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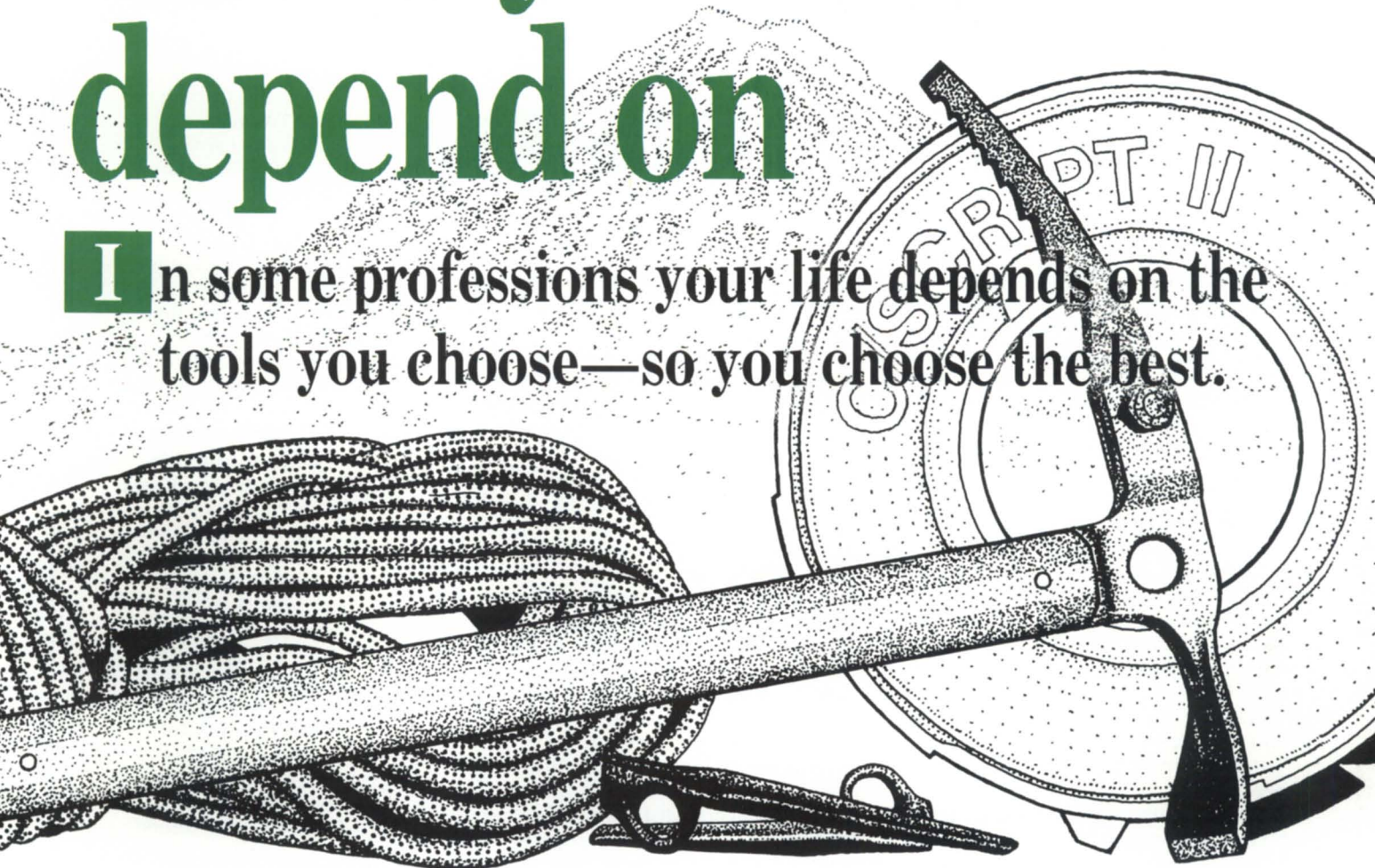
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PAT ON THE BACK

Accomplishments show that NADGUG is all grown up

by Joyce Carter
NADGUG president

As I tend to my duties as president of NADGUG, the scope of what we are, what we are doing, and the complexity of the operation astounds me. In a very short time, NADGUG has grown from a small group run by Data General to a somewhat autonomous, fairly large group, and our accomplishments are not to be taken lightly. Some of these accomplishments include the following:

- highly successful monthly publication of *Focus* magazine
- bigger and better conferences, with still more to come
- steady and continued membership growth
- growing number of regional and special interest groups
- improved relations between users and Data General, exemplified by DG's involvement and attendance at conferences and meetings
- users' input to DG about concerns and needs
- awareness of NADGUG at all levels of DG
- bulletin boards—both OIS and Rational Data Systems
- software library of useful public domain programs
- increased number of vendors exhibiting at the conference
- improved quality of exhibits.

This list certainly doesn't cover everything. These accomplishments do not just happen. Many people have put a lot of time, work, and creative thought into bringing these events to life. NADGUG and Data General have a partnership that is vital, sustaining, and aggressive. Through this partnership, we are able to work toward the common goal of meeting the needs of DG users.

From this cohesive partnership came the aggressive innovations that you have seen put to work. For example, *Focus* is the result of an aggressive idea that was accepted and developed. This magazine is published for the users. Data General advertises in it, and some of their people contribute articles. Data General distributes copies to their personnel and prospective user compa-

nies. Also, other vendors advertise and submit articles. Articles are also written by and about users. *Focus* couldn't exist without the partnership of NADGUG, Data General, and multiple vendors.

In making this partnership work, there must be communication. *Focus* is one method of communication, but there is another method that is important—hearing from the users. We try to provide as many opportunities as possible for each user to “have their day in court.” Roundtables at the conference is one method.

Soon, you will be receiving a questionnaire about our concerns and needs. Please fill it out and return it. Later this year, Don Clark and I will meet with Data General executives and present the results of the survey. This meeting between NADGUG and Data General has been held annually for the past few years. Every issue that has been presented as a result of the questionnaires has been addressed, responded to, and most importantly, followed through by Data General.

Many changes and improvements have been made as a result of this meeting. One of the greatest reasons for the existence of a user group and for belonging to a user group is the open exchange of ideas and goals. This includes voicing user needs and concerns. The people at Data General can not address your needs and concerns if they aren't aware of them, and taking them to the top in a tabulated, prioritized, and packaged presentation does more good than individual grumbles and gripes to the local service representative or salesperson.

NADGUG also needs some ideas, criticisms, and suggestions. Please fill out the evaluation forms at the conference. Let your RIG and SIG representatives know your concerns, and feel free to communicate with your NADGUG officers.

Spread the word about NADGUG to your co-workers and other users. Show them a copy of *Focus* magazine. Tell them what we have accomplished and how we are growing. Join the regional and special interest groups and invite others to be involved. We can be proud when we look at NADGUG and its accomplishments. And pride is what the NADGUG officers and staff, *Focus* staff, and Data General staff feel when each of you participate, grow, and learn through our efforts. Δ

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Good news for acronym fans—No Cal FUDGE is back. After a brief demise, the Northern California Frequent Users of Data General Equipment have resurrected the group with a very successful meeting held January 13 at the Oakland Hyatt. Forty-seven users came from as far away as Fresno, and 11 DG employees attended (including two regional managers and a regional director).

