

microware®

PIPELINES

Covering the Full Spectrum of 6809 and 68000 Applications of OS-9

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The Real World Runs On Real Time.

PIPELINES

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Do you have news for Pipelines? Articles submitted for publication should include authors name, address, telephone number and date. Comments, suggestions and letters of "gripes" as well as "praise" are solicited. Please send to Microware, c/o Dave Davis. If there is someone you know who would like to be on our mailing list, please call or mail in their name and address.**

OS-9/68020 OPERATING SYSTEM

OS-9/68020 is now available for the 68020 microprocessor from Microware. Coded in native assembly language for minimum size and maximum efficiency, OS-9/68020 requires only 26K bytes of ROM or RAM. 125 powerful system and 68881 math calls plus a shared standard C library reduce application overhead and development time.

This new version of OS-9 fully supports the 68020 instruction set. It also supports the 68881 floating point coprocessor. Both 68020 and 68881 instruction sets are fully documented in Version 2.0's new Assembler documentation.**

NEW PRODUCTS NOW AVAILABLE FROM MICROWARE

REPACKAGING OF OS-9

Microware has released new versions of its OS-9/68000 family of software products. The OS-9/68000 Operating System has been repackaged and is available in three different system configurations; Personal OS-9, Professional OS-9 and Industrial OS-9. A complete description of each of the configurations has been included on the following pages.**

PERSONAL OS-9



Personal OS-9 was designed to provide a friendly system software package for personal computers and educational systems. Personal OS-9 combines the standard operating system kernel with the most frequently used OS-9 utility programs and Microware Basic. An easy-to-read manual with detailed tutorials is included.

A network support option can automatically tie OS-9 computers together with virtually any type of controller. OS-9 Network makes remote peripherals look like local devices. Printers, plotters, mass storage subsystems and other I/O equipment can be economically shared by multiple users.

Documentation is available for OEM customization.**

PROFESSIONAL OS-9

Professional OS-9 creates a development environment for 68000 family systems. It includes Microware's 68000 C compiler.



Software tools such as the advanced uMACS editor, Make, a debugger plus over 60 other utility commands support rapid development. Interactive archiving utilities provide the convenient backup facilities vital for project security.

A networking option can be added to tie large development projects and/or distributed application systems together transparently. Microware's hardware independent networking system can be used with virtually any type of controller.

The Professional OS-9 package includes: the OS-9/68000 Kernel, RBF, SBF, Pipe and SCF, the complete Utility Set, uMACS Advanced Screen Editor, Microware C compiler, Professional OS-9 user's manual set and 90 days free Hotline support.**

NEW PRODUCTS NOW AVAILABLE...

INDUSTRIAL OS-9

Industrial OS-9 was designed to provide the system support critical for real-time applications. It supports over 125 function calls and requires less than 24K ROM/RAM. Disk and tape support can be added for local program storage and data logging. A networking option can link systems together transparently.

Industrial OS-9 includes the real-time kernel, character and pipe file managers and associated drivers. The shell and five special utilities (date, mdir, mfree, procs, and setime) provide basic application support. One copy of the Professional OS-9 manual is included for OEM use, additional copies are available from Microware.**

OS-9/68000 FORTRAN COMPILER

Microware's OS-9/68000 FORTRAN 77 compiler combines the powerful language capabilities of FORTRAN with the advanced functionality of OS-9 to provide a uniquely powerful FORTRAN 77 programming environment. The compiler is designed to take full advantage of the 68000 family of microprocessors.

Application software portability to or from non-OS-9 systems is assured by the compiler's conformance with the ANSI X3.9-1978 / ISO 1539-1980 specification. The FORTRAN 77 compiler automatically generates code which utilizes system wide modules, instead of linking redundant copies of the standard library to each program. Therefore, programs require less memory, less disk space, load faster and can be updated externally. As with all Microware programming languages, the FORTRAN 77 compiler allows selectable levels of optimization and produces extremely compact, ROMable, reentrant and position independent code.

