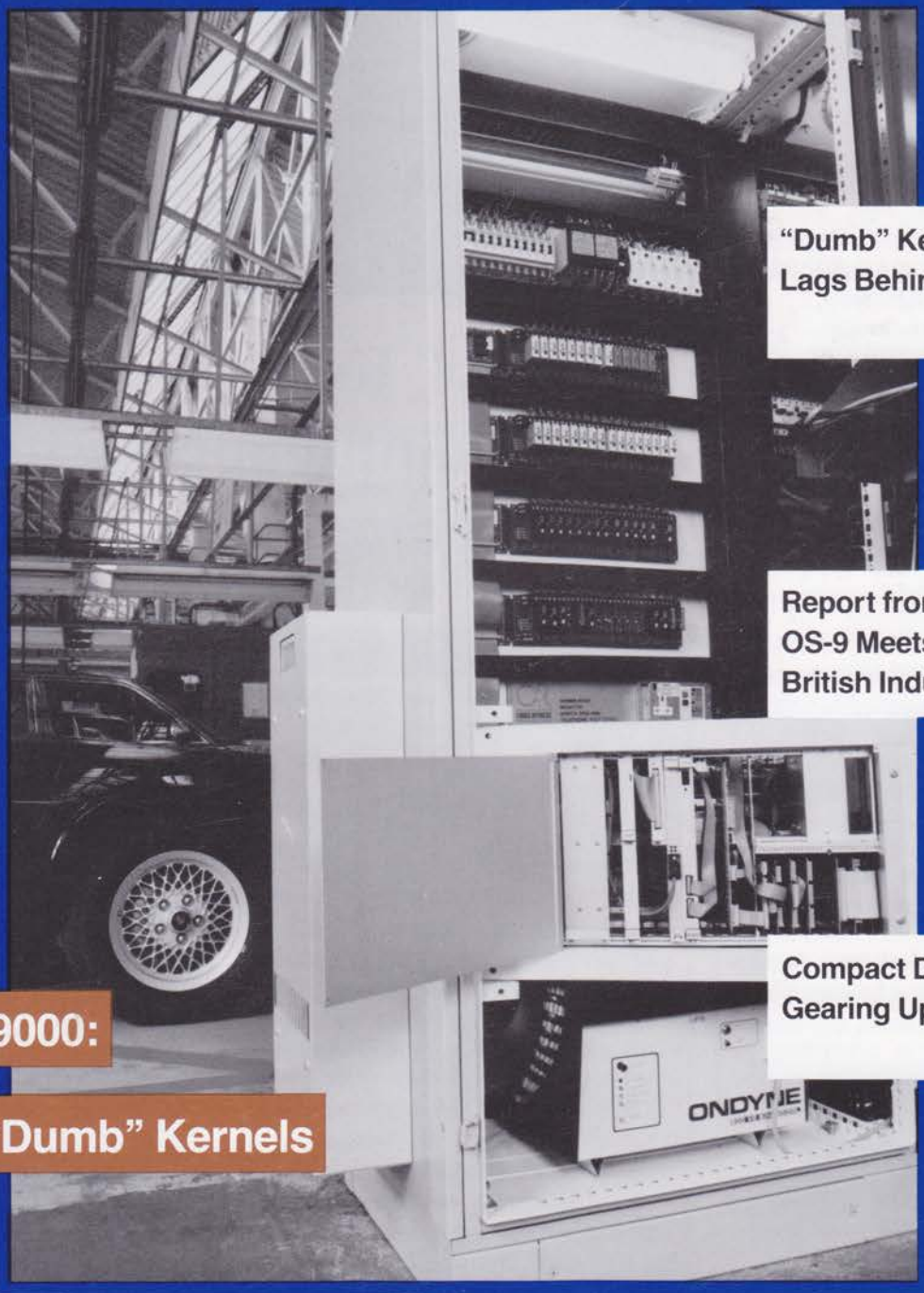
PIPELINES

Volume 5 Number 1

Covering Microware's Real-Time System Software

Winter 1990



OS-9 And OS-9000:

Remedies for "Dumb" Kernels

microware®

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Do You Have New OS-9 or OS-9000 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. All materials should be sent to the Editor of *PIPELINES* at the address above, or call Steve Simpson at Microware.

Job Opportunities With Microware

Would you like to work for a dynamic organization that's helping shape the way the world lives, works and plays? Microware is accepting resumes for programming and marketing positions. Programming applicants must have practical experience with OS-9, UNIX and C. Marketing candidates should have a strong computer background, good communications skills and a superior sales record. Send your resume (with salary requirements) today to the Personnel Director at the address above. No phone calls, please.

Why We're Talking About "Dumb" Kernels

Ken Kaplan, Microware's President

Microware is dedicated to providing "total solutions" for our users. To this end, we've directed this issue toward how Microware's real-time operating systems — OS-9 and OS-9000 — are designed to meet your needs today and tomorrow.

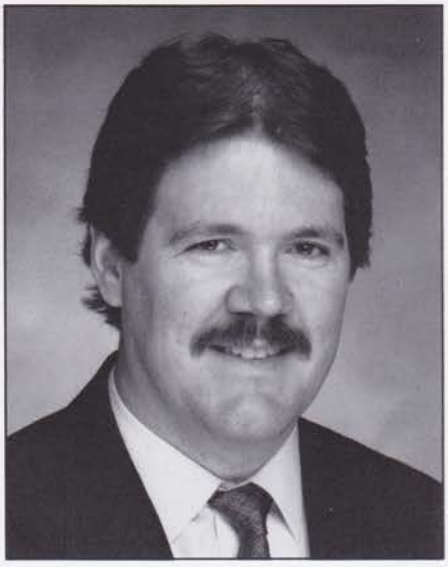
We've made reference to "dumb" kernels in this issue. What's that mean? Well, we're referring to simple kernels or task switchers that offer a low level of functionality. Many of the latest boards are referred to as "intelligent" products. Simple kernels don't fully exploit their potential

"Dumb" Kernel Functionality Lags Behind Sophisticated I/O Technology

by Kim Kempf

Today's CPU boards pack the functionality of a workstation on a single board by providing advanced I/O features such as on-board SCSI and Ethernet. Unfortunately for designers of real-time systems, the development and I/O capabilities of the real-time kernels that run on these boards haven't kept pace with hardware advances. Designed to support simple embedded controllers, most kernels lack the flexibility and functionality needed to support advanced capabilities such as dynamic reconfigurability, multilevel directories, I/O redirection and resident development.