After a no-host reception, the group learned about the changes expected in rev 8 of AOS/VS and rev 3 of CEO, and got details on the newly announced rack-mounted versions of the MV/2000 and MV/1400. Steven Tyler of Airco Solar Products is serving as the acting president of the group, and Charlie Crain of Oracle is the acting vice president. The next meeting, March 9, will focus on system performance, and will feature presentations on DG/PC1 and Rational Data Systems' PC-integration products.

■
The Metropolitan New York regional

interest group has scheduled its next quarterly meeting for Tuesday, March 15, at the YMCA Retirement Fund, 225 Broadway, New York, New York. The meeting will run from 10 a.m. to noon, and will feature a presentation on computer security. If you are planning to attend, please contact Steve Kern at 201/327-6300.

■
The Houston Data General Users Group (HADGUG) held its first meeting of the year on January 14. Newly elected officers are Jeff Campbell, president; Lee Jones, vice president; Randy Berndt, treasurer; and Mike Davis, secretary. The discussion, led by local DG systems engineer Stacie Jakel, covered the pros and cons of CEO rev 3. For more information, contact Lee Jones of Gulf Coast Systems at 713/681-2301.

■
Plans are under way to re-energize the Central New York Users Group. Although the group has not officially met since September, end-users, VARS, and Data General sales representatives have

held several meetings since then, and Joanne Terry calls the new incarnation "dangerous."

The 1988 calendar so far has four meetings scheduled in the first six months at varying locations. The January meeting will be held in Albany, March in Syracuse, May in Utica, and a special June meeting/tour in Oswego.

■
The Colorado Data General Users Group held an afternoon meeting January 21. Officers elected for the new year include Debra Hoglund, president; Joyce Gross, vice president; Wendy Speckman, secretary; Don Davis, treasurer; and Bruce Carey, NADGUG representative. Ron Helart of Data Assurance gave a presentation on disaster recovery called "The Hot Site Solution." The group is also planning on compiling a library tape from contributions of CODGUG members. Their next meeting will be held March 10.

Anyone interested in joining CODGUG, contact Debra Hoglund at 303/490-4126. Annual dues are \$20. Δ

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LOOKING HEALTHY

Data General leads in health care industry

by Geri Farman
Focus staff

With 30 percent of the 200- to 800-bed hospital market and 20 percent of the community hospital market, Data General is one of the fastest growing suppliers of health care information systems. New developments in information management for hospitals may cause that market share to grow even greater. "We are one of the three leading hardware vendors in the hospital market," said Del Richmond, health care industry manager, "and 6 of the top 10 suppliers of health care information systems use our products as the basis of their offerings."



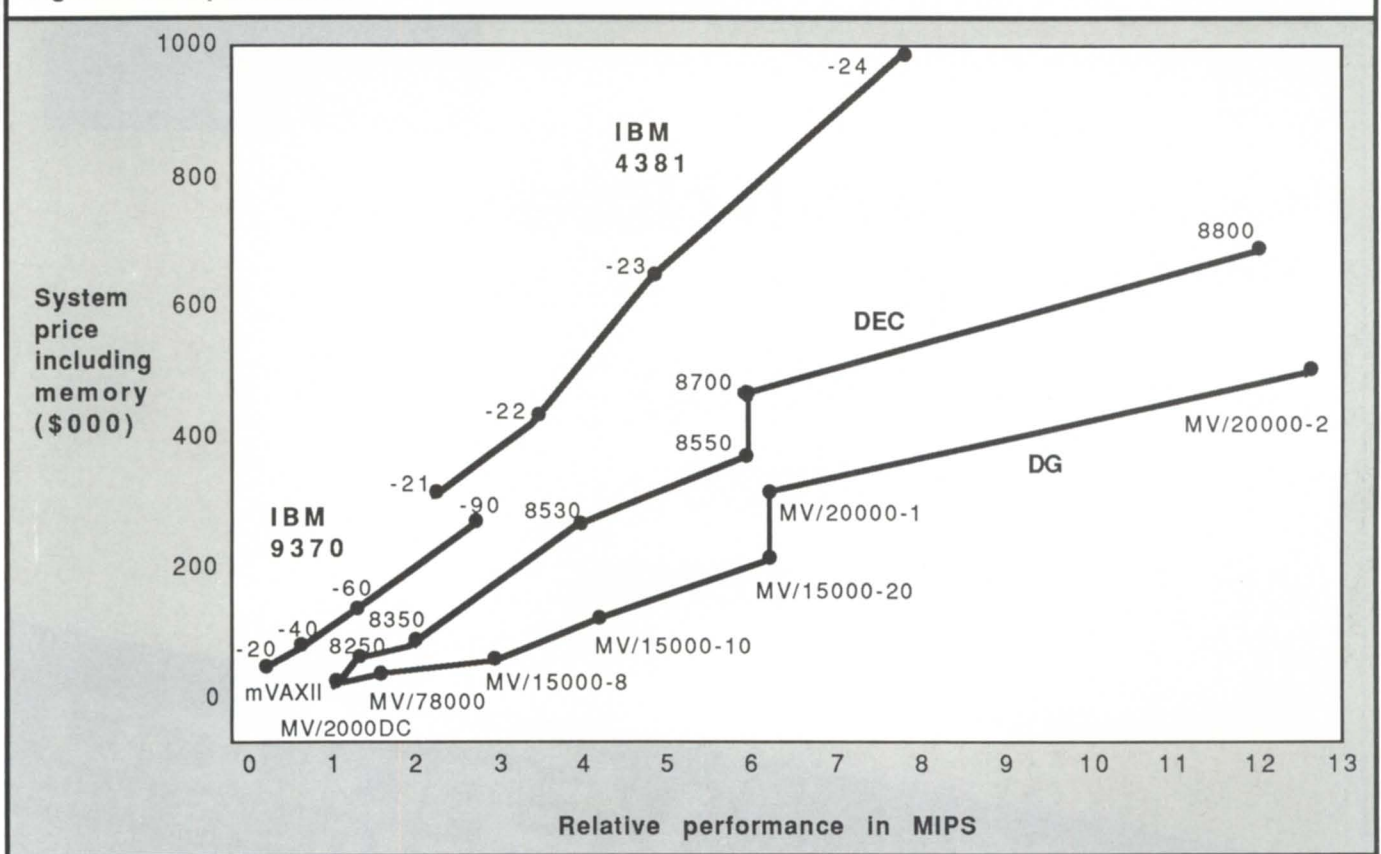
Data General's bedside terminals have gained widespread acceptance in the health care industry because they relieve nurses from many clerical duties.