FORTRAN 77 is a sophisticated two pass compiler that generates optimized object code, regardless of the Motorola processor targeted. For 68020/68881 based systems, the 020 version of FORTRAN utilizes OS-9/68020's inline support of the floating point processor for extremely fast number crunching.

Complete access to all of OS-9's system calls and libraries, along with FORTRAN specific libraries, allow FORTRAN programmers to access those system functions critical for real-time applications. Debugging facilities including trace, breakpoint, disassembly and alteration/examination of variables which simplifies the program development process.

The FORTRAN 77 compiler system executive program, FORT, is designed to encourage modular "building block" programming techniques. FORT allows mixing any combination of FORTRAN source code, assembly language and/or relocatable object files as input to the compiler system. FORTRAN's powerful control options include the ability to create assembly language and/or debugging data output files, as well as concise compiler diagnostic listings.

OS-9/68000 PRINT SPOOLER

Microware's Print Spooler gives OS-9/68000 based systems a comprehensive print spooling management system for timesharing applications. Print Spooler allows multiple users to direct text or output devices, regardless of the current status of the device. Print Spooler automatically routes and monitors the status of the devices and the output files to be spooled. This versatile package gives OS-9/68000 systems a complete print spooling management capability for efficient use of output devices. Features of the spooler include:

* Handles up to seven independent

spooling devices and queue with a "print on first available device" feature.

- * Prints large block header pages between listings with date, time, user name and job name.
- * Multiple listing copy option.
- * Complete forms change capability for each job and device.
- * Prints formatted or unformatted listings.
- * Status command displays print queues and status of each device.
- * User can kill or change priority of queued jobs.

Print Spooler consists of three modular programs. SPLMAN is the heart of the system and controls the queueing and system interfaces. SPL is the user interface with SPLMAN for job control, and SPLPRT is the process that prints the spooled files. Print Spooler prerequisites are: OS-9/68000 Version 2.0 and a minimum of 72K RAM for the Print Spooler system. A hard disk system is recommended but it will work on floppy disk systems with reduced speed and listing file size capacity.**

µMACS

µMACS is a powerful screen-oriented text editor for creating and modifying text files. It maintains multiple buffers to allow the user to work with any number of files at the same time. Special features allow two different files to be displayed on the same screen or two versions of the same file. The user can update a file and refer to its backup simultaneously. µMACS allows cursor movement to any portion of any buffer and the user may change buffers at will.

Cursor positioning commands allow movement to the right or left by characters or words, or to the beginning or end of the line. Movement forward or backwards through the text

(Continued next page)

NEW PRODUCTS NOW AVAILABLE...

μMACS (continued)

may be by line, paragraph or screen. μMACS will search forwards or backwards for any character sequence (including newline and control characters). There are two "replace string" commands to augment the search commands. Text can be "cut" from any region of a file and "pasted" elsewhere. Format commands allow the user to reformat paragraphs with new margins, transpose characters, capitalize words and change words or sections into upper or lower case. The tab handling features work with most existing text files.

μMACS will hold as many buffers as memory permits. There are features that allow the selection of which buffer to be interactively editing, while viewing another buffer on a different part of the screen. If a buffer holds an executable command sequence, μMACS can execute the buffer. A precise account is kept at all times of where the user is in each buffer, allowing easy access and editing between buffers.

μMACS features an extensive command set. Each command has a name associated with it. Each command name can be "bound" to a key or key combination. By binding and unbinding keys to commands, the user may personalize μMACS to his own configuration. To further the personalization of commands, μMACS allows the building of macros.**

OS-9/68000 TAPEPAKS

In the Summer 1986 edition of Pipelines a feature article appeared on Microware's Sequential Block File Manager (SBF). SBF offers an archive/tape support package for OS-9/68000 that includes SBF, device drivers and backup/restore utilities. The support package is available as an additional option to new or existing OEM licensees.

