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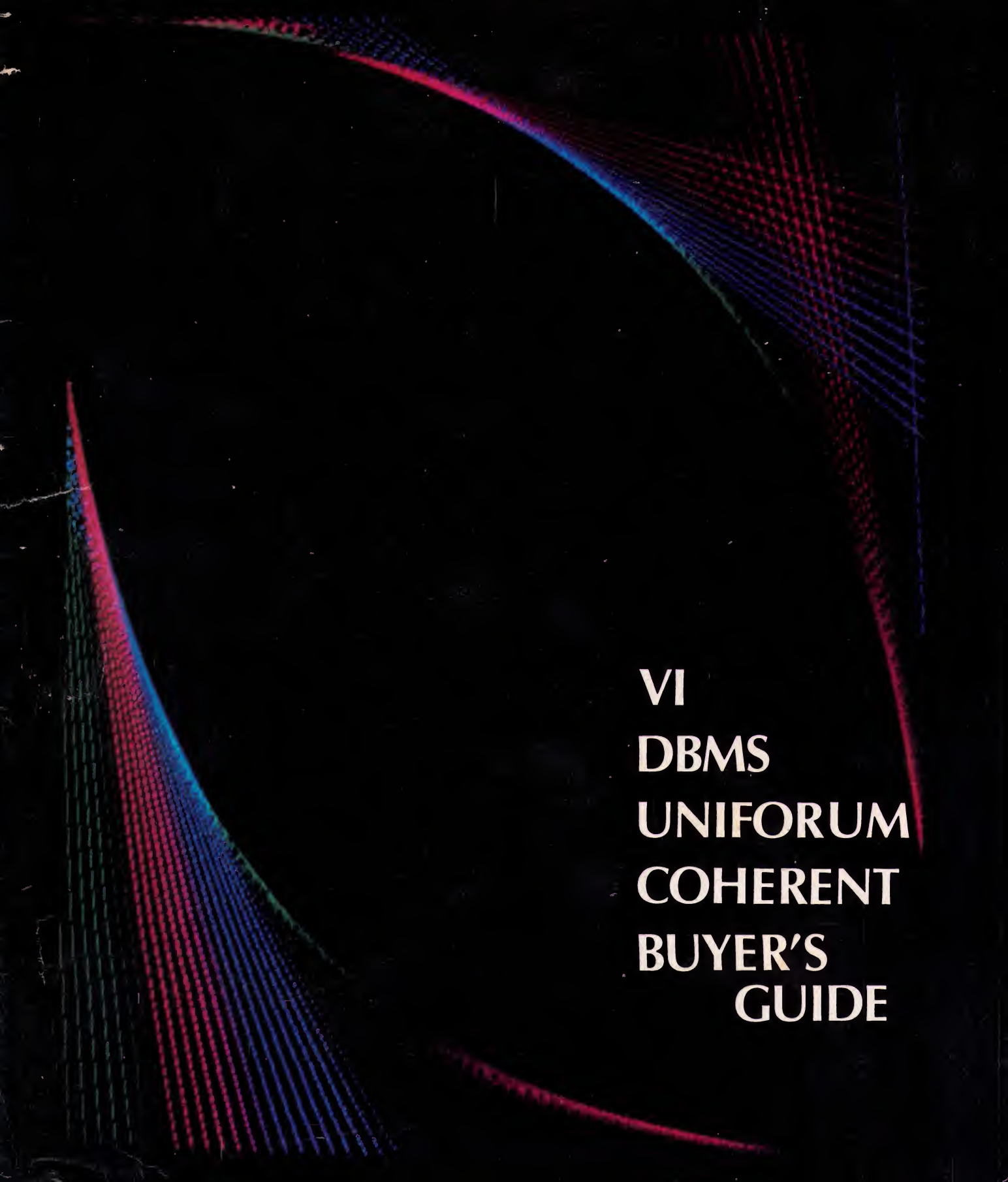
THE PUBLICATION FOR THE UNIX™ COMMUNITY

April/May 1984 $3.95



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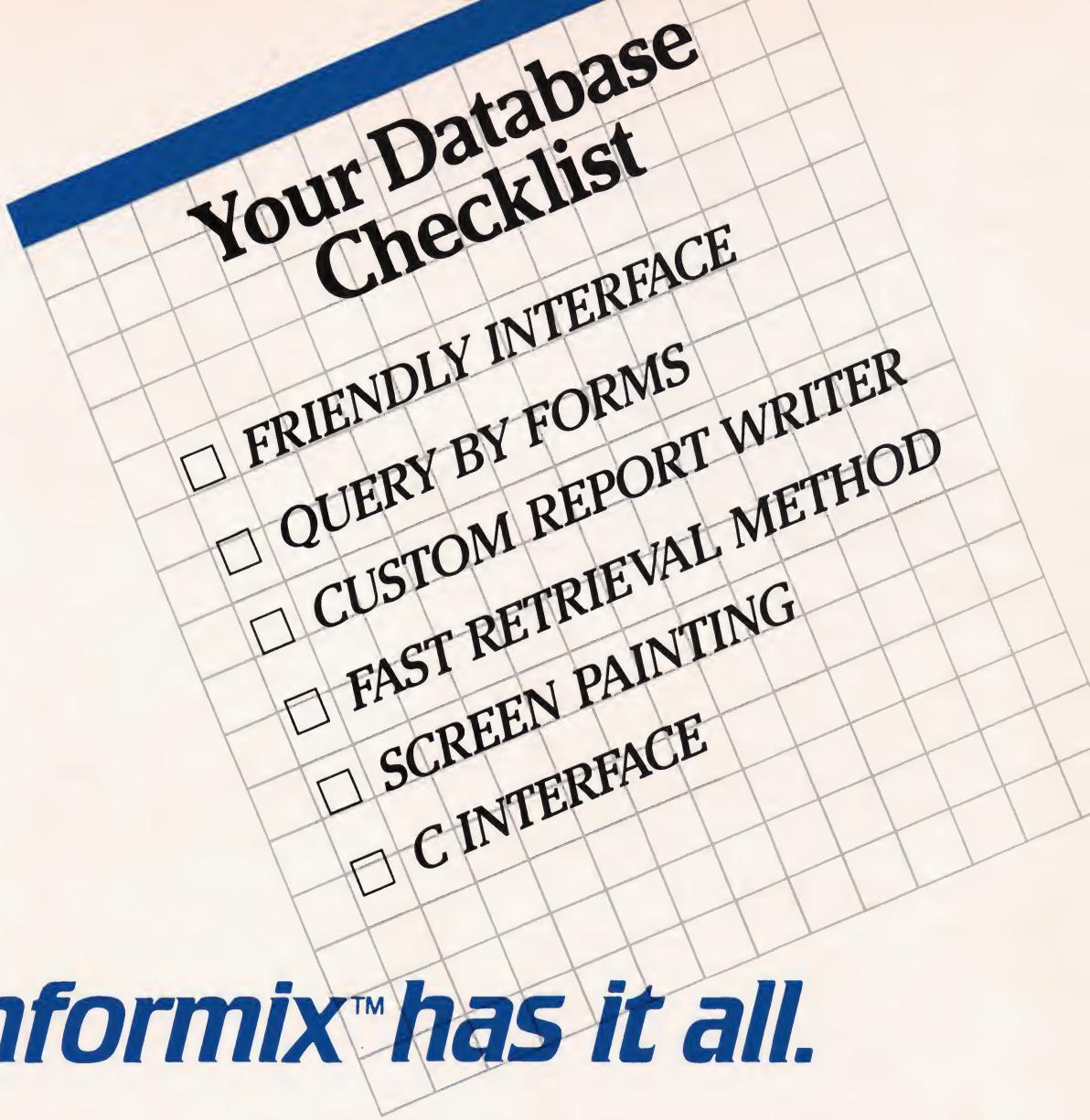

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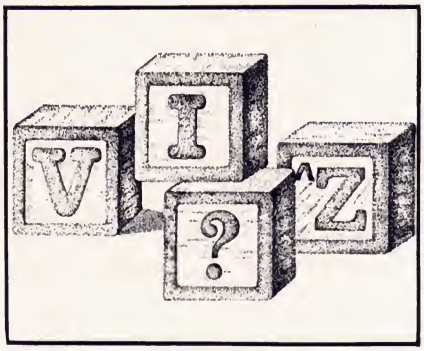

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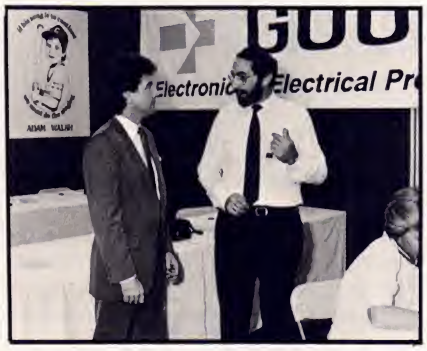

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UNIX™ REVIEW

THE PUBLICATION FOR THE UNIX COMMUNITY

April/May 1984 **Volume 2, Issue 2**

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DEPARTMENTS:

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FROM THE EDITOR

From the disk of: David Fiedler

"Goodbye, *UNIX REVIEW*"

No, we aren't going down the tubes. In fact, *UNIX REVIEW* will be going monthly starting in June, and issues are bigger than ever. Over the last ten months, I have been proud to help *UNIX REVIEW* become the first, biggest, and best magazine to cover the UNIX systems industry. It's been a real treat to bring some solid articles to readers who are just starting to learn how interesting -- and sometimes confusing -- one operating system really can be. But now my contract with *UNIX REVIEW* has been completed, and I'll be moving on down the road, splitting, and taking off.

Before *UNIX REVIEW* came along, most people knew me as the publisher of *UNIQUE* and the author of lots of articles about UNIX. Now, industry newsletters like *UNIQUE* are funny things. They're usually about 12 pages per issue, have all sorts of interesting and useful information, and cost $500 or so. This is because the corporate executives, magazine editors, and venture capitalists who subscribe to them would pay almost anything for the accurate inside information they need.

When I began publishing *UNIQUE* way back in 1981, it caused a bit of a sensation in the industry, because a newsletter for only $54/year was almost unheard of. I wanted to give small companies, corporate end users, and even individuals with an interest in UNIX the chance to get the same inside scoops as the richer folks. At that time, hardly anyone had heard about UNIX, but there was *UNIQUE*, telling everyone where to find C compilers, UNIX-based microcomputers, and applications software. The gamble paid off: *UNIQUE* started from day one with several hundred subscribers, and now we have thousands of regular readers. Probably over a dozen major deals were put together between companies that read about each other in *UNIQUE*.

Anyway, the opportunity to help *UNIX REVIEW* get up to speed was an important one, but *UNIQUE* has always been my first priority. The editor of a major magazine needs a great deal of time to talk to authors, plan articles and issues, schedule time to attend conferences -- all the things the editor of a major *newsletter* needs time to do. It just isn't possible to give both publications the time they need. There was never a conflict between *UNIQUE* and *UNIX REVIEW* -- except for my time -- because newsletters and magazines, by their very nature, take a different approach in their coverage. You have already sampled some of *UNIQUE*'s flavor from my Industry Insider column, and the How to Select a UNIX-Based Computer series of articles. So from now on, I'll be writing in *UNIQUE* exclusively, with an occasional special piece for *UNIX REVIEW*.

This is a transition issue, marking the change of editors. Your new editor will be Mark Compton, who has been working with my good friend Jim Joyce (of The Independent UNIX Bookstore, International Technical Seminars, and /usr/lib column fame). Mark comes from a journalism and computer background, and so can handle both production and technical matters ably. Mark and Jim have formed an Editorial Board for *UNIX REVIEW*, composed of some of the most illustrious names in the UNIX field -- people who really know UNIX (I even made them put my name in). The intent of the Editorial Board is to help keep *UNIX REVIEW* a top-notch, well-written magazine, as you want it.

In closing, I'd like to thank all the authors and columnists who have contributed to *UNIX REVIEW*. Apart from occasional technical difficulties, it's been truly a lot of fun working with all of them. Personal thanks must be given to Pam McKee, the publisher, and my wife Susan, who put up with many late nights transmitting copy out to the West Coast. The final thanks go to you, the readers, who really make the job worth it in the end.

C You Around,
Dave Fiedler

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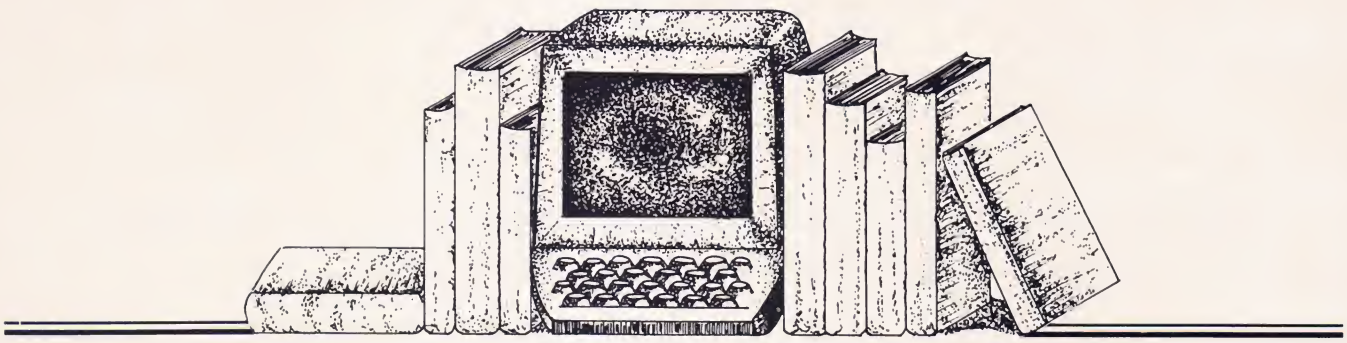

/usr/lib

by Jim Joyce

XINU IS NOT UNIX

As suggested last issue, Douglas Comer's *Operating System Design: The XINU Approach*, (Prentice-Hall, 1984, 474pp. $29.95) is now out and available. As soon as it appeared at UniForum's January meeting in Washington, D.C., the crowds came, saw and wanted. But what did they want?

The Comer book, with its intriguing title and cover art, could be interpreted as a book talking about UNIX internals. It contains extensive C code about XINU, as well as a promise that the machine readable code is available for a "nominal fee". However, the book does NOT, despite persistent rumors, tell ALL about UNIX internals. We must take note of Comer's disclaimer that "although many of the ideas, techniques, and names come from UNIX, the two systems are quite different internally - programs written for one system do not usually run on the other." (p.xiv).

It is tempting to say that this book is a replacement for that underground classic, the Lions commentary and listing of V6 code. And, rightly viewed, it is. XINU is not UNIX, true, but the book *is* a book about operating system design, and *is* used as a textbook for operating system courses. As such, it *is* a guide through any operating system admission. But anyone expecting to finish the book knowing the secrets of the UNIX kernel will not quite have it straight. The precise differences, unfortunately, cannot be discussed because true UNIX kernel code is protected by trade secret.

One nice touch is the inclusion of exercises at the end of each chapter. The exercises are well thought out, challenging, and will keep any instructor alert. Serious readers should do selected exercises, but be wary of tackling those that look tough: they ARE tough.

In contains extensive C code about XINU...

Publication of *Operating System Design: The XINU Approach*, will long be remembered as a major event in UNIX history. The chapter titles and number of pages in the chapter are given in the Table of Contents for XINU.

Table of Contents for XINU

1. Introduction and Overview (19)
2. An Overview of the Machine and Run-Time Environment (20)
3. List and Queue Manipulation (11)
4. Scheduling and Context Switching (10)
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1. A Quick Introduction to C (18)

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2. XINU Programmer's Manual (76)

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THE UNIX BOOK

Mike Banahan and Andy Rutter of the University of Bradford have written a book entitled *The UNIX Book* (John Wiley & Sons, Inc., 1983, 218pp, $16.95). Right from the beginning it is full of errors. UNIX is NOT a registered trademark of Bell Laboratories, as the book claims. It is unregistered. This is a minor but important point.

More vexing are the errors of fact that crop up each succeeding time the book is opened. The authors state on page 3 that, "The first example has no arguments, the second has one, and the third has three," and then give the examples:

```
echo
echo 1 argument
echo with three arguments
```

Had they taken the time to explain each token in each example they would have not made the obvious gaffe in the second example, which as given has two arguments.

The real problem with the book is that Banahan and Rutter were in such a rush to join the august group of UNIX book authors that they did not write or proofread carefully enough. Their discussion of the ls command, to cite just one example, is so full of errors as to be misleading.

I do not advise anyone to buy the book. I think it would be best were the publisher to withdraw the first printing so that the errors can be corrected. The chapter titles are given in the table entitled "Contents to the UNIX Book."

Contents to the UNIX Book

1. Introduction to UNIX (9)
2. Files and Simple Commands (24)
3. The Editor [ed[(14)
4. The C Language (23)
5. The UNIX Filestore (9)
6. Software Tools (10)
7. Text Preparation (17)
8. The Process Environment (12)
9. Libraries (14)
10. Maintenance (15)

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A. General Commands (18)
B. The Editor (5)
C. Shell Syntax (9)
D. Standard Libraries (21)
E. System Calls (7)
F. The ovp Program (5)

A PRACTICAL GUIDE TO THE UNIX SYSTEM

In contrast to *The UNIX Book*, Mark Sobell's *A Practical Guide to the UNIX System* (Benjamin/Cummings, 1984, 428pp. $21.95), is a splendid book, well designed and executed. Sobell's treatment of the vi editor is the best I have seen, providing helpful pictures to illustrate aspects of vi that are difficult to explain. Those wishing to check the pictures might start with the one on page 106. Chapter titles are given in "Table of Contents for A Practical Guide."

Sobell's treatment of the vi editor is the best I have seen...

Table of Contents for A Practical Guide

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1. The UNIX Operating System (14)
2. Getting Started (18)
3. An Introduction to the Utilities (11)
4. The UNIX System File Structure (21)
5. The Shell (23)
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THE UNIX SYSTEM GUIDEBOOK

Peter Sylvester has written *The UNIX System Guidebook*, (Springer-Verlag, 1983, 207pp. $14.50) in a curious way. It is strange to see a book beginning with the old AT&T quote that UNIX has "well over 100" commands, and even stranger to see that the section on writing and running programs begins with FORTRAN! Now, FORTRAN has been a good friend for years, but it is NOT the focus for UNIX, which is written in C, except for interrupt and other low level routines.

But a prediliction for FORTRAN is not the problem with the book, alas. There are strange file naming conventions Sylvester introduces that seem to court danger from the system. Page 16 suggests the command:

```
$ mv a.out program.o
```

to rename an executable file. But UNIX (often referred to as "Unix" in the book) uses the .o suffix to indicate a file that is not quite executable but is ready for linking. Another strange use of names happens on page 18, where the command line reads:

```
$ mv a.out mainprogram.x
```

The renamed program is an

Continued on Page 106

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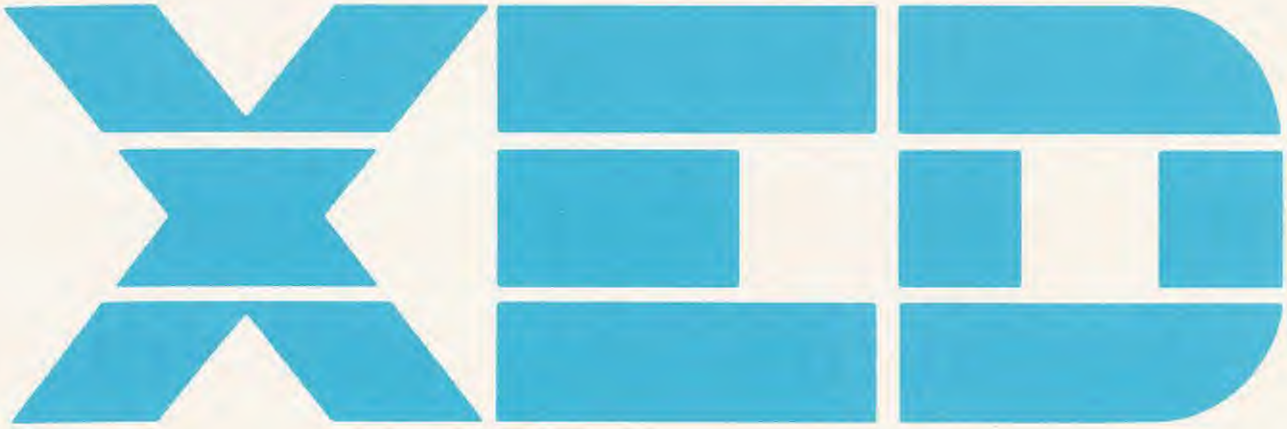

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MENUS? SHMENUS!

by Ira Chayut
and Julia Haviland

As computers move into the realm of the general populace, words such as *user friendly* become more widely heard. While complicated command sequences and thick user guides are acceptable for the professional, the novice and occasional users require more interactive software support.

Computer systems and software are now often purchased after only brief encounters between customer and product. Thus, prospective clients for a given product may make their decision to buy after only a novice-level interaction.

In menus, the user is presented with a list of operations that can be performed and then prompted to choose one of the options. As an additional assist, the list of options may include brief descriptions. In complicated situations, one list of operations (or *screen*) may be linked to other such lists. Thus, in order to edit a file, the user may be initially presented with the available commands. After choosing the *edit* command, the user might be shown a partial list of existing files and given the choice of 1) editing one of these files, 2) viewing the next *screen* of existing files, 3) creating a new file, 4) going back to a the initial list of commands, or 5) requesting a *screen* of helpful information.

Menus have been the favorite user interface for many non-computer personnel. For example, many office automation and word processing systems depend heavily on menus to provide a powerful, but easy to learn and use, command language substitute. Wang and Digital Equipment Corporation are among the believers in menus.

Since UNIX has a reputation of being non-user-friendly, it is only natural that a number of UNIX menu packages have been announced...

Since UNIX has a reputation of being non-user-friendly, it is only natural that a number of UNIX menu packages have been announced (including **/menu**, **Q-menu**, and the **Business Shell**). These packages provide a large amount of functionality for their price (from hundreds to thousands of dollars). However, not all applications require the power and generality offered by these products. In a broad range of applications, the UNIX shell provides a convenient and sufficient environment in which to build and execute elementary menus.

This article describes how to generate menu-based user interfaces employing only the standard UNIX shell and utilities. As with any menu system, the resulting **shell menu** (or **SHmenu**) interfaces are only easy to use if care was taken in the design of the menus and the phrasing of the prompts and options.

The UNIX shell is the command language or interface between the user and the computer system. The same commands that a user can enter from a terminal may be placed into a file. The commands in this **shell file** can be easily performed just as if the user had entered them at the keyboard. For further

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convenience, text can be stored in named locations called **shell variables**.

KNOW YOUR AUDIENCE AND THEIR TERMINALS

Menus are mostly a user interface, but they are also an educational device. The language used in the screens should be tailored to the user's knowledge of the materials and their ability to type. Screens that are too verbose can be as bad as those that are too sparse and cryptic. Buzz words and TLA's (three letter acronyms) are efficient ways to convey information **only** if the user understands the term. If you are unsure of whether or not to use an abbreviation, don't (or use the rule: "When in doubt, spell it out").

Some users (especially those that cannot touch type) prefer their command choices numbered. Long sequences of commands can be easily learned this way. Other users appreciate the mnemonic approach, where commands are represented by their first letter ("e" for "edit", "q" for "quit", etc.). The selection of an approach for any given menu should be partly based on the preferences of the users.

Some systems are able to support a variety of terminals via a standard interface (such as the 'termcap' facility of Berkeley's 4.1bsd UNIX). This allows one menu to use what would normally be terminal-specific functions, such as to clear the screen or position the cursor, for a variety of terminals. However, terminal-specific escape of control sequences can be inserted into the menu in order to take full advantage of special terminal features (such as an alternate character set, graphics, display attributes, or windows). Of course, this may limit the utility of the menu on other terminals.

FROM DEFINITION OF TASK TO SHMENU

After a profile of the users has been generated, the next step is to detail the tasks to be performed while in a menu. Start by listing the commands and options to be available to the user. Next, arrange these commands into groups that are logically connected. Note which groups are linked to other groups, which options imply other options, which options are mutually exclusive, and which groups are actually sub-groups of another higher-level command.

Ideally each group of commands will become one screen. However, large groups may be split across two or more screens and more than one small group can be merged onto one screen. If one logical group of commands are spread over multiple screens, the user should be given an easy way of traveling back and forth through the multi-screen list. Before splitting a group or merging groups, you should re-evaluate the command grouping with an eye towards the size of a terminal's display.

BUILD THE SHMENU

The next step is to convert the command groupings into screens, and these screens are coordinated into a cohesive menu system. Using the power of the UNIX shell, the user will be informed of the command choices, be given assistance when needed, and will execute the desired commands.

The author of a menu system should remember that the user depends upon concise and clearly worded menu phrases/prompts/messages and the ease of flow through the various menu paths. The user should be permitted a convenient way of returning to a previous screen in a menu sequence.

Testing the menu prior to its being released for general use is an important implementation step. A sample of the target user base should be among those critiquing the menu.

A SHMENU EXAMPLE

An example, like a picture, is worth a thousand words. So we will consider a simple menu to allow a user the following command choices:

1) list the current files
2) edit one of the existing files
3) create a new file
4) print a help message
5) leave the menu

It is determined that the user community is from a range of backgrounds. To accommodate the different types of users, the menu must accept two forms of the edit and create commands: one with the file specified, and one without. In the latter case, the user is to be prompted for the name of the file. As a further convenience, the menu will accept single letter abbreviations for the commands.

The command list is easily transformed into the help screen:

```
The available commands are:
    directory     - lists existing files
    edit          - edits an existing file (displays directory list and then
                    asks for the name of the file to be edited)
    edit file     - edits the specified existing file
    create        - creates a new file (asks for the new file name)
    create file   - creates a new file with the specified name
    help          - prints this message
    bye           - leaves the SHmenu demo
Notes: Trying to 'edit' a non-existent or non-readable file will produce an
       error message and a request for a new command.
       Trying to 'create' an existing file will produce an error message
       and a request for a new command.
       All commands can be abbreviated by their first letter ('d' for
       directory, 'e' for edit, etc.).
```

Continued on Page 94

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HOW TO PROTECT YOUR SYSTEM INVESTMENT THROUGH SOFTWARE PORTABILITY

by Gordon Waidhofer

As the end-user and decision maker, you are responsible for your computer system. It's up to you to get your money's worth when you buy one. By taking a close look at what affects software portability, you can avoid some common pitfalls when considering your next purchase, and assure yourself of a more versatile system.

In spite of repeated warnings about the dangers of buying hardware before selecting software, many people who acquire a computer system will purchase the hardware first. And, all too often in doing so they only look at such obvious and conventional factors as price, speed, or power, overlooking the fact that new technologies introduce new standards for making wise investment decisions.

To make a really intelligent decision, consumers need to remember that the solutions they seek with the new technology are found in **applications** (or **END-USER**) software. Simultaneously, the compatibility of system and software, as well as software portability, must be given equal importance, since they are critical to a successful operation.

Software portability -- the ease with which end-user or applications programs can be transferred from one system to another -- can determine whether a system will do what its designers want it to do.

Unfortunately, with the advent of operating systems that cross hardware boundaries -- such as UNIX, MS-DOS, or CP/M -- many consumers have taken software compatibility or portability for granted, assuming they can mix and match hardware and software more readily than the facts will support.

NATURE OF SOFTWARE PORTABILITY

Portable software gives you the capability to buy your choice of hardware or software, based on micro, mini, and mainframe computers.

As advanced, state-of-the-art hardware enters the market, portable software should allow you to move up at your discretion, without relinquishing years of accumulated data. Software that is portable should give vendors the capability to penetrate new markets with existing, well-tested applications without constantly adapting them to new hardware.