The lack of flexibility inherent in today's kernels can be traced to their basic architecture. Unlike stand-alone operating systems such as Microware's OS-9 and OS-9000, most so-called real-time operating systems are actually subroutine libraries that must be linked with the



Kim Kempf

and, therefore, we refer to them as "dumb" kernels.

The article below highlights how OS-9 and OS-9000 are designed to take full advantage of today's sophisticated single board computers. Both of Microware's operating systems offer robust real-time functionality for embedded applications that no "dumb" kernel can match. Plus, OS-9 and OS-9000 offer complete development environments for resident application development.

But, we can't just tell you how Microware's operating systems outperform "dumb" kernels, we want to show you. Our U.K. office has helped bring Microware's solutions to British industry. We've included several illustrations of the ways Microware's products are meeting the needs of British firms, and helped them increase productivity and quality.

Microware is taking a stand against "dumb" kernels. We'll be talking about it considerably in the coming year. We want to help you take full advantage of the power available on sophisticated boards with Microware's system software — the real-time system software of the 1990s.

— Ken Kaplan
President
Microware

application program before their functionality may be exploited.

While the subroutine implementation of "dumb" kernels provides an incremental space savings, it has a number of limitations. One disadvantage is that it makes these kernels difficult to use. Unlike Microware's stand-alone operating systems, designers can't interact with the operating system via simple keyboard commands. In order to perform routine tasks, such as run diagnostics, add a driver or change the system configuration, designers must alter their application code.

The subroutine approach also limits flexibility. Because the kernel must be linked with the application, designers must relink and recompile their entire system each time they want to alter the system configuration. With Microware's operating systems, the kernel, I/O manager, device drivers and application are all implemented as individual position-independent modules. The system can, therefore, be reconfigured dynamically without recompilation or relinking.

Integrated I/O Management

One of the principal weaknesses of subroutine kernel implementation is a lack of integration between the kernel and the I/O system.

With most kernels, I/O is handled through an independent I/O subroutine library. Rather than having the kernel manage the interface between the application and I/O drivers, the responsibility for managing I/O in a dumb kernel is left to the application and the task performing the I/O operation.

Because I/O management isn't centralized, keeping track of the relationship between I/O operations and the tasks that request them is complex. For example, if two tasks want to read the same file, the application developer has to provide a mechanism for queuing the tasks and maintaining data integrity. In order to minimize the complexity of I/O management, many kernel vendors severely restrict I/O functional-

"DUMB" KERNALS LAGGING
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RAVE 1.1 And SUN 4 Support

New Version of RAVE

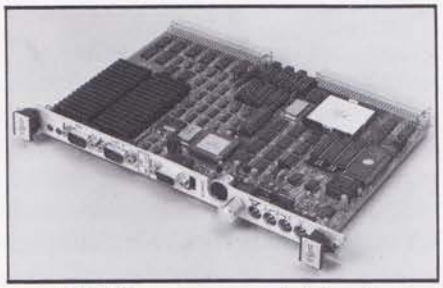
RAVE Version 1.1 is now available from Microware. RAVE (Real-Time Audio/Video Environment) allows you to create man/machine interfaces using real-world images and sounds.

Support for Vigra's **VME-MMI-100** Multimedia board has been added in the new version of RAVE. The VME-MMI-100 combines video, audio, keyboard and pointer capabilities on one board. The video section includes a bit-mapped color graphics controller that can be programmed to provide pixel resolution up to 1024 X 1020. The audio section uses a digital signal processor, the Motorola DSP56001, for digital audio recording and playback. The manual I/O section includes a PC keyboard interface and two RS-232 serial ports.

Version 1.1 of RAVE also includes support for PAL (Phase Alternation Line) video mode, a European standard for video.

Support for SUN 4

OS-9 support for SUN Microsystem's SUN 4 is now available. SUN 4 is the company's first RISC-based processor, using the SPARC CPU. Microware now has SUN 4 Cross C Compiler, UniBridge and Portpak products available. M



RAVE now supports Vigra's Man/Machine Interface board.

Microware U.K.: Providing Solutions for British Industry

"With its advanced software tools and user-friendly development environment, OS-9 once again proved to be exactly what was needed."

Rod Clarke, BVM

Microware's office in the United Kingdom, Microware Systems Limited, opened in the summer of 1988 to provide technical and marketing services to the British Isles. Since that time, Microware U.K. has grown to a staff of seven and now supports over 150 customers.

As part of their mission, Microware U.K. provides technical Hotline support and training to British customers. Each day, one of the technical staff from the office is committed to the technical hotline to ensure immediate response to customers. Training is conducted both in the office and on-site with the customer.

The British office also goes "on the road" with product presentations and trade shows. In the fall of 1989, Microware toured England with a series of OS-9000 introductions. Each of the seminars drew large audiences and helped launch Microware's new operating system. Late last year, Microware, Syntel Microsystems and Bus Solutions Limited held a series of presentations in the north of England and Scotland that met with similar positive responses.

Through the efforts of Microware U.K., Microware's advanced system software is part of sophisticated systems throughout the British Isles. Several of these systems are helping firms set the technological pace in their industries.

OS-9 Tests Jaguar's Brakes

Jaguar is a name synonymous with luxury and prestige. One of the keys to their success is Jaguar's continuing investment in quality testing equipment at its car factory in the central British city of Coventry. One such investment is a new testing system for their anti-lock brake systems (ABS). The system was installed by British systems house Cirrus Reynolds and is designed around Syntel Microsystems' LC 800 computer.

