along freeways.

The San Diego system presently uses minicomputers that connect via serial links run over leased telephone lines to local ramp meters, sensors, etc. Unicon plans to replace the minicomputers with a VMEbus-based data acquisition and control system that is networked to a cluster of workstations from Sun Microsystems.

VMEbus System Acquires Data

Unicon's data acquisition system design consists of a rack of CPU boards based on 68000-family microprocessors. The master CPU handles the network interface and manages the communication traffic in the VMEbus system. Each of the other CPUs includes a VSBbus daughter card that includes UARTS capable of handling 32 serial communication links. Each of the serial interfaces can connect with as many as 15 remote traffic sensors (such as Type 170 controllers) using a multidrop wiring topology.

The master and all of the slave CPUs in the VMEbus system run OS-9. Each of the slaves actually operate as a diskless node on a Sun NFS (Network File System) network using the VME backplane as the network media. The slaves boot RAM copies of OS-9 from the master CPU. Therefore, each slave CPU is essentially a control system with one process running for each of the serial links installed on its VSB daughtercard.

The slave CPUs constantly poll each of the remote sensors connected to its serial lines. When a remote node has data, the slave CPU receives the data and transfers it to the master CPU in the VMEbus system. The master issues a service request using the NFS RPC (Remote Procedure Call) facility and an RPC routine running on one of the Sun systems can retrieve the data package.

The total system architecture allows the master traffic control algorithms to run on the powerful and graphically oriented workstations. The workstation programs can, in turn, send commands back through the VMEbus system to change a setting at a remote site. For example, the Sun system could receive a data packet that indicates that the freeway is becoming congested in a specific area. The Sun system could then send a message to change freeway metering intervals in real time.

According to Unicon's Cadaret, the partitioning of tasks and the extensibility of the design will ensure that the San Diego system isn't overloaded anytime soon. Because the VMEbus boards primarily acquire data and transfer control signals, and because the boards essentially operate as stand-alone network nodes, the boards could be replaced with more powerful boards or with more boards. And OS-9 performs all of the network protocols transparently.

The network design will actually allow the same architecture to work in a multi-level control system, for example a system with a VMEbus unit in a traffic center and with additional VMEbus systems distributed geographically nearer local traffic-control nodes. Even with the physical systems distributed geographically, each slave CPU is still a node on a network relative to the master CPU.

The architecture also allows for adding computing power in the traffic center by adding more or faster workstations. And the center could even house two or more master VMEbus systems if the application requires an excessive number of slave CPUs. As Cadaret points out, the basic architecture works in a city of 10,000, as well as in a city the size of Los Angeles.

As the inset box above indicates, Microware software is involved in a number of traffic and vehicle control systems worldwide. Your future automobile travels will be easier and safer through OS-9.

Microware Software in Traffic Control and IVHS Projects

OS-9 is currently in use in several ATC and IVHS (Intelligent Vehicle Highway Systems) applications including:

- Caltrans: advance traffic controller, Bay Bridge ramp metering, data acquisition, automated crack sealer, lane restriper
- State of New York: traffic control
- New York State Thruway: automated toll collection
- State of New Jersey: traffic control
- New Jersey State Thruway: automated toll collection
- State of Maine: automated toll collection
- City of Los Angeles: traffic control
- Philips/BMW: in-car navigation
- Queen Elizabeth II Bridge: traffic control (see story on page 12)
- MASPRO (Japan): in-car navigation (see story on page 13)

Steve Johnson is the director of marketing for Microware.

OS-9 at the Dartford River Crossing

British high-traffic bridge and tunnel are monitored and controlled by OS-9 system.

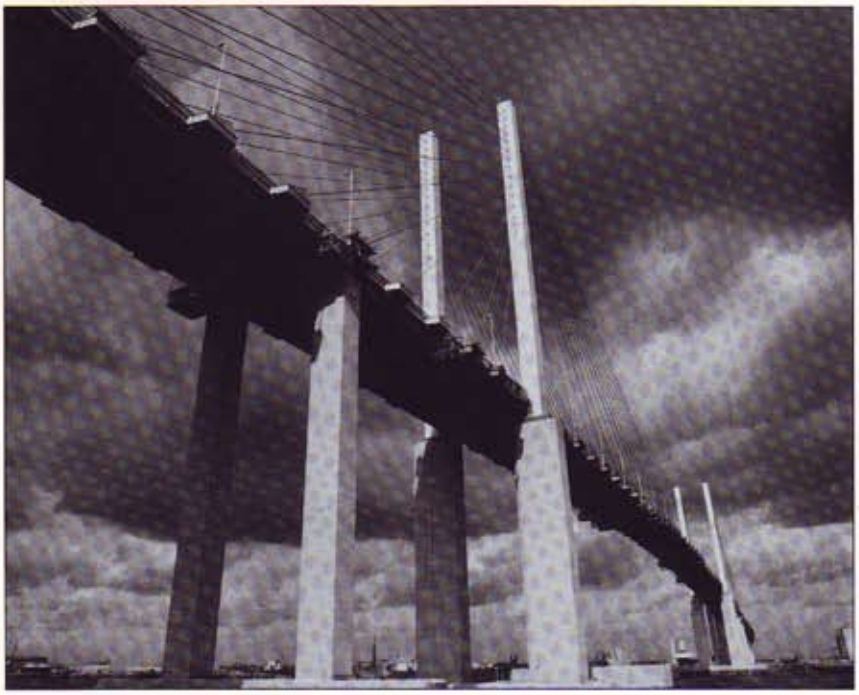
CROSSING THE DARTFORD RIVER, THROUGH THE TUNNELS that mark the boundary of Essex and Kent counties in southern England, has caused motorists major delays for years. The problem has now disappeared with the opening of the Queen Elizabeth II Bridge in October 1991. The bridge has doubled the capacity of the crossing to 135,000 vehicles per day and is the largest of its type in Europe.

Measurement Systems' OS-9-based Magus 2000 System was chosen as the control system for the bridge, as well as to replace the existing control system in the two tunnels. The Magus 2000 System receives input from a number of Measurement Systems' Datascan 7000 intelligent data acquisition modules.

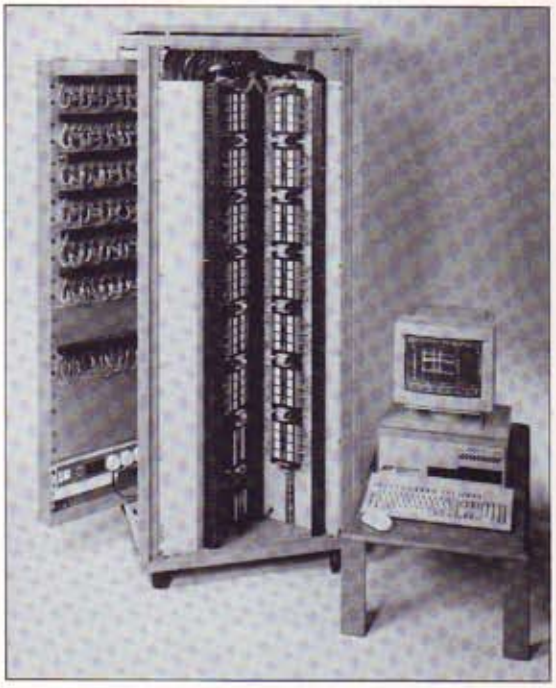
Working in conjunction with Trafalgar House Technology, an engineering consultant firm, Measurement Systems developed a system comprised of six PCs plus a file server on a Novell network, with the Magus 2000 computer handling data to and from the four Datascan networks. Approximately 1,200 I/O points have been installed in the tunnels and 500 on the bridge.

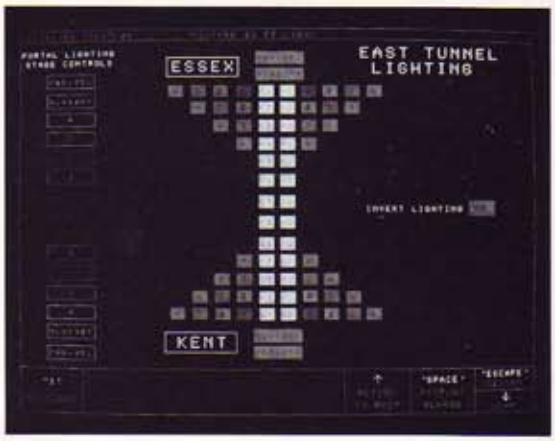
The control and monitoring software package is DM2, a software package developed by Measurement Systems. DM2 offers the advantages of real-time, multiuser and multitasking capabilities, as well as an easy-to-use, friendly operator interface — an important factor at Dartford River Crossing.

DM2 monitors and provides information on wind speed and direction, navigation lights and tunnel lighting. It is also scheduled to assume control of fans used for ventilation and fire control in the tunnels, pumping systems, overall electrical systems, visibility monitoring and operation of the generator sets. The Magus 2000 is also linked with the crossing's security system, monitoring the status of entry points and warning of any intrusion.



The Queen Elizabeth II Bridge at Dartford River Crossing is one of the largest triple span defiled multi-suspension bridges in Europe.





Magus 2000 (above) system used at the Dartford Crossing. Screen (below) shows control mimics for the Dartford Crossing systems.

Japanese Car Navigation System Based On CD-I

Microware's software for Compact Disc Interactive forms the backbone of in-car navigation from Japanese satellite communications experts.

by Tamotsu Ishikawa
Microware Systems K.K.

The MASPRO in-car navigation systems includes a special CD-I player and remote control, a dashboard- or stand-mounted television monitor, and an external GPS antenna.