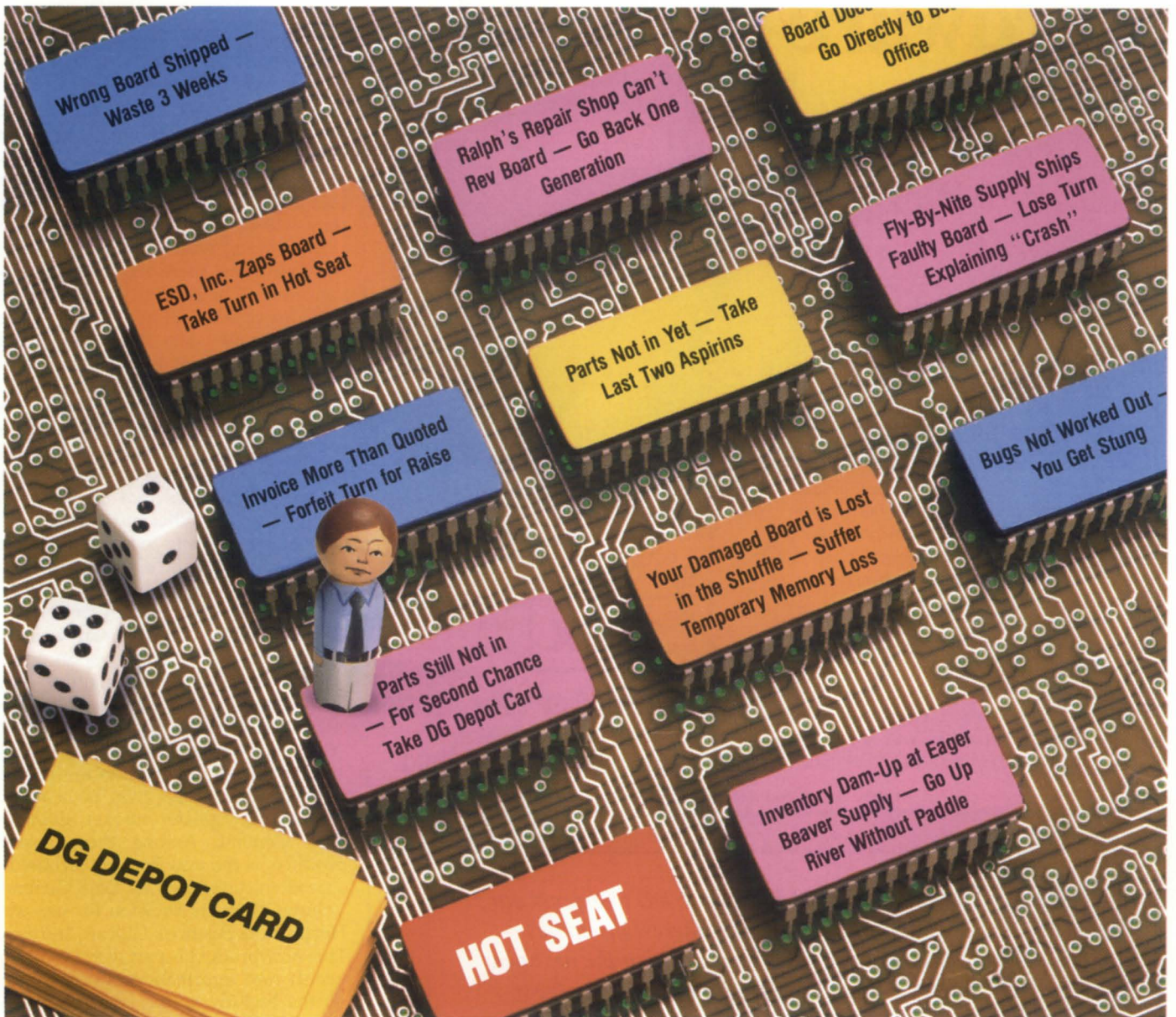
The health care market is VAR-driven, and Data General's relationships with these suppliers have been critical to their success. According to Richmond, Data General's price/performance was the initial draw for these VARs (see Figure 1). DG has fostered these relationships further through a variety of joint

marketing efforts designed to increase DG's visibility as a major part of the hospital "solution."

DG's presence is felt in basic market areas including complete health care systems, medical records systems, long-term care, and physicians' office systems. While their primary focus will

Figure 1: Price/performance





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"We now have a forum to go directly to DG to express our views. The AOS and AOS/VS special interest group has been lobbying, and I hope to be seeing during the next year the fruits of what we've done, for example, our five-year effort toward VT100 compatibility. I would say the DECnet project is the direct result of the users group. DG has been supportive of it and they didn't have to be. Greater connectivity to DEC and support for the Sun NFS under AOS/VS are two of the major goals of the group. If that gets done, I will feel I have done my job."

*David Novy
AOS & AOS/VS SIG
3M*

To find out about a special interest group for your particular interest or a regional interest group in your area, circle reader service #62 in this issue. For further information on the AOS and AOS/VS SIG, contact David Novy at 612/733-3320.

**NORTH AMERICAN
DATA GENERAL
USERS GROUP**

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continue to be on hospitals, health maintenance organizations (HMOs) and smaller hospitals are the next logical steps. Large group practices, clinics, and physicians' offices are areas where they will be pursuing VAR agreements.

In working with VARs, Data General has found that there are some common concerns. "The market wants a vendor that can provide all applications based on one single data base," said Richmond, "but often individual hospital departments want a separate 'Cadillac' solution for themselves that will interface with other departments' solutions. We can do it either way." In fact, one of DG's keys to success has been its ability to sell modules that can be interfaced later with other modules.

Hospitals usually want redundancy in their systems since they can't afford down time. Thus, multiple, smaller CPUs and disks are often preferred—allowing the system to remain available if a single piece fails. Interest in optical disks as a means of maintaining long-term records is also high in the market. All of these needs have been fed into DG's general product plans.

Vendor-specific products are gaining publicity lately, and may be a source for an even greater market share for Data General. Among these custom products is the new bedside terminal—a product developed by Data General's Volume Products Division for use with Health Data Science's Ulticare software. This new product is part of HDS's unique health care information system. Based on the bedside as the key information site, the Ulticare concept is designed to reduce clerical time for nurses, increase interaction with patients, and lower costs.

Until last year, HDS had been using another vendor for its bedside terminals. Data General signed a three-year contract in April 1987 to provide approximately 10,000 terminals for this integrated, bedside-based information system. These terminals were developed by Data General with various special features such as an implosion-proof screen, badge reader, special data/voice board, and various attributes to improve terminal/user interaction.

While a number of hospitals use CEO, office automation has lagged behind other applications. Most hospitals automate patient accounting and then ancillary departments. Working to install a horizontal productivity tool like CEO is one of the next areas of product focus for Richmond's group. Δ

Flood put a Chicago hospital's computers on the critical list

Recovery Room

by J. Stephen Keen and
William C. Queen, Ph.D.

Special to Focus



Ever wonder what is the probability that a fire, flood, power outage, explosion, or earthquake will damage your computer facility? For one hospital in Chicago, that probability became 100 percent last August.

On August 14, 1987, Chicago was hit with heavy rains causing severe flooding throughout much of the city. Firms everywhere started shutting down their machines and taking other precautions to minimize potential damage. Many organizations were spared; others were not so fortunate.

One local hospital experienced no damage to its computers, but lost its uninterruptible power supply system when the first-level facility was flooded. With no power to its computers, the hospital was forced to activate its disaster recovery plan. Overall, the flooding inflicted only minor damage to the hospital's operation, but its effect on the computer processing capability was devastating.

Without access to its MV/4000 and MV/20000 computers, the hospital's contingency plan called for instituting a comprehensive manual system with paper-based controls. Until the disaster occurred, this sophisticated and well-organized procedure had never undergone an extended test, certainly not lasting for 23 days! Operations returned to normal on September 6, more than three weeks later!

Some problems did surface utilizing these paper-based procedures, and unfortunately, it often took several days to spot and correct. However, because enough daily activities continued, it seemed that such a recovery system might work.