TAPEPAKS are now available to

those who want to install SBF on OS-9/68000 systems for evaluation. TapePaks allow you to add powerful tape backup capabilities to your computer system. The TapePak includes the operating system modules and utility programs needed to install advanced tape subsystems. Each TapePak includes: OS-9 Sequential Block File Manager object code, sourcecode for sample tape controller driver and descriptor, the FSAVE, FRESTORE and TAPE utility programs, installation and user's documentation and non-transferable single system software license.**

OS-9 LEVEL II ON THE COCO 3

Tandy Corporation has introduced the new Color Computer 3. Also introduced with the new color computer is a specialized, high-performance version of Microware's OS-9/6809 Level II operating system.

The CoCo 3 combines an economical, high-performance system with a user-friendly environment. At the nucleus of the machine is a powerful version of OS-9 Level II, which maintains compatibility with the CoCo 2 which uses the Level One version. The CoCo 3 version of the operating system has a multi-screen, multi-window environment allowing programs to run simultaneously with-in different windows. It also includes over 30 utility command programs used for basic system and disk file control. OS-9 supports both 128K and 512K versions of the machine.

Besides the memory, Extended Color BASIC has been enhanced. Included are 21 new commands to make the best use of the hardware in the machine. The commands allow access to all 512K of memory and hi-resolution graphics. Hi-resolution text and graphics screens are outside the BASIC workspace and don't use up program memory space.

Multi-View, an enhanced windowing

environment designed specifically for the Color Computer 3, gives a common, graphics based, user-friendly environment for application programs. It consists of systems support for title bars, menu bars, pull down menus and dialogue boxes. The graphics shell allows the user, with the aid of a mouse, to select picture oriented commands to process programs and create windows. Standard desk top utilities include: Calculator, Calendar/Memo Book, Alarm Clock, Printer Configuration, Help, Control Panel and Clipboard Support.

A Development Pak, which includes additional programs and utilities, is designed to provide for advanced program development. The main features of the development pak include: an improved macro assembler and linker, hard disk driver, RAM disk driver, descriptors, system programmer utilities, programming support for utilizing the window environment and Scred, a screen editor.

To best utilize the features of the CoCo 3, Tandy introduced an RGB monitor. Other features include the documented 1.7 MHz clock, 32K ROM, 128K RAM (expandable to 512K), a 57 key-keyboard, text display capabilities, graphics capabilities, six intermediate display formats, Extended BASIC and Program Paks.

By designing and building a special chip called a GIME chip, effective speed is increased even more. GIME stands for Graphic Interrupt Memory Enhancer. GIME makes true multi-user, multi-tasking possible. It allows some of the most sophisticated windowing available on any computer available today.

The CoCo 3 is upwardly compatible with the CoCo 2. Assuming programmers follow the guidelines Tandy set down, virtually every piece of software you have now will run on the CoCo 3. This machine should attract many new third party applications writers.**

OS-9 VERSION 2.0 RELEASE HIGHLIGHTS

OS-9 Version 2.0 has many new and exciting features. The introduction of the SBF file manager and OS-9/68020 are just two of the major additions to Microware's software. Version 2.0 most notably presents two new versions of the OS-9/68000 Kernel: The 68020 (and 68881 FPU) Version and the SPU Version for systems with "System Protection Unit." Version 2.0 also introduces a new file manager for using tape systems: SBF (Sequential Block File Manager).

The Kernel now supports the creation of system state processes. To facilitate this, a system state debugger is now available to debug system state code (i.e. drivers, file managers, etc.). Full speed user state debugging is now possible and the user state debugger now allows continuing after fatal exceptions.

OS-9's module access permissions are now enforced for better system security. Along the same lines, User ID checking is now more rigorous.

Whenever possible, RBF will now perform direct I/O to the caller's buffer. Multi-sector I/O is also now supported for intelligent drivers. This feature when coupled with the direct I/O transfer enhancement significantly improves disk performance.