MASPRO DENKOH CORPORATION IS HEADQUARTERED IN Nagoya, Japan, and specializes in satellite broadcasting equipment, TV antennas and computer-related A/V equipment. MASPRO took its vast experience in satellite communications technology and put it together with the portable, interactive power of CD-I to create a new concept in car navigation. The result was the GPS Navigator or GP2.

The GPS Navigator is a small, portable CD-I player with a separate dashboard- or stand-mounted color display and antenna that fits easily into any car. Positioning data from NAVSTAR GPS (global positioning system) satellites is incorporated into images from CD-ROM map software to guide drivers.

When designing the GPS Navigator, MASPRO was faced with several dilemmas. First, they needed a system that was portable and easy-to-use. Second, MASPRO recognized the need for a sophisticated operating system to manipulate data off the satellite with maps stored in CD-ROM, both while interacting with the user. Secondly, they needed to be able to display DYUV data (the standard for CD-ROM mapping in Japan). Finally, they needed a system that was based on a worldwide standard and that would be able to support the quickly growing world of satellite technology. CD-I, which is built around Microware's CD-RTOS, was the answer.

Getting Around Town or Country

After inserting the appropriate CD-ROM map software, the GPS Navigator displays your current position and allows you to set a course for your destination using a cursor. The system automatically scrolls in the direction you are setting and asks you which way to turn at each of the intersections along the course. Eight levels of scaling (100 m scale to 500 km scale) allow you to set a course across town or across the country.

Once you're on the road, the GPS Navigator displays your current position and the direction you are headed using information it receives off the NAVSTAR satellite every one second. The GPS Navigator signals an approaching intersection by chiming at 300 m and then 150 m in advance of the turn and then a voice directs you as to which way to turn at the intersection. The GPS Navigator also records your actual course which can then be replayed or reversed for the trip home.

With the optional AC adapter, the GPS Navigator can be brought in the house for planning your course ahead of time. When you're not using the navigation system, the GPS Navigator can tune in your favorite TV program (TV tuner is optional), or you can listen to your favorite CD, or play your favorite CD-I title. The GPS Navigator also features a menu-based Integrated Information System that allows you to look up information on cities, towns and places of interest, including maps showing you where they are located.

As public infrastructures for communicating traffic information evolve, services such as road conditions and traffic updates will become readily available. GPS Navigator, for example, would be enhanced to automatically set the course to your selected destination and suggest alternatives en route when traffic jams or accidents block your way.

Tamotsu Ishikawa is CD-I studio project supervisor at Microware's Japanese subsidiary. The above article was excerpted from *MWPipelines*, a publication of Microware K.K.

Ultra C Version 1.1 Now Available

Latest release of ANSI C compiler features code generation enhancements, new optimizations.

ULTRA C V1.1 BUILDS ON THE SUCCESSFUL RELEASE OF V1.0 for OS-9 and OS-9000. This latest release targets both OS-9 and OS-9000 and has many new enhancements. These include:

- Improved code in terms of executable size and speed.
- Improved library size and speed.
- Improved compatibility with V3.2 and V1.3 C compiler.
- Improved Assembly language interface.

Greater Benefits from I-Code Linking

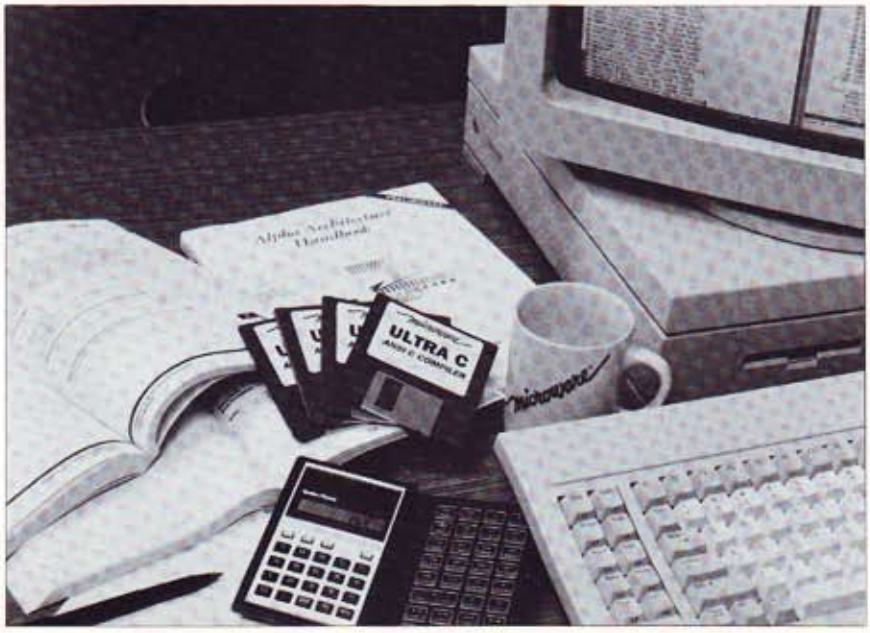
The benefits from I-code linking your application have been increased in many ways with V1.1 of Ultra C. These benefits will continue to get greater with each successive release.

Improved Local Code Generation

The following improvements have been made to the local code generation capabilities:

Register Tracking

Ultra C can now track the contents of registers to eliminate useless instructions.



Multiply Operations Changed to Shifts and Add/Subtracts

Ultra C can now change the multiplication of a value by a constant into shift and add/subtract pairs. For example, an expression of the form:

```
e * 137
```

where ***e*** is an integer may cause any of the following code examples to be generated, depending on the target and the user's setting of the time and space control:

- Assuming ***e*** is in ***d0*** and is no longer needed after the multiplication, and target is not 68000-based:

```
muls.l #137,%d0
```

- Assuming ***e*** to be in ***d0*** and no longer needed after the multiplication, and target is 68000-based:

```
move.l #137,%d1
bsr    __multiply
```

- Or the longer but faster (considerably faster, in the 68000 case) with the result in ***%d1*** rather than ***%d0***:

```
move.l %d0,%d1
lsl.l  #3,%d0
add.l  %d0,%d1
lsl.l  #4,%d0
add.l  %d0,%d1
```

The compiler also looks for cases in which subtraction is preferable (these correspond to runs of 1 bits in the constant). As an example, multiplication by 31 might cause the following code to be generated:

```
moveq.l#0,%d1
sub.l  %d0,%d1
lsl.l  #5,%d0
add.l  %d0,%d1
```

which is considerably faster and shorter than the five shifts and adds one would otherwise be stuck with.

Mostly-Identity Bitwise Operations

Ultra C looks for bitwise operations with constants most of whose bits are the operation's identity. Often in these cases, one can perform the operation only on the addressable piece that contains non-identity bits, saving space by shortening the immediate operand. For example,

```
#define  FORBIDDEN 0x10000000
woof->access |= FORBIDDEN;
```

may be realized as the following on the 68000, assuming ***woof*** is in ***a3***, and ***access*** is a longword four bytes from the beginning of the structure pointed at:

```
bset.b #4,4(%a3)
```

Of course, this cannot be done with a object with a volatile-qualified type, and the back ends take the byte ordering of their targets into consideration.

Implicit Widening with Address Register Destination (68XXX Only)

The 68XXX family back ends now notice some nominally ***.w*** operations with address register destinations that implicitly sign extend the source value and do the operation on a 32-bit quantity anyway, including ***.w*** suffixes on index registers in addressing modes.

This saves space by avoiding explicit ***ext.l*** instructions.

Improved Code for Various Bit Field Operations

The compiler now generates better code for assignment of constants to bit fields and various other operations on bit fields.

Structure Assign Loop Unrolling

Ultra C now unrolls structure/union assignment loops either partially or totally according to time/space settings. This results in faster execution with a larger size.

Object Alignment

Ultra C now optionally aligns objects on the CPU32, 68020 and 80386 processors according to time and space settings. In conjunction with this change, the object linker can now align code and data areas on appropriate boundaries and the C executive automatically passes the correct alignment for the target processor to the linker.

Jump Table Generation

The assembler, when working with large assembly language files, can generate a data area jump table for 68000 targets. This is useful when the entire application (or a significant portion) has been I-code linked. This provides a smaller code model with a slight cost in execution speed.

Smaller Code Size Models

For smaller module sizes, Ultra C has more code generation alternatives. In addition to different code selection according to time and space settings, the compiler provides many new models of function prologue and epilogue code. This deals with stack checking, register save and restore, and frame pointer use. To see the most size savings for code use high values for ***-s*** or use ***-t=0***. This will yield much smaller code at the expense of execution speed.

Library Improvements

The ANSI C library has been improved to bring in the minimal number of functions.

A smaller ***sys_clib.l*** now makes direct system call traps, instead of making calls to the ***os_lib.l*** library.

An additional library is provided, ***sclib.l***, which contains non-ANSI compliant reduced functionality versions of the following functions:

- exit()
- fclose()
- fprintf()
- fread()
- fscanf()
- fseek()
- fwrite()
- printf()
- scanf()
- sprintf()
- sscanf()
- vfprintf()
- vprintf()
- vsprintf()

These functions trade performance and ANSI functionality for size.

All known bugs pertaining to I-code linking with the standard I-code libraries have been fixed.

It is now possible to I-code link with the standard libraries and use ***csl***. This combination allows for much smaller code when using ***csl*** is an option.

New versions of many string and trigonometric functions are available. These functions have been rewritten in Assembler and exist in the I-code libraries in a form that will allow them to be inlined directly into the code when desired.

The precision of the floating point conversion functions has been improved.

Additional Optimizations

Two additional optimization have been added to Ultra C.

Initial Loop Condition Testing

his occurs when Ultra C can determine that the first test of a loop condition will be true. Since both ***for*** and ***while*** loops in C test the exit condition before executing the body of the loop, Ultra C will change the loop such that the exit condition is not tested until the loop body has executed once it can determine that the first test of the loop condition will be true.