Jaguar's systems carry out both static and dynamic testing of their ABS. Static testing is done while the automobile's wheels are stationary, while dynamic testing is performed on a rolling road system.

Cirrus Reynolds developed a portable tester specifically for static testing. "These systems, based on Syntel's CP68 processor, run OS-9 and are programmed in C," according to Steve Hayes, technical director at Cirrus Reynolds. "OS-9 has greatly simplified our software development for these systems."

The portable testers are connected to a new car's wiring harness. The tester then generates a test sequence and issues audible prompts to the operator. The operator carries out the requested action and responds using the keyboard on the portable unit. After static testing is completed, all data is downloaded via radio telemetry link to an intermediate station, then over a Topaz local area network to a base station for analysis.

Jaguar operates five rolling road test stations, each controlled by a Syntel

Jaguar uses OS-9 in its anti-lock brake system test stations.

LC 800. The LC 800 is a 68020-based dual-bus system running OS-9, providing interfaces to both VME and G-64 busses. Each station controls a 20-inch display unit and rolling road equipment such as rollers, brakes, lift outs, speed sensors, ABS test sensors and infrared communications. Once a car is positioned on the rolling road, the test computer reads the vehicle's barcodes and issues prompts to the operator on the monitor. The operator carries out the requested action and responds using a hand-held infrared transmitter. A test certificate is produced by a printer positioned by the rig exit.

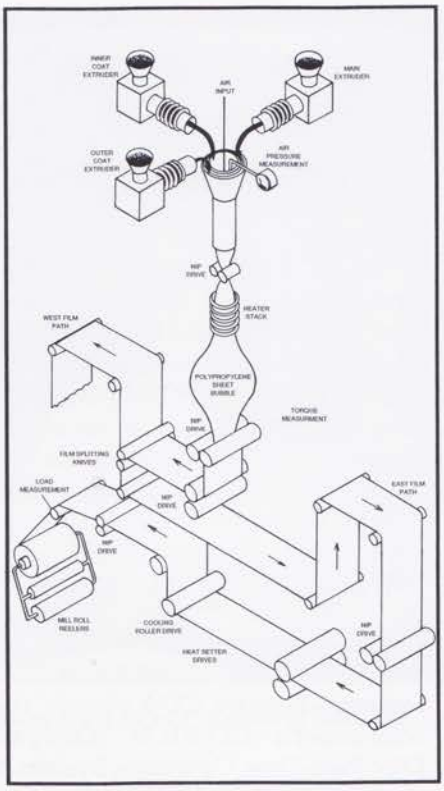
Syntel is making increased use of dual-bus systems, such as the one for the Jaguar ABS project. In addition to Cirrus Reynolds, Syntel provides systems to users that include British Steel and Rolls Royce.

Clear Plastic Film And OS-9

Manufacturing clear plastic film for use as wrapping in the food processing industry is a complex task that requires sophisticated machinery. Sidac, a British manufacturer of plastic films, recently adopted OS-9 to control their production facilities. They have developed and installed an industrial control system based on a BVM Limited hardware system running Microware's OS-9.

Clear plastic film is made by mixing together molten polymers and blowing them into a bubble measuring several feet in diameter. The bubble is cut to produce two continuous sheets of film as the compound solidifies. After the bubble is cut, the two sheets of film are separated before going on to be cooled, treated and wound onto mill rolls. Throughout the whole process, it is essential that the proper temperature, air pressure and tension be maintained. The plastic film is monitored and controlled at each stage of production to ensure that all parameters are maintained at their correct values.

"The whole process is a classical real-time problem, with multiple



Schematic of Sidac's clear plastic film manufacturing process.

feedback loops, just waiting for a computer-based solution," says Rod Clarke, managing director for BVM. "That solution came in the shape of a modular OS-9 VMEbus system from BVM." A total of six single-height VME boards have been used, with no less than four of them handling the large volume of input and output operations.

At the heart of the system are two 10 MHz 68000 CPU modules. The first of these is the main system controller, handling all the major control functions and directing all analog and digital I/O to ensure that the machinery stays in the desired state. The second CPU is used to interface with the machine operator, and communication between the CPUs is via a block of shared memory containing approximately 1,500 different variables.

"OS-9 was the natural choice for this system," says Clarke. "It is ideally suited to handling the real-time, multi-tasking, multiprocessing problems this process presented."

"But these were not the only reasons for choosing OS-9," Clarke adds. Sidac wanted to develop their own software in order to take advantage of their existing expertise in the field of process control. "With its advanced software tools and user-friendly development environment, OS-9 once again proved to be exactly what they needed."

Clarke summarizes the project by saying, "By taking advantage of the combined power of Microware and BVM, Sidac was able to produce a working system, from scratch, in under nine months. The result is an automated process control system that significantly reduces the demands placed upon the operator and allows a more efficient and safer product environment than was possible before."

Tracking Aluminum At Continental Can

Measurement Systems Limited, of Newbury, Berkshire, recently installed a data management system at the Continental Can factory at Deeside, Cheshire. Continental Can is a manufacturer of disposable aluminum cans with plants in both the United Kingdom and the United States.

Measurement Systems' Magus is a 68020-based OS-9 system with 2 megabytes of RAM and a 40 megabyte Winchester disk. The Magus collects data from the can production lines using Siemens S5 Programmable Logic Controllers, and provides a user interface via three color graphics terminals, two monochrome terminals, four printers and four keyboards.

The system provides real-time mimic diagram displays, historic performance displays and extensive reporting facilities. Reports include daily, shift and shift-to-date production, as well as downtime and machine efficiency reports. One of the

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CD-I: Gearing Up For The '90s

Microware's CD-I Publishing Services Developing Titles For Three Firms

CD-I is a revolutionary publishing medium that allows you to incorporate video, audio, graphics, text and data into a single interactive source. The power of CD-I is its ability to transform you from a passive viewer into a fully-involved participant. Information is no longer presented in a predictable linear format; now you set the course while viewing a title.