File descriptor (FD) sectors are now cached in memory as long as the file is open. This allows the FD segment list to be read without intervening seeks to the file data.

Drivers now stack only a few of the 68000 registers when handling interrupts. This significantly improves interrupt response time. This makes it necessary for the driver interrupt handling routine to save any additional registers. Several new options have also been added to RBF Device descriptors for SCSI controllers.

Three new utilities have been added to make use of SBF: **fsave**, **frestore** and **tape**. **Fsave** makes incremental backups on tape or disk systems. **Frestore** restores backups to the

system. **Tape** provides a handy way of manipulating the tape controller from your terminal.

Dcheck has two new options allowing repair of the allocation bit map. **Fixmod** now has options to change the module permissions and owner ID of the module.

The **Shell** now has a number of specifically defined environment variables designed to individualize certain aspects of OS-9 for each user. Two new built in Shell commands have also been added: **wait** and **logout**.

Basic09's name has been changed to **Microware Basic**. It no longer requires parentheses and quoted arguments when executing Basic from the shell command line. The arguments are now, like utility arguments, merely separated by spaces. Basic's random number generator has also been improved and much more.

Scred now supports repeat specifiers for most commands. The control-F command (undo last command) now restores lines deleted by control-X.

uMacs has been introduced as the new OS-9 screen editor. It supports a multi-window environment, allowing multiple files to be displayed and edited.

In addition to numerous bug fixes, the **C Compiler** library now includes support for UNIX style termcap functions. The compiler package includes an example of creating a trap handler containing C functions.

The documentation has been expanded and rearranged to reflect the unbundling of OS-9. Highlights include expanded tutorials on the MAKE utility and the SBF utilities. The Assembler manual now includes both 68000 and 68020 instructions and an enlarged tutorial on the user-state debugger. The new manuals include "Using Personal OS-9", "Using Professional OS-9", "Using Advanced OS-9 Utilities" and "OS-9/68000 Assembler/Linker/Debugger Manual".

NEW FACES



Dave Lyons, software engineer, joined the Microware technical staff in August. He graduated from CAL State in Fullerton, CA in June of 1986 with a B.S. in Electrical Engineering. Dave specializes in hardware related software for device drivers and system ports. As a former employee of Creative Micro Systems, Dave has had over six years of experience working with OS-9 systems software.



Chief financial officer Glenn Rau joined Microware in October. He graduated from Florida State University with a degree in Business Administration and completed his graduate studies in 1976 with an M.B.A. at the University of Texas in Austin. Glenn's responsibilities at Microware will include account management, financial reporting, internal control and treasury functions.

NEW FACES



James Jones, software engineer, attended the University of Oklahoma and received a Master's degree in Science in June of 1979. James was first introduced to OS-9 six years ago while working for Bell Labs. He became familiar with OS-9 while writing application programs on a 6809 system. He has since written a number of articles on OS-9 and is familiar to many OS-9 users in the USENET bulletin board community. James began working for Microware in August, since that time he has been working to port the OS-9/6809 Fortran compiler to OS-9/68000.



Louise Veach, receptionist, has been greeting the many OS-9 customers over the phone since she began in September. She continues to efficiently handle the vital switchboard operation and serves as receptionist for the entire Microware staff.

CONSTRUCTION CONTINUES...



Microware's new headquarters at 1900 N.W. 114th Street is scheduled for completion in March, 1987.



Construction on the outside of the building has been completed. The finishing touches to the inside of the facility continue.