Constant Sharing

Ultra C will examine each of the code area constants declared by a program and removes duplicates, such as duplicate string constants.

Improved Backward Compatibility

It is now possible to use ***#asm/#endasm*** in the backward compatible modes.

The type checking has been relaxed even more in the backwards compatible modes.

Casting of ***lvalues*** — which is illegal in ANSI and K&R First Edition, but commonly found in V3.2 source code — is now better supported in the backward compatible modes.

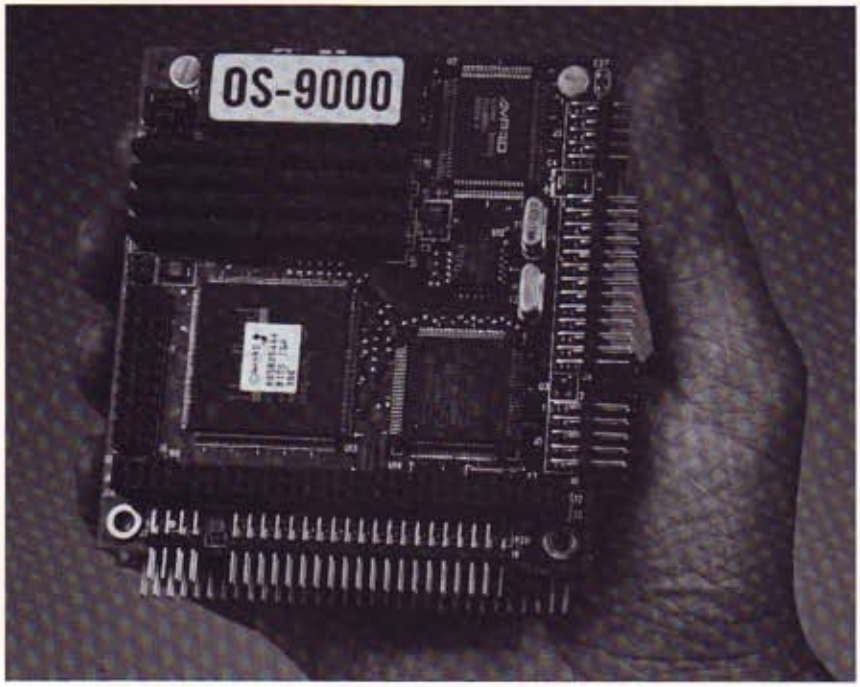
Additional Enhancements

Ultra C V1.1 also includes the follow changes:

- Updated version of the Source Level Debugger (see page 18).
- Ability to embed *_asm()* inside C functions.
- Faster compilation.
- Reduced memory usage during compilation.
- Optional warning for missing prototypes in ANSI and ANSI extended mode.
- Bug fixes.

OS-9000 Supports PC/104 Platform

Microware supports embedded PC format with real-time operating system and membership in PC/104 Consortium.



The PC/104 platform is designed for embedded PCs.

PC/104 WAS DEVELOPED TO PROVIDE A BUS STRUCTURE FOR embedded PCs. The PC/104 Consortium has proposed that a PC/104 appendix be added to the IEEE-P996 draft PCbus specification. Microware became a member of the PC/104 Consortium in 1992.

PC/104 specifies two connector possibilities, stackthrough and card edge. The stackthrough approach allows boards to be stacked on top of each other, with three boards totalling just 2 inches (5.08 cm) high. The card edge connectors are for applications where a minimum amount of space is available. A single board is just .6 inches (1.52 cm) tall with card edge connectors.

Microware's commitment to PC/104 goes beyond our membership in the Consortium. The OS-9000 Real-Time Operating System provides full support for 386 and 486 PC/104 systems. And the modular architecture of OS-9000 lends itself to the modularity of PC/104. As PC/104 modules can be added to meet specific system function requirements, OS-9000 modules can be added to address the exact functionality of the system.

The OS-9000 Version 1.3 Development Pak provides users with a complete Professional OS-9000 development environment including Ultra C, source level debugger and UNIX-like shell interface.

Virtual PC (see story below) is a DOS emulation program that supports execution of DOS tasks, including Windows, concurrently with OS-9000 tasks. VPC allows distributed processing between the two operating systems.

OS-9000's PC File Manager supports disk partitioning, as well as the ability to read and write DOS hard and floppy disks under OS-9000.

OS-9000/VPC V1.1 Released

Supports interprocess communications between DOS and OS-9000.

VERSION 1.1 OF **VIRTUAL PC (VPC)** FOR OS-9000 WAS recently released by Microware. VPC is a DOS emulation program that supports execution of DOS and Windows tasks under OS-9000.

Interprocess Communications

VPC V1.1 supports interprocess communications between DOS and OS-9000 allowing shared memory, events and signals between the two operating systems. Interprocess communication is accomplished with a library of DOS bindings and a set of OS-9000 system calls. One implementation would be interprocess communications through Windows' DDE (dynamic data exchange) facility.

Memory Support, Other Enhancements

This new version of VPC provides support for the following extended memory schemes:

- LIM EMS 4.0
- XMS 3.0
- INT 15

Other enhancements include:

- Support for J-DOS/V 5.0, the Kanji version of DOS for Japanese systems.
- The ability to override configuration file options with command line options.
- Support for a second physical drive.

X Window System Released for OS-9000

Provides full X11R5 implementation.

THE **OS-9000/X WINDOW SYSTEM** PROVIDES A COMPLETE implementation of MIT's X Window System Version 11 Release 5 (X11R5). OS-9000/X gives designers the tools necessary for developing and implementing powerful graphics-based applications under OS-9000 and other computer platforms across a LAN.

X11R5 features several enhancements over Version 4. These include:

- A networked-based font server process to provide and manage fonts to X Servers and X Terminals.
- Scaled font technology in addition to existing bitmap fonts.
- A new facility for providing consistent colors in a device-independent manner.
- Improvements in the resource manager at the protocol level. An new ***editres*** client allows users to graphically change resources.
- Internationalization support through Xlib additions.

OS-9000/X Windows lets you use your PC as an X Terminal with X as your interface to OS-9000. You can also execute X Clients that will be displayed on OS-9000 or other X Servers.

The OS-9000/X Window Systems is a complete X11R5 implementation that can turn your OS-9000 system into an X Terminal.

OS-9/MVME 162 Board Support Packages Available

Three configurations for full line of SBCs.

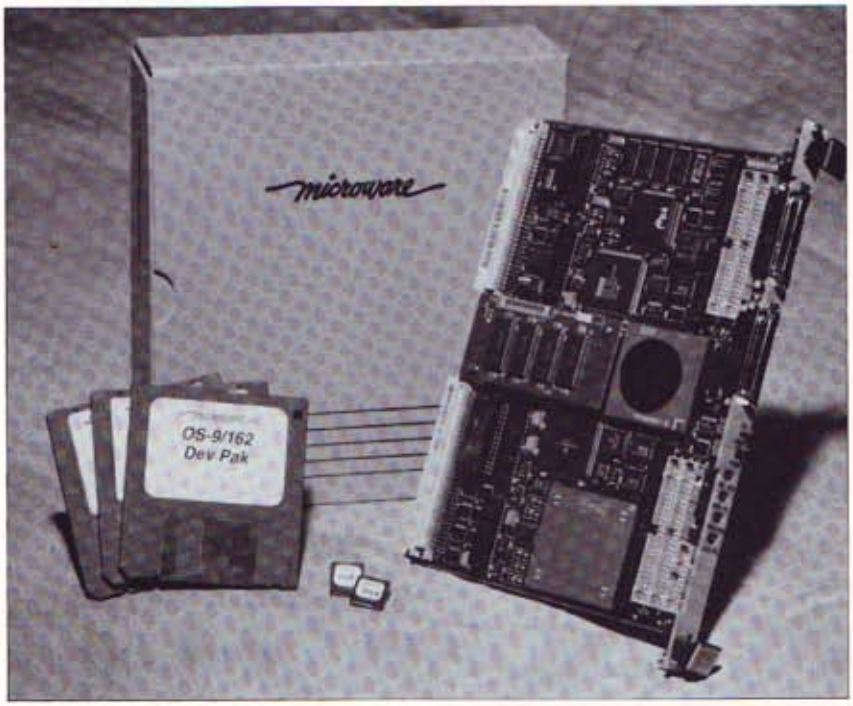
THREE PRECONFIGURED VERSIONS OF OS-9/MVME 162 Board Support Packages (BSPs) are now available. The MVME 162 line includes eight configurations built around a 68040-based VMEbus CPU board.

The **Embedded OS-9/162 BSP** targets ROM-based MVME 162 applications in which disk, tape and Ethernet I/O devices are not required. The BSP includes the OS-9 Kernel, Sequential Character (serial) File Manager and Pipe File Manager.

The **Disk-Based OS-9/162 BSP** targets applications that require mass storage devices such as floppy disks, SCSI hard disks, RAM disks and tape units. Configured to support the SCSI-equipped version of the MVME 162, Disk-Based OS-9 adds Random Block File Managers for DOS and OS-9 disks, and Sequential Block (tape) File Manager to the file managers offered by Embedded OS-9.

The **Extended OS-9/162 BSP** adds support for industry-standard TCP/IP networking and NFS to the Disk-Based OS-9 BSP. This configuration targets users with distributed applications where network connectivity and remote file access are required.

For resident OS-9 development, users add the **OS-9 Tool Kit** to either Disk-Based OS-9 or Extended OS-9 BSPs. The OS-9 Tool Kit includes Ultra C, C Source Level Debugger, MShell, Print Spooler, µMACS and COM.



OS-9 now provides support for the MVME 162 SBCline.

Microware Chosen As A Motorola Platinum Member

Program acknowledges leadership in providing software for the 68000 family of microprocessors.