Microware's CD-I Publishing Services offers the expertise firms need to develop and publish CD-I titles. Microware is currently working on some interesting projects for several firms.

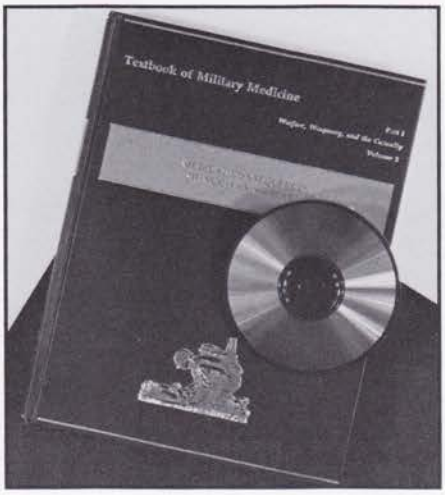
Military Medicine Turns To CD-I

The United States Army is exploring a number of medical applications for CD-I. Microware, in association with PAIV, Incorporated, is currently developing three titles for Walter Reed Army Medical Center, located in Washington, D.C. The first is a *Surgical Procedures* disc, a training title designed to detail surgical procedures using still pictures accompanied by video. Next is the *Text Book of Military Medicine*, a definitive series of volumes dealing with virtually all aspects of military medicine. Finally, the *Catalog of War Wounds* is a compilation of over half a million slides used to diagnose and treat war-related injuries.

According to Sam Ballard of PAIV, Inc., CD-I was chosen for these projects as a testbed for a variety of medical applications. The Army selected CD-I over other interactive media for several specific reasons. First, CD-I provides a low-cost delivery system relative to other systems. CD-I requires only a CD-I player and simple monitor, even a television. Other interactive systems, on the other hand, require personal computers with special hardware, including graphics boards and monitors.

Second, the Army selected CD-I because of the expandability of CD-I systems. Because CD-I players use Microware's CD-RTOS (Compact Disc Real-Time Operating System, a derivative of the OS-9 Operating System), players can easily be expanded to support multiple users and tasks. Since video, audio and text is now all digital, CD-I formatted data can be readily shipped throughout the Army's existing networks for viewing and exchange at remote sites.

The third reason the Army selected CD-I is the low costs of creating titles. Using unique authoring concepts, it is now possible to publish existing textual, graphic and video material but in a more interactive and efficient method at substantially lower costs when compared to competing approaches. CD-I titles are created using sophisticated, yet easy-to-use, publishing tools. In addition, updating an existing CD-I title is as simple as inserting the changes without altering any other portions of the title. Microware's CD-I Publishing Services is providing the tools the Army needs for these initial projects. CD-I Publishing is involved in every aspect of these projects, including title conceptualization, design, video and audio capture and encoding, and final testing of the title.



The Textbook of Military Medicine

Finally, because the military operates around the world, its audio/ visual systems must be capable of handling a variety of standards for audio and video. CD-I was designed to handle all standards for audio and video, including European PAL (Phase Alternation Line) and American NTSC (National Television System Committee) video standards.

Ballard speculates that CD-I will become used in training centers, as well as in the field. For example, compact, rugged CD-I systems could be carried to field hospitals along with medical titles similar to those under development to provide a wealth of information at the site where it's needed.

PAIV is a consulting firm specializing in interactive media, specifically CD-I. Based in Hollis, New Hampshire, PAIV actively enlists organizations whose needs are met by CD-I.

"Microware's unique CD-I publishing capabilities appear to have really struck a responsive chord for medical applications," Ballard summarized. "In addition to our work with Walter Reed, preliminary discussions are underway with other medical institutions and schools." M

Principal Mutual Life staff works with Microware's CD-I Publishing Services.

CD-I In Financial Services

Principal Mutual Life Insurance Company, of Des Moines, Iowa, is one of the nation's leading insurance providers. Microware is currently working with Principal to publish a promotional CD-I title, *Being A Market Driven Company*.

"Principal takes advantage of the best technologies to help us deliver our products," says Mike Walsh, director of Principal's Mature Market Center. "We take a stance as 'early adapters' of emerging technologies to stay one step ahead of the competition."

As part of that stance, Principal is exploring the use of CD-I throughout the organization. "We looked at the interactive media systems out there," says Walsh. "And, CD-I is very attractive to us. We like the fact that CD-I is designed to be a consumer system."

Principal's first title will serve two purposes. It is a corporate promotional title that outlines how Principal meets the criteria of a market driven organization. More importantly, however, the title will serve as a tool to educate others within Principal about the use of CD-I in the delivery of financial services.

"One key to the successful implementation of any technology is enlisting the support of the entire organization," say Principal's Walsh. "In other words, before our field agents use CD-I with customers, they have to be comfortable with it. That's the idea behind developing this title. We aren't breaking a lot of new ground as far as content. What we are doing is showing our people how CD-I can be a valuable tool to them."

Selling Music With CD-I

The Listening Booth is a unique marketing tool for prerecorded music. Conversant Media Group, based in Woodland Hills, California, has developed a CD-I point-of-sale (POS) system for previewing new music. Listening Booth consists of a kiosk containing a CD-I system and video touchscreen. Shoppers are first offered a choice of music types — pop, jazz, hard rock and classical, for example. After selecting a type by touching the screen, the shopper selects an artist and song they want to preview. Listening Booth then shows video segments of the artist along with a sample of the song. At the end of the sample, the shopper rates the song on a scale provided by Listening Booth. Results of the shopper rating are stored for later use.

Listening Booth is designed to serve two primary purposes. First, it is a POS tool to generate interest in new artists and albums. Second, data from Listening Booth can be used as a survey tool by tallying shoppers' responses.