Reviewing the aftermath of the disaster proved otherwise. First, serious financial ramifications resulted, because during this period, the hospital was

unable to bill patients. Measuring this loss was the account receivable turnover rate, which grew by seven days. Equally alarming is that it took more than three months of financial management to return this rate to normal, resulting in a substantial slowdown in cash flow.

Of course, there were intangible costs such as a high level of stress and frustration for employees. Normally routine tasks became laborious and time-consuming. This may ultimately translate into a higher employee turnover rate and, perhaps, renewed union contract negotiations. The true costs can only be measured over time.

The hospital was fortunate, because the payroll had been distributed six hours before the disaster occurred, allowing the staff two weeks to find an alternate solution. If the power had been lost two days earlier, it would have caused considerable inconvenience and even more hardship on the staff.

Second, the computer system returned to full operation on August 25, or 11 days after the disaster occurred. However, it wasn't until 12 days later, September 6, that the paperwork generated by the interim manual system could be processed and normal operations resumed.

During this period, all available staff worked long hours entering every transaction that occurred during the original 11 days in addition to keeping up with the current work load. When the last entry was made, the actual time of the original disaster had more than doubled. In a hospital environment, unless totally up-to-date information exists, a hospital's computer system cannot be brought on line.

While the disaster was an ordeal for the hospital and its staff, consider how much worse it could have been if the CPUs, peripherals, software, or data files had been involved. How many weeks would it have taken if the computer facility itself had to be rebuilt or relocated?

Before this disaster occurred, the hospital's auditors had recommended a true disaster recovery plan be developed. When the disaster struck, the hospital was creating such a plan. Studies determining the limitations and impact of a manual system were already completed. All the various contingencies, approaches, and key decisions had been discussed at a meeting just a week earlier. Unfortunately, Murphy's Law prevailed.

As the above case history indicates, the impact of computer systems on hospital operations is formidable. Virtually every aspect of day-to-day activity is related to, or governed by, a computer. Whether it is locating a patient, scheduling admissions, ordering prescriptions, checking test results, tracking patient progress, or handling financial matters, hospitals rely on computers to control costs and process information.

Computer up time is a key word in an atmosphere where operations such as admissions, emergency, lab, phar-

macy, and billing simply cannot be down. Lost time due to equipment malfunction or even routine maintenance can have serious ramifications since timely and accurate information is critical. In fact, important computer procedures such as backups are typically limited to one hour daily, as longer interruptions cannot be tolerated.

"Dependency" is another important concept in this environment. Many hospitals, in an attempt to reduce their dependency on a single computer system, utilize multiple systems (CPUs). According to the Chicago hospital, however, both of their systems are critical to daily operations and incapable of backing up each other. In other words, the dependency still

exists, but has merely been distributed.

While hospitals have recognized their growing dependence on computers, few have developed viable contingency plans to deal with a prolonged interruption of their processing capability. This, however, is changing.

The analysis and design of a hospital's disaster recovery capability is complex. With multiple CPUs integrating all the various hospital functions, there is a considerable amount of communications and dependency. If one link becomes inoperable, the entire system can be crippled.

In addition, many hospitals are located in relatively old buildings with antiquated wiring, and have situated their computer operations in spaces never designed for such purposes. Most facilities, as the one in Chicago, have grown over the years with little regard for contingency planning.

For many hospitals, falling back on manual procedures is a convenient and easy solution, but one that can have serious consequences. For a hospital to be confident of a timely recovery in such a computer-intensive environment, it must have a well-organized and properly tested total disaster recovery capability.

To be effective, it must at least be able to:

- activate a backup computer facility and establish a complete operations environment
- retrieve backup data and reconstruct critical applications up to the point of disruption
- divert all critical lines in the network to the backup facility
- provide the clerical environment necessary to carry out essential hospital business operations
- simultaneously initiate the steps necessary to restore the damaged facility or equipment
- effectively manage all aspects of the recovery period to minimize confusion and time.

Few hospital recovery plans in existence today satisfy all these criteria. Fewer yet have been tested. Δ

J. Stephen Keen and Dr. William Queen are consultants on the staff of New York-based Sysgen Recovery Services Inc., which provides disaster recovery services to DG-equipped organizations. Send questions or comments to Sysgen Recovery Services Inc., 77 Air Park Dr., Ronkonkoma, NY 11779; 516/737-4300.

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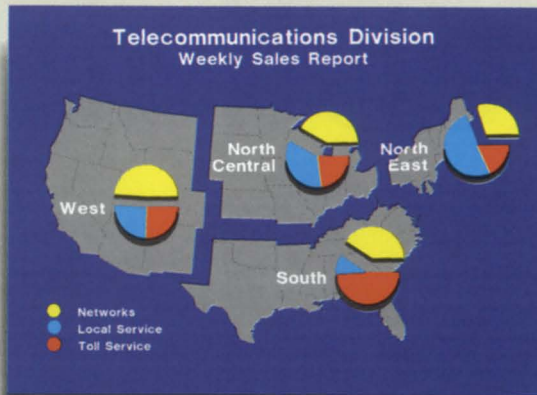
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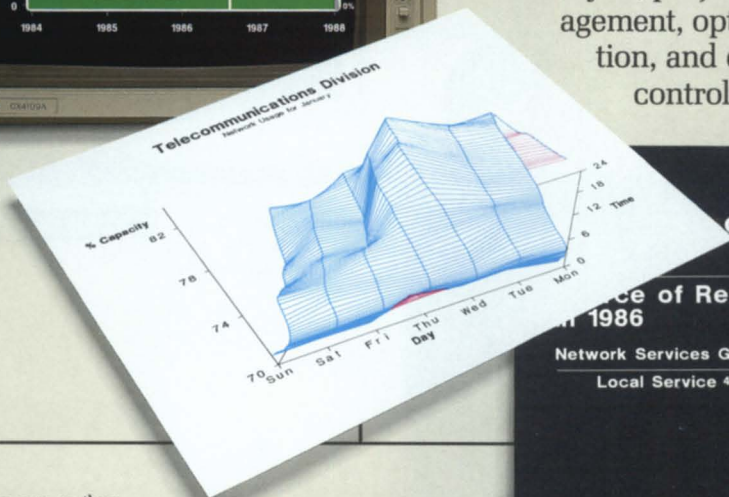
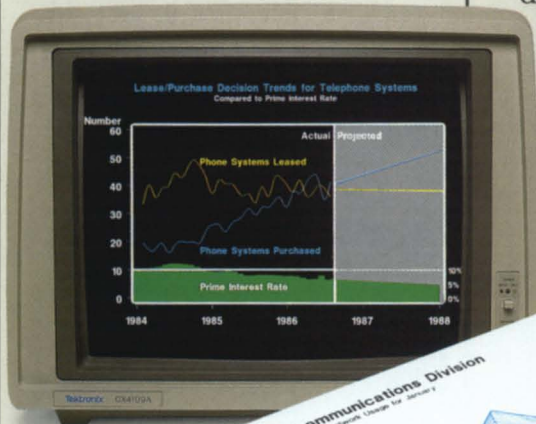
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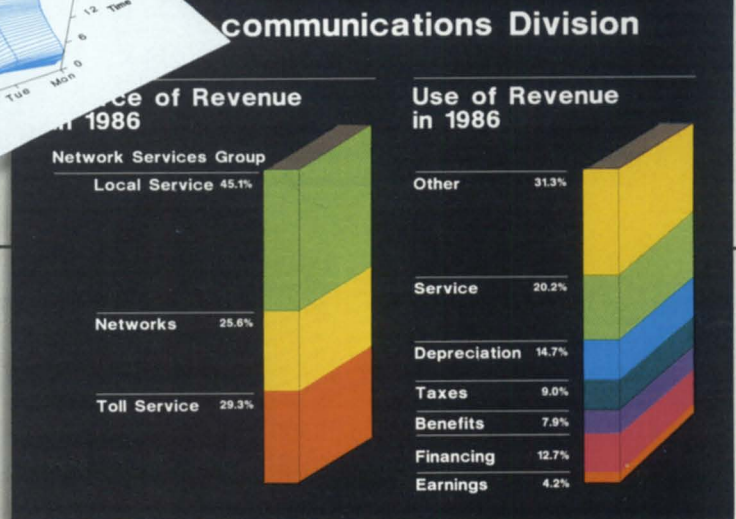
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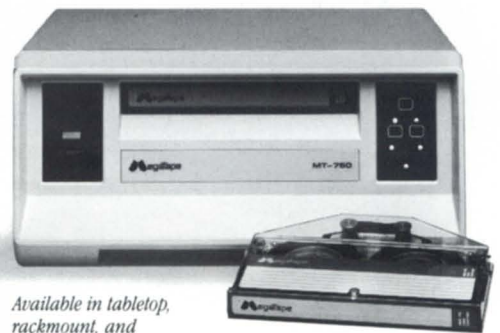