You should ensure that your plans for the future will proceed unimpeded by the decisions you make now. You can begin by considering the elements that will

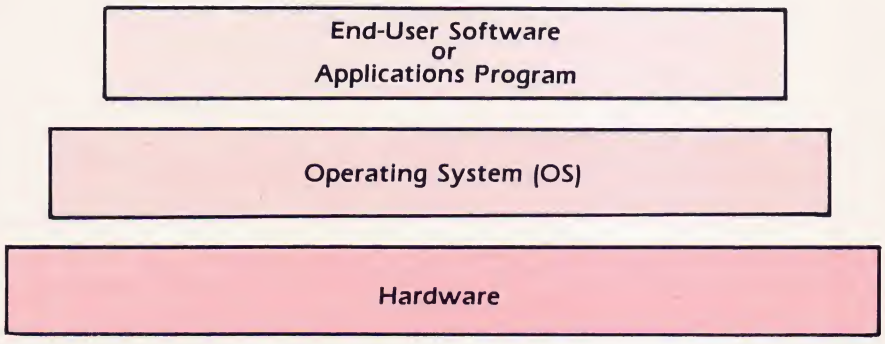

Figure 1 Simplified Machine Model

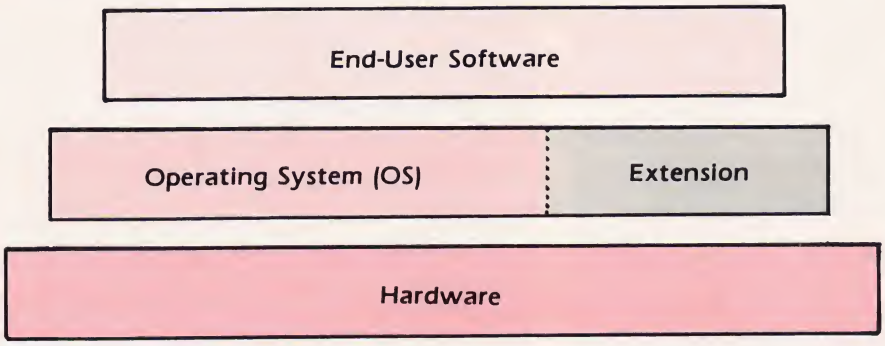

Figure 2 Enhanced Operating System Supporting End-User Software

help you assure optimum software portability and system standardization.

But first, you'll need to understand how the system's components fit together. To help you, we've provided a simplified machine model illustration to show the interdependence of components within a computer system (Figure 1).

The key to assuring the same applications package will run on different machines is the operating system (OS). The operating system is an intermediary between the applications or end-user software and the hardware. In its absence, each software package would need to be written with device-driving software specific to the environment in which the application was required to function.

Without operating system applications, software would not execute on other machines, and would have to be custom-written for each new computer.

Since it provides the same facilities independently of any particular machine, the OS always looks the same to the software it supports, regardless of the computer environment. By configuring one operating system for each target machine, the software developer is saved the effort of rewriting each of possibly hundreds of applications packages to execute on the target system. This enables the author to conserve his energies for such activities as refining, debugging or otherwise improving applications programs.

The UNIX operating system, developed and licensed by Bell Laboratories, serves as a good example for our discussion. In fact, this operating system is particularly apt because of its history and characteristics. Its specific problems are similar enough to those of other operating systems to illustrate how software portability is affected by operating system design and implementation.

Portability has become a UNIX system buzzword. Some people think one UNIX system is like any another. UNIX has been adapted or ported to a wide range of computers, from mainframes to micros. Many OEMs and system integrators offer it. So popular has UNIX become that 1984 is seen by many as the year when UNIX operating systems for personal computers will be sold off the shelf. This ready availability has lulled end users and vendors into the belief that -- since the UNIX system appears to be inherently portable -- UNIX compatibility can be taken for granted.

This is anything but the case, as some unwary buyers have learned, at considerable discomfort and expense.

PORTABILITY FACTORS

As a knowledgeable computer system buyer, you are already aware of the many factors that must be considered in the selection and purchase of a computer system. If you have not previously considered software portability in your evaluation process, here are a number of elements to keep in mind the next time the issue arises:

- Standardization
- Operating system version
- Implementation details
- Operating system extensions or enhancements
- Operating system emulators
- Operating system look-alikes
- Differences between compilers

STANDARDIZATION

Virtually since its inception, the computer industry has been involved in efforts to standardize hardware and software. While some progress is being made toward software standardization, that progress has been slow. By no means can it be said that such

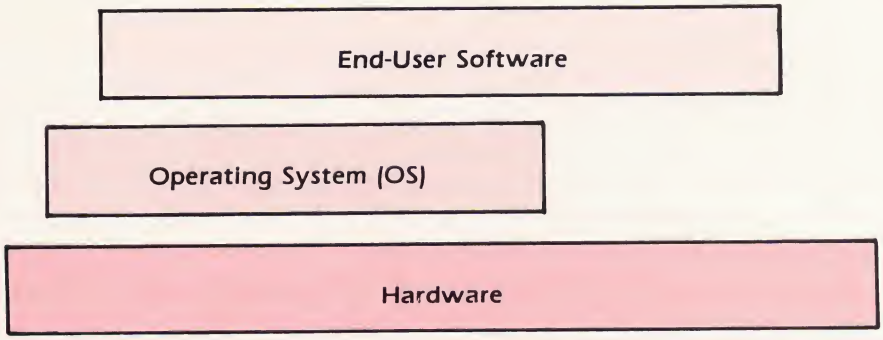

Figure 3 Operating System without enhancement cannot support end-user software that relies on enhancement.

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standardization has occured, is widely accepted or has been firmly established.

The problems of standardization are so general, in fact, that it is easy to draw an analogy between software and hardware standardization by looking at the status of the RS232 connector -- a **standard** extablished some years ago to make the interface between computer systems simpler. Even now, end-users and computer dealers routinely re-wire presumably standard RS232 connectors nearly every time they install a new system or peripheral.

If there is a question about whether a so-called **standard** RS232 interface is really standard, there is an even greated question about whether a **standard** UNIX operating system is compatible with another **standard** UNIX system.

Currently, software standardization must be defined by you, the end-user, who knows best what tasks or functions the sytem will need to perform. Armed with a definition of those needs, you should first acquire the application software that will best achieve the system's objectives. At that point you'll be looking for an operating system that will support your application software. And only after you have selected the operating system will it be time to choose the hardware.

In other words, your standards will evolve from your needs and will first be implemented through the software. That's the only reliable way for you to establish a standard.

VERSIONS OF OPERATING SYSTEMS

As developers update operating systems with successive releases, they add new features, delete old ones, and change others. A program designed to run under an older version of an operating system is likely to run under a new one. But an outdated OS may not have the facilities to support a new program. And the specific program you need may not have been adapted to the state-of-art version of your operating system. Or the OS you prefer may not be available for the machine you like.

One factor that affects the operating system you buy is its history -- which release should you purchase?

Before you make the buying decision, make certain you know the exact version of the operating system you're using or planning to install.

While you're at it, check out its viability. Learn all about its different versions. Determine how well they, as well as the system of your choice, are supported. Can you be sure the system you like hasn't been discontinued? Has its capability for growth been truncated because the group that created it has broken apart and is not likely to reassemble?

... portable software should allow you to move up at your discretion, without relinquishing years of accumulated data.

DETAILS OF IMPLEMENTATION

To some extent the specifics of the hardware on which an application was developed affect its portability to other systems, despite the shielding effects of the operating system.

The perils of implementation can be quite subtle. For example, at Voelker-Lehman we encountered a failure in a new program that utilized **rand**, a UNIX system library function that generated random numbers. On our VAX, **rand** returns numbers between zero and two billion. The new program had apparently been written for a much smaller system than the one on which we tried to run it, and it did not expect numbers above 32,767. As a result, the program failed whenever our **rand** returned a number above 32,767.

In this example, the facility existed, but behaved in a different way. That's not uncommon. Software/hardware compatibility and portability are nearly always directly affected by how a given program is designed to do its job. Some very small differences can create major problems if they are discovered too late in the process.

If you're an end-user, you'll want to have the highest level of confidence that your vendor has the resources, facilities and expertise to take care of such problems should they occur on your system.

EXTENSIONS AND ENHANCEMENTS

Another factor you will want to consider is the operating system derivative -- that is, an operating system that is a modified version of a previously developed operating system.

In this respect UNIX adds a new wrinkle. Independent AT&T licensees derive their commercial UNIX systems from the straight Bell versions. As a result, while they may have a common original source, one vendor's **UNIX System** may not be the same as another's.

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themselves by the extensions or enhancements they offer. These additional features -- the bells and whistles -- can improve performance or functionality of the end-user software the operating system supports (Figure 2).

But extension, while valuable, can also introduce a portability trade-off. The application that uses these extensions becomes specific to the enhanced operating system. It may fail if used on a different derivative operating system (Figure 3).

One common enhancement to UNIX systems is file and record locking. This extention to a **plain vanilla** system prevents more than one person from simultaneously using the same data in a data base. It protects the information from changes or deletions while in use.

File and record locking makes it much easier to develop and use a data base management system (DBMS). However, since the DBMS is dependent upon that extension, it may fail if you try to install it on a system that lacks file and record locking, or that implements it in a slightly different way.

As a canny buyer, you naturally want to get the best and most versatile system for your money. If that involves enhancements, you'll need to exercise special care. It's just possible the extensions your vendor says will give you a competitive edge may also lock you into system-specific end-user software that may dull that edge significantly.

If the end-user software package you are considering relies upon an extension, you will immediately lose the advantages of portability once you purchase it. That may not be a problem for you if -- because of the benefits you gain -- you don't mind being committed to the operating system with that extension for the life of your software.

But you would do well if you learned about it before you signed the check.

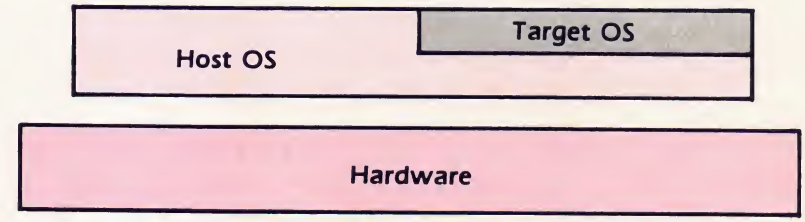

Figure 4 Emulator

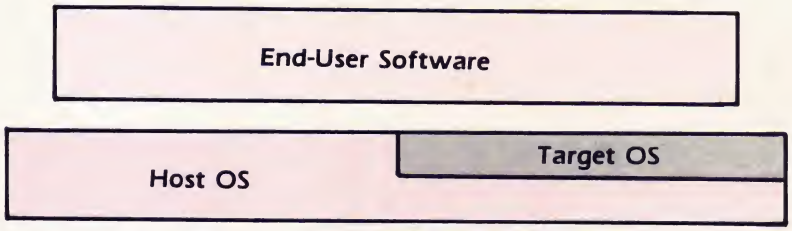

Figure 5 End-user software reliance on host/target facilities forces dependency on that specific host/target configuration.

EMULATORS

Operating system emulators resemble extension. In this setup, one operating system passes itself off as another (Figure 4).

Emulators are frequently touted as a sort of two-for-the-price-of-one opportunity -- an emulator uses one OS as a host for another one, called the target. Not only can you have two operating systems supported by the same machine, but the applications software can exploit the host's capabilities as well as the target's. However, like the **rand** example, if the host does not have the corresponding facilities, the emulator may not emulate all the target's facilities properly.

As with operating system extensions, if the end-user software utilizes facilities from both the host and the target then it becomes dependent upon that particular host/target configuration (Figure 5). But if the application utilizes only the target's facilities, or only the facilities of the host OS -- which we think is the proper way to use an emulator -- then it is conceivable the system could lose the much-vaunted **two fer** advantage (Figure 6).

Another portability factor to remember when considering an emulated OS is the certainty that emulators **always** fail to emulate **some** facility. In other words, unity between the emulator and the emulated OS is never achieved.

Knowing this you will, of course, always find out what facility is not being emulated, and whether its

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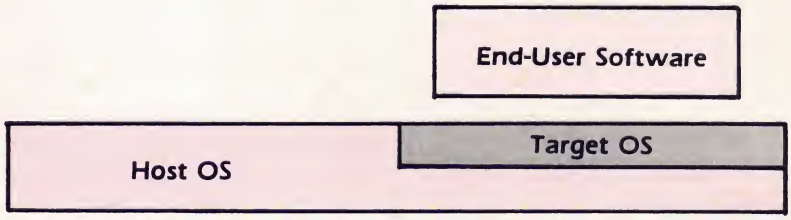

Figure 6 Two-for-one advantage lost when end-user software utilizes facilities of only one of two available operating systems.

UNIX Operating Systems provide the standard environment for applications so they can be ported across advanced multi-tasking and multi-user systems. Word processing, spreadsheets, and database management are some of the applications already available under UNIX. Until now, no business and financial software has been available. Until now, the only solution has been to retrofit existing financial packages—packages that were written for systems with limited storage resources and limited interactive capability. Until HCR's Advanced Business Applications Software for UNIX.

BUSINESS software designed especially for the UNIX environment is now available from Human Computing Resources. Incorporating an ever-growing series of integrated modules with a powerful relational DBMS, the package presently includes Accounts Payable, Accounts Receivable, and General Ledger in a form that users can query and interact with directly. HCR's software takes advantage of System V, making it the first truly multi-user system.

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DATABASE MANAGEMENT SYSTEMS PART 3

by Jon Roland

This installment will continue the feature analysis of the last installment, and discuss the benchmark application programs that are being written in each of the the DBMS products as a way of evaluating them. We will also look at other alternatives to the relational model and at alternatives to UNIX itself.

MISTRESS DESCRIBED AND COMPARED

In the last installment, Informix, Progress, Rubix, and Unify were compared using a list of distinguishing features. We now examine another DBMS. Mistress is a product of Rhodnius, Inc. It is a commercial version of an earlier product called MRS, for Microcomputer Relational System, which was intended to be a product like the IBM System R DBMS which uses the SQL™ language. It is now offered on a number of systems, with some variations, using several operating systems. We will look at the current version 2.2.10 of Mistress Plus, which includes their M-Writer report writer (RG) and M-Vision screen interface program (DEL).

Version 3.1, Mistress/32, which has been optimized for 32-bit UNIX machines, is supposed to be released in April, 1984, and is to include facilities for audit trails, rollback recovery, nested select to 100 levels, math functions in the Query Language (QL), record locking, and a menu generator. Look for a progress report on this version.

Here is how Mistress rates using the distinguishing features from the previous installment. For a more complete explanation of those features, see Part Two of this series. Some of the items counted as one feature in the last article are broken out below. Those features rated as NY (not yet) are supposed to come with version 3.1, which I have not validated.

1	Relational?	QY*
2	Has DBM languages?	Y
3	Easy restructuring?	N*
4a	Passwords to databases?	Y
4b	Passwords to tables?	Y
4c	Passwords to records?	N
4d	Passwords to fields?	N
5a	Has type integer?	Y
5b	Has type fixed?	Y
5c	Has type float?	Y*
5d	Has type dollar?	Y
5e	Has type string?	Y*
5f	Has type date?	Y
5g	Has type time?	Y
5h	Has type boolean?	N
5i	Has type serial?	N
6a	String match test?	Y
6b	String contains test?	Y
6c	String beginswith test?	Y*
6d	String endswith test?	Y*
7	Entity integrity?	QY*
8	Referential integrity?	QY*
9a	File locking?	Y
9b	Record locking?	NY
10	Data entry forms?	Y
11	General join?	Y
12	Views?	N
13a	DML addition?	NY*
13b	DML subtraction?	NY*

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13c	DML multiplication?	NY*
13d	DML integer division?	NY*
13e	DML modulo operator?	NY*
13f	DML rational division?	NY*
13g	DML exponentiation?	N
13h	DML logarithm?	N
13i	DML maximum?	NY*
13j	DML minimum?	NY*
13k	DML truncation/int?	N*
13l	DML rounding function?	N*
13m	DML random function?	N
13n	DML string concatenation?	N
13o	DML substring select?	N
13p	DML substring index?	N
13q	DML string length?	N
14	Report writer?	Y
15	Menu generator?	NY
16	DEL/QL/RG/DML/CL procedural?	QY*
17a	Record-by-record operations?	Y*
17b	Intermediate variables?	N*
18	Auto save intermed var?	N
19a	First operator?	N
19b	Last operator?	N
19c	Next operator?	Y
19d	Previous operator?	Y
20	Helpful error messages?	QY*
21	Mult tables in UNIX file?	Y
22	CL files separate UNIX files?	Y
23	CL files link to db/tables?	N
24	Mult db file per direc?	N
25	Recs/fields fixed/var?	Fixed*
26a	Max num tables/db?	9999
26b	Max num records/table?	9999
26c	Max size records?	2^31-1
26d	Max num fields/table?	9999
26e	Max size fields?	2^31-1
27	Dump, load ops?	Y
28a	Shell escape?	Y
28b	C interface?	Y
29	CL compilation?	N
30	Use/perf run statistics?	N
31a	Timestamp records?	N
31b	Rollback to previous state?	NY
32	Use raw I/O device?	N
33	Transaction logging?	NY
34	Disk storage needed?	3M
35	Main memory needed?	512K

COMMENTS ON THE FEATURE CHART

(1) There is no unique default key to guarantee nonduplication of records, so this must be supplied when *display* (data dictionary) is defined. See (7) and (8).

(3) Tables and fields can be renamed, but to restructure a table, its contents and "display" must be dumped into a UNIX file, the display file edited, the current table "dropped", a new table created from the edited display file, and the data inserted from the contents dump file.

(5a) Range is +/- 2^15-1. Also a type *shortinteger* +/- 2^7-1 and *longinteger* +/- 2^31-1.

(5c) Precision is 7 digits. Notation is scientific, exponent +/- 38. Also a type *longfloat* with 15 digits.

(5d) Dollar type permits amounts up to $9,999,999,999,999.99, sufficient for most national budgets.

(5e) Type *char* may have length of up to 2^31-1! There is also a type *text* with a display length, storage length, and overflow storage length. If the block size exceeds the amount specified for storage length in the table, the excess is stored in an overflow table. This design combines the performance advantages of fixed-length records for the main table with the storage advantages of an overflow table using variable-length records.

(6cd) Wildcard character * is used for matching strings, so can handle contains, beginswith, and endswith.

(7) Has *unique* qualifier which may be used to prevent duplicate records and, in particular, to prevent more than one record from having a *null* entry in an index field, but this is not default situation.

(8) This can be handled by writing a procedure, but it is not default situation.

(13) The report generator M-Writer can be used to do some calculations and the result can be sent to a UNIX file, from which they can be inserted into a database table, but this is too inconvenient to qualify for a Y rating, for the reason discussed in (3).

The usual approach to benchmarking DBMSs is to time them in their performance of each function.

(16) The QL, RG, and CL are procedural, with some limitations, such as the level of nesting of select commands, which is to be increased in v. 3.1.

(17a) M-Writer can do this, but it is inconvenient for data manipulation in a table, for the reason discussed in (3).

(17b) Variable values may not be changed from record to record in a "for each" or "while" loop.

(20) The line with an error is displayed, with a pointer to the position of the error and a message "syntax error". Does not say what kind of syntax error.

(25) See (5e) above. Main tables have fixed length records, the overflow table variable length records.

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OTHER FEATURES AND COMMENTS

Mistress is an older product, and is available on a variety of machines under several operating systems, from the IBM 3031 to the IBM-PC/XT. Several applications have been written using it. Its Query Language departs from SQL in ways that makes its programs more readable and comfortable, but it still suffers from the limitations of SQL for doing data manipulation, which makes it unsuitable for some applications if the user doesn't want to program in C. Mistress tries to make this easier with its *mx* and *mr* routines. Hopefully, some of these limitations will be alleviated in the next version. It has a unique data type: *greek*, which can be used for strings of Greek characters, making it the DBMS of choice for classical Greek scholars. Probably its most outstanding distinguishing feature is its *text* data type, which makes it a good choice for applications needing character fields of almost unlimited length, such as databases of documents and for library science applications.

APPLICATION BENCHMARKS

The usual approach to benchmarking DBMSs is to time them in their performance of each function. However, this does little to test the suitability of the products for practical applications. Anticipated new versions of the products with greatly expanded functionality are too close to make such performance benchmarking appropriate at this time. While waiting for the situation to stabilize, work has begun on rudimentary applications designed to test the functionality of each of the DBMS products. These applications will be written to function as nearly alike as feasible, with no frills and little concern for appearances. The following are some of the ones being written:

Task Manager. Permits the entry of tasks and how they are assigned to each member of an organization. It groups them into classes, links them into projects, and tracks performance to completion. It assigns values and priorities, frequency of repetition, and relates tasks to deadlines and triggering events. It can be used to generate schedules for each person or team for any period and show periods open for appointments or discretionary tasks. It permits the entry of activities, and can generate an operations log. It can analyze productivity and the utilization of time and other resources. It can be used as a source of data to the Time Billing package.

The Progress compiler has some interesting not-yet-documented side-effects.

Sales Manager. Permits the entry of data about prospects, either from the keyboard or from a variety of data files, and facilitates the reduction of data redundancy. It permits updates of data on each prospect, including occupation and interests, what the prospect already has or needs, financial ability, and a history of previous contacts and the results, with suggestions for follow up which can be fed to the Task Manager. Can be used to generate daily call lists for salesmen, and to document sales activity and productivity. Maintains history of sales made and commissions paid.

Time Billing. Permits entry of billable tasks, with the client and matter, the procedure and rate, for each of several producers, and produce statements to responsible parties. Can enter payments received and post them to appropriate accounts. Can distribute payments to appropriate producers and analyze productivity and resource and time utilization.

Document Manager. Uses unique serial number for each document, assigns each to locations and containers, such as file folders and cabinets, and generates labels for each. Matches documents on hand against lists of documents required. Tracks movement of materials and accounts for return to assigned location. Manages disposition of each item.

Reservation System. Could be used for travel reservations, shipping, class schedules, or like situations. Can be used to assign traveler, cargo, or student to sequence of vehicles or classes, allowing time for transfer, and to reassign when unforeseen departures from schedules occur. Can track actual movement. Analyzes productivity. Reassigns to take vehicles or classes out of service if not needed. Prepares statements.

Troubleshooter. Entry of data on observed symptoms and results of tests and procedures. Correlation of data to assist in the specification of production rules of the form "If <condition> then <recommended action>". This would be the front-end for an expert system for which knowledge has not yet stabilized. Would make use of statistics, so would need math capabilities, unless interfaced to statistics package.

General Ledger. Would provide all of usual GL functionality, such as Chart of Accounts, Journal, Profit & Loss, and Financial Statement.

These applications have been designed to represent the kinds of things users may want to do with a DBMS. Readers and vendors are invited to suggest others. Ease of programming will be a consideration. If it turns out to be too much

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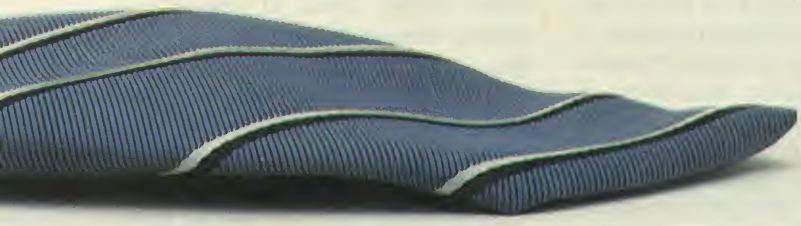

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Getting UNIX Systems Down to Business

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trouble to use a DBMS to write one of these applications, it will be postponed or skipped, and the difficulties noted.

Although this project is far from completed, some comments can be made about preliminary experience with the products. Most work on Mistress and Unify has been put off pending arrival of their coincidentally numbered versions 3.1. Work on Informix has been put off because I found its command structure unpleasantly awkward. The reader should not take that as a final judgement. Further experience with the product may change that reaction. But any professional programmer will admit that esthetic reaction to a programming tool or language affects his productivity, and that is a factor that vendors of such products must take into account if they hope to get acceptance for them. Functionality is not enough. Elegance is important, also.

MAKING PROGRESS WITH PROGRESS

The Progress DBMS language from Data Language Corporation is appropriately named. I have found it difficult to beat for getting small applications running quickly. A programming task can often be accomplished in minutes using Progress which would take hours using another product. It is highly interactive and has some elegant ways to do a lot with a few simple commands.

Although stored as ASCII files, Progress programs are compiled before being executed. This slows operation if the programmer writes many small programs which call one another often, but it is fast enough to make it easy to modify and rerun programs during development, much like an interpreter. In executing a Progress program, it soon becomes apparent that it is being compiled, because the effect of a program statement can depend on later sequences of statements.

The Progress compiler has some interesting not-yet-documented side-effects which can be made good use of once you get some experience with how they work. So far, it has been possible to write all of the applications in Progress without having to do any C programming or calls to the shell. This may not be important to competent C programmers, but it can be worth a lot to the many potential users who either don't want to learn to program in C or UNIX, or who would prefer not to have to, for the kind of *ad hoc* jobs they have to do. Although using Progress is programming, it is on about the level of difficulty of a good spreadsheet. Error messages are very helpful.

...a new body of theory called possibility theory has been conceived to deal with them.

RACING WITH RUBIX

When some of the planned features of their Prefix™ user interface become available, Infosystems Technology's Rubix DBMS with its compilable Q language may become even easier to use than Progress is. In the meantime, it offers a theoretically robust functionality which makes it a good choice for more complex applications. Achieving some of the effects of a single Progress statement might take some thought and the writing of a long function in the C-like style of Q, but the Rubix programmer is not limited by the assumptions the Progress compiler makes about the programmer's intentions. Using Rubix, a programmer could come up with something that would look and act like a spreadsheet and which could be used for applications like interactive modeling of a complex process, as well as more conventional DBMS applications. It would be fairly easy to interface it to a virtual-memory spreadsheet, a graphics or statistics package, or a communications network. However, an effect of having more options is to require more thought in the design of a program if one is to make use of them.

The people at Infosystems Technology are embarked on another project worth watching: the extension of the concept of the relational DBMS to handle the kind of imprecise and uncertain information encountered in artificial intelligence and expert systems, and to provide it with the functionality needed for querying, manipulating, and inferencing on such information. They call their concept the *Set Manager*. It would permit the modeling of not just sets or the relational algebra, but the much more general categories and categorical algebra, and this would extend its reach to advanced applications which have not heretofore been approached.

The logic of existing DBMS products is two-valued. That is inadequate to represent imprecise or uncertain information. One way to do so is with *fuzzy* (sub)sets, which are the subject of *fuzzy reasoning* theory. In this context, this involves the replacement of field values with functions which map the domain of possible values into the unit interval, which is interpreted as the level of confidence associated with each value. These level of confidence values resemble probabilities, but their logic is different, and a new body of theory called *possibility* theory has been conceived to deal with them.

Deep-knowledge expert systems need an inference capability. This can be provided by a single rule of

Continued on Page 110

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vi PART 3

by Dan Sonnenshein

This concluding article in the vi series will show how to use ex commands for "cut and paste", as well as for local and global text substitutions. Also included is a discussion of ex options for altering your vi environment, and of user-definable abbreviations for streamlining your editing. To some extent, these latter two features let you tailor vi to your own needs.