Conversant Media Group chose CD-I for the Listening Booth project due to the low cost of the delivery system and the ease of creating titles. "Listening Booth will be installed in a lot of music stores," says Mark Dillon of Conversant Media, "so we need a system with a low per-unit cost. And, because we'll be creating new titles as more new music comes out, we need an interactive publishing media that is easy to use. CD-I meets both of our needs."

Catapulting CD-I Into The '90s

"CD-I is the interactive media for the 1990s. We're seeing it take big wins over other interactive systems," says Eric Miller, manager of Microware's CD-I Publishing Services. "Microware is helping firms take advantage of CD-I and ensuring their projects are of the highest quality."

"These projects have given us a base of titles and expertise we need to truly demonstrate CD-I to industrial users," says Miller. "Customers can be confident that CD-I is a mature technology and that Microware provides the services they need to publish CD-I titles." M

"DUMB" KERNELS LAGGING

Continued from Page Three

ity. For example, in many kernels, only one task is allowed to perform I/O.

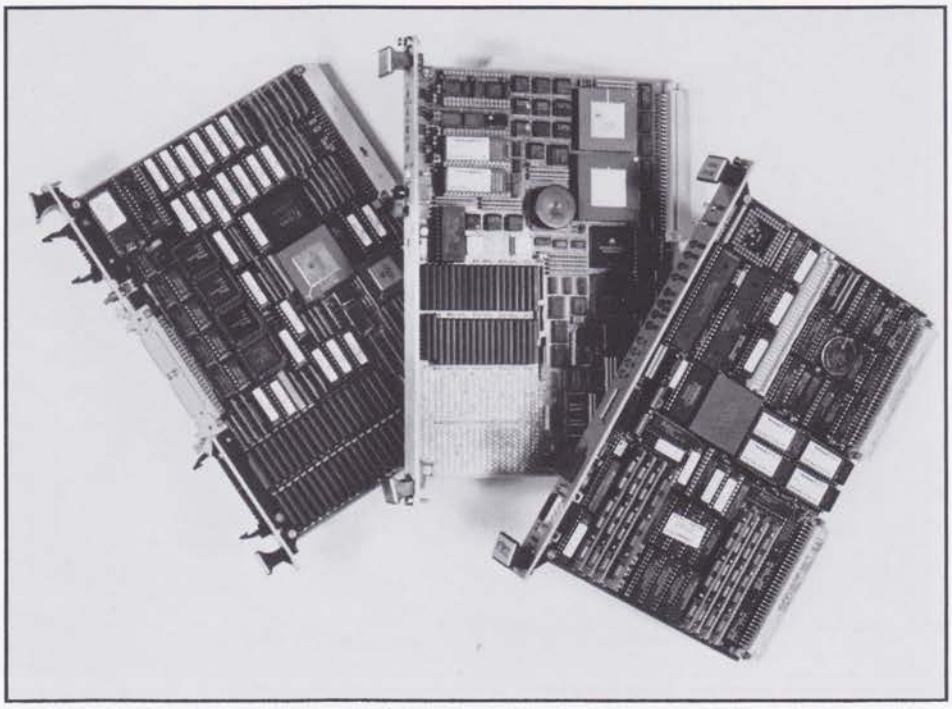
In Microware's operating systems — OS-9 and OS-9000 — the kernel manages all I/O requests in the same manner that it manages other kernel functions. Because the I/O tables are stored together with other task information, housekeeping operations like queuing multiple requests and providing protection can also be handled by the kernel. Consequently, multiple I/O tasks may be simultaneously active, thus greatly enhancing flexibility.

Device Independence and I/O Redirection

Another way that the subroutine approach hampers development and I/O flexibility is that it forces designers to embed device-specific calls within their applications. With most kernels, applications perform I/O operations by making subroutine calls to an I/O library. Consequently, rather than using simple high-level commands to perform I/O such as read/write a file, designers must specify the mechanisms such as invoke a SCSI driver. They must also handle related housekeeping tasks such as initializing the disk and managing access permissions within their application.

In addition to forcing designers to work at a lower level, this approach restricts configuration flexibility. Because designers must specify I/O at the device level, they must make significant changes to their application to change the source or target device at a later date.

To boost development flexibility, Microware's operating systems employ a technique know as I/O redirection, which enables designers to perform I/O without specifying the target device. Device configurations may be specified at run-time, with the kernel automatically integrating the appropriate drivers.



Microware's real-time operating systems help you tap the power of sophisticated SBCs. Shown here are the MVME147, FORCE CPU386 and Heurikon's HK68/V2F.

The ability to specify device configurations at run-time greatly simplifies system reconfiguration for new or additional devices.

It also helps simplify the test and debug process. For example, to test an Ethernet communications channel, designers can simulate the functionality of the Ethernet channel through data stored on a flexible disk. Because communications are conducted at the file level, the application doesn't know whether the target device is an Ethernet controller or a SCSI peripheral. Consequently, the flexible disk driver may be substituted for the Ethernet driver during the test phase.

Remote and Resident Development

Because of the limited I/O support that "dumb" kernels typically provide, most require a separate host system for development. Typically, a UNIX host such as a SUN workstation is used to develop an application. The application is then cross compiled for the target system and downloaded. Microware's real-time operating systems support this type of development through cross development packages such as UniBridge. However, since Microware's operating systems also support full suites of development tools on target systems, they also support resident development.

Resident development not only reduces the cost of development hardware since designers don't have to purchase a separate development system, it also simplifies field maintenance and upgrades. Once the system is deployed in the field, updates and modifications can be performed locally without relying on the host. M

Kim Kempf is Vice-President of Research and Development at Microware.