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A CLEAN BILL OF HEALTH

Mimer 4GL/DBMS tests positively at the BUPA Medical Centre in London

by Mike Sandford, Ph.D.
Special to Focus

The BUPA Medical Centre in London has been using a medical screening system on a Data General C/330 for some years now. This is a 16-bit system with memory mapping and some special transaction processing and data base software. It has done its job well.

However, specially written and shoe-horned software isn't easy to modify, and after seven years, there is a long list of things to be done. One of the major problems was a lack of query facilities. New questions had to be coded in Fortran, and users gave up asking. More importantly, the screening protocol was due to be changed, and the computer system was actively holding up the plans. As a result, the Medical Centre decided to upgrade their computer system and called in Database Associates to do the work.

The Medical Centre screens healthy people by taking various clinical measurements, such as blood pressure or cholesterol level, and checking these values for signs of trouble. The computers collect the data from various parts of the building and print a report. In order to do this, it has to know when people are scheduled, and keep track of them as they move from place to place.

This aspect makes the system dependent on the way in which the screening is organized. Between 80 and 100 people come to the Centre each day, each accumulating between 1 and 2 KB of data per visit. All of this data is kept for comparison at future visits and for research. As a result of all this, the computer should be able to record useful management and marketing

data such as customer throughput and payment. The system currently provides a data base of some 90,000 clinical records that can be used for research.

The first problem Database Associates faced was organizing the project with as little disruption to the screening line as possible and without any loss of existing data. We chose an evolutionary strategy for this. We would write modules in a suitable order and use them as they became available, running both the old and new systems together. This is only possible if the two systems can share data; therefore, a central part of the design involved a real-time link between the two computers so that all data recorded by the old system would be mirrored on the new one.

The new system had to be as flexible as possible, and this implied using a virtual memory machine. This turned out to be a DG MV/10000 running AOS/VS. Similarly, the data base system was to be relational. We wanted to buy a data base management system, and we wanted the DBMS to be reasonably portable. We also wanted to be able to use 4GL techniques and to mix them with 3GL facilities as necessary.

Experience with the previous system showed that the Medical Centre had some requirements that could not be handled any other way. In fact, there are not very many portable DBMS/4GL systems available, and competition among them is very strong.

We went through an evaluation exercise that involved a detailed and weighted checklist of requirements. For the two finalists, we ran a benchmark test simulating the proposed application. This took about a year and resulted in the selection of a Swedish product called Mimer.

Mimer provides a data base interface accessible from COBOL or our preferred Fortran so that, if required, any of the facilities can be accessed from one of these languages. To satisfy our 4GL requirements, Mimer provides a non-procedural language that can be run under an interpreter or be compiled. The compiled output can be linked

with Fortran subroutines or used as a subroutine itself. We use PG as the programming language for nearly all of our code. For ad hoc queries, there is also a query language.

The flexibility of Mimer has allowed Database Associates to design a flexible menu system that is entirely driven by tables in the data base and that allows us to add new facilities at any time without reissuing existing modules.

We had some surprises once the project was under way—the first being that relational tables take up more space than we thought, and certainly more than the original data in our tightly designed, previous system.

Second, it turned out to be more difficult to produce a real-time link than we thought. There was no problem in the principles of converting access commands from one system to the other. It just took too long. The problem was in the command interpretation, not in the eventual Mimer access. We now have a mechanism that runs fast enough, but it has taught us a lot about code and algorithm optimization.

The most interesting problem, however, has been project management. There are well-defined procedures for long life cycle, closed projects, but these aren't applicable when the project actually consists of a number of subprojects, some of which may be running in parallel.

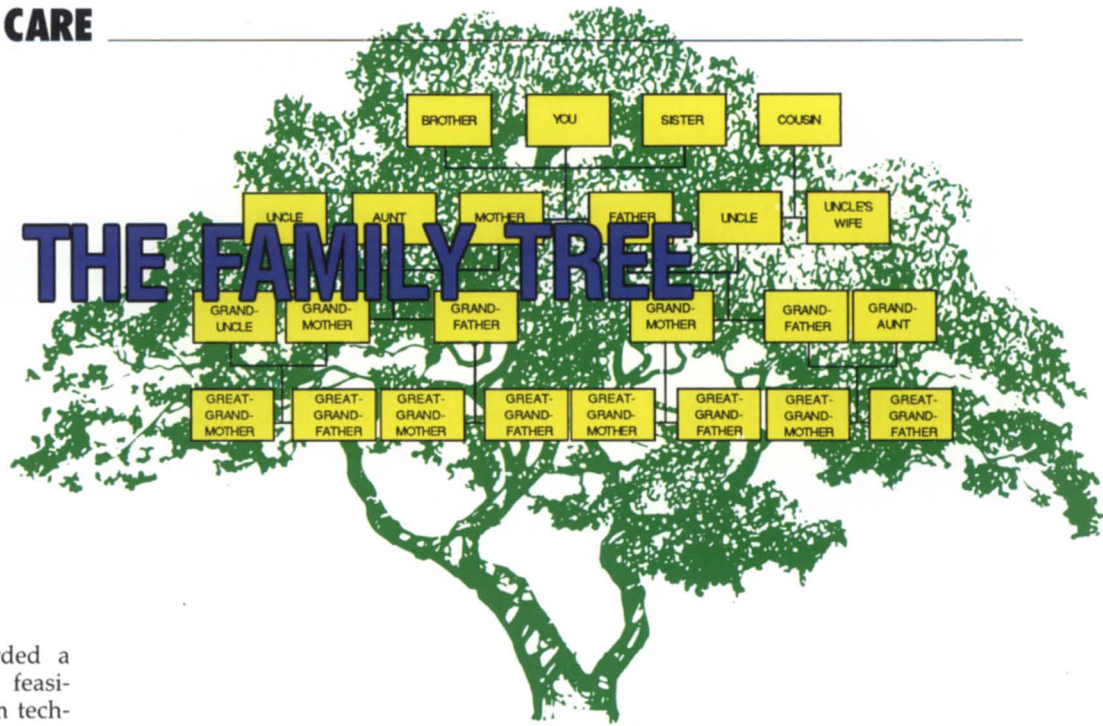
We are now at a stage where the clinical data from the current system is available on the new system. The research department is very pleased with this. They use the query language to isolate the data they want and convert it for use with the statistical package they use. The first stage of the project is now live, and the new system is producing reports based on data collected from either system. New modules are now being developed at an ever-increasing rate, and they can be introduced when the users are ready. Δ

Mike Sandford is the managing director at Database Associates, 9 Mardle Rd., Leighton Buzzard, Bedfordshire LU7 7UR, England.