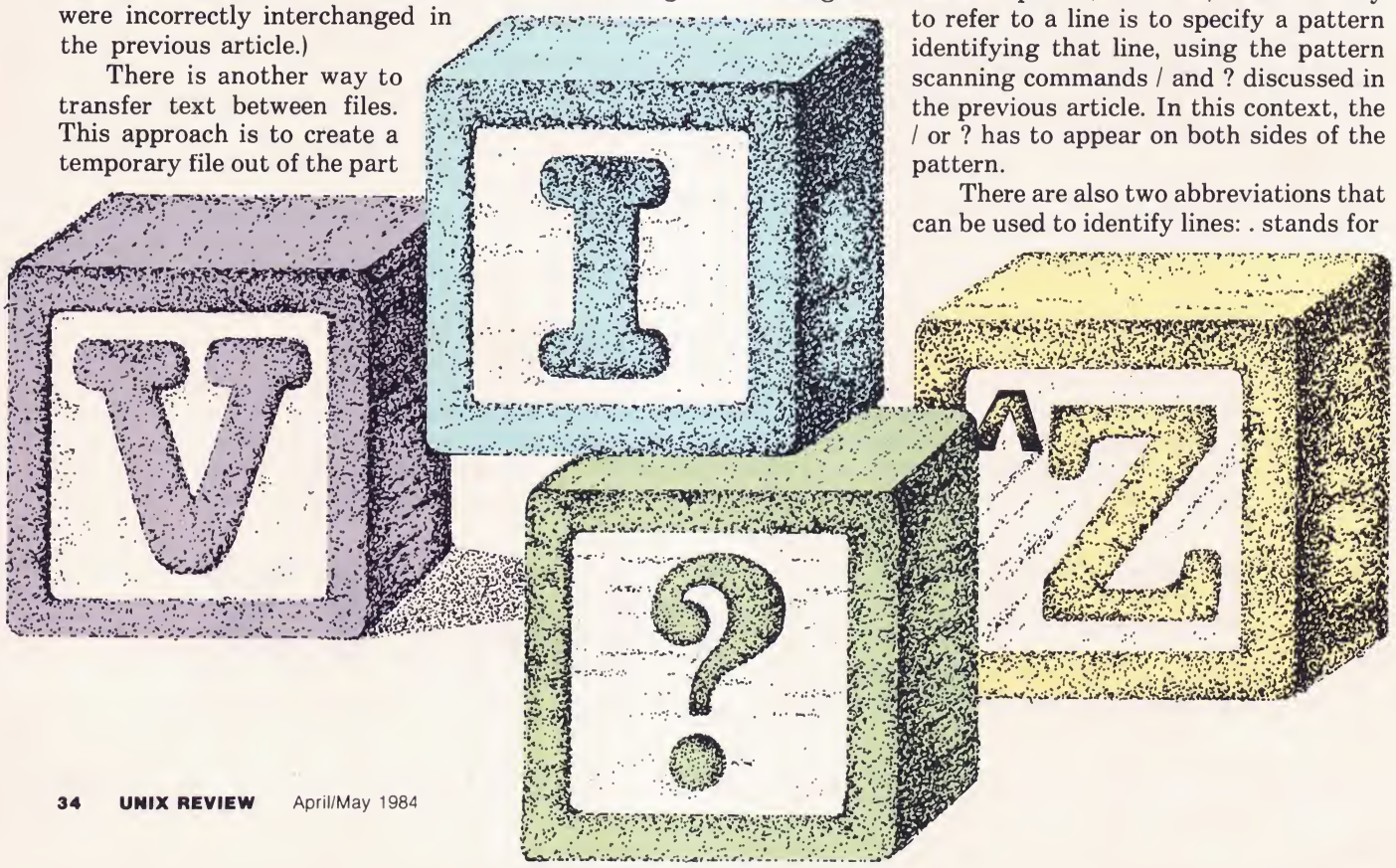
The previous article showed how to cut and paste between files by yanking or deleting into named buffers and 'putting' from those buffers. If whole lines are operated on, (lowercase) **p** puts the operated on text below the current line and **P** puts it above. If a partial line is involved, **p** puts the text after the cursor (to the right) and **P** puts it before the cursor. (These meanings were incorrectly interchanged in the previous article.)

There is another way to transfer text between files. This approach is to create a temporary file out of the part you are interested in, and then insert the temporary file at appropriate locations in another file. This is done using ex commands, whose general forms are:

:M,Nw filename	copying
:M,Nd	'cutting'
:r filename	'pasting'

(Recall that all ex commands are terminated by a <RETURN>, which is usually not shown.) In the above, *M* and *N* are any valid ways of identifying lines in the file. One way is by line numbers. The number of the current line may be obtained with the command **CTRL-g** or **:f**, or all line numbers may be displayed by setting the 'number' option (see below). Another way to refer to a line is to specify a pattern identifying that line, using the pattern scanning commands / and ? discussed in the previous article. In this context, the / or ? has to appear on both sides of the pattern.

There are also two abbreviations that can be used to identify lines: . stands for



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the current line, and $ stands for the last line in the file. Finally, any of these line identifiers may be followed by a plus or a minus and a number, to indicate a corresponding displacement from the main identifier. Here are some examples of valid ways to specify a range of lines in a file:

```
:1,20
:10,/gimble/
:.,/gyre/-1
:?gimble?,. + 3
;1,.
:.,$
:5,$-2
```

The 'pasting' in this approach is simple – **:r** *filename* will read it in above the current line. As an alternative to first cutting out an exact part as a temporary file and then reading it in, you could read in a whole file and then trim off the unwanted parts. The most efficient method would depend on the situation.

A note in passing is that **:r!** *command* will insert the output of *command* below the current line.

To return to the copying command *:M,N*w *filename*, a few things should be added. First, leaving off the range of lines will cause the entire file to be written to *filename*. (One way this can come in useful is when you've just added a lot of text to a file, and then discover that the file is "read only", so that you cannot save your changes under its original name.) Another point is that when *filename* already exists, vi will warn you and suggest that you use a w! instead of a w if you really want to over-write the existing file. Finally, there is the important variation *:M,N*w >> *filename*, which will attach the specified part to the end of the named file.

SUBSTITUTIONS

Local and global text substitutions may be done using ex commands. The range of lines to be affected by the substitution is specified in the same way as above, viz., *:M,N*. The general form of a substitution is

*:M,N*s/*oldpattern*/*newpattern*/g

The trailing **g** stands for 'global' and will cause *newpattern* to replace every occurrence of *oldpattern* on the affected lines. Leaving the **g** off will cause this replacement to be made for only the first occurrence of *oldpattern* on each affected line. As an example, to convert every 'over' to 'under' from the start of the file to the current line, the command is **:1,.s/over/under/g**.

In the context of substitution, leaving off the *:M,N* will cause the substitution to be made only on the current line. To have the substitution applied to every line in the file, use **:1,$** (or the abbreviation **:%** in some versions of vi). For example, to convert every occurrence of 'the' to 'a' in a file, the command is **:1,$s/the/a/g**. As in every type of 'search and replace' operation in any

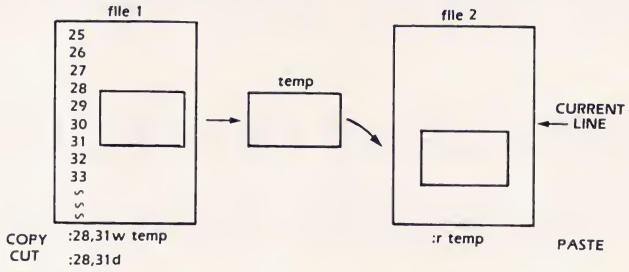


Figure 1

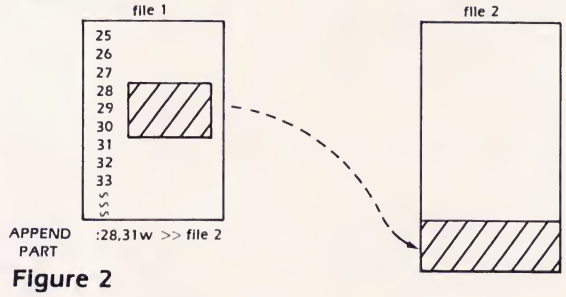


Figure 2

text editor, care must be taken if the string to be replaced may occur as a substring of something else. In the previous example, all occurrences of the the word 'the' would be changed to the word 'a', but also all occurrences of 'them' would be changed to 'am'. To avoid such side effects, include surrounding blank spaces when specifying the text pattern.

OPTIONS

The vi environment includes many 'options' whose settings can be controlled by the user. One type is the 'toggle' or on/off type. To turn a toggle option on, the command is **:set** *optionname* and to turn it off is **:set no***optionname*. Other options always have some value, either a number or a string. To reset the value of such an option, the command is **:set option=***value*. The command **:set all** will give a list of all the available options, and the command **:set** *optionname?* will show the status of the named option.

If options are changed within a vi session, these changes remain in effect only during that session. If the

Generally speaking, the terminal will "beep" if the key is undefined.

'set' lines are placed in the .exrc file in your home directory (without colons), they will take effect next time

you log on and stay in effect until you change your .exrc (or until you temporarily change the options during a vi session).

Some commonly used options are listed in Figure 3, along with the settings they will have if not changed by the user. A brief explanation of each of these follows:

Option	Abbreviation	Default
autoindent	ai	noai
autowrite	aw	noaw
list		nolist
number	nu	nonu
paragraphs	para	para= IPLPPPQPbpP LI
redraw		noredraw
report		report=5
shiftwidth	sw	sw=8
wrapscan	ws	ws
wrapmargin	wm	wm=0

Figure 3

The value of shiftwidth determines how many spaces text is shifted left or right when the < and > operators are used.

If the autoindent option is on, a carriage return in input mode will preserve the current indentation when moving the cursor to the next line. This is useful for entering programs, where indented structure has to be maintained. To back up from the current indent, the command is **CTRL-d**. This will move the cursor back the number of spaces that the shiftwidth option is set at.

The autowrite option was discussed in the previous article. When it is set, the command **:n** *filename* will automatically write your current file before taking you to the named file. Also, if a Shell escape :!*command* is given, the file will be automatically written before *command* is executed.

If the list option is set, tabs in the file will show as '^I' and end-of-lines will show as '$'.

If the number option is set, the line number of each line will be shown.

The paragraphs option is the only string-valued option in these examples. The value of this option is a string of two-character text formatting 'macros'. These define what is interpreted as the start of a paragraph by the cursor-moving commands { and }. In the default value shown, **P** is actually a one-character macro, as indicated by the space before **LI**.

The redraw option causes vi to simulate an intelligent terminal on a dumb terminal, actually redrawing the screen when lines are deleted (instead of leaving a marker), and continually refreshing characters during an insert.

If wrapscan is on, a repeated pattern scan in either direction will "wrap around" the end or start of the file, and continue to look for the pattern. If wrapscan is off, a repeated scan will stop when it hits a file boundary, and a message to that effect will appear.

If wrapmargin is set to a value greater than zero, automatic carriage returns will occur when the text is the specified number of spaces from the right margin. Incomplete words will be transferred to the next line. This is a useful feature for those entering a lot of text, since the user doesn't have to look up to see when to hit RETURN.

The value of report determines the threshold above which the results of operations are reported to the user. For example, with the default setting of 5, deleting 5 lines would cause a message like "5 lines deleted" to appear, while no such message would appear if less than 5 were deleted.

ABBREVIATIONS

First, let's review built-in vi abbreviations and mention some new ones (see Figure 4).

;	repeats last **f** or **F** command (in same direction)
,	repeats last **f** or **F** command (in opposite direction)
~	changes case of current character to its opposite (i.e., lowercase to uppercase and vice versa)
%	when cursor is on any type of bracket, this moves cursor to matching bracket
n	repeats last pattern scan in same direction
N	repeats last pattern scan in opposite direction
u	undoes last change
U	undoes all changes on current line

Figure 4 vi Abbreviations

Previously I didn't classify **u** and **U** as abbreviations, but in effect, these commands can abbreviate what may be a lengthy sequence of actions. For example, if the bottom has just fallen out of your file, by your accidental deletion of the last 300 lines, the 'inverse' to this action is the manual re-entry of all 300 lines. Immediate use of **u** however, will recover all the lines (and bring immediate relief from your throbbing headache). Also useful is the **U** command, which will undo all changes made to the current line (as long as the cursor has not been moved from that line).

Here is another partial safety measure of this type, in the form of nine "numbered buffers". The most recent

deletion of a set of whole lines goes in buffer 1, the previous deletion of this type goes in buffer 2, the one before that in buffer 3 and so on. This material can be recovered by "**1p** or "**1P**, "**2p** or "**2P**, etc. An abbreviation in this regard is a slight variation of . — if you've just 'put' the text from buffer *n*, following this with . will 'put' the text from buffer *n+ 1*.

Let's leave this rather obscure abbreviation and go on to the much more useful user-definable abbreviations available in recent versions of vi. These are **map** and **ab**. The map command allows you to abbreviate virtually any sequence of vi commands with a single key. As a first example, here is a map that will form the simple plural of the word the cursor is on:

:map # eas ^[

The ^[is how the ESC key looks when entered; to actually enter it while in input mode, type CTRL-v followed by the ESC key. The sequence breaks down this way:

e	move the cursor to end of current word
as	append an 's'
^[	terminate text input

One sequence of keys that is used so often it might be worth mapping is :w <RETURN>, to write the current version of the file. (It is actually good practice to do these writes frequently while editing a file – as a preventive measure in case of system crashes.) Admittedly, it is a short sequence, but still, one keystroke is faster than three. Here's how to map :w <RETURN> to the , key:

:map , :w^M

The ^M is how the RETURN key looks when entered; as above, it's entered by first hitting CTRL-v. Something that may be noted is that , already has a meaning in vi. Mapping it to something else will wipe out that other meaning for the duration of the map. Since I find the , to be fast to type, and since I rarely want to use , in its predefined meaning, I am free to use it for another purpose.

In passing, the undefined letters in vi are **g**, **v**, **q**, **K**, **V** and **Z**. There are numerous control characters and special characters that are unused too. And as mentioned, you don't have to restrict yourself to the undefined keys. William Joy's "*Display Editing with*

Continued on Page 64

SofGram
UNIX MEETS TELEX

by Michael J Heffler
and Betsy Longendorfer

In the office of today, on any given day, people mail out orders, send Telex messages, grab messages from a teletype, leave notes on co-workers desks, miss telephone calls and receive slips of paper as reminders, and eventually inspect their in-baskets for inter-office mail. SofGram is a software package that handles all of these communication functions and several others.

SofGram provides a user-friendly interface for communicating via the Telex, TWX and DDD (Telephone) networks. Using SofGram you can create, transmit and receive messages on Telex and TWX, between different computers and between people working on the same computer.

SofGram's contribution to the office is in encouraging and simplifying the use of existing data communication networks and their databases. Too often, the procedures necessary to access the communication network or database - the dialing, redialing, formatting messages to conform to strict network standards, each network requiring a different standard format - is the very thing that keeps people away from these services. SofGram enables the office worker to use the existing tools on his computer that are already familiar, and concentrate on the objective of obtaining or distributing information, and at the same time eliminate the details and drudgery that would otherwise exist.

PROBLEMS

There are three problems in accessing the public networks that SofGram has to solve to be a viable product. These problem areas are:

1. Improving the user interface. Making it easy for people to create, send and receive messages.
2. Provide access to each of the services while hiding the details of logging into each service.
3. Providing an easily maintained product that is not difficult to port to different machines.

SofGram solves all of these problems, the solutions are illustrated below.

THE USER INTERFACE:

Menus and terminal independence

Ease of use is an important, in fact an essential, component of any software pack age. When using SofGram, the end user chooses the action he or she wishes to perform from numbered choices on menus. The user then fills in information on pre-defined forms to provide SofGram with the information needed to send messages (see Figures 2 and 3). The user is no longer faced with a blank

```
ZCZC 0100

NJNJ

.SFSF (Soft)

DEAR JOE

THIS IS A MESSAGE TO TELL YOU ABOUT SOFGRAM
IT TAKES THE DIALING, WAITING, AND FORMATTING
OUT OF TELEX.

YOURS TRULY,

BOB

NNNN
```

Figure 1 Message in the IATA Format

CRT screen or a buzzing Telex terminal, all interactions are through a user-friendly interface where help is always available.

The menus provided with SofGram allow the user to make a single numeric choice to initiate an action. The menu then gives way to a form. The most frequently used forms will contain address related information. SofGram uses the reverse video, on terminals that support this feature, and cursor motion to prompt the user for data. Once address information has been filled out for a particular user it is automatically retrieved by SofGram the next time the information is requested.

The menus and forms provided with SofGram are stored as ASCII text with the system and can be modified or extended by the user. This allows the user interface to be customized to a particular user's specification, as well as making it easy to add new features over time.

SofGram can run as a multi-user system on your existing UNIX computer. Terminal independence is another feature of SofGram, there is no need for special-purpose or dedicated terminals. Any available asynchronous ASCII character terminal can be used. A program is provided with SofGram that builds a SofGram terminal descriptor file from the terminal capability database (termcap file) provided with most UNIX systems. If termcap is not provided with your system, the SofGram manual explains how to build the ten line ASCII SofGram terminal descriptor file.

An extremely easy to use screen editor is integrated into SofGram so that a user can create his message after filling out the address information for the destination of the message. The editor provided with SofGram allows a user to enter data, move the cursor around the screen, insert and delete lines. SofGram can retrieve files from your computer system and send them as messages as well.

SofGram takes messages out of people's hands, out of their in and out baskets, off of their desks and keeps them in the computer for reading and archiving, as needed. SofGram will also access database services offered on the aforementioned networks, such as Western Union's FYI, Compu-Serve and The Source. SofGram can transmit and receive international, inter-U.S., inter-office and intra-office messages.

TELEX

Telex is a world-wide, highly reliable communication network that has been in existence for over 45 years. There are over 200,000 subscribers to Telex in North America alone, and over 1.5 million Telex subscribers worldwide. Telex is one of the only ways to communicate reliably with hardcopy (paper) output and verification that your messages were received, within the United States or overseas. The Telex network is run by regulated corporations, known as International Record Carriers (IRC's), such as Western Union, ITT, and RCA, as well as several smaller companies.

TWX

TWX (also known as Telex II) is a communications network available throughout the continental United States. It is the second generation of Telex technology and somewhat more advanced than is its predecessor. The number of users is in the tens of thousands. It runs at 110 baud, approximately 11 characters per second, and uses the full ASCII character set. The delimiting sequences used within a message are ASCII control sequences as opposed to the character sequences used in TELEX (ZCZC and NNNN).

DDD

DDD (which stands for Direct Distance Dialing) is the telephone network. There are innumerable ways to communicate between computers over the phone network. There are also several database services available that can be accessed through the phone network. When a computer tries to communicate with another computer there must be a protocol set up between the two, as well as a knowledge of what to expect on each end of the communication line.

COMMUNICATIONS INTERFACE: Message scripts, modern equipment

The drawbacks of Telex have, for many years, been the use of special terminals made specifically for Telex use. These special-purpose terminals are noisy, costly and slow (they run at 50 baud, or approximately 6 characters per second, while most dial-up terminals now transmit at 1200 baud, or approximately 120 characters per second). In addition, all messages sent had to be either typed in at the time they were transmitted or fed in through a paper tape reader.

There is a special sequence of actions that must be performed by the person operating the Telex machine for each message sent over Telex. It entails pushing several buttons, waiting for responses, dialing and waiting.

Part of SofGram is a line handling function that determines the network it is accessing and logs into the network without all of the button pushing, etc., that is otherwise handled by a person. It has a script for accessing and logging into each of the networks and database services. These scripts are ASCII text that are provided with the software. They allow for redialing,

```
Main Menu
        1 - Send domestic message
        2 - Send international message
        3 - Access On-line databases
        4 - Examine your in-box
        5 - Examine a file-folder
        6 - Address directory, mass mailing and other features
        7 - Status of outgoing messages
        8 - Help

        Choose a number __                    Message waiting: ____
```

Figure 2 Sofgram Main Menu

```
To:                                   Via:                    __Help

Company: ABC Corp. _____              __ TWX #: 012-345-6789_____
Street: _____                            Answerback: ABC ANYTOWN
City: _____                           __ Telex #: 012345 _____
State: _____ Zip: _____                  Answerback: ABC ANYTOWN
Attention: Mary, Purchasing Dept.     __ Phone #: 201-555-1234 _____
                                      __ Mailgram
Signature:_____                       __ Telegram
                                      __ Computer mail
Send: __ASAP __Overnight __Hold __Periodic

Your order will be shipped immediately via overnight express. Invoice to
follow. Terms net 30 days.
```

Figure 3 Sofgram Message sending form with message

error handling, and validation of network handshakes and other responses. The scripts are described in full in the user manual and can be modified by the user should one of the IRC's change their access protocol.

SofGram can also periodically log into these networks to receive or transmit data without human intervention, if instructed to do so. This allows users to send messages at low rate periods over the various networks, or to periodically send a message if the message can't get through to a destination when it is first transmitted.

Telex messages must conform to a particular format in order to be transmitted. This format is usually the IATA format, or some variation of the IATA format. IATA stands for International Air Transportation Association. The air lines were one of the first major industries to make use of the Telex network to help with flight scheduling in the 1940's and 1950's. The IATA format is highly structured, very strict in terms of its syntax, yet both sufficient and extensible for the purpose it served and that it still serves. An example of a message formatted to the IATA standard is shown in Figure 1. As you can see it is highly structured, thus well suited for interpretation by a computer, and yet very unforgiving of human errors. In addition, each IRC uses a different variation of the IATA standard, and each service offered by each IRC uses a slightly different format.

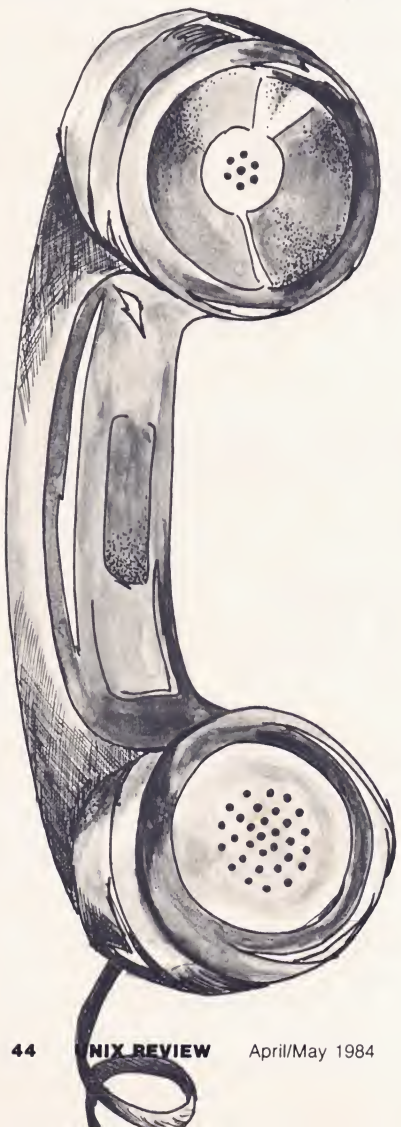
SofGram has scripts containing the message formats required for each of the networks. The formats are different enough to require people accessing different networks to constantly have to read manuals. SofGram's scripts takes care of these variations. Like the SofGram line handling scripts, the message format scripts are ASCII text and user-modifiable, if one of the IRC's should change a standard message format.

There are basically two ways to access the Telex network. You can either buy or rent a Telex machine and have a line (cable) from the Telex network running into your building and attached to the Telex machine. The Telex terminal must be turned on at all times for you to receive messages when they are sent.

The alternate means of connecting to the Telex or TWX networks is by renting a mailbox from an IRC. This mailbox is stored on the IRC's central computer. The mailbox can

be accessed by dialing a number, provided by the IRC, on the telephone network. You can then access the contents of your mailbox or send messages over the phone line connection to the IRC. In this way a Telex machine is not necessary. Message formats, as always, are strictly enforced.

SofGram can connect to the Telex/TWX network in either way. Using commercially available modems any computer can be connected directly to an existing Telex line. Connecting to the Telex line directly limits transmission to 50 baud. By renting a mailbox from an IRC, you can connect a commercially popular modem to your computer which SofGram can transmit at 1200 baud. In either case, SofGram handles the receiving, transmission and formatting of messages, and accessing the different network services. Renting a mailbox is the fastest, least expensive and most convenient choice.



Another feature of the Telex network is that when you send a message through a mailbox or store and forward service, you get an immediate acknowledgement that the IRC received your message. At some unspecified time after the message was sent, the IRC will send you an acknowledgement that the message was received at the destination, or a message that the IRC could not connect to your destination. If you don't leave your Telex terminal on you will not receive this acknowledgement. SofGram will catch these asynchronous positive and negative acknowledgements and maintain them in the user's in-box and in its chronology file.

OPERATING SYSTEM INTERFACE: Databases and Background mode

SofGram is written in the C programming language which is the language of choice on UNIX systems. Programs written in C, with porting taken into account in their design, are generally easy to port to new systems that support C. SofGram creates its own database thus minimizing the use of operating system specific features that vary on different operating systems and different computers. In addition, the code is modularly written so that the operating specific system calls have been localized.

SofGram maintains a database of people who have been sent messages with their addresses, the networks they use and other information relevant to communications. The database maintains its own file system and uses a virtual memory package that SofTest has available in-house. The virtual memory package insures the most recently accessed information remains in primary memory for as long as possible so it can be quickly re-accessed. This cuts down on disk reads and writes and speeds user response time.

The user is no longer faced with a blank CRT screen or buzzing Telex terminal...

The database is a combination of system files that contain the line and format scripts, user-related data, etc., and user files that are maintained by each user. One of the database files maintained by SofGram uses a key supplied by the end user when he or she first sends a message to a particular destination. This key is an index into the address file where all the relevant information for sending a message to a user is kept. In addition, a mass mailing file is maintained for mailings to groups of people. The mass mailing file contains lists of keys into the address file. SofGram maintains a chronological record of all messages sent and received. This chronological file can be archived and maintained for future reference. Many companies require this record of all messages for legal and corporate accounting reasons.

Every message received by SofGram is stored in the "in-box" of the recipient. Upon logging into SofGram you are informed of the number of messages that have been received. When viewing your in-box you are presented with a summary

Continued on Page 112

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MISSING CHILDREN AND THE UNIX SYSTEM: A UNIQUE APPLICATION

by Robert R. Thibodeau

Fifteen missing children were found, more than $110,000 was raised, and 6,000 phone calls from around the country were handled in 3 days.

Those results are a summary of the nation's reaction to "Adam," a docu-drama which was shown in prime time by NBC on October 10, 1983. The film described how John and Reve Walsh of Hollywood, Florida, coped with the kidnapping and murder of their 6-year-old son, Adam, in July, 1981.

The program attracted an estimated national audience of more than 50 million persons. They pledged contributions to the Adam Walsh Child Resource Center, Fort Lauderdale, Florida, through a national and local phone link to Gould Inc., Computer Systems Division. The company donated the use of computer resources valued at more than $100,000 to the fund-raising effort.

UNIX DATA BASE

Involved in the record-keeping for this massive effort and its follow-up compaign is the Mistress relational data base management system running under the Universal Timesharing Executive (UTX™), the authorized Gould implementation of the UNIX operating system developed by Bell Laboratories. The hardware involved is a Gould CONCEPT 32/27 super minicomputer.

Ralph M. Parilla, Director, Compensation and Employee Relations for Gould CSD, said, "When the Adam Walsh Center was founded, it was a local thing. We at Gould felt that we should be involved." Parilla serves on the Center's Board of Directors.

He said, "The suggestion was made to C. S. James, our President, that we contribute resources as well as cash to the Adam Walsh Child Resource Center, and especially to the national phone-in pledge effort. As I recall, it took about three seconds for him to say yes." Gould is one of the pioneer companies in the rapidly expanding high technology area of southeast Florida, and is highly active in community affairs.

Left to right—John Walsh, father of Adam. Ralph Parilla, Director, Compensation and Employee Relations, Gould Inc., CSD.

PREPARATION AT GOULD

In preparation for the NBC broadcast, Gould furnished the Walsh Center volunteers who would be manning the call-in phones with 12 toll-free 800 numbers and 40 local Florida numbers.

In addition, Gould provided a large open area that could be used for volunteers manning

the phones. The Southern Bell Telephone Company donated the services of eight technicians to help with the installation of the phone room.

As with almost all telethons, the volunteer phone workers took pledges, recording them on 3x5 cards for later follow-up. Parilla said, "Had we a little more time to prepare, we could have equipped each phone operator with a terminal instead of a pencil and stack of cards."

The phones were busy for 72 hours after the broadcast and logged more than 6,000 calls. Most of those calls were pledges to the Adam Walsh Center. Other calls asked for more information. Leads about missing children were also received and directed to the Child Find Center in New York.