MOTOROLA'S HIGH PERFORMANCE MICROPROCESSOR DIVISION recently announced that Microware has been selected as a Platinum member of Motorola's Third-Party Developer Program. This membership identifies Microware as a leading provider of 68000 Family products.

Motorola's Developer Program includes more than 200 third-party hardware and software vendors, from which Microware and five other firms were selected for Platinum membership.

"Our Platinum status from Motorola," says Microware president Ken Kaplan, "reflects our commitment to the Motorola processor family. This status will be increasingly important during ports to new processors such as the 68349 and 68360."

OS-9 Provides Support for New 68349

Chip developed for personal intelligent communicators.

MOTOROLA'S NEW 68349/DRAGON I IS THE HIGHEST PERformance member of the 68300 integrated microprocessor family. The 68349 was designed to meet the rigorous power and performance demand of personal intelligent communicators (PICs) and other compact computing devices.

Microware's OS-9 Real-Time Operating System and Ultra C ANSI C compiler are among the first third-party software products to support the advanced chip. The chip integrates a 16 or 25 MHz CPU030 core, high-speed 32-bit DMA controllers, a dual serial communications port, power management functions and a system integration module for a flexible and glue-less system interface.

According to Jack Browne, vice president and director of marketing for Motorola's High Performance Microprocessor Division: "The 68349 marks the beginning of what will be a series of integrated 68300 Family processors aimed at PICs and other innovative applications — a focal point of our effort to ensure the 68000 Family's continued dominant standing in the embedded marketplace."

Source Level Debugger V2.6 Now Available

Enhancements for Ultra C V1.1.

VERSION 2.6 OF THE **C SOURCE LEVEL DEBUGGER** HAS been released in conjunction with Ultra C V1.1 (see page 14). The latest version of the Source Level Debugger for OS-9 and OS-9000 lets users debug programs that take advantage of the newest Ultra C compiler features including constant data structures stored in the code area.

The Source Level Debugger provides a complete ANSI C debugging environment. One of the powerful features available is the prototyping of ANSI C functions. If a prototype is provided for a function in ANSI C code, the Source Level Debugger will convert arguments for that function to the correct type. For example, if a C function takes a ***float*** as a parameter, and the

user passes that function an ***int*** (while doing a SrcDbg print command or other expression evaluation) SrcDbg will convert the ***int*** to a ***float***.

MShell V1.1 Released for OS-9 and OS-9000

New editing and programming features.

VERSION 1.1 OF **MSHELL** FOR OS-9 AND OS-9000 WAS recently released by Microware. MShell is an enhanced command line interface and procedure file interpreter which can be used as a replacement for the standard Shell. New features found in V1.1 include:

- Control of the default command line editing mode (insert vs. overwrite).
- Automatic logout of idle users.
- BASIC-like ***data/enddata*** construction for more procedure file flexibility.
- ***which*** command tells users all places that a command exists and which one will execute.
- Enhanced ***pushd*** options to access HOME and current execution directories.
- Various speed enhancements.

X.25 Support Added to ISDN File Manager

Single ISDN line serves multiple X.25 endpoints.

THE ADDITION OF X.25 SUPPORT TO THE ISDN FILE MANAGER (ISM) allows dialup access to X.25 packet networks. This allows all ISDN systems to have wide area connectivity while being able to communicate to endpoints using the standard X.25 protocols.

The current option for X.25 connectivity is to purchase a dedicated "leased" telephone line for each X.25 endpoint. Since each of the endpoints receives little usage, this becomes inefficient, particularly with in networks with multiple endpoints.

The ISM/X.25 package, on the other hand, requires a single ISDN connection for connection to any X.25 endpoint. This maximizes the utilization of a single line to multiple X.25 networks.

New Markets Open, Export Restrictions Change

Eases the distribution of software to developing and newly-opened markets.

ALTHOUGH SIGNIFICANT POLITICAL CHANGES HAVE TAKEN place around the world, stringent guidelines still exist that govern the export of Microware software. To help define Microware's export capabilities, Microware sought and was granted the ability to export software to a broad base of countries by the United States Department of Commerce. In accordance with the GTDR general license, software can be exported to all countries except those listed below without Letters of Assurance (GTDU).

To open these doors for exporting, the Department of Commerce has issued Export Control Commodity Numbers for OS-9 and OS-9000 Real-Time Operating Systems and related software products:

- For OS-9 the number is 5D03A.
- For OS-9000 the number is 4D96G.

The following paragraphs are found in Microware's standard distribution license agreement and define the countries and uses that are restricted.

Export And Use Restrictions

Excerpted from Microware's standard distribution license agreement.

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>
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These changes extend to Microware's customers who re-export Microware software and will make it easier to provide software to customers in developing countries or newly-opened markets.

To order the products listed on the previous pages or for additional information, contact Microware or your authorized Microware representative.

Surviving the Flood of '93

Despite record rainfall and two weeks without running water, Microware survived the Flood of '93. Thanks to our customers for your support.

ALL ALONG THE MISSISSIPPI RIVER AND ITS TRIBUTARIES, residents spent the summer shoring up and sandbagging property as record rains pushed the waters out of their banks. Des Moines fell victim to these rising waters on July 11th as the Des Moines and Raccoon Rivers flooded portions of the city.

Water System Knocked Out

It was the Saturday after Independence Day and the Ruan Greater Des Moines Grand Prix was in full swing. The rising Des Moines River threatened to close a portion of the track, but it looked like a banner year for the race. Then the rains came again Saturday night along the upper Des Moines River, pushing the waters even higher. Officials cancelled Sunday's racing, but had no idea about what was to come.

About 4 a.m. the word went out that the Des Moines Water Treatment Plant had been flooded. Residents were told to get what water they could from their taps; it would be the last for a while.

Sunday morning brought the realization that 250,000 Des Moines residents had no water for bathing, flushing, drinking, cleaning or cooking. Grocery store shelves were wiped out of bottled water, milk, juice and anything that didn't require the addition of water.

Water distribution sites were quickly set up by the National Guard. Residents faced new challenges. In our homes, anything that held liquid was used for water storage. Trips to water distribution sites became part of our daily routines. For almost two weeks, every drop of water was precious.

Microware Remained Mostly Dry

Microware was not directly affected by the flood waters except for a small portion of our parking lot.

Several ingenious Microware employees quickly rigged a reverse pump system to provide running water throughout the building. Pumping from a 500 gallon farm tank, employees and their families had an opportunity to shower, and the company's sanitation system kept operating.

Ahhh, The Sound of a Flushing Toilet

After nearly two weeks without running water, the system was fully restored. We all rushed to flush our toilets, bathe, fill a glass with water or just let the faucet run to hear it run. The crisis had ended. By banding together, Des Moines had survived the Flood of '93.

To Our Friends, Thank You

News of the flooding reached all corners of the globe and Microware's customers responded by expressing their concern for our well-being. All the employees of Microware would like to thank those people across the nation and around the world who sent their best wishes as we endured this crisis. We appreciate the concern and caring, and hope that we can respond in the same fashion when others are in need. Once again, thank you.

Microware's lower parking lot went under water during the flooding of the neighboring Walnut Creek. The creek feeds the Raccoon River, one of two rivers that flooded Des Moines. The bridge in the photo above normally has about eight feet of clearance below it. The view at the right is looking from the bridge to Microware's corporate headquarters building.

Creating the Flood of New Products from Des Moines

A look at the people behind the products.

THIS ISSUE OF *PIPELINES* CONTAINS ALMOST A DOZEN NEW and updated products from Microware. Untold hours went into the development of these products. We want to recognize the people that created the "Flood of New Products," particularly those involved in OS-9 Version 3.0 and FasTrak.

The development teams shown above are listed with the areas they were responsible for:

First row (l. to r.): Warren Brown, manager of OS-9 group, and Lee Glenn, OS-9000/X Windows.

Second row: Alex Stagg, OS-9 porting; Gwenna Jacobsen, FasTrak UNIX integration; and Curt Schwaderer, OS-9 SLIP support.

Third row: Mark Hawkins (with shovel and boots), director of system software group; Yeongleh Lee, OS-9/ISP; Tony Hoffman, OS-9 V3.0; Gopal Miglani, OS-9/ISP backplane driver; Rick Grewell, OS-9 V3.0; Debbie Baier, FasTrak HyperHelp and documentation; Scott McGee, FasTrak Makefile Editor; Peter Dibble, OS-9 V3.0; Todd Earles, FasTrak project leader, FasTrak Workbench; and Dave Lyons, FasTrak project leader, FastFix debugger.

Top row: Boisy Pitre, FasTrak Text Editor Tool; Richard Russell, director of languages and development environments group; and Anil Purohit, FasTrak GUI.

Not pictured: Mike Ahrens, FasTrak Target Tool and Brent Thompson, OS-9/ISP and SLIP.

Third-Party Products

IF YOU HAVE NEW HARDWARE OR SOFTWARE products that run under OS-9 or OS-9000, please submit a press release and black & white photograph of the product for consideration for publications in *PIPELINES*. All materials should be sent to the Editor of *PIPELINES* at the address on page 2. For additional information, contact Steve Simpson at (515) 224-1929 by phone, (515) 224-1352 by fax or steves@microware.com by Internet.