PRUNING THE FAMILY TREE

Prototype AI software helps advance genetic research

by Sue Dintelman
Special to Focus



DMS Systems has been awarded a federal grant to investigate the feasibility of combining expert system technology with genetic analysis technology to produce the prototype for a system that could help a physician or genetic counselor identify potential health problems.

Several factors influence personal health, including diet, exercise, place of residence, and use of tobacco and alcohol. Another factor is genetic background. Genes not only determine a person's hair color and eye color, but they also influence the probability a person has of developing certain diseases. High blood pressure, breast and colon cancer, and some mental disorders are examples of diseases that have a genetic component. In other cases, diseases are completely caused by a defective gene, such as Huntington's disease, cystic fibrosis, and muscular dystrophy.

Recent developments in genetic technology have improved our understanding of genetic diseases. These developments rely on gene cloning, which is the ability to isolate a small segment of hereditary material (DNA) and study it in detail. This technology makes it possible to see the differences in a specific segment of DNA between the general population and individuals who carry a defective gene.

When isolating the disease-causing gene is not possible, gene cloning can be used to develop genetic markers. Markers are cloned pieces of DNA that indicate differences in the DNA sequence at a particular location in the human genome between one individual and another. These differences are important because they can be traced in families, effectively allowing re-

searchers to trace the inheritance pattern in that part of the genome. Finding markers for a disease-related gene allows researchers to understand the nature of a defect that was previously completely unknown. Eventually, it can lead to the identification of the specific gene related to the disease. This process of identifying genes using cloned pieces of DNA is called gene mapping.

Markers also provide tools for genetic counseling, because predictions can be made concerning who will be affected by a genetic defect. For some diseases, an experienced geneticist can identify individuals who will develop the disease by collecting blood samples from family members, testing for markers, and doing a genetic analysis. In other cases, it isn't yet possible to determine if an individual will get a disease, but it is possible to compute a risk level. A physician can recommend changes in lifestyle to people who are identified as being affected or at high risk for a condition like high blood pressure, which may reduce the risk of getting the disease. For other diseases such as breast or colon cancer, an individual at high risk can be tested more frequently, so that if the condition does occur, it can be caught at the earliest possible stage.

Several computer programs have been developed to perform genetic analysis, but they require someone with extensive computing and genetic expertise to identify individuals at risk for certain diseases. As genetic knowledge with practical applications con-

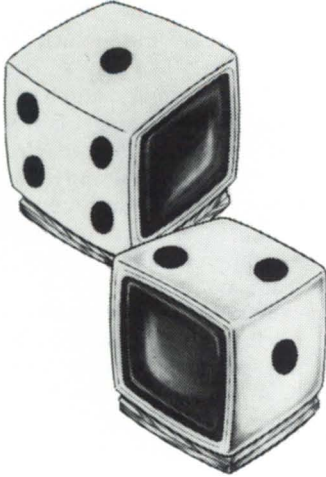
tinues to increase, the number of institutions that will benefit from the ability to collect and analyze family data will also increase. DMS Systems is currently investigating ways of packaging these sophisticated analysis programs so that a physician or genetic counselor may have the benefit of a genetics "expert" when dealing with diseases with a genetic component.

The expert in this case is a computer program. An expert system is an artificial intelligence (AI) program that uses a body of knowledge to perform a somewhat difficult task usually performed by a human expert. Expert systems are used today to do real-world jobs including configuring computer systems (XCON), mass-spectrogram analysis (Dendral), and diagnosing pulmonary function disorders (PUFF).

The expert system currently under development at DMS Systems to do genetic analysis is called Genex. Genex is a prototype system intended to demonstrate that genetic analysis is an appropriate area for expert system technology. Genex will aid in directing a complex genetic data collection and analysis process. The initial Genex implementation deals with the analysis that is done in order to determine which people in a large, complex family tree are carrying a particular recessive gene.

It is possible to identify individuals in a family who have two matching recessive genes because they exhibit whatever trait is associated with the gene. If the recessive gene is associated with a terminal disease, it is important to try to determine who is carrying the

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recessive gene, especially when individuals in the affected families are considering having children.

The first step in a genetic study is the collection of familial information. This takes the form of a family tree, with as many branches of the family included as possible, as far back as possible. Indicated along with the individuals in the family tree are the results of any medical or genetic tests that have been

conducted, and whether or not the individual is affected. From a data processing point of view, the handling of familial data is interesting because of its recursive nature. That is, a person has a father, who had a father, who had a father, etc.

The project is using Genisys, a DMS Systems data base management product, for data storage and retrieval. The

first part of the analysis process involves deciding which part of the family tree to analyze. Because of the time-consuming nature of the genetic analysis programs, it is not possible to analyze the entire tree. Pruning a family tree to include only the most informative or relevant components is a common problem in genetic analysis, not only in human genetics, but also in plant and animal genetics. This type of problem, like many others in artificial intelligence, involves narrowing down the set of all possible cases and investigating only cases that have the greatest possibility of success.

Analyzing the pedigree is done by choosing a hypothesis as to who introduced the gene and who is carrying it. Then the software computes the probability that the hypothesis is correct. If the probability is low, another hypothesis is selected for testing. This process is repeated until a hypothesis is found that matches the data well or until it is evident that no progress is being made. In the latter case, another part of the pedigree can be chosen and the process repeated.

The determination of the best subsets of a pedigree to consider and the best hypothesis to pursue for analysis can be done by an expert geneticist. Genex will model this pruning expertise. The expert who is providing the knowledge for the expert system is Dr. Elizabeth Thompson, who is the principal investigator for the grant. Dr. Thompson, professor in the Department of Statistics at the University of Washington, is one of the foremost experts on genetic analysis and is the author of many of the analysis programs that will be used in the system. Dr. Thompson is spending several months at DMS Systems to direct this project. Consulting on the project is Dr. Mark Skolnick, vice president for medical research at DMS Systems.

The grant that has been awarded is a Phase I Small Business Innovation Research (SBIR) grant from the National Institutes of Health (1R43RR03678-01). This type of grant is made to small businesses to help fund primary research that, if successful, might eventually produce a viable commercial product. Δ

Sue Dintelman is vice president of DMS Systems, Inc. She can be reached at 1111 Brickyard Rd., Salt Lake City, UT 84106; 801/484-3333.



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HALF FULL OR HALF EMPTY?