It was these comments that led to finding 15 missing children. Parilla said, "At the end of the show, the photos of 54 missing children were displayed on the screen, and viewers were asked to call Child Find on a special 800 number if they had knowledge of any of the children. Some of these calls came to the telethon phone center at Gould. As a direct result of these leads, 15 children were located."

Volunteer answering phone during telethon.

HANDLING THE DATA

Because of the enormous response to the broadcast, the Adam Walsh Center realized that manual methods of following up on all the pledges and mail would not be timely or efficient. Michael Cox, Gould's director of Marketing Communications, was called in to help. Cox suggested that a program employed by his Marketing Communications department be modified and used. The Mistress RDBMS was used. Cox said, "Mistress is a relational data base that is very easy to use. To interact with a program developer under Mistress, the person using the program does not have to know a thing about computers. They simply type information in response to prompts that appear on the screen."

It was a relatively simple matter to adapt a powerful program Cox's department uses at trade shows to keep track of the people who visit a Gould booth. In that program, as much information as possible is gathered about each visitor. The value of this kind of program for marketing sales personnel at Gould is obvious. They are presented with a list of interested prospects.

The RDBMS has two key features which seemed to make it ideal for the Walsh application. First, it is almost "bomb-proof," meaning that with a minimum of training almost anyone can function efficiently at a terminal and not damage permanent files no matter what they type in. This feature was particularly important to the Walsh effort because the group's volunteers were largely unfamiliar with computers. Second, the data base itself can be manipulated in many ways, including ways developed long after the data base itself had been created.

With the adaption of the data base program from the original trade show data system, volunteers were brought in to convert the card files to computer files. Parilla said, "The ease of use of the data base program was the key factor. Since each volunteer could only be expected to work one session of three or four hours, it would have been foolish to use a program that took an hour to learn. The system required learning only 10 commands, which took about 15 minutes, even for the retiree volunteer who had never before seen a computer terminal."

The system accepts input from four terminals simultaneously. The volunteers simply respond to key word prompts on the screen and type complete address data, pledge amount, phone number and comments from the cards that were completed at the time of the broadcast.

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HOW IT WORKS

The overall Adam Walsh Center RDBMS is named CHILD. In the CHILD data base are a number of tables, or separate data files. One of these is named CALLIN, which is a master file of all persons who responded. The next level "down" is a set of files named CALLIN1, CALLIN2, and so on, which are temporary files that hold the input of the volunteers. The volunteer can access those numbered CALLIN files, but not the main file. Their input is screened and refined, then put into the table named CALLIN. The master file is made up of more than 3,000 names with about 200 characters per record.

Similarily, a set of files called DONOR1, DONOR2, etc., holds pertinent information on persons who have fulfilled their pledges or who mailed contributions directly to a Post Office Box number that was provided during the telecast. As with the CALLIN files, the volunteers only have access to temporary files named DONOR1, DONOR2, etc. while the Adam Walsh Center staff has access to the main program, DONOR.

The phones were busy for 72 hours after the broadcast and logged more than 6,000 calls.

Built into the entire system are a set of shell scripts (macros) that perform various manipulations on the data to give the Walsh Center directors an overview of pledges fulfilled and outstanding, persons who simply called for more information, and various other compilations of the data.

HOW THE DATA IS USED

The data in this base was used in a number of ways. The first was to acknowledge donations by generating mailing labels for "thank you" letters. The second use was to verify pledges and follow up on collection of those pledges.

The internal function capability of UTX to sort and print in a variety of formats made writing the mailing label programs relatively simple. Additionally, the UTX capability for macro generation of programs made modification easy. On many data base systems, putting together a simple macro to manipulate the base in new ways involves learning an entirely new programming language. A good example of how easy it is with the UTX/Mistress program was a request from the Walsh Center to give them a listing of donors who had contributed more than $100, along with pertinent address information. It was a simple matter to generate the macro to do that.

Some macros, such as the one to show the tables in the file CALLIN, are only one line of code: "show db". Other macros, such as the one to print mailing labels, are very complex. Yet even there, the power of the UTX operating system is apparent. One part of the mailing label table asks that the program "sort by ZIP." The Mistress data base software knows that UTX contains powerful sort commands and invokes those commands in a manner that is completely transparent to the user when it sees the command "sort by ZIP." Using the data base in new ways by creating new macro, or shell script, commands is as fast and easy as the entry process.

Still another use for the data base is in analysis of respondents and their locations. Parilla said, "The Adam Walsh Center is becoming a national organization, growing from its roots here in Florida. By analyzing the data and the sources of interest as indicated by pledges, mail contributions, and requests for information, we received guidance as to what areas would be receptive to working with our organization."

The ease of use of the data base program was the key factor.

Parilla pointed out that analysis of the pledge and mail data indicated that Houston-area response was among the heaviest in the country. As a result, Houston is being considered for early establishment of a regional Adam Walsh Center. Without the computer-assisted analysis, the need for a center in the Texas metropolis may not have been recognized, Parilla said.

Parilla continued, "With this solid base of known and interested persons, we can recruit local residents to help in the expansion of the program, as well as include them in future fund-raising efforts."

IMPORTANCE TO FUTURE

The importance of this fund-raising effort to the Adam Walsh Center is underscored by Parilla, who said, "The Center initially was funded in part by the money the Walshes received from the makers of the docu-drama. They turned over the entire amount to the Center. The donations received as a result of the broadcast will allows the Center to continue its vital work."

Among the projects in which the Adam Walsh Center has been involved is the Federal Missing Children Act, which mandates police agencies to list missing children on

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Volunteer answering phone during telethon.

the FBI computer network. Other projects include fingerprinting of children for identification purposes, and educating children about the potential dangers of strangers through the schools in the Safety with Strangers program. Still another Adam Walsh Center project is a court monitoring system using trained court observers in cases of child molestation and other child abuse.

Dennis Abbott, Executive Director of the Adam Walsh Center, said, "The Center is extremely grateful to Gould for providing us with the technology and expertise to collect and manipulate this data. Without their assistance, we would never have been able to handle this great mass of information in any efficient way. As a direct result of Gould's help we were able to make prompt contact with the thousands of people all over the country who responded to our campaign."

The data base probably could have been done in a number of ways, using other operating systems and languages. But there is no doubt that using UTX and the program developed under the "Mistress" program made it as simple, foolproof, and efficient as possible.

Putting it most simply, UNIX-based operating systems and packages on the system are intended to be convenient for the user. When one combines that convenience with third-party software which takes advantage of the ease of use and the internal capabilities of UNIX-based operating systems, you have a very flexible, powerful, friendly combination, as in this application for the Adam Walsh Center.

ABOUT THE AUTHOR

Robert R. Thibodeau is the Senior Marketing Communications specialist for Gould, Inc. He also participated as a volunteer in the telethon and is the contact person for all volunteers. ■

PART TWO: LIVING WITH COHERENT

by Les Hancock

I've been living with COHERENT for the last six months. I used it to write the first half of this review, and I'm using it now to apologize for missing the last issue with this half. Truth is, I felt I hadn't leaned on the product hard enough. I couldn't seem to make it misbehave. Waiting two more months gave me time to rattle the tiger's cage, but it wasn't much fun — the system never lost its temper. I'm afraid this review makes pretty dull reading. My original impressions were confirmed: COHERENT's a solid product, well documented and nicely matched to the IBM PC. A few tools and texts are missing, but they're promised for the near future. Otherwise COHERENT did everything I asked, with no fuss and no surprises.

Readers of Part One (**UNIX REVIEW**, December/January 1983) will recall that I wound up running COHERENT multiuser on a PC/XT with 256K RAM and a ten-megabyte hard disk. Good documentation made it easy to configure. There was a little trouble about mounting and unmounting file systems, but I got around that by following a strict shutdown discipline. A smart modem from U.S. Robotics turned the PC's serial port into a dial-up line, and the system ran fairly well with two users. In fact it ran perfectly — except when it didn't run at all. If I began to fit pipes, or tried to shell a long script with pattern-matching utilities like **awk** or **sed** or **grep**, COHERENT would abort the task with the message *out of memory in exec*. For example, this little routine, meant to find entries in a catalog of phonograph records, always blew up:

```
grep "$1" recordings ¦ sort ¦ uniq ¦
awk -F\; '{printf"%s\n\t%s\n", $1, $2"}'
```

Even I could diagnose the symptoms. COHERENT 2.3 keeps 93K bytes of core to itself, and a command sequence like **grep¦sort¦uniq¦awk** puts heavy demands on memory. 256K just wasn't enough.

Everybody says memory's cheap, and for once everybody's right: $256 brought me up to 512K, and that put an end to the problem. Bill Lederer, General Manager at Mark Williams, says he routinely runs three users in that much memory. I certainly had no trouble running two. You *can* fit two users into 256K, if they run small jobs that don't load the system — and you can raise a family on a teacher's salary, too, if you like a lot of roughage in your diet. For serious work go to 512K.

Apparently COHERENT'S m4 is the real thing, or at least a proper subset.

Administering COHERENT hasn't given me any trouble. Because the PC's processor doesn't feature memory protection, and the only backup medium available is the single minifloppy, I was a little apprehensive about being solo operator and system administrator. But the **dump** program made it easy to do incremental saves, and so far I've always been able to recover from crashes with **icheck -s** and **dcheck -s**. At

PRODUCT REVIEW

Product: COHERENT for the IBM PC, version 2.3+ ($500)
Manufacturer: Mark Williams Company
1430 West Wrightwood Avenue
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one point the IBM's Seagate disk developed a couple of trouble spots. COHERENT's **bad** command handily put them on a bad-block list; files are written around them and I don't have to give the matter any more thought.

COMPATIBILITY

COHERENT is supposed to be compatible with the Seventh Edition of UNIX. Of course Mark Williams wants to make it easy to port UNIX applications to COHERENT and vice-versa, so a lot of work has gone into matching the UNIX system calls. At the command level the issue's not as urgent, and in a few cases COHERENT's command syntax or functionality doesn't quite follow the model. For instance, COHERENT's version of **ed** won't allow you to give the command **50,60 w file1**, with blanks separating the **50,60** range from the **w**. Nor can you enter **50, 60w file1**. You have to type **50,60w file1**. This isn't accidental, though. It's meant to let you stack up **ed** commands, so that a line like **50,60wq file1** can be used to write lines 50 through 60 to **file1**, then quit. The only way to parse that was to forbid constructions like **50,60 w file1**.

The idea is to let you step through your program and debug it in terms of the "source code", not load modules or core dumps.

Well — yes and no. There's a philosophical problem here. Certainly there's room for improvement in some UNIX tools, and I hate sacred cows as much as any other child of the sixties. But I confess to being a little shocked at this free-and-easy attitude towards **ed**. What's the old catch phrase? "You're either on the bus or off the bus." I don't see why Mark Williams was in such a hurry to get off at this stop.

Happily the point's almost academic. COHERENT seldom strays from the true path — **ed** is the exception, not the rule. And where there's a variation there's generally a reason for it.

Perhaps we can build a hierarchy here. Compatibility is most important at the system-call level, where a hundred-percent match should make it possible to move C-based applications from UNIX to COHERENT merely by recompiling them. Compatibility is least important at the interactive command level, where the user can adjust to minor differences as they occur. (E.g., by typing **50,60w** instead of **50, 60 w**.) Between these extremes live programs like **lex**, **awk**, **sed**, **m4** and the shell interpreter — programming tools that aren't often run in the command mode. The syntax and behavior of these programs should match the UNIX standard as closely as possible, but small differences aren't disastrous, since they're easy to find and accomodate. After all, some such adjustments usually have to be made when you go from one edition of UNIX to another, or from machine *a* to the same edition running on machine *b*.

I don't have access to a running instance of UNIX 7, so I wasn't able to test COHERENT's UNIX compatibility as thoroughly as I'd like. In particular I couldn't try the system calls head-to-head, though a close reading of UNIX and COHERENT manuals shows that they *should* be the same. To try the compliance of the programming tools I ran examples from two new books on UNIX, *The UNIX System* by S.R. Bourne (of the Bourne shell) and *The UNIX Programming Environment* by Brian Kernighan and Rob Pike. (Let me say parenthetically that I find Kernighan and Pike's book the best guide to date for UNIX programmers. One complaint: Augustus de Morgan's flea verse, quoted on page 18, is a pet hate of mine. I prefer the original doggerel by Jonathan Swift.)

Bourne illustrates his chapter on "data manipulation tools" with a program that exercises the UNIX shell, **lex**, the C compiler, and the **makefile** utility; Kernighan and Pike's chapter on filters calls on **grep**, **sed** and **awk**, and their "Program Development" section includes excellent illustrations of **yacc**. In general COHERENT ran these examples as printed. Differences were very minor — COHERENT's version of **lex** doesn't define **yylineno**, and its **awk** apparently doesn't support functions like **cos** and **sin**, and you can't **double** a **yacc** stack using K&P's notation — things like that. Such small differences seem trivial to me; at least I had no trouble making the changes necessary to run the examples.

It was easy to test the **m4** macro preprocessor, though neither Bourne nor K&P deal with it. **rubik**, a rubik's-cube game that comes with COHERENT, is a tiny *tour de force* written entirely in **m4** macros. I shipped it over the phone lines to a UNIX V installation and ran it there without any trouble at all. Apparently COHERENT's **m4** is the real thing, or at least a proper subset.

COHERENT's shell seems identical to the shell S.R. Bourne wrote for UNIX 7, which means there's no true comment syntax. You have to use the : operator followed

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Command **eval**

NAME
eval – evaluate arguments

USAGE
eval [*token* ...]

DESCRIPTION
The shell **sh** normally evaluates each token of an input line before executing it. During evaluation, the shell performs parameter, command, and file name pattern substitution, as described in **sh**. The shell does *not* interpret special characters after performing substitution.

eval is useful when an additional level of evaluation is required. **eval** evaluates its arguments and treats the result as shell input. For example,

```
A='>file'
echo a b c $A
```

simply prints the output

```
a b c >file
```

because '>' has no special meaning after substitution, but

```
A='>file'
eval echo a b c $A
```

redirects the output

```
a b c
```

to **file**. Similarly,

```
A='$B'
B='string'
echo $A
eval echo $A
```

prints

```
$B
string
```

Listing 2

by the comment string. So you can't put comments just anywhere in a shell script, which is bothersome. Here's a case where I wouldn't have minded a little creative cheating on compatibility; the comment operator # would be welcome.

COHERENT adds a few utilities that stock UNIX doesn't have. Some of these are PC-oriented; others are popular extensions like the **cpdir** command that copies a whole directory hierarchy. There's no room to discuss these additions here; in my opinion they don't make COHERENT top-heavy or mar its UNIX-like character.

DOCUMENTATION

The following documents were delivered with COHERENT 2.3:

BC Calculator Language: A Tutorial (32 pp)
COHERENT Administrator's Guide (73 pp, index)
COHERENT Assembler Reference Manual (35 pp)
COHERENT Command Manual (192 pp, index)
COHERENT on the IBM PC (31 pp)
COHERENT System Manual (176 pp, index)
ed Interactive Editor Tutorial (69 pp, index)
Introduction to the COHERENT System (111 pp, index)
lex — Lexical Generator: a Tutorial (34 pp)
m4 Macro Processor User's Manual (14 pp)
MWC86 User's Manual (60 pp, index)
nroff Text Processor Tutorial (64 pp)
sh Shell Command Language Tutorial (32 pp, index)

These are very good manuals, nicely tuned to the level of the product. The reference material never falls below the UNIX standard and often rises above it. The tutorials and introductory material seem to be written for intelligent readers who, probably without prior experience, find themselves faced with the job of setting up and maintaining a multiuser operating system. Even if you're new to computers, you should have little trouble going from *COHERENT on the IBM PC* to the *Introduction to the COHERENT System* and thence to the *Command Manual* and the *Administrator's Guide*, and so on to whatever other text suits your special needs.

I like the tone of the manuals. It's crisp but not too dry, friendly but not impertinent, and only occasionally (as in the **nroff** tutorial) a little cute. I got the impression that the writers knew more words than they used.

In literary matters it's better to show than tell, so take a look at Listing 2, a sample page from the *Introduction to the COHERENT System*. (In Part One of this review another sample, headed *BOOTING COHERENT*, was accidentally run into my text. Sorry: it should've been labeled "Listing 1." That example and the one given here are copyright Mark Williams Company.)

Good documentation, but not quite complete. There are tutorials for **nroff**, **lex** and **sh**, but no reference manuals, and there's no documentation at all for **awk** and **yacc**. When I put this to Bill Lederer he said that **awk** and **yacc** will be documented for COHERENT 2.4, and that there are plans for an **nroff** reference and a more thorough **sh** tutorial. The feeling that something's missing is always annoying, of course, but I can see how Mark Williams' priorities run: mighty few COHERENT customers will be using **yacc**, and those who do can learn about it elsewhere — in *The UNIX Programming Environment*, for instance.

The manuals as I received them are well organized and legible, but not elegant. They're offset from **nroff** typescript on three-hole-punched 8.5 x 11" stock. Typeset manuals in standard IBM format are now in production and should be available soon. Listing 2 is a preview of the new format.

AMONG THE MISSING

Three tools I was hoping to find in COHERENT weren't there: a communications utility, a screen editor, and an MS-DOS emulator.

COHERENT handles incoming dial-ups beautifully, but there's no way for users to dial out to another system. In UNIX 7, **uucp** transfers data back and forth between computers. Mark Williams has a version of **uucp** under development, but it won't be ready in time for COHERENT 2.4, which is in beta test at this writing. When it does become available, it will move data between COHERENT systems or between COHERENT and UNIX.

UNIX 7 doesn't offer a screen editor, but most installations put up Berkeley's **vi** or MIT's **emacs** or something home-brewed. Mark Williams has two screen editors under test, one imitating **emacs** and one vaguely like **vi**; they'll probably be bundled with 2.4. Personally I'm happy with **ed**, which I use in preference to **vi** on UNIX.

As I explained in the first half of this article, COHERENT partitions the XT's hard disk into three file systems. Unfortunately it doesn't provide for an MS-DOS partition, so the only way to run MS-DOS is via the single floppy drive. That serves most needs well enough, especially since COHERENT includes a nice facility for reading from and writing to MS-DOS floppies. Still, it's irksome to know that you can't run an MS-DOS application without shutting down COHERENT. What's wanted is an emulator, and here again Mark Williams has one in the works. No firm release date has been set, though, and the initial release of 2.4 won't include it. Expect it later this year.

UNIX and systems based on UNIX are notoriously short on applications software, and COHERENT's no exception. However, I'm told that quite a few packages are being developed or in test. Among them are the big three that everybody wants: a word processor, a spreadsheet and a data base manager.

TEXT HANDLING

UNIX has always been used to create and format documents — in fact its inventors got funding by describing early UNIX as a text-processing system. The cornerstones supporting its text-handling features are **nroff** and **troff**, now somewhat overgrown by spelling checkers, equation shapers, table makers, memo generators, style rectifiers and sexism detectors. COHERENT offers only **nroff**, with the **-ms** macro package.

Mark Williams' **nroff** produces the kind of output needed to drive a letter-quality printer, like the Diablo or Qume. But the PC comes with a dot-matrix printer (typically an Epson MX80) whose control sequences are different. To send **nroff**'d copy to that printer you have to filter it through the COHERENT utility called **epson**. The command line is simple: **nroff** *text* | **epson**. However, I have an IBM "graphics" printer which can't handle the italic font generated by **epson**. I wrote a quick filter in C to replace the italics with underlining, and told Mark Williams about the problem. If you have the graphics printer and want to use it with **nroff**, maybe you should ask Mark Williams how things stand before ordering COHERENT. The fix is trivial, and I suppose they'll add it as an option to **epson** or as a separate utility.

I've used **nroff** heavily over the trial period. It works fine, but I do have a nit to pick. Compare the two examples in Listing 3. The first comes from COHERENT's **nroff**, the second from a UNIX installation. Input was identical. The blanks have been turned into periods.

```
But.it.will.be.argued.by..some..that..Francis
Bacon...had...not...the..time..to..write..the
Shakespeare.Plays;.that.he.was.too.busy..with
politics,.philosophy,.law.and.statesmanship.

But.it..will.be..argued.by.some..that.Francis
Bacon...had..not..the...time..to...write..the
Shakespeare.Plays;.that..he.was.too.busy.with
politics,.philosophy,.law.and.statesmanship.
```

LISTING 3

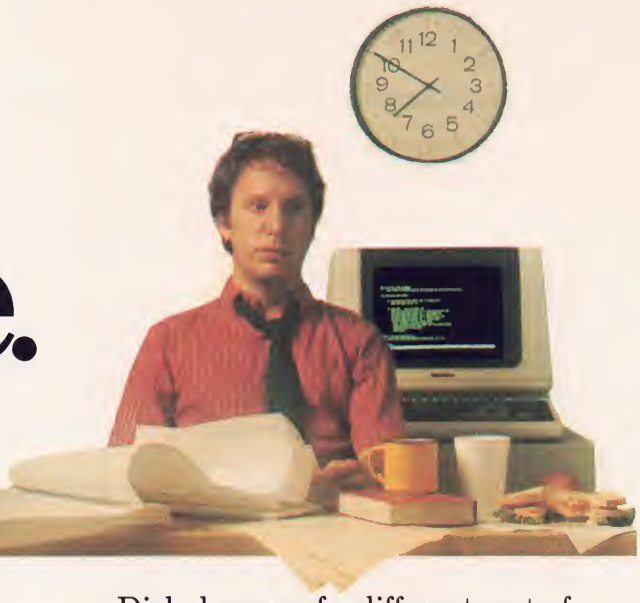
To justify the lines it's necessary to put more than a single blank between some words. UNIX follows the simple and satisfying pattern recommended by Kernighan and P.J. Plauger in their book *Software Tools*: in the first line put the extra blanks between words starting from the right margin, then in the next line start from the left margin, and keep on alternating that way. On the other hand, COHERENT's **nroff** uses no pattern that I can find. The pleonastic blanks seem to be put in at random, and the result isn't pleasing to my eye.

COHERENT's spelling checker was left out of the PC version to save disk space. (The same is true for **man**.) According to the release notes **spell** (and **man**) will eventually be made available "as options."

THE C COMPILER

Mark Williams' 8086/88 C compiler is sold separately as MWC86. In MS-DOS format it costs $500 — but it's bundled with COHERENT. It's certainly one of the best C compilers available for the PC, and deserves a product review to itself. Briefly, it has the heft and loft of a professional product — I mean one designed to earn a living through hard and continual use. It offers all the features defined in Appendix A of Kernighan and Ritchie's standard text, *The C*

See Software.



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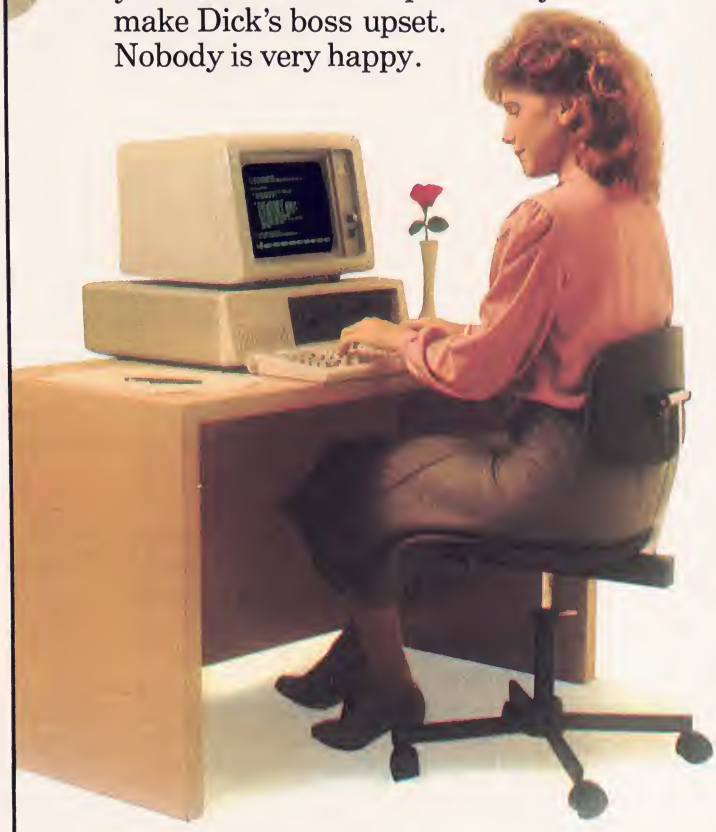

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Programming Language, with a few extensions. (It supports the popular data-type extensions **void** and **enum**, as well as direct structure assignment. Static data may be declared **readonly**. Names have up to 39 significant characters. Bit fields are implemented in types shorter than **int**.)

MWC86 can generate code for both the small and large 8086 memory models. The small model is used by default, since it generates a quicker and smaller program. Under its rules your program has 64K bytes for executable code and another 64K bytes for data. The large model, invoked by a **cc** switch, gives you access to the full address space of the 8086, with 32-bit pointers. The runtime library works with both models and is very complete, even including such esoterica as **setjmp** and **longjmp**. A few **libc** routines from UNIX 7 are missing (but will you really miss the log gamma function?); however, that loss is more than balanced by new routines for pattern matching, Shell sorting and such. (Strangely, **ecvt** is present but not accounted for — it works but doesn't appear in the manuals.)

I was sorry to see that COHERENT doesn't offer a version of the syntax checker **lint**. However, the compiler itself prints a number of **lint**-ish warning messages, of which my favorite is *construction not in Kernighan and Ritchie*. Sadder still, the execution profiler **prof**, available for other machines under COHERENT, hasn't been adapted to the PC; it's promised for a future release.

Also coming soon is a symbolic debugger along the lines of UNIX's **sdb**. The idea is to let you step through your program and debug it in terms of the *source code*, not load modules or core dumps. Those who've had a chance to try a source-code debugger know how useful even a poor one can be — it cuts development time by a **big** factor. And the long prerelease description Mark Williams sent me makes their debugger sound very good indeed. It frames information in four windows — source code, data, standard output and breakpoint log. If this product works as promised, COHERENT-based programmers will be able to crank out finished software in a fraction of the time it takes to write it now. (Again, I can't name a date. Before it's made available for COHERENT, the debugger will be shipped with the MS-DOS stand-alone version of MWC86.)

The *MWC86 User's Manual* is excellent, but it's devoted strictly to the compiler and the C library *per se*. A knowledge of the C language is taken for granted.

BENCHMARKS

Benchmarks, especially the quickies given here, should be taken with a grain of salt. But they're useful in a gross way, and these show that COHERENT and its C compiler are no slowpokes.

A simple benchmark I use to compare varieties of UNIX simply calls **getpid( )** ten thousand times. In a review of XENIX running on Sritek's 8MHz 68000 (**UNIX REVIEW**, October/November 1983), I timed the 68000 at 4.3 cpu seconds and a PDP-11/70 with UNIX V at 2.5 sec. The same job takes 12.9 cpu seconds to run under COHERENT. As for the C compiler, I used the familiar Sieve-of-Eratosthenes program (*BYTE* for January 1983) to benchmark MWC86 against the XENIX 68000 C, the 11/70 UNIX C, and Marc deSmet's C88 (run under MS-DOS). Here are the results:

	exec time	compile time
MWC86	11.5	17.5
MCW86 with **register**	6.5	17.5
C88	11.5	---
68000 XENIX	5.9	8.3
11/70 UNIX	3.2	5.2

"Compile time" is actually compilation + assembly + link time. That measurement's omitted for C88 because I had to compile it from the PC's floppy disk, so the times aren't comparable. Notice how the use of register variables sped MWC86 through the loops. C88's time was the same with or without **registers**.

I haven't had a chance to put other PC-based versions of UNIX or C to this test, but the numbers bear

out my feeling about COHERENT's speed. Despite the PC's slow disk, my two-user COHERENT often turns jobs around as fast as the PDP-11/70 I use in the workaday world.

All times shown above are **user + sys**, except the figure for C88, which was clocked from start of execution to completion.