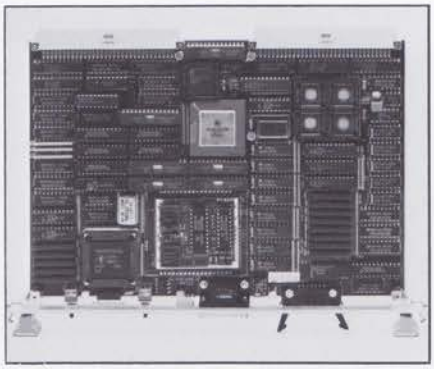
New Vendor Products

Intelligent I/O Subsystem on VME and Token Ring

Compcontrol B.V., Eindhoven, The Netherlands, introduces their **CC140** intelligent I/O subsystem. The CC140 connects VMEbus systems to both 4M/s and 16M/s Token Ring networks. The 32-bit board implements a complete node on the Token Ring and links Token Ring to existing networks.

The CC140 has a 20 MHz 68020 CPU and a TMS380 chip set. Local data is held in either 1M or 4M 32-bit Dynamic RAM that is shared between the VMEbus, the CPU and the Token Ring chip set. The board meets IEEE-802.5, ISO 8802/5 and TOP 3.0 standards.

For more information, please contact Mr. Johan Knape, Compcontrol B.V., Stratumsedijk 31, Postbus/P.O. Box 193, 5600 AD Eindhoven, Holland. Phone: 040-124955.

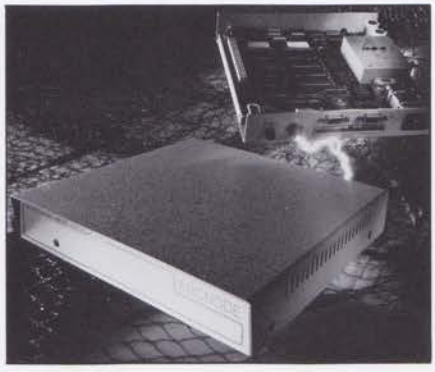


Compcontrol's CC140 subsystem connects to VMEbus and Token Ring.

Windrush Introduces ARC-NODE

Windrush Micro Systems Limited recently introduced **ARC-NODE**, an intelligent ARCNET node. ARC-NODE is a self-contained 68000/010-based SBC that includes two RS-232 serial ports, one 20-bit parallel port, 256K RAM, 128K ROM, an ARCNET interface and an internal bus expansion adapter. ARC-NODE works in any OS-9 ARCNET environment.

For more information, contact Bill Dickinson, Windrush Micro Systems Ltd., Station Road, Worstead, North Walsham, Norfolk NR28 9SA England. Phone: (0692) 404086.



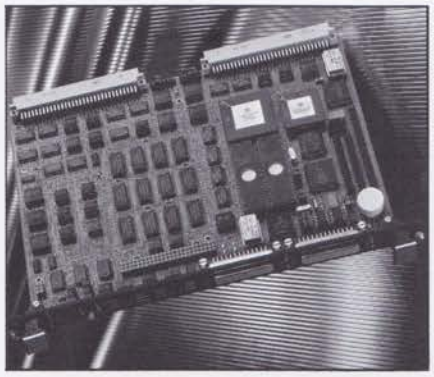
ARC-NODE from Windrush.

EKF Introduces Powerful 68030 SBC

EKF Elektronik GmbH, of Hamm, West Germany, now offers their **VME 68080-U32** SBC. The VME 68080-U32 provides a capacity of more than 6M High Speed Static RAM or 32M Dynamic RAM.

The VME 68080-U32 features a 25 or 33 MHz 68030, 68882 FPCP, two serial ports, one parallel port, 68230 timer, SCSI controller, flexible disk controller and a battery-backed real-time clock/calendar.

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



VME 68080-32 from EKF.

MATRIX Offers Family of Dbus Expansion Modules

MATRIX Corporation's public domain **Dbus** features full 32-bit address and data paths with master and slave operation for bother VMEbus and the Dbus-68. According to Laurent Meilleur, VME Sales Manager, the specification has been submitted to VITA for consideration as an open standard for VMEbus manufacturers and users.

MATRIX now offers a full family of expansion modules that are compatible with MATRIX's 32-bit processors. MATRIX currently offers Ethernet, SCSI, parallel I/O, serial I/O modules and a combination module. Their combination module, the DB-MAXIO, includes eight high-speed serial ports, 32-bit DB-ETH Ethernet module and SCSI controller.

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

On The C Side

Two ftp Programs

These two programs illustrate many of the operations on sockets. **Tcpsend** and **tcprecv** are a matched pair. Tcpsend creates a socket, connects it to tcprecv, and squirts data through it. Tcprecv creates a socket that accepts tcpsend's connection, and copies the data from the socket into a file. This code makes a good template for programs that will use TCP sockets.