OS-9/68000 VERSION 2.0 EDITION NUMBERS

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

OS-9/68000 VERSION 2.0

System Modules:

<u>Module</u>	<u>Edition</u>
Kernel	#32
NFM	#19
PipeMan	#24
RBF	#40
SBF	#3
SCF	#20
Math (Software)	#12
Math (68881)	#3

Utilities:

<u>Module</u>	<u>Edition</u>
attr	#18
backup	#12
binex	#14
build	#12
cfp	#18
cmp	#12
code	#11
compress	#12
copy	#19
count	#12
date	#13
dcheck	#15
debug	#30
deiniz	#12
del	#13
deldir	#16
dir	#21
dsave	#22
dump	#18
echo	#14
exbin	#14
expand	#13
fixmod	#11
format	#6
free	#12
grep	#10
help	#1
ident	#13
iniz	#12
link	#12
list	#12

Utilities:

<u>Module</u>	<u>Edition</u>
load	#13
login	#20
mkdir	#12
make	#20
mdir	#16
merge	#12
mfree	#12
os9gen	#14
pd	#12
pr	#19
printenv	#3
procs	#16
qsort	#15
rdump	#8
rename	#17
save	#12
setime	#19
shell	#42
sleep	#10
sysdbg	#44
tee	#9
tmode	#15
touch	#10
tr	#13
tsmon	#14
unlink	#11
xmode	#12

Editors:

<u>Module</u>	<u>Edition</u>
edt	#12
scred	#58
maketerm	#8
uMacs	#13

Communications:

<u>Module</u>	<u>Edition</u>
com	#7

SBF Utilities:

<u>Module</u>	<u>Edition</u>
frestore	#3
fsave	#5
tape	#2

Networking Utilities:

<u>Module</u>	<u>Edition</u>
ndir	#9
nmon	#4

Print Spooler Utilities:

<u>Module</u>	<u>Edition</u>
spl	#20
splman	#20
splprt	#20

C Compiler - Version 2.1:

<u>Module</u>	<u>Edition</u>
cc	#24
cpc	#15
c68	#116
o68	#16
r68	#34
r68020	#42
l68	#38
cio	#6

Microware Basic - Version 2.0:

<u>Module</u>	<u>Edition</u>
Basic	#19
RunB	#19

OS-9/68000 VERSION 2.0 RELEASE NOTES NOW AVAILABLE FROM MICROWARE

Version 2.0 features kernel and disk file manager (RBF) enhancements for even higher performance and throughput. Many of the utilities have additional new functions added, and the documentation has been completely revised.

Version 2.0 comes complete with release notes that outline all enhancements and improvements, as well as listing corrections to code and documentation problems. The release notes present a thorough analysis of the changes made in the following categories:

Kernel, Drivers, Microware
Basic, Utility Set, C
Compiler and Scred.

All OEM customers automatically receive the release notes with their license updates. If you are interested in receiving a copy, please call or write Microware's Marketing Department.**

**OUR DEDICATED STAFF
IS WAITING TO SERVE YOU.**



At Microware, we never lose site of our primary commitment - providing quality products and service to you, the customer. Our dedicated staff of professionals await the opportunity to serve your needs and provide you with the very best software possible.

REFLECTING BACK ON THE FIRST TEN YEARS

In January 1987, Microware will reach an important milestone, its tenth anniversary. A decade of innovation has led to the spectacular acceptance of OS-9 as the world's premier real-time operating system. Microware is one of the oldest system software houses in existence today.

To mark the tenth birthday of Microware Systems Corporation, we would like to take a moment to reflect on those chapters from our tradition we think are worth sharing.

1976

- * Microware was started in the spare bedroom of Ken Kaplan's apartment.
- * Microware's first advertisement for RT68 appeared in BYTE magazine. Back then a half page ad cost \$660.00 (about 1/10 of today's cost).
- * Microware began development of an operating system for 6800.

1977

- * On January 4th, Microware became incorporated. At that time there were four employees.
- * The RT68 Real Time Executive and A-BASIC compiler were released.
- * Microware was active in several custom process control projects.

1978

- * Motorola Semiconductor of Austin, Texas was Microware's first major development contract for BASIC09.
- * Microware introduced hardware I/O interface boards for 6800 computers.

1979

- * Microware began developing OS-9/6809 Level I with Motorola.
- * The A-Basic interpreter was released.