WHY BUY COHERENT?

There are two ways to approach the job of putting UNIX on the PC. The first is to do a straight port: buy the right to use Western Electric source code, recompile it into 8086 instructions and make whatever enhancements or deletions seem necessary to fit UNIX into the new environment. COHERENT's competitors VENIX and XENIX have followed that line of action. The other is to rewrite UNIX from first principles. That's the direction taken by COHERENT itself. There are advantages and disadvantages on both sides.

The first approach has the big advantage of continuity with UNIX. Not only are system calls compatible, the tools and commands have the syntax of the UNIX being ported. And the internals are the same. Maybe you've paid dearly to build a staff of system people who literally know UNIX inside out, and maybe they've written lots of software that makes assumptions about file formats and magic numbers. Or maybe you've decided to write yet another book about UNIX, and want a system that's guaranteed to behave exactly the way UNIX behaves, for better or for worse, so you can check your facts and run your examples. Or maybe you're going to sell hands-on UNIX training. In cases like these you'll want to stay as close to the original code as possible.

But most individual users don't have to worry about that kind of thing. If you aren't responsible for a big installation with lots of UNIX-trained personnel, and if you haven't invested a great deal of money in UNIX-based applications that must be used as is, you may be better off with a UNIX look-alike.

COHERENT has all the advantages associated with good look-alikes. To begin with, it really was written from first principles. It has a quality of rightness that's hard to quantify, but which many UNIX connoisseurs will savor. UNIX has put on weight over the years; it's no longer the slender, agile, tight operating system I remember from the seventies. COHERENT still has much of that small-system feel, in the good sense of *multum in parvo* — you get a lot from a little. I don't like a system that sits heavy. That's my bias, and I admit it pleased me to hear Bill Lederer say the same.

Another point in favor of COHERENT is the fact that the code belongs to Mark Williams. If you have problems, call Chicago. They know how their product works, and they're willing to help end users. (Whether they're really set up for it I can't say. A hotline number would be nice.) If you're an OEM looking to sell a package based on COHERENT, licensing arrangements are likely to be more flexible than they would be if you were sub-sublicensing Western's code.

There's one final point to consider before you buy. In January IBM announced PC/IX, a UNIX System III port from Interactive Systems. PC/IX will be sold, single-user, for $900, and I expect it to become COHERENT's most important rival in the PC/UNIX market. At the moment PC/IX is an unknown, at least to me: I don't know how well it runs or how much IBM's support will be worth. The price is pretty high for a single-user system.

As you've probably guessed by now, I like COHERENT. It works as advertised, it's nicely documented, and I believe Mark Williams will support it properly. (True, many well-intentioned software houses have fallen down on support because their money ran out. Mark Williams Company is luckier than most in this regard: it belongs to the 4A-rated Embossograph family of companies, and should have the resources for long-term product development and support.) COHERENT's not flawless, but the flaws I found weren't deep ones. It's a likeable look-alike, and gives good value at a good price. If you *must* have a purebred instance of UNIX, look elsewhere. But if you can settle for a look-alike that's solid, and that captures the original UNIX spirit, have a look at COHERENT. ■

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GENIX is UNIX—and more. It stands to reason that our own in-house port of the UNIX operating system would capitalize on the unique features of the NS16000. And that's exactly what GENIX does.

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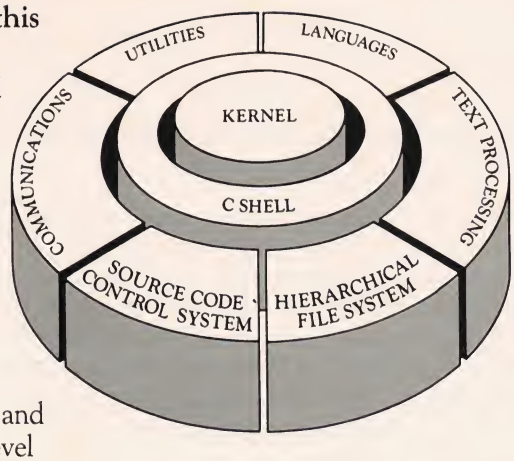
The custom match of GENIX with the NS16000 architecture is an obvious benefit. Besides providing all the proven benefits of the Berkeley 4.1 bsd version of UNIX--such as multiprogramming, a hierarchical file structure, and over 200 powerful utilities--GENIX adds value. GENIX supports true Demand Paged Vitual Memory and floating point operation. High level languages are also supported by an optimized C compiler and an optional, powerful Pascal compiler.

Of course, support for the full range of NS16000 advanced components is provided: CPUs, Memory Management Unit, Floating Point Unit, Interrupt Control Unit, and Timing Control Unit. These components, combined with GENIX, provide an unbeatable integrated microcomputer solution. GENIX runs on the SYS16 Development System and is also available now in source code, under license, for NS16000-based systems.

Expect more from the future.

The long-term success of a system depends upon its ability to expand. The clear migration path of fully implemented 32-bit architecture throughout the NS16000 microprocessor family means innovation never equals obsolescence. The NS16000 family brings the benefits of 32-bit architecture to 8, 16 and 32-bit systems to protect and optimize your system and software investments. Future 32-bit CPUs will also be compatible.

And there's more. Our UNIX expertise is already being applied to the implementation of Berkeley 4.2 for added technical and networking capabilities. The generic port of UNIX System V is also underway.



NS16000

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For more complete details request the *GENIX Summary.*

GENIX
Summary

National Semiconductor
MICROCOMPUTER SYSTEMS DIVISION

vi *Continued from Page 39*

Vi" contains a glossary of the meaning or non-meaning of all the keys. If you don't have this handy, and are in doubt about a key, just try it. Generally speaking, the terminal will 'beep' if the key is undefined. The effect sometimes depends on what key was previously typed, but you can make sure by hitting ESC first and waiting for a possible 'beep' from that, then trying the key in question. It might be useful to have "report=1" set during this exercise.

As another example, recall from the previous article that in some versions of UNIX !}**fmt**<RETURN> will reformat the current paragraph (i.e., from the current line up to the next blank line, the next recognized macro, or the end of file). It could be mapped this way:

:map ^P!}fmt^M

If you're going to change an option often, it might be worth mapping that. For example,

:map = :set list ^M
:map + :set nolist^M

Here's a more complicated example. The way to tell the text formatting program troff to italicize a word, say 'thing', is: **\fIthing\fR**. If you had to go through a file, arranging for certain words to be italicized, a convenient map would be something like:

:map m i\fI^[Ea\fR^[

To use this, place the cursor at the start of the word and type **m**.

Say though, that you want to put in the italicizing instructions as you go along entering text. There is a variation of **map** that allows you to abbreviate in input mode. This variation is **map!**. For example,

:map! ^O\fI
:map! ^K\fR

Now say that you want to italicize 'thing'. Just before typing the word, type **CTRL-o**, and the string **\fI** will be entered. Then type 'thing'. Finally, type **CTRL-k**, and the string **\fR** will be entered. You will still be in input mode, and can then continue entering text.

There is another way to abbreviate while in input mode. This is to use the command **ab**. For example, if the word 'UNIX' has to appear often in a document you're entering, you could go:

:ab u UNIX

Then whenever you type a 'u', preceded by a space or text input command, and followed by a space, an ESC,

UNIX™ & 'C'

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or a RETURN, it will be expanded into 'UNIX'. A slight disadvantage to using a single letter for such abbreviations is that if you have to insert or append the single letter 'u', it will still be expanded to 'UNIX'. For this reason, it may be better to use two-letter or longer abbreviations. Abbreviation using **ab** is different than using **map!** – for example, **:map! u UNIX** would cause 'u' to be expanded into UNIX whenever it was typed.

Strings longer than one word can also be abbreviated this way. For example,

:ab uos UNIX Operating System

At times, you may want to change a **map** or **ab** within a vi session. The way to do this is to say, for example,

:unmap ,
:unab u

and then define your new ones.

All of the above examples of **map** and **ab** have illustrated them being defined within a vi session. When defined this way, they stay in effect only for that session. If you want these types of abbreviations defined over a number of sessions, put them in the .exrc file in your home directory (without colons). They will take effect next time you log on, and remain in effect until you change your .exrc, or redefine them temporarily in a vi session.

If options are changed during a vi session, these changes remain in effect only during that session.

If you have the **map** and **ab** features on your version of vi, you should play around with them and discover what time-savers they can be.

This concludes the tutorial series on vi. Not every feature has been discussed, but enough perhaps to illustrate the scope and versatility of this text editor. Certainly the reader who has completed this series has enough information to accomplish any reasonable editing task. Speed and efficiency will come about through practice.

ABOUT THE AUTHOR

Dan Sonnenschein is a training coordinator and consultant at Microtel Pacific Research, located in Burnaby, B.C., Canada. ■

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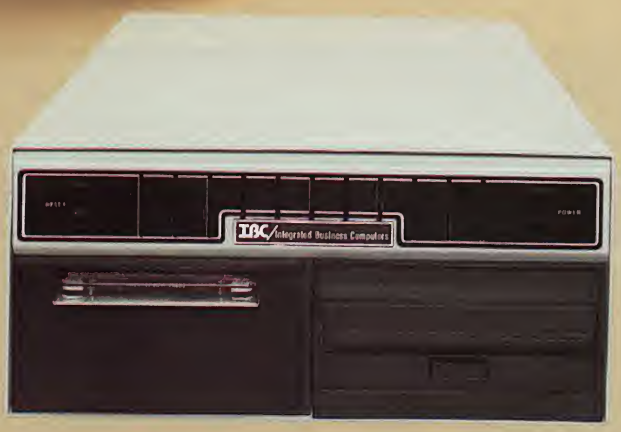

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BUYER'S GUIDE TO HARDWARE PART 4

by Rod Bailey

The number of manufacturers supporting UNIX and UNIX-like systems now stands at over 100. The advent of IBM's PC/IX on their PC/XT will fire the market even more. We expect to see most of the PC compatibles announcing similar offerings in 1984. However, the most significant fallout of the IBM stamp of approval for UNIX will be the rush to fill the software gap. Our sources of information for this section are the manufacturers' promotional and technical literature, a questionaire and phone interviews. The intent is to present a brief overview of UNIX-based computer systems where the operating system is provided and supported by the manufacturer. With dozens of vendors jockeying for position in the highly volatile marketplace, the price, software and technical specs are a moving target -- subject to change almost on a daily basis.

After picking some candidates for your application, there's still plenty of research needed on your part to obtain the most current technical specifications, software and maintenance availability, expansion capability, etc. For detailed information we have provided telephone numbers and mailing addresses of manufacturers or dealers. They all have excellent literature and helpful telephone support.

Many of the machines being presented are scheduled for in-depth evaluation by our staff. If you have a specific computer you'd like us to review, please drop a line to our editorial office and we'll try to schedule it. Meanwhile, we hope you enjoy our Buyer's Guide, and enjoy the luxury of being a buyer in a true buyer's market.

Sun-2/120

MANUFACTURER

Sun Microsystems
2550 Garcia Ave.
Mountain View, CA 94043
415-960-1300

Sun was established in 1982 as a full-service manufacturer of technical/professional workstations for the OEM and sophisticated end-user. Sun has delivered over 1,100 systems to date. Sun is committed to an open architecture design philosophy which utilizes industry standards for hardware and software (e.g., Multibus, Ethernet, TCP/IP, CORE, UNIX).

HARDWARE

Model: Sun-2/120
Price: $16,900
Configuration: The Sun-2/120 includes a high-resolution display, 9 slot Multibus cardcage (5 slots available for expansion), 1 MB memory, Ethernet interface, keyboard and mouse. Included in basic configuration is full UNIX 4.2bsd, SunWindows, SunCore device independent graphics library, 3 compilers and networking software.

First delivered: December, 1983

Processor

CPU: MC68010
Cycle time: 10 MHz, no-wait-state
Main memory: 1 MB
Max main memory: 4 MB
Memory management: Demand-paged virtual

Secondary Storage

Floppy disk: None
Winchester: 42 MB, 84 MB, and 130 MB formatted
Winchester backup: 1/4''cartridge or 1/2'' tape

Console

Sun bit-mapped display and keyboard standard

Display

Character format: 80 X 33
Dot matrix: 12 X 20 standard
True descenders: Yes

Graphics

Monochrome resolution: 1152 X 900
B&W (X), Green ( ), Amber ( ) (Color board and monitor optional) Color resolution: 640 X 480 (optional)

I/O Support

Serial ports: 2 RS-423
Parallel ports: None
Ports for multiusers: up to 3
Battery backup for clock: Yes
Bus extension: 5 slots
Type of bus: Multibus I

SOFTWARE

Operating System: UNIX 4.2
Shell: C-Shell, Bourne
User-friendly front-end: Yes
Multiuser: Yes
Max number of users: 3

Text preparation

Editors: ED, EX, VI
Formatters: NROFF, TROFF, MS, ME
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: Arpanet standard remote login and file transfer (TELNET and FTP); 4.2bsd remote login, file transfer, and execution (RLOGIN, RCP, RSH).
Protocols: TCP/IP, Ethernet

System Maintenance

Accounting: No
Device allocation/utilization: No
Library/archive maintenance: Yes

Program development

Languages: C, Pascal, FORTRAN 77
Debug facilities: DBX, ADB

Documentation

On-line: MAN
Hard-copy: Complete hardware and software documentation
Reference card: No

Terminal software

Curses: Yes
Termcap: Yes

Other applications

Word processing: Horizon, LEX, WordMarc
Spreadsheet: C-CALC, Q-CALC
Data Base: Sun MicroINGRES, Mistress
Other: Graphics packages, multiple window management, Document preparation packages, editors, engineering packages, languages, and software development tools.

SALES AND SERVICE

Dealer information: 800-821-4643
800-821-4642 (In CA)
Telephone support: 800-toll-free number

SIM

MANUFACTURER

SYDIS, Inc.
410 East Paumeria
San Jose, CA 95134
408-945-1100

Founded about 18 months ago, SYDIS manufactures and sells a high-performance office automation system featuring voice recognition, word processing, graphics, and database. The system consists of the SIM (System Information Manager)--utilizing four MC68000 processors and substantial RAM--and a number of Voice Stations (desk-top workstations which communicate with the SIM over normal telephone lines.) Each Voice Station includes a 68010 processor and 128 KB RAM.

HARDWARE

Model: SIM/Voice Station
Price: Approximately $7,000 per user for and entry-level system (OEM price)
Configuration: SIM with 4 CPU's, 3.5 MB RAM, 160 MB Winchester, 1/2" tape, and SYDIX operating system
Frist delivered: Expected Feburary, 1984

Processor

CPU: MC6800
Cycle time: 8 MHz
Main memory: 3.5 MB
Max main memory: 8 MB
Memory management: Yes, proprietary

Secondary storage

Floppy disk: None
Winchester: 8" 80 MB
Winchester backup: 1/2" tape

Voice Station Console

Detachable: Yes
Number of programmable keys: 10

Display

Character format: 104 X 38
Dot matrix: 8 X 16 True descenders: Yes

Graphics

Monochrome resolution: 832 X 608 B&W (X), Green (X), Amber (X) (all three available)

I/O Support

Serial ports: Each workstation has one RS-232C port
Parallel ports: None
Ports for multiusers: 16
Battery backup for clock: No
Bus extension: Expandable in 16-slot increments up to 80
Type of bus: Proprietary

SOFTWARE

Operating System: SYDIX (based on XENIX) Shell: C-Shell
User-friendly front-end: Icons and directories accessible by mouse, keyboard, soft keys on bezel or telephone signals
Multiuser: Yes
Max number of users: 16 in entry-level configuration; can be expanded

Text preparation

Editors: ED, VI, integrated full-function word processor
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: Voice Stations communicate over normal telephone lines
Protocols: None

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, Assembler included
Debug facilities: ADB

Documentation

On-line: HELP files
Hard-copy: Microsoft manuals, user manuals
Reference card: Yes

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: Included
Spreadsheet: Included
Data Base: Included
Other: DESKTOP: Includes icon system and supports all PBX functions, with on-line directories

SALES AND SERVICE

Dealer information: 408-945-1100
Telephone support: 408-945-1100

Zebra 700

MANUFACTURER

General Automation
1045 So. East St., p.o. Box 4883
Anaheim, CA 92803
714-778-4800

General Automation, in the general business applications business for about 16 years, currently has annual sales of about $100 million. They are represented in 42 different countries and offer two other Zebra models besides the 700.

HARDWARE

Model: 700
Price: $9100
Configuration: Processor unit with 256 KB RAM, 10 MB Winchester, 5 MB removable cartridge drive, and XENIX operating system

Processor

CPU: MC68000
Cycle time: 8 MHz, no wait states
Main memory: 256 KB
Max main memory: 512 KB
Memory management: Virtual

Secondary storage

Floppy disk: None
Winchester: 10 MB 5 1/4" and 5 MB removable cartridge
Winchester backup: Removable cartridge

Console

Optional, 2 models
Detachable: Yes
Number of programmable keys: 4 or 16

Display

Character format: 80 X 25
Dot matrix: 7 X 10
True descenders: Yes
B&W ( ), Green (X), Amber ( )

I/O Support

Serial ports: 5
Parallel ports: 1
Printer ports: 1 serial, 1 parallel
Ports for multiusers: 4
Battery backup for clock: Optional

Bus extension: 3 open slots
Type of bus: Proprietary (other models use Multibus)

SOFTWARE

Operating System: XENIX, ported by Santa Cruz
Shell: Bourne
User-friendly front-end: Menus
Multiuser: Yes
Max number of users: 4

Text preparation

Editors: ED, VI
Formatters: NROFF, TROFF
Spell checkers: Yes

Communications

Mail: MAIL, UUCP
Networking: ARCNET
Protocols: 2780/3780, 3270 binary synchronous; SNA and X.25 planned for future release

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C included; RM COBOL, SMC BASIC optional
Debug facilities: Yes

Documentation

On-line: MAN
Hard-copy: Enhanced Microsoft manuals
Reference card: Yes

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: Q1 optional
Spreadsheet: Q-Calc: Q-Office Automation system optional
Data Base: Included in optional Q-Office Automation System

SALES AND SERVICE

Dealer information: 714-778-4800
Telephone support: 714-778-4800

Cadmus 9000

MANUFACTURER

Cadmus Computer Systems, Inc.
600 Suffolk St.
Lowell, MA 01854
617-453-2899

Cadmus Computer Systems, located in Lowell, Massachussetts, offers a line of systems ranging in price from $9,000 to $17,300 for a fully-loaded graphics workstation.

HARDWARE

Model: 9000
Price: $13,500 retail (substantial OEM discounts available)
Configuration: Processor unit with 512 KB RAM, 65 MB Winchester, 1 MB floppy, VT-55 terminal, and UNIX

First delivered: September, 1983

Processor

CPU: MC68010
Cycle time: 10 MHz
Main memory: 512 KB
Max main memory: 4 MB
Memory management: Virtual

Secondary storage

Floppy disk: 1 MB 5 1/4''
Winchester: 65 MB 5 1/4''
Winchester backup: Streaming tape optional

Console:

VT-55 terminal

I/O Support

Serial ports: 4 RS-232
Parallel ports: 16
Printer ports: Included above
Ports for multiusers: 16
Battery backup for clock: Yes
Bus extension: 16 Q-Bus quad slots
Type of bus: Q-Bus; Multi-bus adapter available

SOFTWARE

Operating System: UNIX Version 7 with Berkeley 4.1, other enhancements
Shell: Berkeley and C-Shell, also G-Shell (graphics multi-process windowed shell)

User-friendly front-end: Optional menu system, icon management available
Multiuser: Yes
Max number of users: 16

Text preparation

Editors: ED, VI
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: UNISON
Protocols: Under development

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes
Other: Yes

Program development

Languages: C, Assembler standard; FORTRAN, LISP, APL 68000, Pascal, COBOL optional
Debug facilities: ADB

Documentation

On-line: MAN, HELP files
Hard-copy: Enhanced Bell manuals

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: XED, Q1 both available
Spreadsheet: Supercomp 20 available
Data Base: Unify, Spectrum both available
Other: OPS 2000 by Interleaf (office publishing system), solids modeling & graphics packages, real-time and static charts

SALES AND SERVICE

Dealer information: 617-453-2899
Telephone support: 800 toll-free number

MV 4000

MANUFACTURER

Data General
4400 Computer Drive
Westboro, MA 01581
617-366-8911

Data General, in business since 1969, is a large supplier of mini- and superminicomputers, and recently introduced some desktop units also. The MV 4000, 8000 Model 2, and 10,000 are all available with UNIX, ranging in price from $60,000 to $250,000.

HARDWARE

Model: MV 4000
Price: $72,000
Configuration: Processor unit with 1 MB RAM, 354 MB hard disk, streaming tape backup, systems console, UNIX/VS and AOS/VS (Data General kernel)
First delivered: Expected October, 1983

Processor

CPU: 32-bit proprietary
Main memory: 1 MB
Max main memory: 8 MB
Memory management: Virtual

Secondary storage

Floppy disk: None
Winchester: 354 MB
Winchester backup: Streaming tape

I/O Support

Serial ports: 16 (64 max)
Parallel ports: None
Ports for multiusers: 16 (64 max)
Battery backup for clock: Optional
Bus extension: 6 open slots
Type of bus: Proprietary

SOFTWARE

Operating System: UNIX/VS (compatible with System III; will be compatible with System V early '84)
Shell: Bourne
User-friendly front-end: No
Multiuser: Yes
Max number of users: license for up to 6; can be upgraded to 16

Text preparation

Editors: ED, VI
Formatters: NROFF
Spell checkers: SPELL

Communications

Mail: MAIL (UUCP to be included in next release)
Networking: ZODIAC
Protocols: X.25, IEEE 805 to be available early 1984

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, Assembler standard; FORTRAN, COBOL, APL, BASIC, RPG, PL/I, Pascal, Ada, most major languages available
Debug facilities: SWAT (Data General high-level debugger)

Documentation

On-line: MAN
Hard-copy: Enhanced Bell Manual
Reference card: No

Terminal software

Curses: No
Termcap: STTY

Other applications

Word processing: To be available early '84
Spreadsheet: To be available early '84
Data Base: To be available early '84
Other: Interface to INFOS II (file mgmt. system)

SALES AND SERVICE

Dealer information: 617-366-8911
Telephone support: 800 toll-free number

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ERG III

MANUFACTURER

Empirical Research Group
P.O. 1176
Milton, WA 98354
206-631-4855

Empirical Research Group, incorporated in 1974, has been shipping 68000-based products since April, 1979. A hardware design and system development company, they have been delivering UNIX-type systems since Nov., 1980, and currently offer four different systems, ranging in price from $5145 to $19,745 (OEM qty. prices).

HARDWARE

Model: ERG III
Price: $12,895 (list) $9,645 (OEM quantity. 25 per year)
Configuration: Processor unit with 512 KB RAM, two 10 MB removable cartridge drives, and UNIX operating system
First delivered: July, 1983

Processor

CPU: MC68000
Cycle time: 12 MHz
Main memory: 512 KB
Max main memory: 140 MB
Memory management: 68451 MMU

Secondary storage

Floppy disk: Optional
Winchester: Two 10 MB removable cartridge drives
Winchester backup: Two additional cartridges included

I/O Support

Serial ports: 8 RS 232
Parallel ports: 3
Ports for multiusers: 8
Battery backup for clock: No
Bus extension: 7 slots
Type of bus: S-100

SOFTWARE

Operating System: UNIX System III with Berkeley enhancements (System V to be available very soon)
Shell: C-Shell
User-friendly front-end: No
Multiuser: Yes
Max number of users: 16

Text preparation

Editors: VI, ED
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: Optional
Protocols: None

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C standard; Pascal, BASIC, COBOL, FORTRAN, Assembler optional
Debug facilities: Yes

Documentation

On-line: MAN
Hard-copy: Unisoft Manuals
Reference card: Yes

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: Optional
Spreadsheet: Optional
Data Base: Optional
Other: graphics

SALES AND SERVICE

Dealer information: 206-631-4855
Telephone support: 206-631-4855

Silicon Valley Micro Model 5

MANUFACTURER

Silicon Valley Micro, Inc.
4010 Moorpark Ave., #213
San Jose, CA 95117
408-246-1101

Silicon Valley Micro is a high-tech start-up that is one of the pioneers in 32-bit microcomputers. The company has been engaged in R&D for 2 years on 32-bit microprocessors and microcomputers, and has created the first 32-bit portable microcomputers. They offer five different systems, ranging in price from $5,000 to $25,000

HARDWARE

Model: Model 5
Price: $5,000 + any extra-cost options
Configuration: Complete portable system with 32-bit and 8/16-bit processors,.5 MB RAM, two 360 KB floppies, display and keyboard
First delivered: Planned for July 1, 1984

Processor

CPU: NS32032 and intel 8088
Cycle time: 640 ns (32-bit without MMU), 800 ns (32-bit with MMU), 800 ns (8/16-bit)
Main memory: 512 KB
Max main memory: 2.5 MB
Memory management: Virtual (32-bit only)

Secondary storage

Floppy disk: Two 360 KB 5 1/4", IBM PC compatible
Winchester: Optional 75-380 MB available
Winchester backup: Streaming tape optional

Console

Detachable: Yes
Number of programmable keys: 10

Display

Character format: 80 X 25
Dot matrix: 9 X 7 standard
True descenders: Yes

Graphics

Monochrome resolution: 320 X 200 B&W ( ), Green (X), Amber (X) (optional)

I/O Support

Serial ports: 2 standard, 16 optional
Parallel ports: 1 Centronics
Ports for multiusers: 2
Battery backup for clock: Optional
Bus extension: 5 VME slots; 5 IBM PC slots
Type of bus: VME (32-bit); IBM PC (8/16-bit)

SOFTWARE

Operating System: UNIX Version 7 and MS-DOS 2.0
User-friendly front-end: Yes
Multiuser: Yes
Max number of users: 2 (up to 10 windows each), up to 10 users possible on higher-priced systems

Text preparation

Editors: Optional
Formatters: Optional
Spell checkers: Optional

Communications

Mail: Optional
Networking: Ethernet standard; ARCNET, Net 1000, Desnet, Wangnet, DECnet optional
Protocols: Asynchronous standard; synchronous, BSC, SDLC, HDLC, X.25, ADCP optional

System Maintenance

Accounting: Optional
Device allocation/utilization: Optional
Library/archive maintenance: Optional

Program development

Languages: C, Assembler standard; FORTRAN, Ada, BASIC, APL, LISP, Prolog, Pascal COBOL optional
Debug facilities: Optional

Documentation

On-line: Yes
Hard-copy: 5 manuals
Reference card: Yes

Terminal software

Curses: Optional
Termcap: Optional

Other applications

Word processing: Wordstar & others optional
Spreadsheet: Lotus 1-2-3 and others optional
Data Base: DBase II and others optional
Other: Numerous UNIX and IBM PC programs available

SALES AND SERVICE

Dealer information: 408-246-1101
Telephone support: 408-246-1104

Tektronix 8561

MANUFACTURER

Tektronix, Inc.
P.O. Box 4600
Beaverton, OR 97075
503-629-1718

Tektronix has been in business over 35 years and last year had $1.2 billion in sales. The 8561 is a design automation/microprocessor development system. Another configuration, the 8560, has a 35.6 MB Winchester and two additional ports.