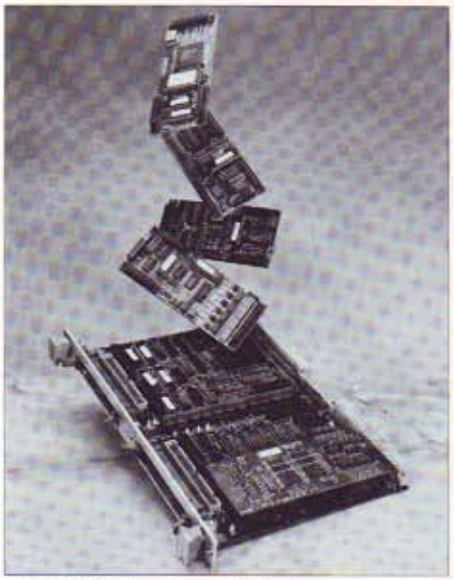
Acromag Offers OS-9 Support for All Boards

Acromag, Inc. (Wixom, Michigan) now offers OS-9 support for its full line of A/D, D/A and digital VMEbus boards. All OS-9 drivers are written as C libraries to simplify integration with applications.

Acromag's latest products include a family of 96-point channel-to-channel digital input and output boards.

CALL OR WRITE
Acromag, Inc.
P.O. Box 437
Wixom, Michigan 48393
Phone: 1-800-336-8655 (U.S. Only) or (313) 624-1541
Fax: (313) 624-9234

Two SCIM Mezzanine Boards from Arcom



Arcom's VSIP universal expansion board.

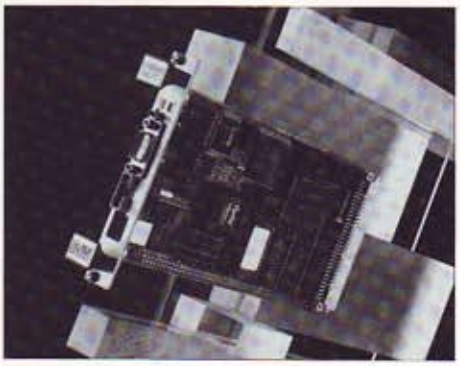
Arcom Control Systems Ltd. (Cambridge, England) recently announced two new boards for the open-architecture SCIM (Standard Computer Interface Module) mezzanine bus. The **MOD901** features a 12-bit A/D converter capable of sampling up to eight differential channels at up to 20 kHz, four digital outputs and an 8-bit parallel port.

The **VSIP** is a 6U VMEbus universal expansion board that can be populated by up to four standard or custom SCIM modules.

CALL OR WRITE
Alan Timmins
Arcom Control Systems Ltd.
Units 8-10 Clifton Road
Cambridge CB1 4WH
England
Phone: (44) 223 411200
Fax: (44) 223 410457

Hardware and Software from BVM

BVM Limited (Southampton, England) has announced the release of several new hardware and software products.



The BVME486 3U 486 board from BVM.

The **BVME486** is a 3U VMEbus CPU board that features a 25 MHz Cyrix 486SLC, up to 4M zero wait state DRAM, IDE hard and floppy disk controller, one Centronics port, two RS-232 ports, keyboard interface and SVGA 16-color non-interlaced video driver. A 16-bit AT connector header is also provided to allow the use of remote 8- and 16-bit PC expansion slots.

BVM has updated their **BVME305** counter/timer module. The BVME305 is a 3U VMEbus board that features two AM9513A counter/timer chips to provide ten independent 16-bit counters. The board can be used either as a pulse counter or as a pulse generator.

The **MoDule File Manager (MDF)** from BVM is a file system package to read and write OS-9 data modules. MDF emulates OS-9's Random Block File Manager (RBF) commands and can be used to access data modules over an NFM or PCLINK network system.

TARGET-LINK allows developers to load OS-9 applications and relevant modules into a target system's RAM using a simple serial link. TARGET-LINK helps overcome the differences between development and target systems, and allows remote debugging of applications in the target's RAM from the development host.

TARGET-LINK provides serial links to OS-9 targets.

PCLINK Version 2 (see *PIPELINES* Fall 1992, p. 15) has been upgraded to allow the package to run on top of OS-9 ISP (Internet Support Package).

BVM announced a **multiprocessor solution** for up to eight 68030 or 68040 CPU modules. Their multiprocessor software creates multi-protocol packets which interface with Microware's Network File Manager (NFM) or Internet Support Package (ISP). Modules can be connected via the VMEbus, direct serial link or network protocols such as Ethernet.

The firm also announced the release of 20 new I/O IndustryPacks, as well as the **BVME31**, a 3U VMEbus carrier that will accept two IndustryPacks.

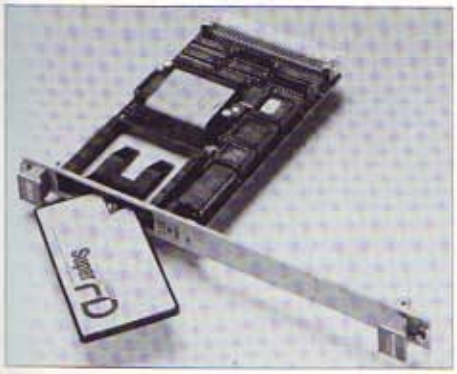
Contact BVM for a new catalog of their product line.

CALL OR WRITE
Rod Clarke
Managing Director
BVM Limited
Flanders Road, Hedge End
Southampton, Hampshire SO3 3LG
England
Phone: (44) 703 270770
Fax: (44) 489 783589

Contactless Memory Card Drive, CAN Interface from Compcontrol

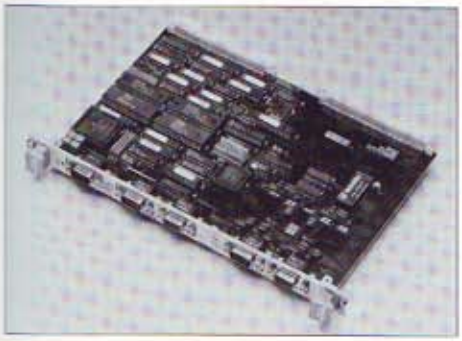
Compcontrol Inc. (Los Gatos, California) recently announced its **CC155**, a 3U or 6U VMEbus board that reads and writes contactless memory cards. An on-board 8051

processor provides transmission of data to the memory card.



The CC155 contactless memory card drive.

The **CC175** 6U VMEbus module provides two independent CAN (controller area network) channels with each channel having its own CAN protocol controller. The CC175-I features the Intel 82527 CAN controller that supports the extended frame with 29-bit identifier format. The CC175-P uses the Philips PCA82C200 that is capable of handling all CAN functions on-chip and filtering of standard frames. The board also features a 16 MHz 68000 CPU, dual-ported RAM and two RS-232 ports.



Compcontrol's CC175 CAN interface.

The **CC126** is a 3U or 6U VMEbus Ethernet board. The board features a Seeq 8005 Advanced Ethernet Data Link Controller and an optimized VMEbus interface. Versions are available for twisted-pair or Cheapernet networks.

Compcontrol's **CC151** programmable controller features a 16 MHz 68000 CPU, auto-calibrating 12-bit A/D and D/A convertor, one RS-232 ports, one RS-422/485 port, Arcnet interface and on-board Flash EPROM. The board includes 24 isolated digital channels and 64 isolated analog channels.

CALL OR WRITE
Compcontrol Inc.
15466 Los Gatos Boulevard, Suite 109-365
Los Gatos, California 95032
Phone: (408) 356-3817
Fax: (408) 356-1755

Development Utilities for OS-9

Datentechnik Reischke (Kiel, Germany) has released their **devTOOL** package for OS-9. devTOOL provides more than 80 utilities for system development and application programming, including a full set of wildcard file manipulation utilities and a disk sector editor. Utilities are included for the following:

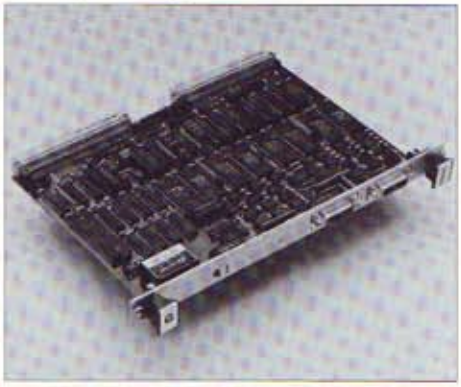
- System Utilities
- System Analysis, Maintenance and Service
- Text File Processing and Output
- Programming Aids
- System Software
- File Maintenance
- C Libraries

All utilities include *-?* command line help with examples.

devTOOL from Datentechnik Reischke.

CALL OR WRITE
Oliver Reischke, Director
Datentechnik Reischke
Bremerstraße 2
D-2300 Kiel 1
Germany
Phone (49) 431-805293
Fax: (49) 431-86511

High-Speed Communications Card from Dynatem



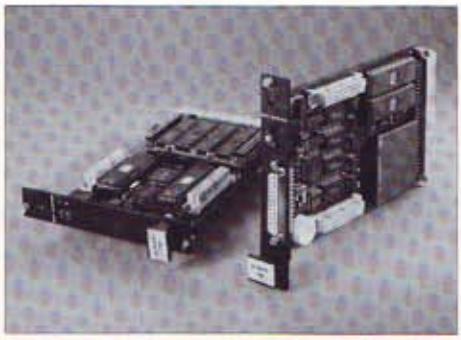
Synchronous Serial Data Link card from Dynatem.

Dynatem, Inc. (Mission Viejo, California) now offers the **DSSDL**, a 6U VMEbus high-speed serial communication card. Serial communication conforms to the Synchronous Serial Data Link (SSDL) protocol and offers VME-to-VME transfers of up to 20M/sec. The DSSDL offers two full-duplex serial ports, 8K FIFO buffers and programmable clock rate.

CALL OR WRITE
Dynatem, Inc.
23455 Madero, Suite B
Mission Viejo, California 92691
Phone: (714) 855-3235
Fax: (714) 770-3481

New Boards from EKF

A variety new boards were recently released by EKF Elektronik GmbH (Hamm, Germany).



EKF's 3U 68040 SBC.