1980

- Microware discontinued sales of boards to concentrate on software projects.
- * OS-9/6809 and BASIC09 were

introduced at the West Coast Computer Fair. The first copy of OS-9 was sold during the trade show.

- * A bonafide Marketing Department was created.
- * Production facilities were set up to produce technical manuals.
- * The European and Japanese distributors were established.

1981

- * The OS-9/6809 Pascal compiler was released and C compiler development began.
- * Microware began the development of 68000 software.

1982

- * New products released that year: OS-9/6809 Version 1.2 which included a Pipe File Manager, a full implementation of a native code C compiler for OS-9/6809, a full implementation of Micro Focus CIS Cobol for 6809.
- * OS-9 ran on the Apple 2, thanks to Stellation Two's "The Mill" 6809 coprocessor board. This upgrade introduced Apple users to OS-9's Unix-like environment.
- * Microware licensed their first major personal computer vendors, Tandy/Radio Shack and Fujitsu, Ltd.
- * The First Annual OS-9 Seminar was held May 14th - 16th. 130 users from the United States, Europe and Japan attended.
- * The December issue of Benchmark published by the Association of Computer Users (ACU) Research and Education Division gave Microware's BASIC09 a superior rating for running business software.
- * Under the leadership of Brian Capouch, the OS-9 User's Group was formed.

1983

- * The Second Annual OS-9 Seminar was held August 12th - 15th.
- * October 9th, ground breaking ceremonies were held for the current Microware headquarters at 1866 N.W. 114th Street.

- * New products released included: OS-9/68000 Version 1.0, OS-9/6809 Level II, 6809 Print Spooler, File Handlers Tool Box, Entertainment Pack I and the Relocatable Macro assembler and linker.

1984

- * The first OS-9 Software Sourcebook and Hardware Vendor Lists were compiled.
- * Microware launched the Japanese subsidiary now located in Tokyo, Japan.
- * A cooperative research and development agreement was reached with Hitachi for the HD63484-ACRTC graphics chip.
- * Microware moved into the newly completed headquarters at 1866 N.W. 114th Street.
- * The Official BASIC09 Tour Guide written by Dale Puckett for Microware was published.
- * Microware hosted the Third Annual OS-9 Seminar.

1985

- * At N.C.C. '85 in Chicago, IL, the first demonstration of graphics for the ACRTC graphics chip was shown. Microware was also one of the first American companies to develop software in Japanese Kanji and English.
- * Microware joined The American National Standards Institute (ANSI) X3J11 Technical Committee for the C language standards.
- * Microware hosted the 4th Annual OS-9 Seminar.
- * A Technical Documentation department was created. Microware began writing and producing its own manuals in-house.
- * OS-9/68000 Version 1.2, OS-9/68000 Pascal and OS-9/68000 COM utility were released.
- * Microware was selected by the Des Moines Chamber of Commerce Economic Development Committee as an Iowa Economic Impact Award winner.

(Continued next page)

REFLECTING BACK...

(continued)

1986

- * OS-9 was selected by N.V. Philips and Sony Corporation as the operating system for C.D.-I. (Compact Disc-Interactive).
- * OS-9/68020, OS-9/68000 Version 2.0, 68000 FORTRAN 77 Compiler, 68000 Print Spooler, 68000 uMacs Screen Editor and 68000 TapePaks were released.
- * Microware repackaged OS-9/68000 into three configurations; Personal, Professional and Industrial OS-9.
- * OS-9/6809 Level II was introduced on the Tandy Color Computer 3.
- * A Training and Education Department was established.
- * The Production Facilities were expanded.
- * Ground breaking ceremonies for an additional 8,000 sq. ft facility were held on June 13th.
- * Microware currently has 37 employees in the United States, 17 in Japan and six distributors throughout Europe.
- * Microware was nominated by the Des Moines Small Business Chamber for National Small Business Association (S.B.A.), for the Small Business Innovation Award.