HARDWARE

Model: 8561
Price: $12,000
Configuration: Processor unit with CPU and three other processors (8088 handles two user ports, add. processor handles mass storage), 256 KB RAM, 13.6 MB Winchester, and 1 MB floppy disk
First delivered: Oct., 1981

Processor

CPU: LSI 11/23
Cycle time: 13 MHz
Main memory: 256 KB
Max main memory: 1 MB
Memory management: No

Secondary storage

Floppy disk: 5 1/4'' 1 MB
Winchester: 5 1/4'' 13.6 MB
Winchester backup: Floppy disk

Console:

4095M color terminal is optional: $3995

I/O Support

Serial ports: 2 (8 max)
Parallel ports: 2 line printer ports
Ports for multiusers: Yes
Battery backup for clock: Yes
Bus extension: 2 open slots
Type of bus: Q-Bus

SOFTWARE

Operating System: UNIX Version 7, with additional tools
Shell: Bourne, Key Shell
User-friendly front-end: Color-Key + (soft key system)
Multiuser: Yes
Max number of users: License for up to two

Text preparation

Editors: ED standark; ACE and LDE (screen editors) optional
Formatters: NROFF standard, TROFF optional
Spell checkers: SPELL optional

Communications

Mail: MAIL standard, UUCP optional
Networking: None
Protocols: None

System Maintenance

Accounting: Optional
Device allocation/utilization: Optional
Library/archive maintenance: Optional

Program development

Languages: C, Pascal, Assembler optional
Debug facilities: ADB

Documentation

On-line: MAN, HELP files
Hard-copy: Revised Bell manuals
Reference card: No

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: Available from other vendors
Spreadsheet: Available from other vendors
Data Base: Available from other vendors
Other: LANDS (LANguage Development System for 8086, Z8000, other processors)

SALES AND SERVICE

Dealer information: 503-629-1718
Telephone support: Offices in major cities

PERQ 2

MANUFACTURER

Three Rivers Computer
720 Gross St.
Pittsburgh, PA 15224
412-621-6250

Three Rivers Computer was founded in 1974 by a group of engineers from the Carnegie-Mellon Institute. They began development of graphics workstations in September, 1978 and currently offer two: PERQ and PERQ 2.

HARDWARE

Model: PERQ 2
Price: $24,000
Configuration: Stand-alone graphics workstation with 512 KB RAM, 35 MB Winchester, 1 MB floppy, high-res graphics B&W display, keyboard, and Ethernet networking capability.
First delivered: October, 1980

Processor

CPU: 16-bit proprietary
Cycle time: N.A.
Main memory: 512 KB
Max main memory: 2 MB
Memory management: In firmware

Secondary storage

Floppy disk: 1 MB 8''
Winchester: 35 MB 8''
Winchester backup: Floppy disk

Console:

Detachable: Yes
Number of programmable keys: 4

Display

Character format: Software-definable
Dot matrix: 9 X 13 standard, but redefinable
True descenders: Yes

Graphics

Monochrome resolution: 768 X 1024
B&W (X), Green ( ), Amber ( )

I/O Support

Serial ports: 2 RS-232
Printer ports: 1 parallel
Ports for multiusers: None
Battery backup for clock: Yes
Bus extension: 2 open slots
Type of bus: Proprietary

SOFTWARE

Operating System: UNIX System III
Shell: Bourne
User-friendly front-end: Menus
Multiuser: No
Max number of users: 1

Text preparation

Editors: ED, EMAX (screen editor), SPY
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: Ethernet standard
Protocols: None

System Maintenance

Accounting: No
Device allocation/utilization: No
Library/archive maintenance: Yes

Program development

Languages: C standard; FORTRAN, Pascal optional
Debug facilities: SDB

Documentation

On-line: MAN
Hard-copy: Bell manuals with additions
Reference card: No

Terminal software

Curses: No
Termcap: No

Other applications

Word processing: Under development
Spreadsheet: Under develpment
Data Base: Under development
Other: Graphics package

SALES AND SERVICE

Dealer information: 412-621-6250
Telephone support: 412-621-6250

SBE 200

MANUFACTURER

SBE, Inc.
4700 San Pablo Ave.
Emeryville, CA 94608
415-652-1805

A premier manufacturer of CB radios during the 60's and 70's, SBE merged with Adaptive Science last November. They sell primarily 68000-based systems, to OEM's only.

HARDWARE

Model: SBE 200/10/F
Price: (OEM) Hardware: $4995
Regulus O.S.: $795 single, $695 in quanity.
Configuration: CPU with 256 KB RAM, 10 MB Winchester, 512 KB floppy disk, and 10-slot card cage

Processor

CPU MC68000
Cycle time: 10 MHz, no-wait-state
Main memory: 256 KB
Max main memory: Same
Memory management: No

Secondary storage

Floppy disk: 5 1/4" 512 KB
Winchester: 5 1/4" 10 MB
Winchester backup: Floppy disk

I/O Support

Serial ports: 2
Parallel ports: 1 Centronics
Ports for multiusers: 2
Battery backup for clock: No
Bus extension: 9 open slots
Type of bus: Multibus

SOFTWARE

Operating System: Regulus (UNIX-like O.S. by Alcyon)
Shell: REGULUS shell
User-friendly front-end: Menu
Multiuser: Yes
Max number of users: Limited by performance and response

Text preparation

Editors: ED standard, VI optional
Formatters: NROFF
Spell checkers: SPELL optional

Communications

Mail: MAIL standard, UUCP optional
Networking: None
Protocols: None

System Maintenance

Accounting: No
Device allocation/utilization: No
Library/archive maintenance: AR

Program development

Languages: C, Assembler
Debug facilities: PROBUG (PROM-base debugger, similar to ADB)

Documentation

On-line: Manual
Hard-copy: Alcyon REGULUS documents
Reference card: No

Terminal software

Curses: No
Termcap: Yes

Other applications

Word processing: Under development
Spreadsheet: Under development
Data Base: Under development

SALES AND SERVICE

Dealer information: 415-652-1805
Telephone support: 415-652-1805

CPU 32/16

MANUFACTURER

Parallel Computer
1201 Schaffer Rd. Bldg. 1
408-429-1338

Parallel Computer is a 3-year-old company manufacturing low-cost 68000-based fault-tolerant systems.

HARDWARE

Model: CPU 32/16
Price: Less than $50,000 in OEM quantities
Configuration: One logical processor (2 MC68000's in fault-tolerant mode), two 80 MB Winchester drives with controllers, 1/4'' streaming tape, 1 MB RAM for each processor, two power supplies with battery backup, console (TBD), and UNIX
First delivered: expected early 1984

Processor

CPU: MC68000
Cycle time: 10 MHz, no-wait-state
Main memory: 1 MB (each processor)
Max main memory: TBD
Memory management: Virtual

Secondary storage

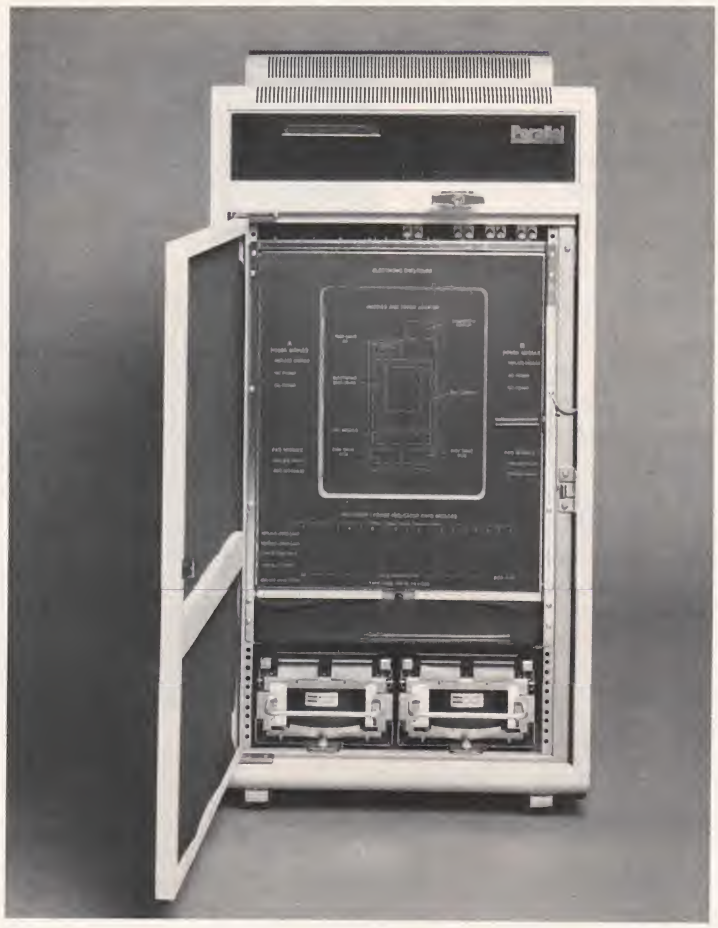
Floppy disk: None
Winchester: Two 8'' 84 MB each
Winchester backup: 1/4'' streaming tape

I/O Support

Serial ports: 16
Parallel ports: Optional
Ports for multiusers: 16
Battery backup for clock: No
Bus extension: TBD
Type of bus: Multibus-compatible

SOFTWARE

Operating System: Berkeley 4.2 UNIX
Shell: C-Shell
User-friendly front-end: None
Multiuser: Yes
Max number of users: 16



Text preparation

Editors: ED, VI
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: Ethernet optional
Protocols: None yet

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, Assembler standard; Pascal, FORTRAN, COBOL, BASIC optional
Debug facilities: ADB

Documentation

On-line: MAN, HELP files
Hard-copy: Manuals produced in-house
Reference card: No

Terminal software

Curses: Yes
Termcap: Yes

Other applications

Word processing: Available
Spreadsheet: Available
Data Base: Available

SALES AND SERVICE

Dealer information: 409-429-1338
Telephone support: 409-429-1338

Uniq 23

MANUFACTURER

Uniq Digital Systems
28 S. Water St.
Batavia, IL 60510
312-879-1008

Uniq Digital Systems was founded in 1975 by some former Western Electric employees. They sell systems, applications, training, and support services for the UNIX operating system.

HARDWARE

Model: Uniq 23 (DEC PDP 11/23 with UNIX) Price: $20,000 for entry-level system (full line of systems available)
Configuration: Processor unit with 1 MB RAM, two 10 MB Winchesters, four serial ports, system console, and UNIX
First delivered: 1981

Processor

CPU: DEC 11/23
Cycle time: 500 ns
Main memory: 1 MB
Max main memory: Same
Memory management: Deman-paged

Secondary storage

Floppy disk: None
Winchester: Two 5 1/4'' 10 MB removable
Console: System console only included

I/O Support

Serial ports: 4
Parallel ports: Optional
Ports for multiusers: 4
Battery backup for clock: Optional
Bus extension: 3 open slots; add. backplane can be added
Type of bus: Q-Bus

SOFTWARE

Operating System: UNIX system III
Shell: Bourne
User-friendly front-end: None
Multiuser: Yes
Max number of users: 8

Text preparation

Editors: ED, VI
Formatters: NROFF, TROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: ARPANET
Protocols: X.25

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, BASIC, FORTRAN, Assembler included
Debug facilities: ADB

Documentation

On-line: MAN
Hard-copy: Bell manuals with additions
Reference card: No

Terminal software

Curses: Yes
Termcap: Yes

Other applications

Word processing: Horizon optional
Spreadsheet: Three-dimensional spreadsheet optional
Data Base: Unify optional
Other: Over 20 accounting and other applications packages included

SALES AND SERVICE

Dealer information: 312-879-1008
Telephone support: 312-879-1008

MDX 0117X

MANUFACTURER

Scientific Microsystems
777 East Middlefield Road
Mountain View, CA 94043
415-964-5700

Scientific Microsystems, originally called Sygnetics Memory Systems, is a systems company which has been in business about 12 years.

HARDWARE

Model: MDX 0117X
Price: about $10,000 (UNIX is extra)
Configuration: Processor unit with 256 KB RAM, 10.6 MB Winchester, and 8'' multiple format (IBM, DEC compatible) floppy disk drive.

Processor

CPU: LSI 11/23
Cycle time: 13 MHz
Main memory: 256 KB
Max main memory: 4 MB
Memory management: Not in hardware

Secondary storage

Floppy disk: 8'' 1.2 MB max. capacity (multiple formats avail.)
Winchester: 5 1/4'' 10.6 MB
Winchester backup: Cartridge tape optional

I/O Support

Serial ports: 4
Parallel ports: Optional
Ports for multiusers: 4
Battery backup for clock: No
Bus extension: Backplane expandable
Type of bus: Q-Bus

SOFTWARE

Operating System: XENIX 3.0, ported by Santa Cruz Operations
Shell: Bourne and C-Shell
User-friendly front-end: No
Multiuser: Yes
Max number of users: 4

Text preparation

Editors: ED, VI
Formatters: NROFF
Spell checkers: SPELL

Communications

Mail: MAIL, UUCP
Networking: None
Protocols: None

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, Assembler
Debug facilities: ADB

Documentation

On-line: None
Hard-copy: Microsoft manuals
Reference card: No

Terminal software

Curses: Yes
Termcap: Yes

Other applications

Word processing: Avail.
Spreadsheet: Avail.
Data Base: Avail.

SALES AND SERVICE

Dealer information: 415-964-5700
Telephone support: 415-964-5700

OFFICEPOWER

MANUFACTURER

Computer Consoles, Inc.
97 Humboldt St.
Rochester, NY 14609
716-482-5000

Computer Consoles, Inc. designs, develops, and manufactures and services a variety of minicomputer-based application-oriented file management systems and OFFICEPOWER, a turnkey multi-functional integrated office automation system.

HARDWARE

Model: Power 5/20
Price: $42,650
Configuration: Processor unit with 2 MB RAM, 70 MB Winchester, 20 MB cartridge tape, PERPOS operating system, console, and OFFICEPOWER software

First delivered: April, 1983

Processor

CPU: MC68000
Cycle time: 125 Ns
Main memory: 2 MB
Max main memory: 4 MB
Memory management: Yes

Secondary storage

Floppy disk: None
Winchester: 70 MB (up to 3 may be used)
Winchester backup: 20 MB streamer tape

Console:

Detachable: Yes
Number of programmable keys: 10

Display

Character format: 80 X 29
Dot matrix: 9 X 12
True descenders: Yes

B&W ( ), Green (X), Amber ( )

I/O Support

Serial ports: 8 standard (8 more optional)
Parallel ports: None standard (2 optional)
Printer ports: Uses 1 serial port
Ports for multiusers: 8 standard (8 more optional)
Battery backup for clock: No
Bus extension: Yes
Type of bus: VERSAbus

SOFTWARE

Operating System: PERPOS (UNIX-III compatible)
Shell: Bourne, C-Shell available
User-friendly front-end: Yes, with OFFICEPOWER
Multiuser: Yes
Max number of users: 16

Text preparation

Editors: OFFICEPOWER full-function word processor (proprietary), EV (proprietary), VI available
Formatters: NROFF, TROFF
Spell checkers: SPELL, OFFICEPOWER option

Communications

Mail: MAIL, UUCP
Networking: TCP/IP, Data Highway (Ethernet-like)
Protocols: Asynchronous, bisynchronous (2780/3780, 3270)

System Maintenance

Accounting: Yes
Device allocation/utilization: Yes
Library/archive maintenance: Yes

Program development

Languages: C, FORTRAN 77, SMC BASIC, COBOL
Debug facilities: ADB, SDB

Documentation

On-line: None
Hard-copy: Yes
Reference card: Yes

Terminal software

Curses: Yes
Termcap: Yes

Other applications

Word processing: Included
Spreadsheet: Available
Data Base: Available
Other: Includes office applications such as calendar scheduling & graphics, meeting scheduler, telephone log, reminders, name & address list, archives, calculations, alias/distribution lists

SALES AND SERVICE

Dealer information: 716-482-5000, 12 regional offices
Telephone support: Field offices and 800 toll-free number

The new CONCEPT AVT+
In a word: capability.

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THE CONCEPT AVT+ DISPLAY TERMINAL

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UNIX AT THE TRADESHOWS

UNIFORUM

story by Ken Roberts
photos by Scott M. Hinnrichs

THE CODATA DIFFERENCE

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With so many microcomputers on the market, and with each manufacturer claiming to have the solutions to everyone's problems, why are more and more OEM users choosing CODATA?

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An expanded CODATA 3300, with 84 megabytes of disc storage, is priced at $13,500. The 3300 is also available as a 12-megabyte system for as low as $7,800.

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285 North Wolfe Road
Sunnyvale, CA 94086
1-800-521-6543
In California: 1-800-221-2265

UniForum, an international conference of UNIX users sponsored by /usr/group, was held January 17 - 20, at the Washington, D.C. Hilton. Like all the computer trade shows and conferences lately, the actual attendence far surpassed what was expected.

The keynote address was given by Jack Scanlon, vice president of Computer Systems for AT&T Technologies. After pledging to make System V the standard operating system for the world, if not the entire universe, Mr. Scanlon punctuated his address with some impressive statistics. About 1,300 universities are licensed for UNIX with 750 in the U.S. and Canada, 400 in Europe and 150 in other countries. Ninety percent of computer science graduates in the U.S. are being exposed to UNIX as part of their education. The Bell System alone has 2,500 UNIX-based computers in service. In total there are about 70,000 computers running UNIX systems, with the total number of installations expected to increase by a factor of two to three. There are about 100,000 programmers writing UNIX-related software and about 300 application packages being offered by more than 90 companies. Lastly, Mr. Scanlon expects all this to increase by a factor of two to three by 1986.

AT&T announced a new release of System V which includes better job control, an improved mail system, five to ten percent better performance and new documentation. They also announced three "value-added" packages available directly from the AT&T Software organization in Greensboro, North Carolina. The new packages are: UNIX Documentor's Workbench which helps a user format text for display and typesetting; BASIC; and the Motorola Software Generation System designed for users who are developing software on Motorola's 68000 microprocessor.

WELCOME IBM!

The long awaited defacto stamp of approval for UNIX was given by the IBM Corporation when they announced PC/IX at the UniForum Conference. This will start the stampede to get UNIX up on the dozens of look-alikes; however, the implications go much deeper. The gap in applications software will begin to fill and IBM's power to set industry standards will be given a real test by AT&T. The initial offering is single-user and missing some essential ingredients, but the 8088 in multi-user mode isn't all that swift anyway.

The PC/IX is based on Interactive's IS/3, which in turn is based on AT&T's UNIX System 3. PC/IX is a single-user system and co-resides with PC DOS on a standard PC XT; however, IBM recommends a 512 KB configuration.

Included in the offering is the INed Editor which is a full screen text editor with support of function keys, windows for displaying more than one file, cut and paste operation, ability to use some system calls from the editor and several backup levels. C and assembler are the only languages included. PC/IX appears to be a lean but workable system. It will be available in late April 1984.

The June issue of *UNIX REVIEW* will feature the IBM PC/IX -- stay tuned for further details on this new entry in the UNIX community.

UNIX SOFTWARE APPLICATIONS COMPANIES ANNOUNCE NEW STANDARDS CONSORTIUM AT UNIFORUM

Four leading vendors of third-party software for UNIX operating systems announced their formation of a standards consortium dedicated to promote convenient interchanges of information between different software environments. The four companies are Access Technology, Quadratron, Inc., Software Express, Inc., and Unify Corporation.

The consortium, to be known as the Independent Software Information Standard (ISIS), will be open to all third-party UNIX software producers who wish to participate, and who agree to maintain compatibility with the standard interface as it evolves.

The acronym ISIS comes from the name of the goddess charged by ancient Greek mythologists with raising civilization to a higher level, a task the four software vendors hope to apply to the UNIX environment by joining forces through a common data interface.

ISIS will meet four times a year, beginning at UniForum. The group's chairman in Jeff Hulton, vice president of Access Technology, the Boston-based manufacturer of decision support software for the UNIX environment. ISIS also includes Karl Klessig, president of Quadratron, Inc., of Encino, California, producers of office automation programs for the UNIX market; Bill Adams, marketing vice president for the Software Express of Houston, which designs capital applications packages and applications generators for UNIX; and Nico Nierenberg, president of Unify Corporation, with marketing headquarters in Portland, Oregon. Unify designs a relational data base used on UNIX systems.

"The move toward UNIX-based systems among Fortune 1000 companies has begun," said Hulton. "Many manufacturers recognize that they have to include UNIX in their product mix, at least as an alternative. Because it's growing fast, cooperation is vital among third-party software houses, to assure users that we're committed to provide the best, most easily integrated software available for the office environment."

Circle No. 68 on Inquiry Card

RIDGE COMPUTERS INCREASES CAPABILITIES WITH VIRTUAL MEMORY SYSTEM V OPERATING SYSTEM

Ridge Computers demonstrated their new operating system which is derived from UNIX System V. Called the Ridge Operating System (ROS) Release 3.0, it combines the facilities and software portability of the newest UNIX operating system with virtual memory.

The Ridge-developed UNIX kernel adds several capabilities not included in most UNIX System V implementations. Among these are paged virtual memory, high-performance file servers, and high-speed interprocess communication.

The Ridge 32 computer has floating-point hardware, and high-resolution bit-mapped graphics in one- to four-user configurations. It is priced from $42,400, with quantity discounts available. The company is also designing a family of compatible products that will interconnect through a high-speed local area network.

For further information, you can contact Ridge Computers at 2451 Mission College Blvd., Santa Clara, CA 95054, 408-986-8500.

Circle No. 70 on Inquiry Card

APOLLO EXHIBITS DISTINCTIVE UNIX ENVIRONMENT

Apollo Computer, Inc., demonstrated the unique features of AUX, the firm's adaptation of UNIX System III software with Berkeley extensions. Operating in a multi-node local-area network, AUX allows users full Bell System and Berkeley UNIX functionality in addition to Apollo's standard windowing, networking and graphics capabilities.

Apollo's DOMAIN architecture lets both AUX and proprietary Apollo shells operate simultaneously as autonomous processes on the same screen.

AUX supports FORTRAN 77, ISO PASCAL, and C programming languages and features an on-line interactive source level debugger. Later this year, Apollo will implement both the UNIX Bell System V release and the Berkeley release 4.2.

Apollo Computer, Inc., manufactures dedicated, high-performance, 32-bit professional workstations, which operate in a distributed, local-area network. Over 3000 workstations have been installed. For further information, contact Apollo at 15 Elizabeth Drive, Chelmsford, MA 01824.

Circle No. 72 on Inquiry Card

ORACLE AVAILABLE ON UNIX SYSTEM V

Oracle Corporation has added UNIX System V to the list of operating systems supporting ORACLE relational data base management systems. Larry Ellison, president, claims that availability under UNIX System V makes ORACLE the DBMS of choice for OEMs developing in multi-user UNIX-based minicomputer and microcomputer systems. He said this is particularly true because the SQL language and compatibility with IBM/VM systems, and even MS-DOS systems, are design goals.

Written in the C programming langauge, ORACLE is almost 98 percent operating system independent. Of its 2000 modules, Ellison said, only 30 need to be modified to move ORACLE to almost an operating system on a 16- or 32-bit computer.

This was made possible because ORACLE bypasses the host operating system by implementing its own file management system. In the UNIX environment, for example, disk space is allocated to the

ORACLE DBMS. Within this file system, it allocates its own system table, data dictionary, and user tables, and is solely responsible for their management and extension.

The ORACLE relational language, SQL PLUS, is a superset of SQL. It allows users to perform the full range of data base functions: users can query the data base for information; manipulate data by operating on tables in the data base; define data by adding new columns or tables; and implement data security controls.

Oracle Corporation is located at 2710 Sand Hill Road, Menlo Park, CA 94025, 415-854-7350.

Circle No. 75 on Inquiry Card

DUAL SYSTEMS SHOWS VERY FAST SUPERMICRO

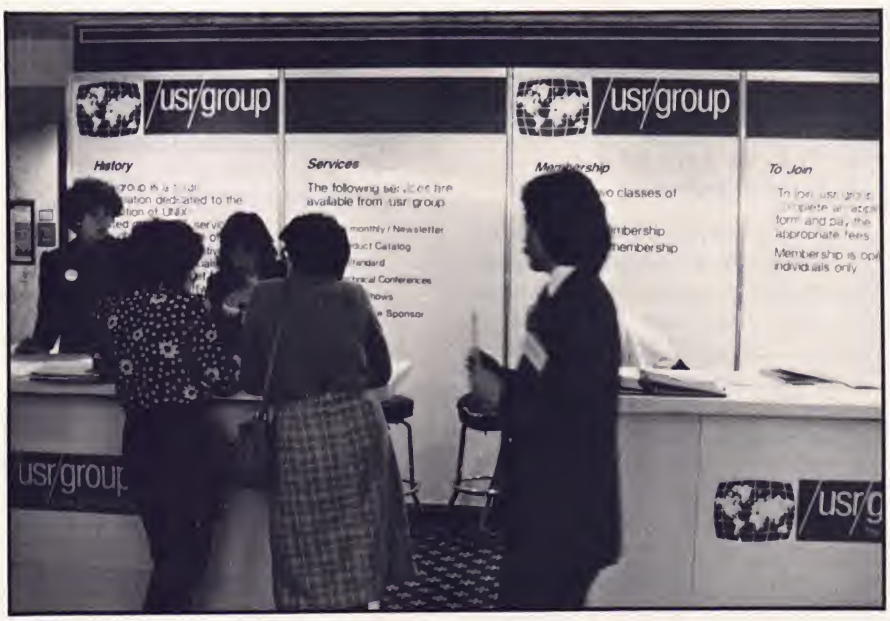
Dual Systems Corporation displayed a new MC68000-based system which combines very high throughput and the full UNIX System V operating system. The 83/80 was first introduced with System III UNIX at the Wescon Show last November. Designed as a high-performance system, the 83/80 conforms to IEEE-696/S-100 bus standards, with a 10 MHz clock rate, and memory management.

An industry-compatible SMD disk controller, for which Dual Systems has a patent pending, yields average transfer rates of 800 kilobytes per second in read mode, and 560 kilobytes in write mode. All sectors on a track are transferred within a single disk rotation, regardless of where the head first settles. The controller supports one or two 80-megabyte hard disks. The standard 512 kilobytes of dynamic random-access memory with parity is expandable to 3.25 megabytes.

Twenty board slots are available in the system chassis, and systems integrators may also purchase board sets without power supplies or cabinet. Application software includes word processing, electronic spreadsheet, and a relational data base management system.

Test sites have been successfully installed and evaluated. The 83/80 is available now for $20,990, inclusive of UNIX, 80-megabyte disk, and one year warranty. Contact Dual Systems at 2530 San Pablo Avenue, Berkeley, CA 94702, 415-549-3854.

Circle No. 76 on Inquiry Card



INTERACTIVE SYSTEMS ANNOUNCES ENVIRONMENT FOR SINGLE- AND MULTI-USER COMPUTERS

Interactive Systems has introduced TEN/PLUS, a new software environment that offers its users a simple, consistent interface to computer applications on both single- and multi-user computers.

In the TEN/PLUS environment, a user first points at data with a cursor and then issues a command. Inexperienced users can use a small set of commands and menus to perform their work. More experienced users can employ a larger set of commands and can bypass the menus. Users can also view data through multiple windows and can move data from one window to another.

TEN/PLUS has been developed as an open-ended environment for organizations selling or using several different kinds of computers. TEN/PLUS runs on microcomputers, minicomputers, and mainframes. It can be ported to different operating systems and can use any CRT terminal with cursor-positioning capability.

TEN/PLUS shields the user from the pecularities of specific hardware or operating systems. No matter what the underlying system, it provides a uniform interface that can serve as the complete environment in office systems, in business data processing and in technical computing.

The user interface of TEN/-PLUS is based on Interactive's screen-oriented text editor, INed. It expands the power of INed commands so that they can be used to process text, files, directories, mail messages, and other kinds of data.

Interactive has also announced an initial set of applications for TEN/PLUS. The first application is an electronic mail system that can be used to create, send, answer, file and print messages. The second application is a networking system that links computers so that they can transfer electronic mail, exchange files, and share such central resources as printers and typesetters.

Interactive Systems Corp., is located at 1212 Seventh St., Santa Monica, CA 90401, 213-450-8363.

Circle No. 24 on Inquiry Card

Circle No. 25 on Inquiry Card

TI INTRODUCES NU MACHINE

Texas Instruments displayed its new Nu Machine, the first commercial computer system implementing the advanced, high-speed 32-bit NuBus technology developed at the Massachusetts Institute of Technology.

The Nu Machine is a high-performance system based on the 37.5 megabyte NuBus, and is particularly well suited for applications requiring multiple or special purpose processors.