The **VME 78045-TSC** is a rugged CMOS 3U VMEbus SBC built around an 80 MHz 68040 CPU and features up to 1M HSRAM, up to 1M EPROM, two RS-232 channels and battery-backed calendar/clock/timer. The board also features an expansion interface for a variety of piggyback modules. Versions are also available with a 68EC040 (**VME 78040-TSC**) and a 68LC040 (**VME 78043-TSC**).

The **VME 68080-U32** is a 6U VMEbus CMOS SBC that features a 50 MHz 68030, 68882 FPCP, 2M HSRAM, 1M dual-ported RAM, SCSI port, floppy disk controller, two RS-232 ports, parallel port, and battery-backed real-time clock. The board includes a local expansion socket for either 8M HSRAM, 32M DRAM or 4M battery-backed SRAM.

The **VME 78035-TSC** is a 3U VMEbus CMOS SBC that features a 50 MHz 68030 CPU, 68882 FPCP, up to 1M HSRAM, up to 1M PROM, two RS-232 ports and battery-backed calendar/clock/timer. An expansion interface is provided for special I/O functions such as SCSI controller, floppy disk controller or additional memory.

The **VME 78550-SI** is a 3U VMEbus serial board that provides four RS-232 V.24 or RS-422/485 V.11 ports. The **VME 68550-SI** is a 6U version of the board.

EKF's **VME 78240-PTO** is a 3U VMEbus I/O board that provides 26 TTL-compatible parallel ports and a 24-bit timer/counter. A 6U version of the board is also available.

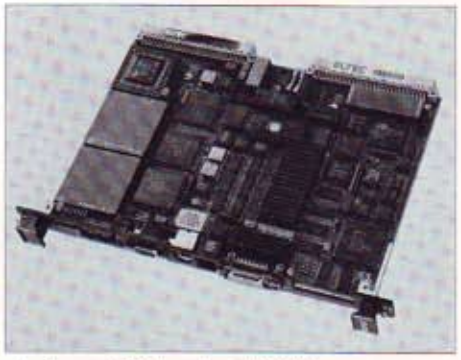
The **68470-PGM** is a 6U VMEbus megabit programmer for programming all 8- and 16-bit EPROMs with JEDEC pinouts. The board features an on-board 68000 CPU and 512K RAM.

The 3U VMEbus VME **78310-ADCT** is an analog data acquisition board that features 16 single-ended or 8 differential inputs with 12-bit resolution, 24-bit timer and 10-bit TTL-compatible parallel port. The VME 68310-ADCT is a 6U version of the board.

CALL OR WRITE
B. Kleeburg
EKF Elektronik GmbH
Philip-Reis Straße 4
D-59065 Hamm
Germany
Phone: (49) 2381 6890-0
Fax: (49) 2381 6890-90

Dual '040 Board from Eltec

Eltec International plc (Milton Keynes, England) recently released a new CPU board and a new graphics board. The **Eurocom 17** is a 6U VMEbus board that features two 40 MHz 68040 CPUs, up to 32M DRAM, 53C720 SCSI-2 controller, 79C900 Ethernet controller, VGA interface with resolution up to 1152 × 900 pixels, 1M VRAM and a VME64 interface.



The Eurocom 17 features two 68040 CPUs.

The **IC40** is a 6U VMEbus graphics board that features an on-board 25 or 33 MHz 68040 CPU, 4.5M VRAM and programmable 8-bit resolution up to 1280 × 1024 pixels. Up to four standard cameras can be connected to the IC40.

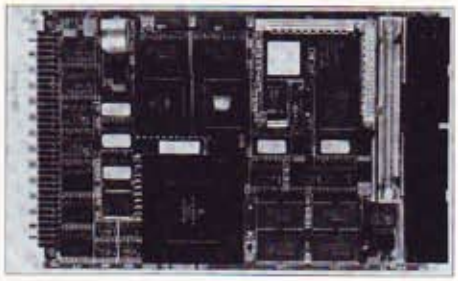
CALL OR WRITE
Phil Bull
Eltec International plc
Sunningdale House
45 Caldecotte Lake Drive, Caldecotte Business Park
Milton Keynes MK7 8LF
England
Phone: (44) 908 366499
Fax: (44) 908 274600

The OS-9 Guru Now Available

The OS-9 Guru by Paul S. Dayan is now available from Galactic Industrial Ltd. (Durham, England). The 400+ page book provides a technical reference for new and experienced OS-9 users.

CALL OR WRITE
Hanna Furlong
Galactic Industrial Ltd.
Unit 3B, Mountjoy Research Centre
Stockton Road
Durham, England
Phone (44) 91 384 8343
Fax: (44) 91 384 7742
In the US, Steve Weller
Windsor Systems
Phone: (502) 425-9560
Fax: (502) 426-3944

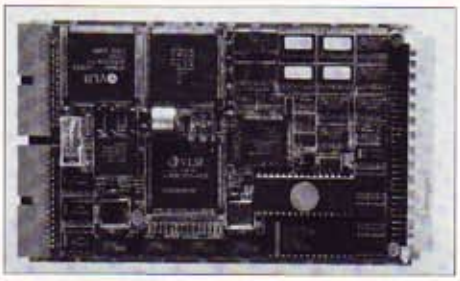
68340, 386SX Boards from GESPAC



GESPAC's 68340 SBC.

GESPAC's **GESSBS-34** is a 3U SBC that features a 16 MHz 68340 CPU, 4M DRAM, floppy disk and SCSI controllers, 256K on-board CMOS battery-backed RAM, two RS-232/422/485 ports, battery-backed clock and three 16-bit timers. The board also includes an on-board socket for a GESPAC eXpansion Submodule Bus (XSB) piggyback I/O module.

The **GESSBS-38 is** a 3U G-96 bus CPU board that features a 25 MHz 386SX CPU, on-board VGA controller, 2 or 8M RAM, full hardware EMS support, two serial ports (COM1 and COM2), bidirectional parallel printer port (LPT1), floppy disk and IDE hard disk interface, real-time clock calendar, DMA and a PC/AT compatible keyboard controller.



The G-96 bus GESSBS-38 features a 386SX CPU.

CALL OR WRITE
Fred Strouse (GESSBS-34) or Jean Brunelle (GESSBS-38)
GESPAC, Inc.
50 West Hoover Avenue
Mesa, Arizona 85210
Phone: (602) 962-5559
Fax: (602) 062-5750

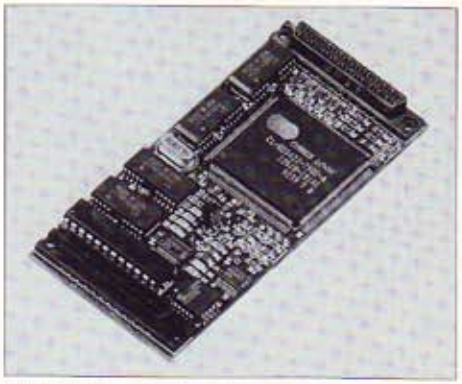
SVGA IndustryPack, More from GreenSpring

GreenSpring Computers (Menlo Park, California) recently announced several new IndustryPacks, as well as a 68332-based SBC. The **IP-SVGA** SuperVGA IndustryPack features a Cirrus Logic CL-GD5422 SVGA controller and up to 512K VRAM. The board will run Microware's RAVE, X Windows and GESPAC's G-Windows user interfaces.

GreenSpring has also released six other IndustryPacks, including:

- **IP-16ADC** — 16-channel 16-bit analog/digital converter
- **IP-Ethernet** — Ethernet using the LANCE chipset for coax or twisted pair cabling
- **IP-Stepper** — two-motor stepper motor controller
- **IP-FLASH** — up to 8M Flash EPROM
- **IP-NVRAM** — up to 1M battery-backed SRAM
- **IP-PC Card** — handles two PC memory cards

The **Platform332** is a stand-alone SBC built around a 16 MHz 68332 microcontroller. The board measures 10 × 10 × .7 inches (254 × 254 × 18 mm) and can be configured to include up to six IndustryPack slots, up to 4M RAM, up to 1M Flash EPROM, up to three RS-232/422/485 serial ports, parallel port, IDE hard disk interface and floppy disk interface.

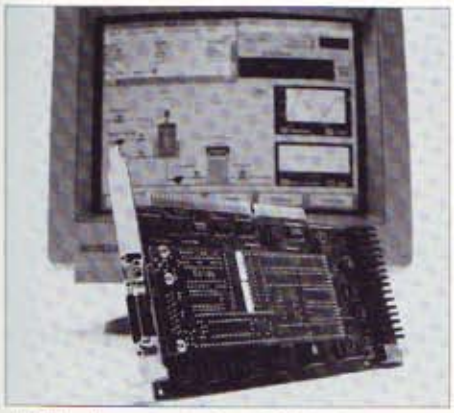


The IP-SVGA provides SuperVGA graphics.

CALL OR WRITE
Kim Rubin, Vice President
GreenSpring Computers
1080 Linda Vista Avenue
Mountain View, California 94043
Phone: (415) 969-4905
Fax: (415) 969-1905

OS-9 and Windows Solution from LP Elektronik

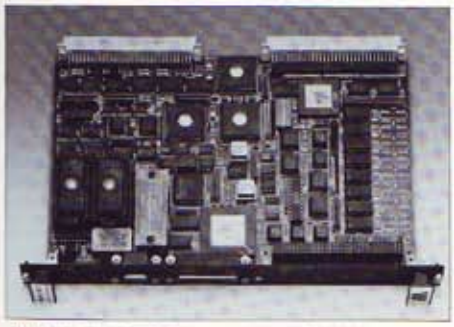
The **LC-20** from LP Elektronik (Weingarten, Germany) is a PC plug-in card that features a 68020 CPU and software that creates a link between OS-9 on the LC-20 and DOS/Windows on the PC. The package provides direct C compiler access to DOS files allowing OS-9 source files to be edited by DOS applications. Each systems' RAM is accessible to the other, and the LC-20 can access any address on the PC. The LC-20 can also control any of the I/O cards on the PC.