An introduction to system capacity planning

by Dennis J. Berman
Special to Focus

Put 10 system managers in a room to discuss capacity planning, and they will emerge one week later with 11 opinions. What is capacity planning? Some have defined it as taking your annual hardware budget and tripling it. The more optimistic say it is the measurement of how much more will fit on your computer, and what is needed to efficiently satisfy your future processing requirements. That is a lot of variables—even more than you are probably aware of.

Capacity planning is an inexact science, but a science nevertheless. If you have the bucks, pay someone else to do it, because capacity planning is time-consuming and involved. One wrong calculation could ruin your projects, or worse, your job security. I wish there was one simple formula for measuring and projecting your computer needs, but predictably, this topic is too system dependant.

Keep in mind two things when considering capacity planning. First, to be worth the effort, your system must be well tuned before you start any study. Second, don't make any hasty assumptions. Your system is one big cause-and-effect merry-go-round. These interactions can be narrowed down to combinations of CPU horsepower, memory pages, disk space, and chassis slots. Capacity planning is closely tied to performance monitoring. You need to be able to measure these components.

If you are executing an average of 2 million system instructions per second

on your MV/20000 model 1, then you are utilizing about 40 percent of your CPU's horsepower. Capacity planning would predict how much more CPU you would use when you add on those two new accounts payable systems you have planned for next spring. If you will be adding many users and/or a lot of large programs (or a few poorly written ones), plan on a heavy increase in CPU demand. A good way to measure CPU usage is with one of the DG performance monitor programs called CPUTIME. It is a spruced-up version of PED. (Come on DG, give this program to everyone without making them buy the entire monitor package. It should help sell hardware!)

DG computer memory is measured in megabytes that are broken into 512 pages each. Once again, you may use the performance monitor to see how many of these pages are, on the average, in use by the system or its users. You may obtain the same data by using much less expensive third-party monitoring packages such as :PERFMGR (by :SYSMGR/B.J. Inc.). For the adventurous, you could also grab a copy of the *System Programmer's Guide* and write your own monitor using system calls.

Memory is the golden ring on the above-mentioned merry-go-round. If you run out of pages, the resultant memory contention will affect CPU horsepower once the intense page-stealing routines kick in. In turn, the disk drives will heat up as the :SWAP and :PAGE directories are put to use. Adding more memory isn't always the answer. Your CPU may not have room for more memory, or you may have an I/O bottleneck even before any contention sets in. In this case, another channel may be in order. If you are adding large data bases or busy applications like spreadsheets and word processing, plan on more page usage in your future.

File- and disk-level reorganization is your disks' best friend. Reloading

heavily updated, large INFOS files in descending key order is a good trick. The new DISK_PAK disk reorganizer (by Eagle Software, Inc.) is a handy tool for disk-level cleanups. You will need to do all this anyway when DG introduces the new file system this year. If you are adding high I/O applications like data entry or file maintenance, plan on more disk drives or at least some disk load balancing.

Chassis slot limitations are the most overlooked of the capacity planning components. For instance, if you need to add 17 users to a system that has no open device ports, you will need to install at least two new IACs. Can your expansion chassis accommodate? Will your power supply give up? Will all those users be too much for the IAC's buffer to handle (CAD/CAM could do this)? If you answered yes to any of these, plan on a CPU upgrade or some sort of port-contention scenario.

While the study is ongoing, be aware of two things: processing environments and methods of projection. If you are like most shops, your system has two personalities. By day, it has a high PID count and is mostly interactive. A lot of memory management and CPU activity is taking place. As the sun sets and most normal people head home, the emphasis shifts to batch processing with increased disk activity.

This schizoid state means that when you monitor the system, make sure you cover both the interactive and batch periods. Treat them as two separate studies. Do not average them together. Your CPU may be able to handle an increased user (interactive) load during the day, but your batch will now have to handle the extra data they created. Those jobs could run well into the next day's interactive cycle. Be aware of your processing windows.

When projecting future system behavior and needs, never get caught doing geometric straight-line projections. If you now have 10 users who use 20 percent of your CPU, don't as-

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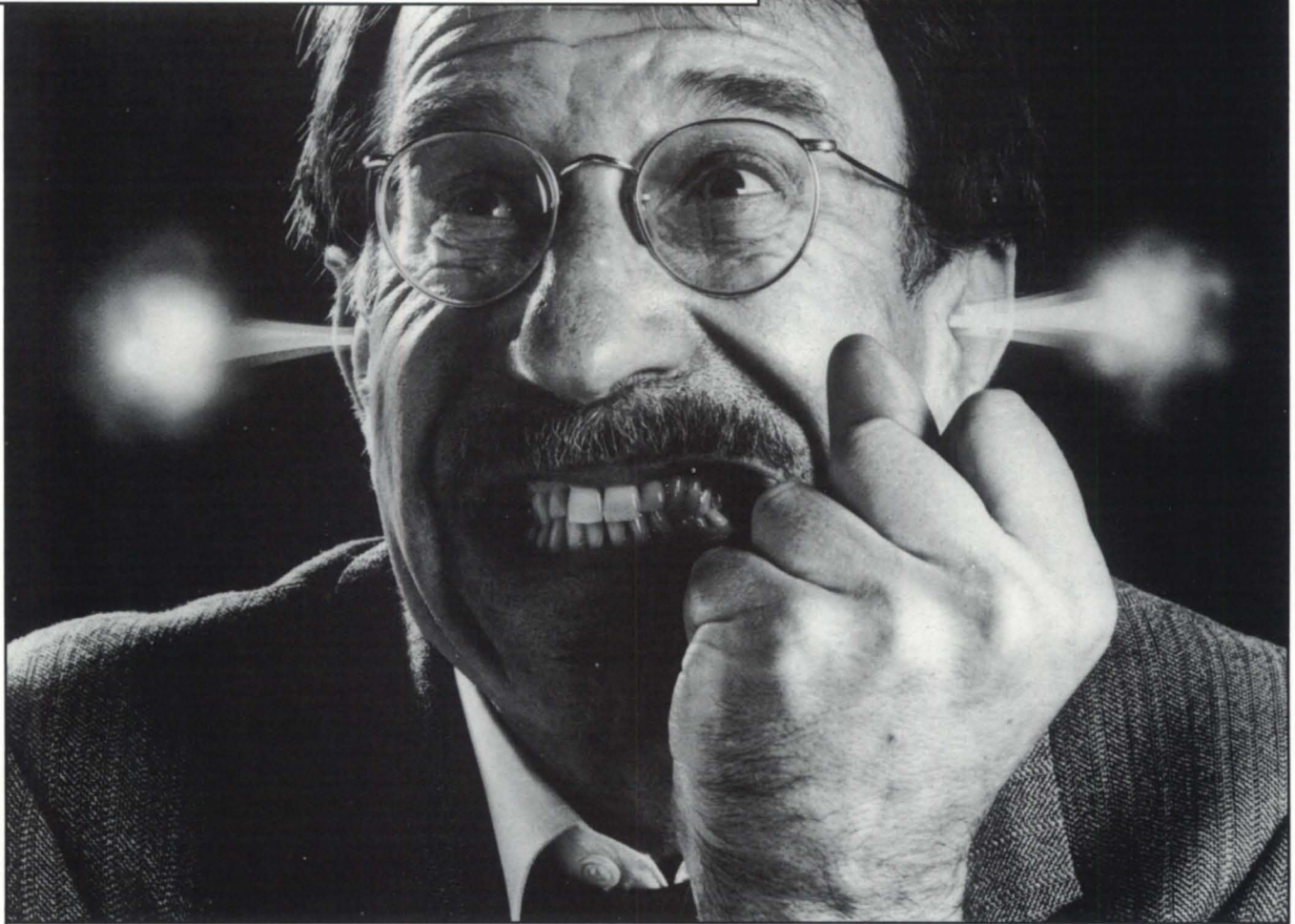
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sume that adding 10 more users will take up 40 percent. Computers don't work that way. As system activity increases, the planning components start interacting with each other. The trick is in predicting when each bottleneck will occur. Plan for one bottleneck and you may cause another. If you can, phase in your new applications. Take benchmark monitor statistics at each milestone and base your projections on those results.