Some features of sockets are a little obscure. For instance, both the sender and the receiver must create sockets; the subsequent connect and accept operations create the link between the sockets. Socket numbers are another obscure subject. The operating system claims port numbers up to 1000, but applications may choose any port numbers. Since port numbers are often compiled into programs (as here), allocation of numbers to avoid collisions needs consideration. Strange things happen when a port number is shared unexpectedly. M

```
/* <<<<<tcpsend.c>>>>>>>
    tcpsend host [file --]
    Send the named file or standard input through a socket to the named host.
    This program is ready to compile under OS-9.
*/

#include <stdio.h>
#include <errno.h>
#include <types.h>
#include <socket.h>
#include <in.h>
#include <netdb.h>

#define RETRY_COUNT   10
#define SOCKET_PORT   2700

struct sockaddr_in ls_addr;
struct data {
    int code, count;
    char data[512];
};

char msgbuf[2048];

main(argc, argv)
register char **argv;
{
    register int count = RETRY_COUNT, s, ifile;
    register int totbytes=0;
    register struct data *pack = (struct data *)msgbuf;
    struct hostent *host;

    /*
        If the first command line argument starts with a '-' give a help message and quit.
    */
    if (*argv[1] == '-') {
        fprintf(stderr, "tcpsend <host> <file>\n");
        exit(0);
    }

    /*
        Convert the host name from the command line into a host structure.
    */
    if ((host = gethostbyname(*++argv)) == NULL) {
        fprintf(stderr, "don't know host '%s'\n", *argv);
        exit(0);
    }
```

```
/*
    Open a file for input. If the second command line argument is a '-', use standard input (path 0).
    If the second command line argument is not '-', it "must" be a string that we will use as a file
    name for the input file.
*/
if (*argv[1] == '-')
    ifile = 0;
else if ((ifile = open(*++argv, 1)) == -1) {
    fprintf(stderr, "can't open file '%s'\n", *argv);
    exit(errno);
}

/*
    Make a connection:
    * Open a socket:
        Request internet domain and a sequenced, reliable, two-way connection.
    * Initialize an internet-style socket address:
     - Take the family from the host type.
     - Use a port number that we think will be unique to this set of programs.
     - Copy the host address into the in_addr field.
    * Connect the socket to the address.
    * If the connect fails, keep trying up to RETRY_COUNT times.
*/

while (1) {
    /* Create a socket */
    if ((s = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        fprintf(stderr, "can't open /socket\n", errno);
        exit(errno);
    }

    /* Initialize a socket address */
    ls_addr.sin_family = host->h_addrtype;
    ls_addr.sin_port = SOCKET_PORT;
    memcpy(&ls_addr.sin_addr.s_addr, host->h_addr, host->h_length);

    /*
        Connect the socket to the other socket specified in ls_addr.
    */
    if (connect(s, &ls_addr, sizeof ls_addr) == -1) {
        fprintf(stderr, "connect failed\n");
        if (--count) {
            close(s);
            fprintf(stderr,"retry connect %d\n",
                    RETRY_COUNT -count);
            sleep(1);
            continue; /* retry */
        }
        exit(errno);
    }
    break;
}

printf("Connection established\nSending file '%s'...", *argv);
fflush(stdout);

/* Copy the input file to the socket.*/
while ((count = read(ifile, msgbuf, sizeof(msgbuf))) > 0) {
    if (write(s, msgbuf, count) != count) {
        fprintf(stderr, "socket write error\n");
        exit(errno);
    }
    totbytes += count;
}
```

```
    if (count != 0) {
        fprintf(stderr, "read error on file\n");
        exit(errno);
    }

    /*
        Close the socket and the input file, and exit.
    */
    close(s);
    close(ifile);
    printf("sent %u bytes\n", totbytes);
}
```

```
/* <<<<<<tcprecv.c>>>>>>

    tcprecv [- file]
    Copy a file from a socket into the named file.
    This program is set up to compile under Unix.
*/

#include <stdio.h>
#include <errno.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <sys/socket.h>
#include <netinet/in.h>

#define SOCKET_PORT2700 /*  This number must match the port number used by the sender. */

struct sockaddr_in ls_addr, to;

char msgbuf[20480];

main(argc, argv)
register char **argv;
{
    register int sx, s, count = 1, totbytes = 0, ofile;
    auto int size;

    /* If the first argument starts with a '-', give a help message */

    if (*argv[1] == '-') {
        fprintf(stderr,"tcprecv <file>\n");
        exit(0);
    }

    /* Create a file to hold the data that will come through the socket.*/
    if ((ofile = creat(*++argv, S_IREAD|S_IWRITE)) == -1) {
        fprintf(stderr, "can't open file '%s'\n", *argv);
        exit(errno);
    }

    /*
        Create a socket for internet stream protocol.
        The procedure is:
            Create a socket.
            Bind it to the socket port (the port amounts to the name).
            Listen for a connection.
            Accept the connection which creates a new socket.
            Read data from the new socket.
    */
```

```
    if ((sx = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        fprintf(stderr,"can't open /socket\n", errno);
        exit(errno);
    }

    /* Bind the socket to SOCKET_PORT */
    ls_addr.sin_family = AF_INET;
    ls_addr.sin_port = SOCKET_PORT;
    ls_addr.sin_addr.s_addr = 0;

    if (bind(sx, &ls_addr, sizeof ls_addr) == -1) {
        fprintf(stderr,"can't bind socket\n");
        exit(errno);
    }

    /* Wait for a connection attempt on the socket */
    if (listen(sx, 1) < 0) {
        fprintf("tcp_listen - failed!\n");
        exit(errno);
    }

    size = sizeof(struct sockaddr_in);

    /*
        Accept a connection.
        This function picks up the pending connection, and creates a clone of socket sx.
        The clone can be used to send and receive data.
        The original socket can listen for additional connections, but it cannot send or receive.
        Accept will set the to variable to the address of the other end of the connection.
    */
    if ((s = accept(sx, &to, &size)) < 0) {
        fprintf(stderr, "can't accept\n");
        exit(errno);
    }
    close (sx); /* We don't expect another connection. */

    printf("connected to %d.%d.%d.%d\n",
        to.sin_addr.S_un.S_un_b.s_b1,
        to.sin_addr.S_un.S_un_b.s_b2,
        to.sin_addr.S_un.S_un_b.s_b3,
        to.sin_addr.S_un.S_un_b.s_b4);

    while (count) { /* While data comes from the socket */
        /* Read the socket */
        if ((count = read(s, msgbuf, sizeof(msgbuf))) < 0) {
            fprintf(stderr, "can't recv (cnt=%d)\n", count);
            exit(errno);
        } else if (count == 0) {
            break;
        } else { /* If the read got anything, write it. */
            if (write(ofile, msgbuf, count) != count) {
                fprintf(stderr, "can't write output\n");
                exit(errno);
            }
            totbytes += count;
        }
    }
    /* Close the socket and the output file. */
    close(ofile);
    close(s);
    printf("read %d bytes\n", totbytes);
}
```

Microware Continues To Grow

Dan Ahrens joins Microware as a technical support engineer. Previously, Dan was with First Interstate Bank, Des Moines, Iowa, where he was in charge of programming for financial reporting. Dan has a Bachelor of Arts degree in Management Information Systems from Buena Vista College in Iowa. In his spare time, Dan enjoys tae kwon do, in which he holds a black belt.