LC-20 development system from LP Elektronik.

CALL OR WRITE
Heinrich Munz
LP Elektronik GmbH
Ettishofer Straße 8
D-7987 Weingarten, Germany
Phone: (49) 751-52327

Rugged 68030 SBC from MATRIX



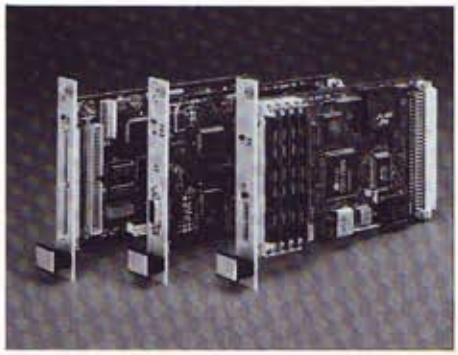
MATRIX's MR-CPU330 is a ruggedized '030 SBC.

MATRIX Corporation (Raleigh, North Carolina) recently released its **MR-CPU330** rugged SBC. The MR-CPU330 is a 6U VMEbus SBC that features a 25 MHz 68030 CPU, optional 25 MHz 68882 FPCP, up to 8M dual-addressed DRAM, up to 1M ROM/EPROM, battery-backed clock and SRAM, Dbus-68 Standard Expansion Interface, one EIA-232 port, one EIA-232/422 port and two 16-bit timers. The board is designed for extended temperature operation from -40° to 85°C and was tested against severe shock and vibration standards.

CALL OR WRITE
MATRIX Corporation
1203 New Hope Road
Raleigh, North Carolina 27610
Phone: 1-800-848-2330 (U.S. Only) or (919) 231-8000
Fax: (919) 231-8001

ISA Electrical Standard Mapped to Eurocard Format

Micro-Link (Indianapolis, Indiana) recently announced their **PCEbus (Personal Computer–Eurocard)**. PCEbus maps the electrical standard for the desktop ISA bus to the mechanical standard of the Eurocard (3U) format. PCEbus is intended for designers who require the functionality of PC hardware packaged in a format that is compact and rugged. Micro-Link has developed a line of PCEbus boards.



PCEbus boards PCE601, PCE605 and PCE201 (l. to r.).

The **PCE201** is a 3U PCEbus SBC that features a 25 or 33 MHz 80386SX CPU, 80387 FPCP, up to 16M DRAM, 128K FLASH EPROM, PC/AT keyboard interface and battery-backed calendar clock.

The **PCE601** system interface adapter includes an IDE hard disk drive controller interface, floppy disk interface, one parallel printer port and two RS-232/485 ports.

For graphic monitors, the **PCE605** supports VGA, EGA, MDA and CGA modes. The board features 256K VRAM, VGA resolution up to 800 × 600 and up to 256 colors.

CALL OR WRITE
Jan Collins
Micro-Link Products
Pennsylvania Parkway
Indianapolis, Indianapolis 46280-1385
Phone: 1-800-428-6155 (U.S. and Canada Only)
Fax: (317) 848-2254

MIL-STD-1553B File Manager from NAS

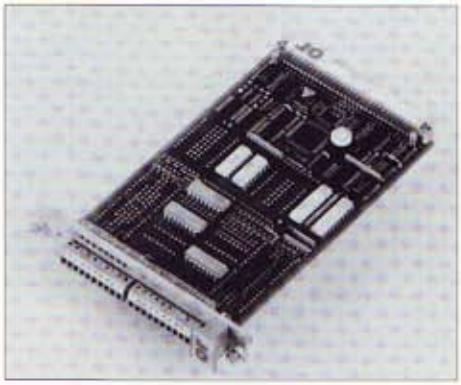
Native American Services, Inc. (NAS, Huntsville, Alabama) recently announced the release of their OS-9 **file manager for MIL-STD-1553B** Bus Interfaces. The file manager operates in bus controller, remote terminal and bus monitor modes. All data transfers, mode codes and real-time to real-time transfers are handled using the standard OS-9 I/O system functions.

CALL OR WRITE
Paul Moeller or Chuck Wesolowski
Native American Services, Inc.
3411 Triana Boulevard
Huntsville, Alabama 35805
Phone: (205) 539-7928
Fax: (205) 539-5935

New Products from oettle+reichler

oettle+reichler Industrial Computers (Augsburg, Germany) recently released several new boards and two software packages. The **IBMIO2** is a 3U PCbus I/O board that features a VGA interface with resolution up to 1024 × 768 pixels, a flexible disk interface, an IDE/SCSI hard disk interface, two serial ports and one Centronics port.

The **VC-302** is a 3U VMEbus CPU board that features dual 68302 CPUs and six serial interfaces designed for industrial applications. The board also features up to 2M dual-ported battery-backed SRAM, up to 4M dual-ported DRAM, up to 4M EPROM, five 16-bit timers, 20 TTL I/O, real-time clock and watchdog.



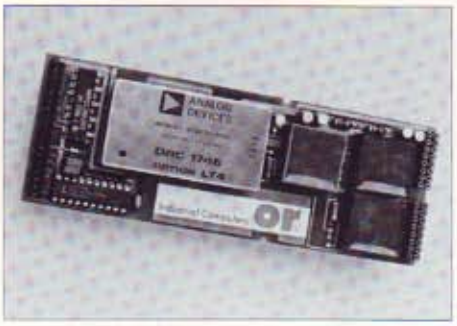
Direct wiring terminal block from oettle+reichler.

The **VDIO-1X** family of digital VMEbus modules provides terminal blocks with screws for direct wiring and accepts wires up to AWG 15 (1.5 mm²). The boards feature short circuit protection, error reporting and LED status displays. The family includes:

- VDIO-10 with 16 inputs
- VDIO-11 with 16 outputs

- VDIO-12 with 8 inputs and 8 outputs
- VDIO-13 with 16 bi-directional inputs and outputs

The **XSRO-10** is a low power CMOS 16-bit synchro/resolver transmitter. The unit operates on just .1 Amps and in temperature ranges from -40° to +85°C. The XSRO-10 emits two phase-displaced sine signals which are used to set the absolute angle axis. Up to two XSRO-10 units can be mounted on a 3U VMEbus carrier module, or up to four units on a 6U carrier.



oettle+reichler's XSRO-10.

Windows-9 is a graphical windowing environment for OS-9 systems. Windows-9 features real-time capabilities, as well as networking via OS-9/NET. Windows-9 includes an OS-9 graphics shell and an object library for switches, push buttons, options menus and more. A text editor is available that features mouse-driven operation and compatibility with µMACS. A graphics object editor is available for the creation of target user interfaces based on Windows-9. A process visualization package transfers incoming data to the appropriate display.

DOS-9 gives OS-9 users access to DOS and Windows applications on the VMEbus. DOS-9 allows OS-9 to share all functions of the PC such as hard and floppy disks, display, keyboard, printer, serial interfaces and networking. Communications between the systems is accomplished via common memory on the VMEbus. DOS-9 also includes Windows-9.

CALL OR WRITE
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Fax: (44) 821 5034119

OS-9 International Magazine

OS-9 International is devoted to OS-9 and its publisher plans to:

- Maintain a list of OS-9 sites that have public domain software available.
- Reserve pages for OS-9 user groups (*OS-9 International* is the official organ of the EFFO, The European Forum For OS-9).
- Present professional articles on software solutions for common problems.
- Conduct software and hardware tests.
- Print letters and short communications in order to establish a platform between OS-9 users and programmers.
- Publish features of commercially available OS-9 software.

CALL OR WRITE
Marc Balmer
OS-9 International
Hagentalerstraße 12
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Switzerland
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Fax: (41) 61 43 55 02
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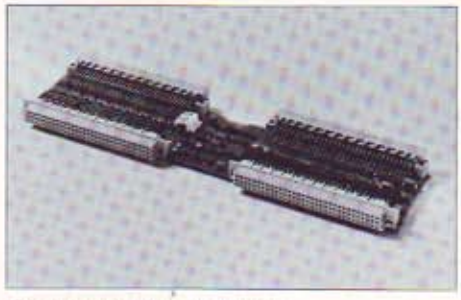
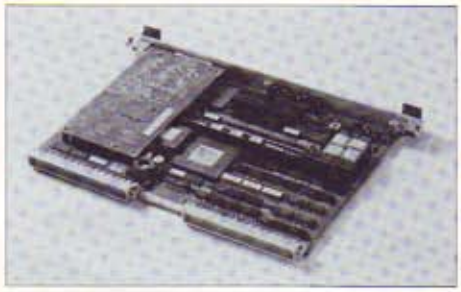
"Hot Swap" Module from Radstone

Radstone Technology Corporation (Montvale, New Jersey) recently announced several new products, including their **HS-1 Live Insertion Module**. The HS-1 is a 6U VMEbus module that fits between a VME board and the VME backplane. The module provides complete isolation of the bus from board during power up/down sequences and powered-down states for complete "hot swap" capabilities.



Radstone's HS-1 "hot swap" module.

Radstone's **CPU-40D** is a VME64 SBC that features a 68040 CPU, up to 64M on-board DRAM and an MXbus (Military Expansion bus) interface. A complete 64-bit VMEbus interface in provided by a Cypress VIC64 CMOS ASIC.



Ruggedized graphics board from Radstone.

The **GDP-1A Graphics Display Processor** is a 6U VMEbus full Mil-spec and ruggedized board that features a TMS34020 graphics processor, resolution up to 1280 × 1024, up to 256 colors, 1M dual-ported SRAM, up to 3M VRAM, three resident text fonts and two RS-232 ports. The GDP-1A drives standard raster RGB monitors and incorporates Genlock inputs for synchronization to external RGB video signals.