Microware is especially grateful to all its customers for helping make this possible. We hope the next ten years will be as fulfilling as the first ten. Each day brings about a new discovery and new sources of pride.**

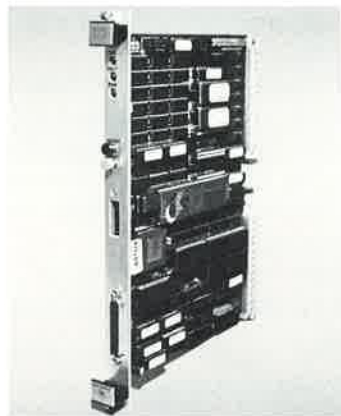


SYSTEM 1000

The System 1000 VME-Bus development system has been upgraded to release 2.0 of OS-9. The Development Pak supports the 121 CPU, 050 system controller and 320 floppy/hard disk controller. The Development Pak is configured to boot from a five-inch, 80-track floppy diskette and includes a hard disk driver and sample descriptors for user installation. New features of System 1000, which runs on the 68010 CPU, include: a parallel printer driver, caching is supported and the floppy disk now supports Microware's standard OS-9 format.



A 68020 version of the System 1000 development pak is also available using the VME 133 CPU. This version has the same configuration as the 121 version, but includes the 020 kernel and math package.



Also available is a VME 117 development pak using the 68010 CPU. The development pak supports the OMTI 5400 floppy/hard disk controller and includes two serial ports, one parallel port and a built-in SCSI interface.**

SOFTWARE SOURCEBOOK HARDWARE VENDOR LIST

Microware will be updating the OS-9 Software Sourcebook and Hardware Vendor List in February 1987. These popular publications are provided free of charge to Microware customers and potential customers. As the base of OS-9 users continues to grow, Microware feels this is an excellent means of advertising your company products, free of charge, worldwide.

The OS-9 Software Sourcebook contains a list of OS-9/6809 and 68000 compatible applications programs. Included is a list of business and productivity software, text editors, word processors, database systems, communications software, assemblers, cross-assemblers, simulators, translators, and utility programs.

The OS-9 Hardware Vendor List contains a list of vendors who manufacture equipment for OS-9/6809 and 68000 based computer systems. Included are development system board level products, coprocessors and personal computers.

Microware believes this is an economical way for you to increase sales and encourages to you to participate. If you would like your company to be included in either of these catalogs, please contact the Microware Marketing Department and a product information sheet will be sent to you.**

LOOKING FOR INFO ON OS-9?

Commercial bulletin boards provide a valuable source of information on OS-9. On CompuServe, "go OS-9" will get you to the OS-9 forum with OS-9 experts from all over the world. Discuss and solve technical problems, gain useful programming information or just chat. All it takes is a mod and a communications program such as COM.**

ADAPTIVE TRAPEZOIDAL QUADRATURE TEST PROGRAM

Microware FORTRAN 77 Demonstration Program

Now that the Microware 68000 FORTRAN compiler has been released, we thought you might want to give it a test run and see for yourself how well it works. This sample program is an example of numerical integration, it is not a full-fledged adaptive quadrature program, but it will suffice to show the basic method. For a good example of a production-quality adaptive quadrature routine, see Forsythe, Malcolm, and Moler's "QUANC8" in Computer Methods for Mathematical Computations (Prentice-Hall, 1977). This program has been published by the PIPELINES staff, not the support service staff; therefore, ON ERROR do not GOTO Microware's Support Service Hotline.

```
program adapter
  external f
  double precision a, b, f, adapt
100  read(0, '(2f10.5)', end = 200) a, b
     write(1, 300) a, b, adapt(f, a, b, 1.0d-5)
300  format('from ', f10.5, ' to ', f10.5, ' integral is ', f10.5)
     goto 100
200  continue
end

double precision function f(x)
  double precision x
  f = x * x
end
```