According to Joe Watson, vice president of TI's Data System Group, "The features of the Nu Machine make it a unique product in the industry. The combination of high-performance and flexible architecture makes is particularly attractive to sophisticated end-users, system integrators, and OEMs in the scientific and engineering marketplace. One of our first Nu Machine customers is Lisp Machine, Inc., who designed their own Lisp processor for artificial intelligence applications, and chose the Nu Machine because of its powerful architecture and display capabilities."

Some features of the Nu Machine include the following: a 10 MHz 68010 processor with 4 kilobyte, 45 nanosecond cache memory, and a memory-management system implemented in hardware; a high-resolution display of 800 x 1024 pixel 15-inch 60Hz black-and-white display and bit-mapped graphics controller that will produce high-quality graphics and multi-font text; two Winchester disk storage systems are available -- a 474 megabyte Winchester disk subsystem with 18 milliseconds access time and an 84 megabyte disk with 20 milliseconds access time. For disk backup, 1/2-inch streamer and 1/4-inch cartridge units are available.

The Nu Machine UNIX operating system has enchancements to support high-resolution graphics and other Nu Machine hardware features. It is offered in two configurations -- a small office unit designed to operate in a quiet environment and a rackmount model that supports larger peripherals and is designed for computer room operations.

For more information, contact: Texas Instruments, Data Systems Group, P. O. Box 402430, Dallas, TX 75240, 1-800-527-3500.

Circle No. 27 on Inquiry Card

UNIX-BASED WINDOWING

Officesmiths, Inc., exhibited its UNIX-based document management system at UniForum. The Officesmith provides application development tools, and an advanced multi-windowing operating environment. "Although a number of windowing systems are being announced for MS DOS," said president Glenn McInnes, "The Officesmith is the first windowing system built on UNIX."

The Officesmith is being made available to corporate office system developers through microcomputer

vendors and systems integrators. It provides a strategy for many office applications, from corporate policy and procedure systems to proposal writing systems and marketing data bases for sales forces.

The multi-windowing operating environment of The Officesmith has been designed to support a broad range of applications. The user/machine dialogue style provides menu formats that are common across applications. The DESK menu displays all available applications and the WINDOW menu displays the current application. The on-screen windows are shaped, sized and stacked depending on what applications are active.

While they have several office applications of their own, Officesmiths has an open system architecture product policy. The controlled release of application-transparent interfaces to the document-based management system and the window-management system will provide office systems developers with the tools to integrate third-party software.

Officesmiths, Inc., is located at 331 Cooper Street, Ottawa, Canada, 613-235-6749. ■

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HOW TO TELL TOM FROM DICK AND HARRY.

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```
 1 echo Welcome to the SHmenu demo
 2 cat help.text # display the help screen when first invoked
 3 while true
 4 do
 5    # show command summary and read user's request
 6    echo -n "Commands: directory, edit, create, help, bye ? "
 7    read cmd file
 8
 9    case $cmd in
10
11       # directory listing
12       d* ) echo Currently available files:
13            ls ;;
14
15       # edit a file (if no file argument then show the user
16       # a list of current files and ask for one to edit
17       e*) while test -z "$file"
18            do echo Files available for edit:
19               ls
20               echo -n "Name of file to edit? "
21               read file
22            done
23
24            if test -r $file
25               then ed "$file"
26               else echo Error - $file cannot be read
27            fi ;;
28
29       # create a file (ask the user for a file name if needed)
30       c*) while test -z "$file"
31            do echo -n "Name of new file? "
32               read file
33            done
34
35            if test -f $file
36               then echo Error - $file already exists
37               else cp /dev/null $file
38                    ed $file
39            fi ;;
40
41       # help (display contents of help file)
42       h*) cat help.text ;;
43
44       # bye (leave the SHmenu demo)
45       b*) echo Bye ; break ;;
46
47       # anything else is an error (inform user and show help file)
48       *) echo Error - $cmd not a valid command
49          cat help.text ;;
50
51    esac
52
53 done
```

A Demonstration SHmenu

To simplify the construction and updating of the **SHmenu**, the above screen will be stored in the file **help.text**. This file will be separate from the **SHmenu** command file.

Below is a listing of the **SHmenu** file which contains the UNIX shell commands that control the user prompting and task execution. Note that the numbers on the left hand side of the listing are NOT part of the shell file, but are added to aid our discussion.

ECHO

The **echo** command on line 1 of the SHmenu listing will print the greeting "Welcome to the SHmenu demo" on the user's terminal. The simplist form of the **echo** command is:

```
echo a line to be printed
```

which will output the words "a line to be printed". Since the **echo** command line is processed by the UNIX shell and there are a number of characters that have special meaning to the shell (including the asterisk, dollar sign, and semicolon), you may need to surround the line to be output with single or double quotes:

```
echo 'What is the price of $5
      worth of tea in China?'
echo "*** This line will stand
      out ***"
```

Single quotes will prevent the shell from processing all enclosed characters, including dollar signs. Double quotes will prevent the processing of all enclosed characters except dollar signs which are used to reference shell variables.

In the forms of **echo** discussed above, a new-line is output after the specified text. Thus any text output after an **echo** would be placed at the start of the line just below the **echo**'d message. This normally is the desired mode of operation. Frequently it is useful to not append a new-line, such as when a user is to be prompted for information.

New-line suppression is accomplished by preceding the text to

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be output with the argument "-n" (for no new-line). The following example from line 6 of the SHmenu listing demonstrates this type of prompting:

```
echo -n "Commands: directory, edit, create, help, bye ? "
```

The user will see the line:

```
Commands: directory, edit, create, help, bye ? _
```

Where the underscore is the location of their cursor on a CRT terminal, or the next print position on a hardcopy terminal. Note that a space was output after the message by enclosing the message, with a final space, in quotes. Had the quotes not been used, the cursor would be left immediately following the question mark.

CAT

Another way of displaying information to the user is with the **cat** command. This simplist use of the **cat** is:

```
cat file
```

which will output the contents of the named file.

Long help screens can be output via sequences of **echo** commands. However, it is usually easier to compose these screens into separate files. Thus, the text can be entered as it will appear on output. In the example, the help screen is stored in the file **help.text** and is output with the **cat** command on lines 2, 42, and 49 of the SHmenu listing.

WHILE ... DO ... DONE

In a menu-based system we wish to have the user to continually loop through the sequence:

1. View the menu choices
2. Select a choice
3. Perform the task selected
4. Go to Step 1

The **while** command is a convenient way a doing this in the UNIX shell. A format of the **while** construct is:

```
while command2
do
    command2
        .
        .
        .
    commandN
done
```

The UNIX shell command line **command1** is executed. If the command was successful, the lines **command2** through and including **commandN** are also performed. This sequence will repeat until: 1) **command1** returns with an unsuccessful exit status, or 2) a

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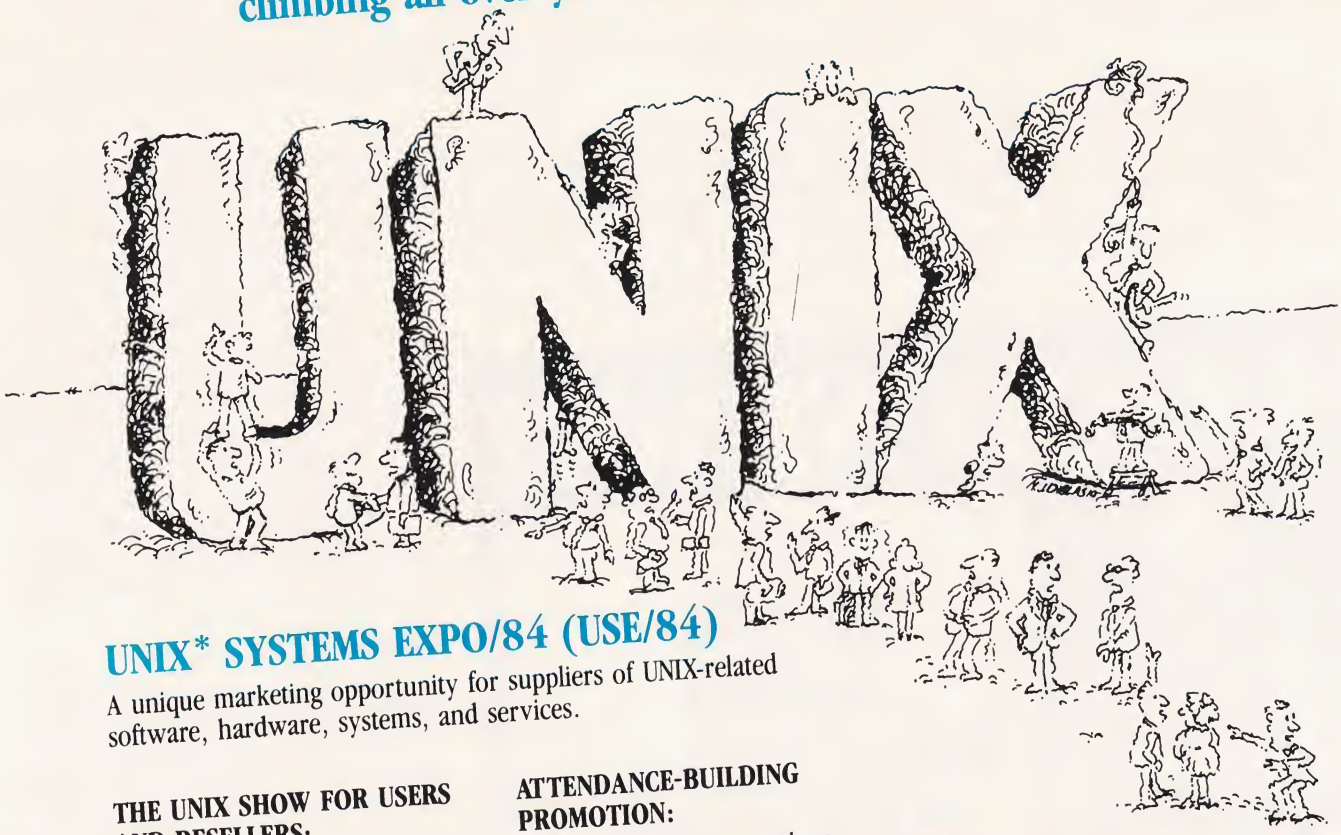

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continue or **break** command is encountered. A **continue** will cause execution to resume at the next intersection of the loop, while a **break** will cause execution to resume past the end of the loop.

Lines 3 through 53 of the SHmenu listing demonstrate the **while** command. Note that the **true** command, which controls the execution of the **while**, always returns a successful exit status. Thus, the **break** command on line 45 is the only way of terminating the loop. In this example the menu will terminate after the **break**, as there are no commands after the **done**.

Lines 17 through 22 and 30 through 33 each demonstrate smaller **while** loops that are controlled by the exit status of the **test** command. In these examples the statements within the **while** loops will be executed while the shell variable **file** is empty (contains a zero length string). The **test** command and shell variables are discussed below.

COMMENTS

The maintenance and future enhancement of a menu are made easier by including comments to the reader of the command file. These comments are ignored by the UNIX shell, but are very valuable to anyone trying to understand the workings of the menu. Comments begin with a pound sign and continue until the end of that line. Full line and partial line comments have the formats:

```
# This is a full line comment
cat file # This comment can explain the command to the left
```

The SHmenu demonstration contains comments on lines 2, 5, 11, 15, 16, 29, 41, 44, and 47.

SHELL VARIABLES AND READ

Shell variables are names by which we can refer to stored textual information. While the first character of a variable name must be a letter, the remaining characters may be letters, digits, or underscores.

While there are a few ways to attach textual information to a shell variable, the demonstration listing illustrates only the **read** command on lines 7, 21, and 32. The **read** causes one line to be input (normally from the user's terminal keyboard) and assigns the input words to the specified shell variables.

The simplist form of read is with

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only one variable specified:

```
read var
```

(as in lines 21 and 32 of the demonstration listing), where the entire input line is stored and associated with the shell variable (**file** in the example). If more than one shell variable is specified in the **read** command:

```
read var1 var2 var3 ... varN
```

then the first word is associated with the first shell variable, the second word with the second variable, etc. (A **word** is a group of characters separated by either a space or a tab character.) If all words have not yet been associated with a variable, the remainder of the line will be associated with the last variable specified. On line 7 of the demonstration listing:

```
read cmd file
```

will associate the first word entered at the terminal keyboard with the variable **cmd** and the remainder of the entered line with the variable **file**.

Simple references to the text represented by a shell variable are made by preceding the name of the shell variable with a dollar sign, as in:

```
echo $prompt
cat $file
```

In the demonstration listing, the text associated with the shell variable **file** is referenced in lines 17, 24, 25, 30, and 35. The text associated with **cmd** is similarly accessed in lines 9 and 48.

Double quote marks surround the use of **$file** in lines 17 and 30 to prevent the UNIX shell from discarding the variable reference in the event that the variable was empty. (This is required for the test command to operate properly.)

CASE

On line 6 of the SHmenu listing the user is prompted for a command. The command is input on line 7. Now we wish to perform different tasks depending on the command selected. Portions of lines 9 through 51 will be executed, as selected by the text associated with the shell variable **cmd**. The general form of the case command is:

```
case word in
   pattern1) command1a
             command1b
                .
                .
                .
             command1x ;;
   pattern 2) ...
        .
        .
        .
   pattern N) ...
esac
```

Where **word** is compared to the patterns. The commands associated with the first matched pattern are executed. Usually (as in line 9 of the SHmenu listing), the word is a shell variable. The patterns follow the same rules for the UNIX shell's file name generation (see the **SH** section of your UNIX manual). The demonstration SHmenu only uses the asterisk wild-card character, which matches any pattern. Lines 12 and 13 are executed if the input command begins with a letter 'd'. The asterisk in the pattern 'd*' will match anything that might follow the 'd'. Thus, a directory listing can be requested with the commands 'directory', 'dir', 'di', 'd', as well as 'dog', 'doctor' and 'ddddddd'. It is important to remember that the commands executed are associated with the **first** pattern matched. Thus, if you wanted to select between the two commands 'dirt' and 'dir', the 'dirt' pattern and its commands must appear before those for 'dir'.

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Since the asterisk will match any pattern and only the first pattern matched will be recognized, the pattern on line 48 of the demonstration that consists only of an asterisk will match any unrecognized pattern. The commands associated with this pattern will be executed only if the user entered an invalid command. In this case we output an error message on line 48, and then output the help file on line 49. The menu will continue at the top of the **while** command where the user will be prompted for a new command.

IF ... THEN ... ELSE ... FI

Conditional execution of commands can be accomplished with the **if** command, the format of which is:

```
if command1
   then command2
                .
                .
                .
        command3
             else command4
                .
                .
                .
        command5
fi
```

The UNIX shell command line **command1** is executed. If **command1** was unsuccessful, the lines **command2** through **command3** are executed. If **command1** returns with an unsuccessful exit status, the lines **command4** through **command5** are executed. Note that the **else** section and its associated commands are optional.

TEST

Control of the **while** and **if** commands is often done with the **test** command, some formats of which are:

```
test -r file      # successful if
                  the file can be
                  read
test -w file      # successful if
                  the file can be
                  written
test -f file      # successful if
                  the file is
                  regular file
test -x file      # successful if
                  the file can be
                  executed
test -z "test"    # successful if
                  the text is of
                  zero length
test -n "text"    # successful if
```

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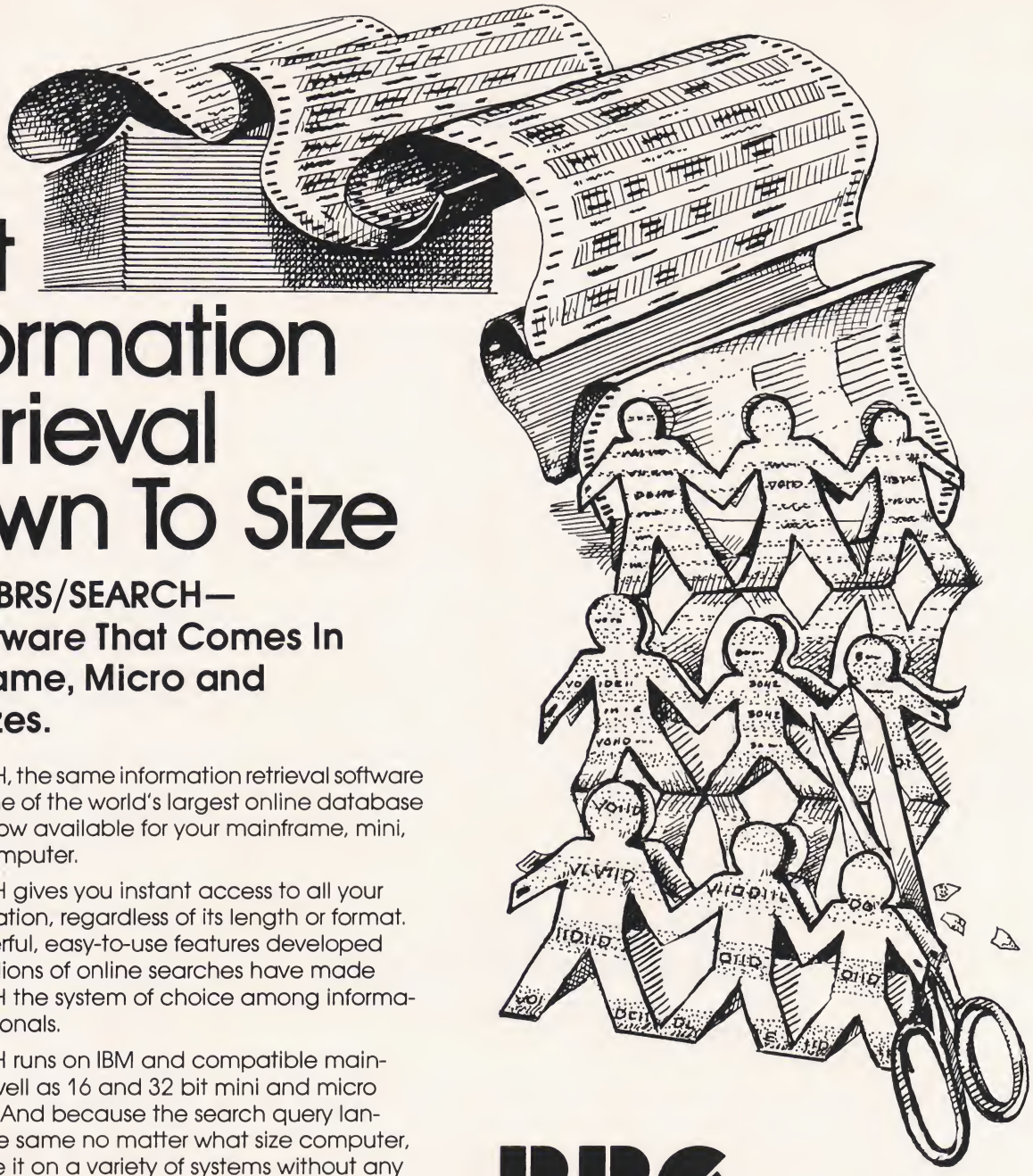
the text is not
of zero length

There are many more options available with the **test** command that are documented in the UNIX user manual. Usually, the **file** and **text** entries above will be names of shell variables and thus be preceded by a dollar sign.

In line 17 of the SHmenu listing we have a **while** command that will repeat until the shell variable **file** is associated with a non-zero length text string. In line 7 the user was asked to input a command. If the command was 'edit' and the user also input the name of a file to input, then the shell variable **file** would be associated with a non-zero length file name. However, if the user just input the command 'edit', then **file** would be associated with the zero length file name. In this case, a directory listing is output (with the **ls** command on line 19), the user is prompted for the name of the file to edit (with the **echo** command and line 20), and the shell variable **file** is associated with the text input by the user (with the **read** command on line 21). If the user inputs just a carriage return, then the shell variable will still be associated with a zero length file name and process will repeat.

Once a file name as been entered, we check to see if the file exists and can be read. This is done with the **test** command on line 24. If the file can be read, then the editor is invoked (with the **ed** command on line 25), otherwise an error message is output and the process continues from the top of the **while** command (where the user is prompted) for a new command).

The procedure is similar if the user entered the 'create' command. On line 30 we check for a zero length file name. If no file name has been given, then we prompt for a name (with the **echo** command on line 31) and associate the input with the shell variable **file** (with the **read** command on line 32). On line 35 a check is made to see if the file exists as a regular file. Since we are in the 'create' section of the menu, an error message is output it the file exists (with the **echo** command on line 36). If the file does not exist, the file is created by copying a zero length file (with the **cp** command on line 37) and then the editor is invoked (with the **ed** command on line 38). Note that the **cp /dev/null $file** was not needed, as **ed** can be used to create a file.



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However, **ed** will issue a warning message by creating a zero length file by the given file name.

STYLE

While, for the most part, the UNIX shell isn't sensitive to the layout of your SHmenu command lines, the readability is greatly improved by:

1) keeping the format simple and consistent throughout the command file (or files)
2) indenting the body of **while**'s and **if**'s
3) using meaningful comments where needed
4) including blank lines to group command lines.

These will speed the writing and implementation of the initial version, as well as speed the future additions of new features.

CONCLUSIONS

The UNIX operating system contains many powerful commands that can be tied together with the UNIX shell to produce a user-friendly, menu-based user interface. While the tools necessary to build a **shell menu** (or **SHmenu**) are readily available, one must still define the user community, the terminals to be employed, and the tasks to be performed while in the menu.

Commercial menu packages exist and offer some advanced features over what can be accomplished with a **SHmenu**. However, the SHmenu approach is often adequate and a more cost-effective solution.

ABOUT THE AUTHORS

Ira Chayut and Julia Haviland are co-partners of CSCAPES which produces reference material for UNIX and C. ■

/usr/lib *Continued from Page 10*

executable FORTRAN program. Well and good, except that executable programs under UNIX blend with commands - that is, they do not have suffixes:

```
$ mv a.out program
```

After all, how silly of us to have to type:

```
$ ls.x
```

to see the filenames in our working directory. The naming runs against standard UNIX conventions.

The book is flawed by the choices indicated, and it does not seem to be the "true introduction" the jacket blurb claims.

This book might be useful to the scores of people who want to use f77 under UNIX. May we have a show of hands? The chapter titles are given in the table, "Table of Contents for The Guidebook."

Table of Contents for The Guidebook

COMING UP NEXT

Donald H. Beil, *Using the Horizon Spreadsheet with the UNIX Operating System*, Reston Publishing, 1984.

Alan Feuer, Narain Gehani, Editors, *Comparing and Assessing Programming Languages: Ada, C, Pascal*, Prentice-Hall, 1984.

Stephen Kochan, *Programming in C*, Hayden Book Co., 1983.

Jack J. Purdum, Timothy C. Leslie, and Alan L. Stegmoller, *C Programmer's Library* Que Corporation, 1984. ■

SOFTWARE PORT. *Continued from Page 22*

absence is important to you and your system. Naturally, when the vendor assures you all facilities are in fact present, he will make that assurance willingly in written form, for the record. You'll draw your own conclusions if the vendor displays reluctance to go that far.

In other words, where emulation is concerned, there's no free lunch.

OPERATING SYSTEM LOOK-ALIKES

A look-alike OS differs from a derivative in that the developer independently devises an operating system that **mimics** another one. The look-alike OS is not an operating system derivative in the sense we have been using the word, since the originator of the imitated operating system does not license the look-alike.

A look-alike can offer significant advantages -- reduced price, increased performance, or freedom from licensing restrictions among them -- but it will not necessarily support the same applications software as its model.

Before you substitute a look-alike for the real article, you may want to be sure is will support all your current and future programs. If you're positive enough, there's no problem. If you can't predict the future too well, prudence and caution may be the better course.

DIFFERENCES BETWEEN COMPILERS

A program's source code -- the code humans can read, understand and change -- is always the same. But the compiled (or machine) code varies greatly from system to system. Also called object or binary code, machine code is the string of zeroes and ones the machine can read, understand and execute. The compiler is a program that converts source code to machine code.

Compiler output depends upon the design of the processor -- its instruction set, the number and type of registers, and the method used to address memory, to mention only a few important parameters.

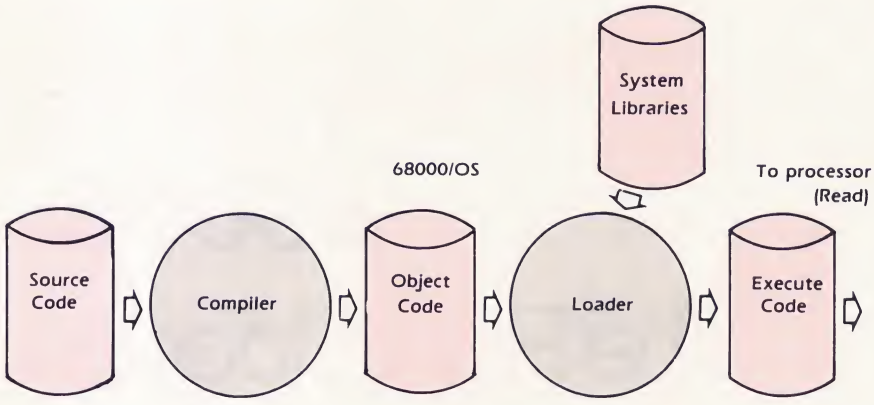


Figure 7 Operating system will issue read call to 68000 processor based on compiled code. Only one of two read calls illustrated will be executed.

Vendors are reluctant to release product source code. For this reason, software is generally distributed in its binary form. A compiler is developed for each machine on which the software is intended to execute. Machines using the same operating system or microprocessor, but different OS derivatives, will not necessarily be able to execute identical object code. The way the program calls the operating system during execution, or differences in operating system derivatives result in behavior variations between systems that must be allowed for by the compiler (Figure 7).

For example, a system call issued for a **read** to a 68000 microprocessor might consist of the following:

```
fileno, buffer, bytecount
```

While the total of each word would not exceed 32 bits, (Figure 8) word size might vary because the file number could be less than 5 bits long and the bytecount need not exceed 16 bits.

As a result, one **read** might be structured as three 32-bit words (32,32,32) while another program might issue the call as two 16-bit words bracketing a 32-bit word (16,32,16). Inevitably, both system calls would not work on the same operating system.

When selecting software, remember to make it a condition of the sale that your software will be compiled for the exact OS and hardware version you'll be using.

CONCLUSIONS

The watchword on software portability is ancient and familiar -- **caveat emptor** -- let the buyer beware.

Whether you are contemplating a desktop computer or a three-quarter million dollar development system, as a seasoned buyer or computer hardware and software you will explore all facets of software portability before you pull out your checkbook.

As with all big-ticket items, this may not be the best area in which to shave costs. Your objective is not only to find the right tools to solve your original problem, but to be able to adapt them readily and economically to the solution of future problems. Keep in mind the cost of duplicating the data files you will have generated on the new, but possibly inadequate system.

If you find yourself involved with a consultant selling anything besides services, you may want to select somebody more likely to be

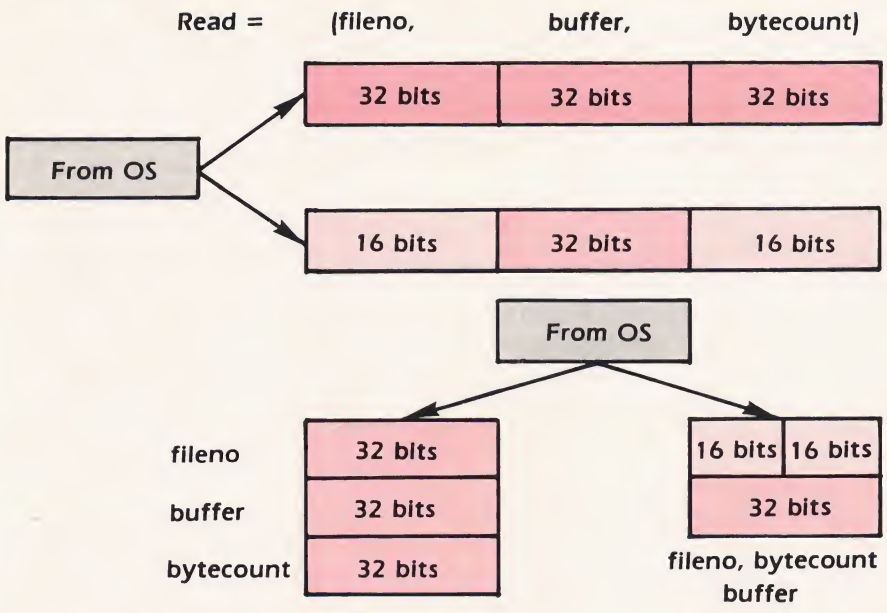


Figure 8 Compiler converts source code to object code.

unbiased in their recommendations about how you should spend your budget.

Finally, when you're evaluating software for its portability, it's important to be sure all the standard features of your operating system are in place and implemented in a standard way. You may need to be the one who decides what is standard. However, once the choice is made, make sure what you need is there, and workable.

If you're an applications program developer, with an interest in gaining the widest possible market for your product, determine the operating system with the widest support among potential users of your program. Then write your program for it.

As an end-user, keep control of the negotiating process. Remember the old army adage -- cover your assets. Provide yourself with the written, legally binding assurances that will allow you to return to the vendor for satisfaction should there be an incompatibility between the hardware or software you buy and the system on which you expect it to function.

One good way to do this is to obtain a **written** statement from the vendor indicating that the product is guaranteed to run in the selected environment. In doing so, you will, of course, make sure you identify the target accurately.

You'll also want to be sure you have the answers to the following questions:

- What operating system support will be required by the end-user software you need?
- Do the end-user packages under consideration require extensions to the operating system?
- Which operating system derivative is best for your present and future needs?
- Does the operating system implement the standard features you need?
- Are the methods of implementation standard?
- Will other application programs you may need later be available?
- What kind of support can you expect from the vendor?
- Can you get a warranty that stipulates the system will support your end-user software, or that the software will execute on the system?

Last of all, remember non-compatibility is not restricted to any one operating system. It is nearly universal -- and likely to stay that way for some time to come.

But you, as a careful buyer of software with the highest portability potential, will continue to make your computer the most effective and economical problem-solving tool the state-of-the-art will permit.

ABOUT THE AUTHOR

Gordon Waidhofer is the manager of Software Services at Voelker-Lehman Systems, Inc. in Fremont, California. ■

inference called *resolution* which is not very intuitive but which replaces the several rules of inference used by humans and is efficient on a computer. By using a single rule of inference, one avoids having to provide the program with the ability to decide which rules of inference to use and in what order.

The Set Manager or something like it is going to be needed if AI work is to make the transition from the academic world into the commercial marketplace. Commercial expert systems will need to be able to use large quantities of data in complex ways. A product like Rubix may serve as a foundation for this.

It should also be mentioned that Rubix is derived from Logix, which was developed by Logical Software, Inc. They also offer a full-screen user interface to UNIX called Softshell. The company is marketing the products on several machines.

ALTERNATIVES TO THE RELATIONAL DBMS MODEL

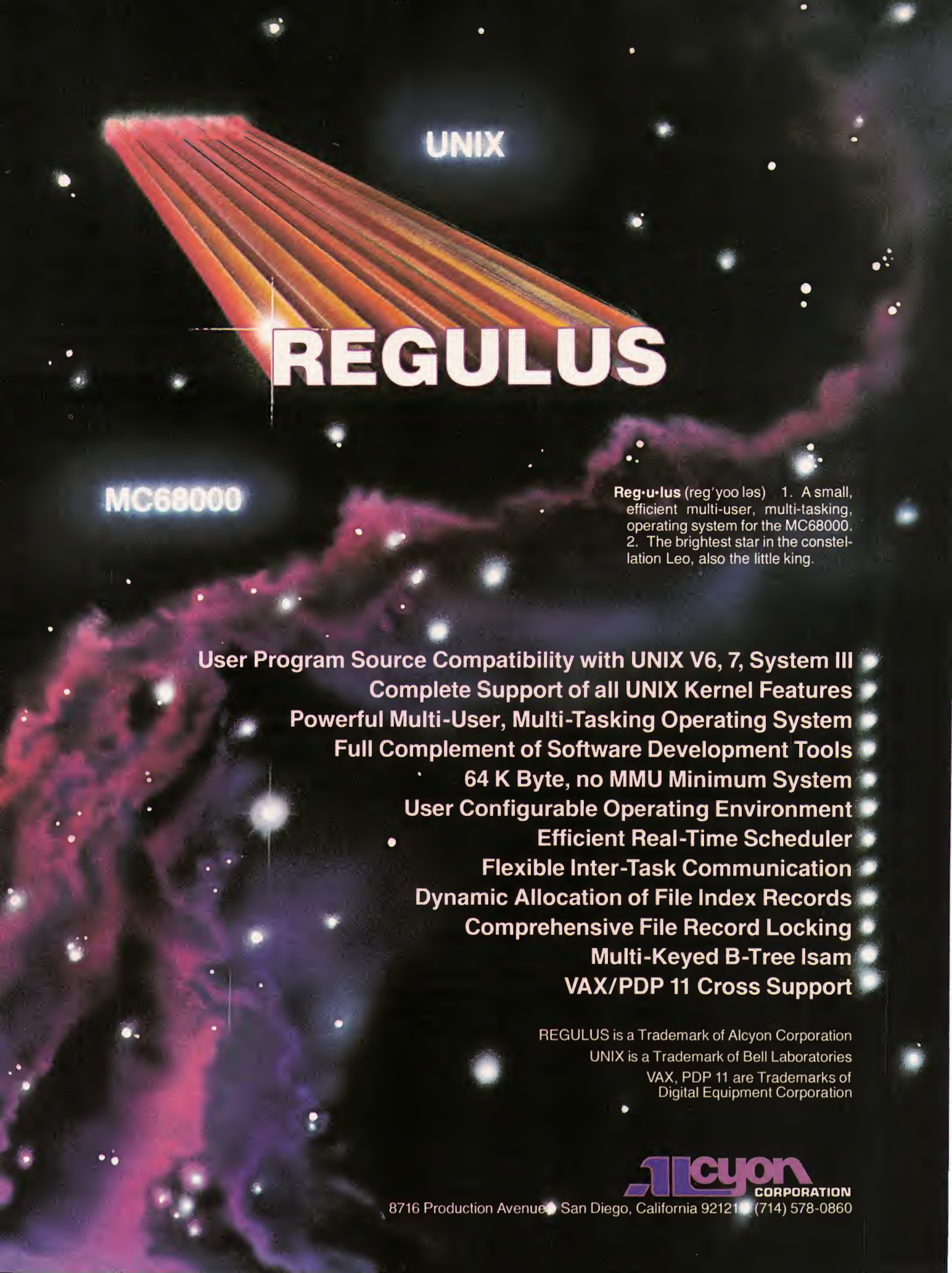
In the first installment, the alternatives of the hierarchical and network models were discussed, with the advantages and disadvantages of each. The relational model is now favored in the marketplace, but it has its limitations and should not be assumed to be the ultimate answer.

Suppose we have a relational database we are happy with, for the most part, except that we want to attach some qualifications to some of the field values. For example, we might want to note about a telephone number that it is only valid for the hours from 10 to 3, Monday through Wednesday, and that there is a second number to be called at other times. If every other telephone number was valid 24 hours a day, we would not want to structure the table with extra fields to handle just this one exception. Cramming the extra information into the telephone number field would violate one of the conditions for considering a database relational, namely that it be in First Normal Form (1NF) and have no composite field values. Departure from this restriction is discussed by Dreizen[1].

Another approach is to abandon the relational table and represent information using *nested arrays*. In this model, the principal data structure is the rectangular array, each element of which may be another array of arbitrary dimension and size, with no requirement for uniformity. A language, called NIAL, has been developed for this model[2]. It can be used to implement the relational model, but can also go beyond it. Its syntax is similar to that of APL, but the notation is more readable. It has the functionality for AI work of LISP and Prolog, but avoids the need for the programmer to be constantly aware of the backtracking logic used by Prolog. It also provides resolution as a primitive. It promises to be better for AI work than LISP or Prolog. It is written in C, and is currently implemented as an interpreter. A compiler is under development. I will be doing the part of the interpreter to at least one UNIX machine, starting with the Fortune 32:16. Watch for a progress report on this effort.

ALTERNATIVES TO UNIX

Running DBMSs under UNIX raises a number of issues. We may be enthusiastic about UNIX because it is better than the alternatives that we have seen, but we must also admit that it has its flaws. It is not quite a standard - there are several



Reg·u·lus (reg′yoo ləs) 1. A small, efficient multi-user, multi-tasking, operating system for the MC68000. 2. The brightest star in the constellation Leo, also the little king.

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incompatible versions. Such portability as exists is of the C language rather than of the operating system, and C is not standard, either. The shell and many of the utility programs are user-unfriendly, their syntax is irregular, and some are antiquated. There are no standard approaches to record and file locking, interprocess communications, removable media handling, real-time process control, and fast disk I/O. UNIX is not secure against defective programs or malicious programmers. It does not adapt well to multiprocessor architectures. The file system is slow, lacks several features like keyed files, and is vulnerable to crashes. It does not support reliable transaction logging, and has no standard way to implement virtual memory.

That the world may move to UNIX as the new standard now seems certain, but it may also be a stepping stone to something else. A number of alternatives are under development. I will be looking carefully at these. One on which we have received documentation is S1™, from Multisolutions, Inc. It claims to provide all the functionality and advantages of UNIX and to overcome all of the deficiencies noted above. If it can do what the developers say it can, it may indeed be the successor to UNIX. Watch for reports on it.

REFERENCES

[1] Dreizen, Howard M., and Chang, Shi-Kuo, "Imprecise Database: A Rationale for Relations with Embedded Subrelations," Information Systems Laboratory, Illinois Institute of Technology, Chicago, IL 60616.

[2] Glasgow, Janice J., "Logic Programming in NIAL," Queen's University, Kingston, Ontario, Canada K7L 3N6.

ADDRESSES OF VENDORS MENTIONED

Logix. Logical Software, Inc., 55 Wheeler St., Cambridge, MA 02138, 617-864-0137.

Mistress. Rhodnius, Inc., 10 St. Mary St., Toronto, Ontario, Canada M4Y 1P9, 416-922-1743.

Progress. Data Language Corporation, 5 Andover Road, Billerica, MA 01821, 617-663-6500.

Rubix. Infosystems Technology, Inc., 6301 Ivy Lane, Greenbelt, MD 20770, 301-345-7800.

S1™. Multisolutions, Inc., 660 Whitehead Road, Lawrenceville, NJ 08648, 609-695-1337.

ABOUT THE AUTHOR

Jon Roland is a consultant with Cyberian Computer Consultants and Director of the Vanguard Institute, which does research in several fields, mainly artificial intelligence. His address is 206 East Nakoma, San Antonio, Texas 78216, 512-340-7641.

■

SofGram *Continued from Page 44*

of all messages received, the most recently received messages are first. This summary information includes who sent you each message, and the first line from the message. Having a list of all of your messages right in front of you greatly simplifies perusing and maintaining the information. Messages that have not been read or acknowledged are specially marked to distinguish them from messages that have been read. You can see the full text of any message, make copies of any message and distribute them, print copies of message summaries and perform additional housekeeping tasks.

A terminal or computer need not be dedicated to SofGram use; SofGram can operate in the background while a terminal is used for other activities. SofGram remains active receiving and transmitting messages. When a message is received, the user's terminal will "beep", informing him of a new message. This is in contrast to a dedicated Telex terminal or a dedicated computer, which is described below.

ALTERNATIVES TO SOFGRAM: Message Switching in the Office

The most common alternative to having a room full of Telex and TWX terminals to receive and send messages is a message switch. A message switch requires a dedicated computer and customized software. Many large corporations buy a message switch for their corporate communications headquarters. These switches usually cost in the hundreds of thousands of dollars. SofGram, which is general purpose, not customized for a particular application, which runs on computers that cost as little as $7000.

CONCLUSION

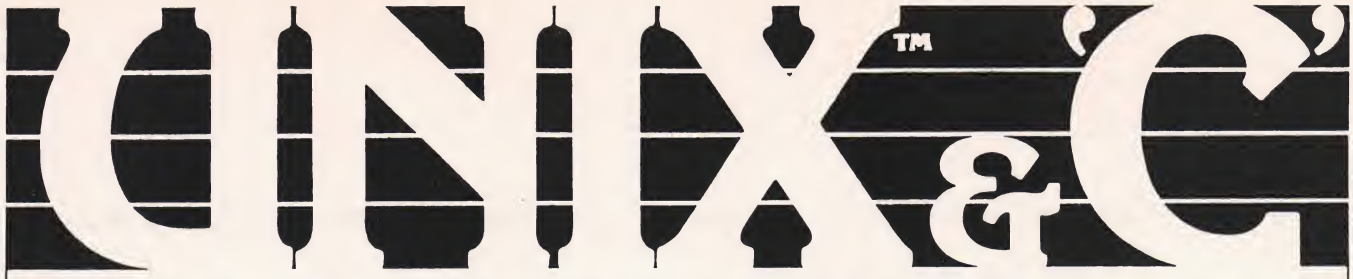
The biggest problem people have when communicating over the public networks is getting on the networks and organizing their messages. These are the problems that SofGram solves through its line handling, menus and forms, message formatting and database services by taking them out of the hands of people and letting the computer handle the drudge work and organization of data.

ABOUT THE AUTHORS

Mike Heffler is the Executive Vice President of SofTest and the creator of the menu system, plus the project manager of SofGram.

Betsy Longendorfer is a Senior Software Engineer at SofTest and is responsible for implementing a major portion of SofGram.

■



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RECENT RELEASES

QMS RELEASES TROFF SUPPORT FOR LASERGRAFIX 1200

Quality Micro Systems, Inc., announced the release of a new support software package for the UNIX typesetting utility, troff, for the QMS Lasergrafix 1200 laser printer.

The Lasergrafix 1200 is a compact laser printer that offers easily programmed graphics and letter quality output with a resolution of 90,000 dots per square inch. The new software support package, named "Qtroff", includes several utilities for preparing fonts, for handling print spooling and for converting CAT typesetter output of troff to appropriate formats for the Lasergrafix 1200.

The Lasergrafix 1200/Qtroff system is already installed at customer sites and has successfully run in UNIX System 3, System V and Berkeley Standard Distribution 4.1 implementations. The cost of the QMS Qtroff software package is $1,500. The Lasergrafix 1200 sells for $24,995 (quantity one).

Contact Quality Micro Systems, P. O. Box 81250, Mobile, AL 36689, 205-633-4300.

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COLOR GRAPHICS ON UNIX

Pacific Basin Graphics has expanded its color business graphics program and subroutine library to include the UNIX operating system. The new software packages are part of Pacific Basin Graphics' PBG 200

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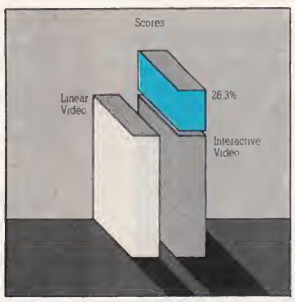

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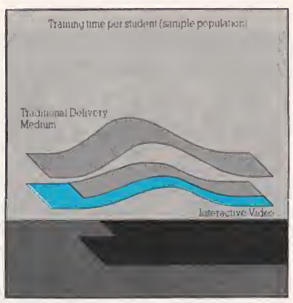

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series, designed especially for UNIX users.

The PGB series can be run on a wide variety of computers, and supports 35 printers, plotters and graphics terminals including the Hewlett-Packard, Houston Instruments and C. Itoh families of peripherals.

The PGB 200 Business Graphics package is a menu-driven program for graphic displays of numeric data. It provides a full line of displays including: pie charts, vertical or horizontal bar charts, stacked and clustered bar charts, three-dimensional bar charts, line graphs with many elements, and organization charts.

The images produced by PBG 200 can include original drawings and illustrations, such as a company logo or a schematic diagram. Functions supported include points and lines, scale drawings, inclusion of text and numbers, axes, and full color. The subroutines are programmable in both FORTRAN and C.

For further information, contact Deborah Klug at Pacific Basin Graphics, 1577 Ninth Avenue, San Francisco, CA 94122, 415-564-5416.

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LATTICE C ADDED TO VRTX INTERFACE LIBRARY

With the introduction of the VRTX C Interface Library (VCLIB), programmers using Hunter & Ready's VRTX/86 real-time operating kernel can now use the Lattice C compiler to write real-time applications code in C for any Intel 8086-based system, according to James Ready, vice president.

Ready said, "We wanted to interface the Lattice C compiler with VRTX because of the compiler's popularity and the fact that it's hosted by the IBM PC and other 8086-based computers -- all of which are rapidly moving out of the office and into the microprocessor development lab.

VRTX (Versatile Real-Time eXecutive), is a software component used in microprocessor-based systems that require fast, highly reliable software such as those used to control industrial robots, medical instruments and airline flight systems. VRTX can plugged in, without modification, to microprocessors or single-board computers, regardless of hardware configuration.

The VRTX Interface Library (VCLIB) is available on 5 1/2" PC-compatible floppy diskettes and comes with complete documentation for $750. Hunter & Ready also supplies interface libraries for Hewlett-Packard 6400 Logic Development System (C and Pascal), the Alcyon C compiler and Whitesmith's C compilers.

For more information, contact Hunter & Ready at 445 Sherman Avenue, Palo Alto, CA 94306, 415-326-2950.

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(2) HOST OPERATING SYSTEMS INCLUDE: VMS, RSX, RT-11, PRIMOS, UNIX V7, III, V, BSD 4.1, 4.2, UNOS, IDRIS, XENIX, MS/DOS, VM/CMS, CPM 68K
(3) OTHER TARGETS ARE: M6801-6803, 6805, 6809, 8080, 85, 28, 35, 48, 51; Z-80
(4) ALL ASSEMBLERS INCLUDE LINKER, LIBRARIAN AND CROSS-REFERENCE FACILITY
(5) AVAILABLE ON: CALLAN, OMNIBYTE, CHARLES RIVER DATA, PLEXUS, SAGE, FORTUNE, WICAT . . . to name a few.

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- **COMMUNICATION UTILITIES**
- **C-BASED FLOATING POINT MATH PACKAGE**
- **BASIC-TO-C TRANSLATOR** ... AND MORE

UNIX ON IBM PC TO BE DEMONSTRATED BY USER GROUP

UniGroup of New York, the largest regional organization supporting UNIX users in the United States, will be hosting a demonstration of the UNIX operating system on the IBM Personal Computer at its next meeting. The meeting will be held on April 25, in the basement auditorium of the CUNY Graduate Center at 33 West 42nd Street, at 5:30 PM. Representatives from IBM, Whitesmiths Ltd., Mark Williams Co., and UniSource will each present their software products on identical computer hardware for comparison.

Attendees will be able to see PC/IX, Idris, Coherent, and Venix operating systems in a side-by-side demonstration. David Fiedler, a UNIX industry analyst, will introduce the speakers, explain the benefits of using a UNIX-type system on personal computers, and benchmark the systems at the meeting.

UniGroup has over 200 members who meet every 2 months to discuss use of the UNIX operating system in professional, commercial, and software development environments. Both members and non-members are encouraged to attend this special meeting. The entrance fee for non-members is $10 and will be applied towards a subsequent membership application. Yearly membership is $35, which includes free admission to meetings, voting privileges, and a subscription to the quarterly UniGroup Journal.

Contact Richard Struse, Chairman, at 212-961-5252.

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NEW UNIX APPLICATIONS GENERATOR

UniComp Corporation, a software company specializing in UNIX System applications, announced Release 3.0 of their UniGen application generator. UniGen is available for most popular supermicros running UNIX including the IBM CS-9000, as well as larger machines, such as the 3B series.

UniGen includes interactive generators for building menus,

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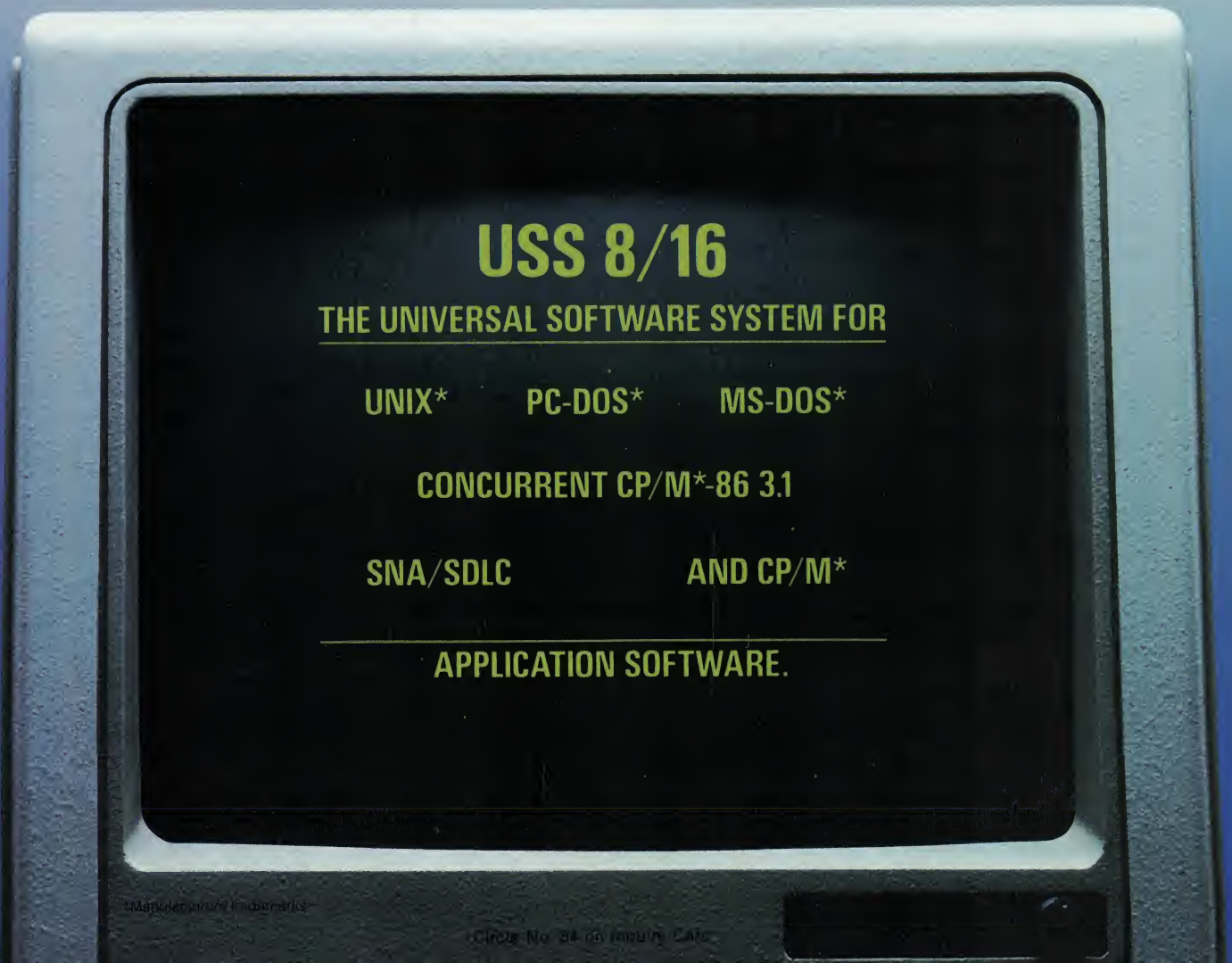

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prompts, keyed files, and interactive terminal sessions.

UniGen's menu and prompt generation capability allows the system supervisor to create completely customized user interfaces to the UNIX System in a matter of minutes. Users can also define their own keyed record file systems.

According to Donald Anderson, vice president of UniComp, "Since UniGen is completely interactive, no programming language is necessary to generate an application. This makes UniGen easy to learn and use."

UniGen in shipped with a complete menu and prompting interface to UNIX and is ready to use as an office automation system. All of the menus and prompts included with UniGen can be changed and regenerated to fit into a locally customized environment.

UniGen is written in C, specifically for UNIX, and takes advantage of all UNIX capabilities. For further information contact UniComp Corporation at 202 Plaza Towers, Springfield, MO 65804, 417-883-6800.

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ADVERTISING AGENCY ACCOUNTING AND MANAGEMENT INFORMATION SYSTEM

Beta Principles, Inc., announces that AAAMIS its Advertising Agency Accounting and Management Information System is available for immediate delivery. From insertion order writing to advertisement production, the major ad agency functions are supported and tied into payables, receivables, general ledger, and control of cost and profit centers. AAAMIS has a menu-driven format, numerous prompts and messages, "help" features, error trapping, and sophisticated data backup and recovery procedures which make it easy to use even for those with no prior computer experience.

AAAMIS runs on Pixel and Data General computers and can be ported to other UNIX-based systems. The price range for AAAMIS is $3750 to $6250 depending on the computer. Dealer inquiries are welcomed. For more information contact J. Grillo or S. Gordon, Beta Principles, 203 Beethoven Avenue, Newton, MA 02168, 617-965-5059.

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PCDOS* CP/M86* 8088/8086	500.00	500.00	500.00	200.00 without source 350.00 with source

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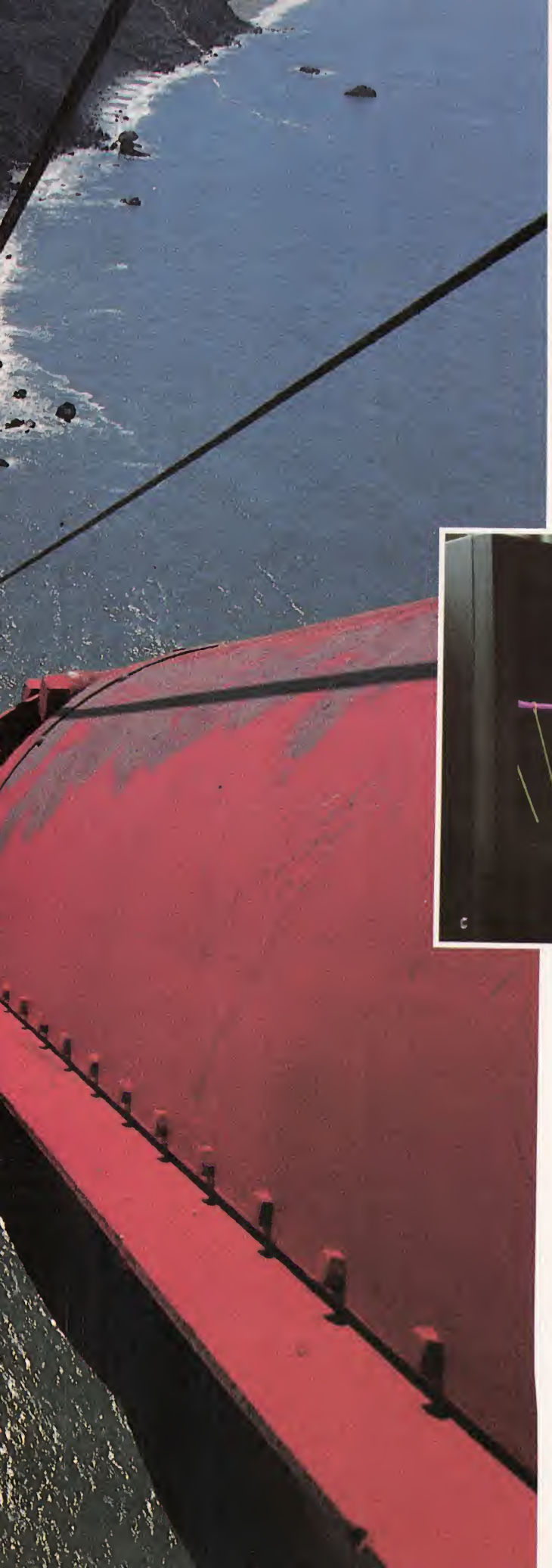

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