Julie Kramersmeier is Assistant Account Administrator for Microware, a position she held on a temporary basis during the summer of 1989. Microware is developing a more comprehensive database for its marketing department and Julie is responsible for maintaining this new record system. Julie enjoys alpine skiing and playing pool.

Vicki Heitland splits her time between Microware and OptImage. Vicki serves as receptionist for OptImage and performs administrative duties for Microware. Spare time activities include reading and cooking.

Lisa Chappelle is the newest member of the Microware U.K. staff. Lisa joins Microware as administration assistant. In addition to working for Microware, Lisa is attending school where she is studying mathematics. In her leisure time, Lisa enjoys aerobics, swimming and badminton. M

Pictured above, clockwise from upper left: Julie Kramersmeier, Vicki Heitland and Dan Ahrens.

Pictured to right: Lisa Chappelle, Microware U.K.

MICROWARE U.K.

Continued from Page Five

keyboards is dedicated to defining the source of the aluminum currently in use. This helps plant managers relate efficiencies to the different aluminum suppliers.

All of the system's functions are based around standard software utilities supplied by Microware and Measurement Systems. According to Steve Uden, marketing manager at Measurement Systems, "The architecture of OS-9 allowed a multi-user system to easily be implemented without the use of a network of PCs or an expensive minicomputer system."

Automating British Broadcast Systems

British Satellite Broadcasting (BSB) is a new television broadcast company and they're using OS-9 throughout their playout equipment. "BSB is taking the lead in automating broadcast equipment in the U.K. through their use of OS-9," according to Shaun Froome, technical manager at Gothic Crellon. BSB will begin transmitting five channels in the spring of 1990 with systems from Gothic Crellon and other vendors.

BSB's Playout Team has designed and implemented a three-level system that automates TV studio equipment and program scheduling. The highest level of the system is a series of VAX workstations. The VAX system provides scheduling control via windows and an operator interface to control studio equipment.

The second layer provides the intelligence for the entire system and is comprised of a number of 68030-based machines running OS-9. They are connected to the layer above through Ethernet and the third layer via a Topaz local area network. This layer is responsible for control of the BSB system, including the device controllers in the lower level.

The lowest level of BSB's system is a series of OS-9 68000 SBCs that act as device controllers. Each SBC controls two devices including video/audio mixers, still stores and video recorders. These systems are controlled by the 68030 systems in the layer above them.

"Most of OS-9's features have been utilized in this project," says Graham Harvey, a Playout Team software engineer.

Solutions For British Industry

Microware's advanced system software is changing the way people live, work and play around the world. Through the efforts of Microware's U.K. operation, British companies are using Microware software to more efficiently develop and produce their products. M

OS-9 Version and Edition Numbers

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

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

System Utilities

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

Operating System Modules

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

Language Modules

Module	Edition
cc	#40
cpp	#37
c68	#321
c68020	#321
o68	#19
fort	#21
fortp1	#24
fortp2	#159
fortp220	#159
r68	#66
r68020	#94
l68	#62
pc68	#12
pp68	#12
pt68	#12
basic	#32
runb	#32

OS-9 Version 2.3 Updated Products

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

Product	Current Version
Atari/OS-9	2.2
Basic Runtime Module	2.2
Cross C Compilers (all)	3.1
DevPaks	2.3
Includes MVME 147, 133, 133XT, 131, 130, 121 and 107	
Disk File Manager/ Diskpak	2.3
Driverpaks (all)	2.3
Ethernet Support Pak	1.3
Fortran Compiler	1.2
Internet Support Pak	1.2
Microware Basic	2.3
Network File Manger/ Netpak	3.0
Pascal Compiler	1.1
PCBridge	1.1
RAVE	1.1
Resident C Compiler	3.1
SmartWare	3.1
Source Level Debugger	2.0
System Security Module/ Securitypak	1.2
System State Debugger	1.2
Tape File Manager/ Tapepak	2.3

Correction: In the Fall 1989 issue of *PIPELINES*, the edition number for **r68** was erroneously listed as #67. The edition number should have been #66, as noted in this issue. We apologize for any inconvenience this error may caused.

OS-9 Notes

Microware has made several changes to its OS-9 product line. Many of these changes were made to simplify Microware's product offering, including newly combined products. Below is a summary of these changes.

- OS-9/68020 and OS-9/68030 have been combined and are now offered as a single package. Similarly, OS-9/68000 and OS-9/68070 have been combined to form a single package. These combinations are for both Professional and Industrial configurations of OS-9.
- The Programmer's Toolbox was developed by combining COM (including Kermit), uMacs, E-Mail and the Print Spooler into a single package. The product code for the Programmer's Toolbox is PTB68NA68EI.
- Personal OS-9 has been discontinued. Industrial OS-9 and the Random Block File Manager (RBF) provide an effective substitute for industrial users.
- Three individual products have also been discontinued, including SCRED, Advanced Utilities Package and the Assembler/Linker/Debugger.The Assembler/Linker/Debugger was discontinued because it is already included with all Microware compilers.
- OS-9 C and Fortran compilers are no longer sold as separate products by processor types. These compilers now include the ability to generate both 68000 and 68020 code. The C compiler's product code is CCC68NA68EI and the Fortran Compiler is FTN68NA68EI.
- Version 1.3 of OS-9/ESP (Ethernet Support Package) now requires Version 2.3 of the OS-9 Operating System. ESP V1.3 supports colored memory and, therefore, requires the latest OS-9 kernel.
- In the Summer 1989 edition of PIPELINES, we announced the discontinuation of OS-9/6809. End user products and technical support for OS-9/6809 were discontinued effective January 1, 1990. Initial OS-9/6809 OEM licenses and OEM technical support will be available to OEMs until the end of 1990.

If you have any questions about these changes, please contact Microware or an authorized Microware representative. M

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