All the real work happens here. Adaptive routines are inherently recursive, but this is FORTRAN, so you keep your very own stack. Since the lower half is always done first, you need only stack the upper endpoint and function value to emulate recursion. Note also you never have to backtrack, in effect you proceed straight from a to b; that, combined with the use of trapezoidal integration, means one can apply this routine to plotting.

```
double precision function adapt(f, a, b, eps)
  double precision a, b, f, eps

  double precision xstack(10), fstack(10)
  double precision x0, x1, xm, f0, f1, fm, fi, sum
  integer sp

  sp = 1
  adapt = 0.0
  x0 = a
  f0 = f(x0)
  x1 = b
  f1 = f(x1)
100  xm = (x0 + x1) / 2.0d0
     fm = f(xm)
     fi = (f0 + f1) / 2.0d0

     if (dabs(fm - fi) .gt. eps * dabs(fm) .and. sp .le. 10) then
```

f doesn't look very linear, and you haven't fallen off the deep end of the stack. Promise to do the upper half later, and concentrate on the lower half for now.

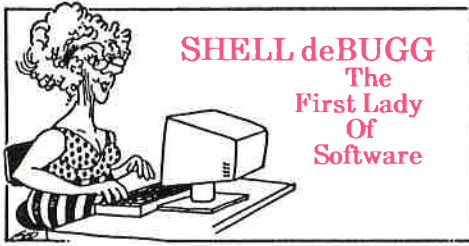
```
       xstack(sp) = x1
       fstack(sp) = f1
       x1 = xm
       f1 = fm
       sp = sp + 1
       goto 100
endif
```

f does look sort of linear (or you're too deep), pretend that it really is linear.

```
      adapt = adapt + fi * (x1 - x0)
```

Now, do you have any leftover intervals you promised to do?

```
if (sp .gt. 1) then
  sp = sp - 1
  x0 = x1
  f0 = f1
  x1 = xstack(sp)
  f1 = fstack(sp)
  goto 100
endif
end
```



Dear Ms. deBugg

I love 'em, but my kids are driving me crazy. They used to share everything, then they asked for separate rooms and got them. Separate phones? Got 'em! However, I draw the line at private data storage, because the family budget can't afford another memory board for our OS-9 machine. The data they want to access is the same, but you know kids...they want everything to themselves. How can I get these brats to efficiently share data? -**Short of Memory**

Dear Shorty,

It sounds like your kids could use a swift kick in the bit map. I suggest you introduce them to the idea of common data storage via data modules. Data modules, which conform to OS-9's module format, can be thought of as memory-resident, data files that

can be accessed by separate processes that require the same data. However, no record locking facilities or access attributes normally associated with disk files are available.

Creation of a data module is done in an assembly language program with the system call F\$DatMod, or from C using the `__mkdata_module()` function. In either case, the data module is created with the specified name string, attributes, and data storage size (which does not include module header and CRC bytes) and then entered into the module directory. In addition, F\$DatMod returns the execution entry pointer and the module header pointer in registers a1 and a2 respectively. `__mkdata_module()` only returns a pointer to the beginning of the module header.

Each process that accesses the data module must first link to it. From assembly language this is done with the F\$Link system call, from C, use the `modlink()` function. Whenever this is done, the data module's link count is incremented by one.

While there is little restriction to the type of information that can be stored

in data modules, it is important to note that any information is stored beginning at the module's execution entry point. This is straightforward from assembler because F\$Link returns the execution entry point in register a1. In C, however, you must explicitly find this entry point. If you do write to a memory module, remember that the CRC, which was established during module creation, will be invalid. If the module is altered and saved, the CRC must be updated before it can be reused in its modified form.

Unlinking (removing it from the module directory) a data module is the same as unlinking any other module. It can be done from the SHELL command line using the UNLINK utility, from a C program using the `munlink()` function, or from an assembly language program using either the F\$UnLink or F\$UnLoad system call. As with any other memory module, the data module will be removed from the module directory when its link count reaches zero.

So, cut the kids some slack when you can, but when it comes to data modules, it's nice to share! - **Shell deBugg**

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