The **MXES-1** is an Ethernet and SCSI interface module for VMEbus boards that support the MXbus.

Radstone also announced its **RS series** of rugged chassis to accommodate 5, 10 and 15 6U VMEbus slots. All joints and apertures are sealed and gasketed to meet MIL-STD-461 electromagnetic compatibility requirements.

CALL OR WRITE
Don Tidey, Sales Engineer
Radstone Technology Corp.
20 Craig Road
Montvale, New Jersey 07645
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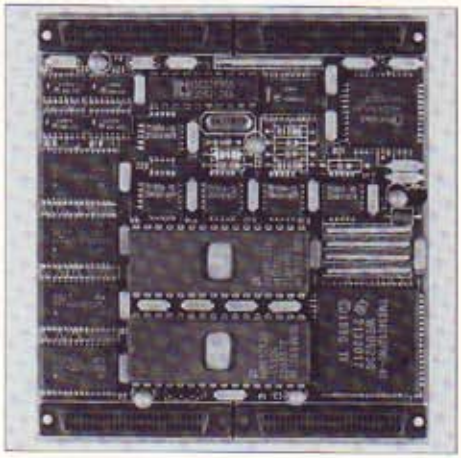
Fax: (201) 391-2899

Graphics Products from Raster Graphics



The RG-7900 dual-width Industry Pack.

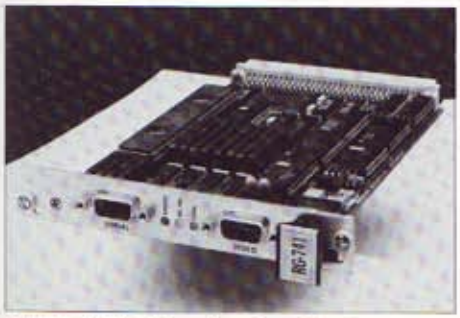
Raster Graphics Inc. (Bend, Oregon) offers a full line of graphics boards for OS-9. The **RG-7900** is a dual-width IndustryPack board for VGA and SVGA support. The board features a TMS34010 graphics processor, programmable resolution up to 1024 × 768, 16 colors, 128K of instruction RAM, 384K VRAM, on-board AFGIS firmware for graphics primitives and the AFGIS C graphics library.

The **RG-741** is a 3U VMEbus RGB graphics board that features the TMS34010 graphics processor, programmable resolution up to 1024 × 768, 16 or 256 colors, 512K DRAM, 1M VRAM, mouse and keyboard

interfaces, and AFGIS firmware and C libraries. The **RG-740** features the same as above with resolution set at 640 × 480, 16 colors, 256K DRAM and 256K VRAM.

The **RG-750** 6U VMEbus board features RGB and Planar EL flat panel display interfaces, TMS34010 graphics processor, programmable resolution up to 1024 × 768, up to 16 or 256 colors, up to 4M DRAM, 1M VRAM, mouse and keyboard interfaces, and AFGIS firmware and C libraries.

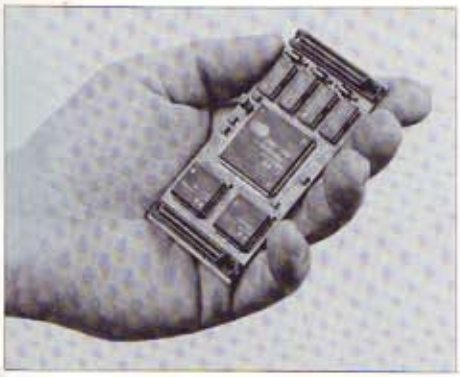
The **RG-73x** series of 6U VMEbus high-resolution graphics boards each feature a TMS34020 graphics processor, TMS34082 math coprocessor, up to 1280 × 1024 resolution, up to 256 colors, 60 Hz non-interlaced display, up to 8M DRAM, serial mouse interface, AT keyboard interface, ten built-in fonts, and AFGIS firmware and C libraries. The RG-73x boards offer both screen-oriented and 2D/3D graphics.



The RG-741 3U RGB board from Raster Graphics.

CALL OR WRITE
Phillip D. Smith, President
Raster Graphics Inc.
P.O. Box 5157
Bend, Oregon 97708
Phone: (503) 388-2584
Fax: (503) 389-8249

VGA IndustryPack from Snijder



Snijder's VGA Industry Pack.

Snijder Micro Systems (Deurne, The Netherlands) has released their **IP-UVGA** module. The IP-UVGA is an IndustryPack-compatible VGA interface that features programmable resolution up to 1280 × 1024 and up to 2M video memory. A 3U VMEbus version is also available.

CALL OR WRITE
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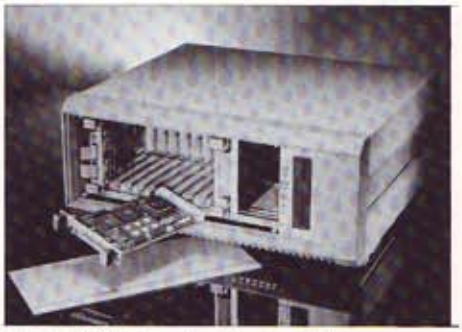
5750 AH Deurne
The Netherlands
Phone: (31) 4930-10725
Fax: (31) 4930-10715

New Development System from Syntel

The **LC730 OS-9 Development System** from Syntel Microsystems (Huddersfield, England) is built around their VM030 CPU. The VM030 features a 40 MHz 68030, 68882 FPCP, up to 4M 32-bit DRAM and two serial ports. The LC730 includes a SCSI/floppy interface card, 1.44M floppy disk drive, 100M hard disk and optional 160M streaming tape drive. Professional OS-9 is included with the LC730. The system can be fitted for 3U, 6U or 19" rack mount use.

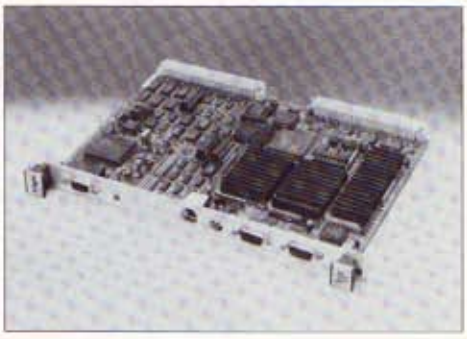


LC730 OS-9 development system from Syntel.

CALL OR WRITE
Paul Wilson
Syntel Microsystems
Queens Mill Road
Huddersfield HD1 3PG
England
Phone: (44) 484 535101
Fax: (44) 484 519363

X Server Board from Vigra

Vigra, Inc. (San Diego, California) has announced their **Vgs** board. The Vgs is a 6U VMEbus high-performance X Server board that features an LSI Logic 33020 graphics processor, FPCP, 2M VRAM, 512K overlay VRAM, 8M DRAM, resolution up to 1280 × 1024 with 64 colors, IBM-compatible keyboard port, two RS-232C ports and a sound generator. The board also features a local 64-bit interleaved data path from the 33020 to the VRAM.



Vigra's Vgs X Windows Server board.

CALL OR WRITE
Harry White
Vigra, Inc.
6044A Cornerstone Court
San Diego, California 92121
Phone: (619) 597-7080
Fax: (619) 597-7094

Automatic Documentation Tool from Wuest

PANORAMA from Wuest Informatik AG (Feuerthalen, Switzerland) automates the creation of software documentation. PANORAMA extracts information directly from source code so that in-line comments can be used for documentation. The resulting documentation is in the form of diagrams with module, procedure hierarchies, procedure headers, pseudocode and Nassi-Shneidermann structograms. Text from project definitions and specifications can also be included. Structograms can be generated in ASCII text, HPGL, DXF or Encapsulated PostScript format. PANORAMA OS-9 is for available C, Omegasoft Pascal, Modula-2 and Fortran 77 source codes.

CALL OR WRITE
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Switzerland
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Fax: (41) 53 29 31 43

Correction

In the Fall 1992 issue of *PIPELINES*, the phone number for Bob van der Poel Software was misprinted. The correct phone number is (604) 866-5772.

Training Schedule for Fall and Winter 1993

By offering week-long blocks of related training courses, Microware's Training and Education department can provide students with a breadth of information that is not possible in short, individual classes. The weekly format also saves out-of-town attendees money by letting them attend several courses during one trip.

To sign up for Training and Education sessions or for more information, please call Microware's Kristin Doane at (515) 224-1929. Outside the U.S. and Canada, contact your authorized Microware representative.

Date	City	Seminars Offered
October 4-8	Santa Clara, CA	OS-9 Starter/Intermediate/Advanced
October 25-29	Des Moines, IA	OS-9 Starter/Intermediate/Advanced
November 8-12	Des Moines, IA	OS-9 Starter/Intermediate/Advanced
November 15-19	Des Moines, IA	OS-9 Starter/Intermediate/Advanced
November 29-Dec. 3	Pittsburgh, PA	OS-9 Starter/Intermediate/Advanced
December 6-10	Des Moines, IA	OS-9 Starter/Intermediate/Advanced
December 13-17	Dallas, TX	OS-9 Starter/Intermediate/Advanced

Real-Time Computer Shows for End of 1993

Look for Microware at the following Real-Time Computer Shows through the rest of 1993. These shows provide an excellent opportunity for hands-on demos of the latest Microware software.

October 12th — Irvine
October 14th — San Diego
October 26th — Toronto
October 28th — Detroit
November 30th — Melbourne
December 2nd — Fort Lauderdale

Embedded Systems Conference Nearing

This year's Embedded Systems Conference West is slated for the first week of October at the Santa Clara Convention Center, Santa Clara, California. Join Microware as we show our Flood of New Products.

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