As mentioned, try to get someone else to help you with your capacity planning. *Focus* sports many ads from consultants who do performance tuning. These folks should be pretty good with capacity planning. If you ask me, it is the hottest new DG market since disaster planning. DG has a group in Atlanta called the Systems Engineering Performance Analysis Center (SEPAAC) that offers capacity planning services. They can work in conjunction with your local DG office. Prices range from \$500 for a quick-and-dirty MV checkup to full wash-and-wax plans for around \$10,000. It is worth looking into. Contact your DG account representative for details.

In conclusion, a continuous program of capacity planning is essential if you are to make the best of your current and future systems. Here are some ways how:

- Educate yourself on how your system's CPU, memory, disks, and ports all play together.
- Learn how to measure those interactions.
- Make no assumptions when predicting future system behavior.
- Interview all users who may have future needs.
- Check your actual results against your most recent capacity plan to see if you need to alter your study the next time around.

■
In response to my November 1987 *Focus* article, DG's Kim Medlin (of blackjack fame) has come up with an easy way to subtotal and item-count fields in DG Present without sorting or control-breaking on them. I will review this in a future article, or drop me a SASE for a reply.

Thanks for the job offers in response

Dennis J. Berman is the supervisor of data processing facilities for Crown Central Petroleum Corp., 1 North Charles St., Baltimore, MD 21202; 301/539-7400.

to my May 1987 article. But I am sorry, I have no desire to relocate to Siberia. I make it a practice not to live more than 50 miles from a supply of freshly steamed crabs.

Per your requests, I am also working on an article where I'll review some of my favorite software packages for DG systems. It will include my best find to date—THE ULTIMATE by LeSoftware

Man Ltd. This versatile data management package is a cross between DG's Inquire and Sort/Merge. For more information, write them at P.O. Box 545, London N78DF, England (telephone 01-609-4494, Michel Creppy).

Finally, from my January 1987 article, I want you to know that I am still patiently waiting for Vanna White to return my calls! Δ

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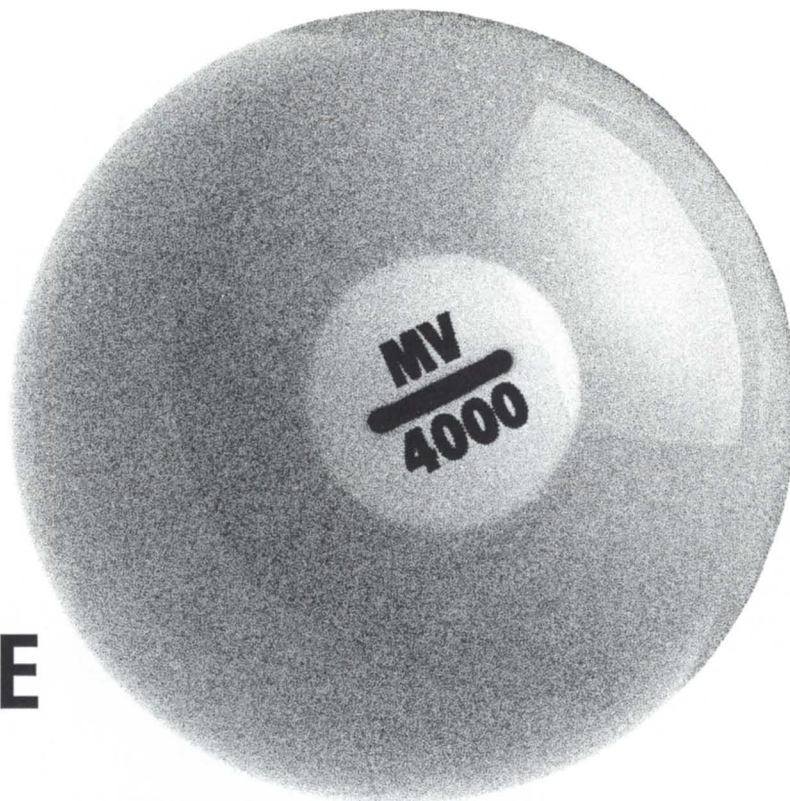
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ON CUE

Modeling the performance of an MV/4000 minicomputer using queuing techniques

by Jeff Buckwalter and Arthur Lin
Special to Focus

Does this sound familiar? Response time on our MV/4000 got worse as more users wanted to do more work. What to do about it?

This was the situation we found ourselves in with our Computer Science Department computer at the University of San Francisco. Since time and talent are easier for us to come by than money, we decided to first investigate the effects of upgrading the system *before* actually purchasing additional hardware.

To do this study, we built a queuing network model of our MV/4000 system. A queuing network model is a good compromise between a complex but highly accurate simulation model versus a simple but less accurate seat-of-the-pants estimate. Queuing network models need relatively few input pa-

rameters and are straightforward to build. They can be evaluated quickly using relatively simple software packages. They can be easily modified to predict the performance of different hardware and work load configurations. And they are acceptably accurate. All of these advantages have been discussed extensively in the literature. We found *Quantitative System Performance*, by Lazowska, et. al., particularly clear on these points, and used their methods in our study.

We set out to see if a queuing network model of our system would help us predict the effect of hardware upgrades, such as doubling the CPU speed or adding a second disk. Briefly, the answer was yes. In fact, the model even pointed out some counterintuitive effects that we probably would not have foreseen otherwise. This article will outline how we built the model and what results we got.

Stages of modeling

Building a queuing network model has three stages: defining the model, parameterizing the model, and evaluating the model. *Defining* the model means abstracting the essential aspects of the real-life system from the myriad of details about the system. This includes selecting the system resources and work loads that will be repre-

sented. *Parameterizing* the model means collecting the numeric inputs to the model. For a *baseline model*, the input parameters come from work load measurements of the actual baseline system. For a *projection model*, the input parameters come from modifications of the baseline parameters. The modifications reflect anticipated changes to the baseline system. Thus, the modifications are intended to answer some "what-if" questions about the original system.

Lastly, *evaluating* the model means using an algorithm to calculate the model outputs. For a baseline model, these outputs can then be compared to performance measures of the actual system. This comparison, and possible reworking of the model, is called *validating* the baseline model. For a projection model, the outputs are estimates of how the actual system would perform if the anticipated changes were made.

Defining the model

We model the hardware in the system with two service centers. One represents the MV/4000 CPU. The other represents our single disk.

We model the system's work load with two classes of processes. One class is the interactive processes, which we define as "terminal type" since the interactions are generated by a small

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Figure 1: Results summary

Performance quantity	Class	Baseline model	Faster CPU	Second disk
Throughput (processes/sec)	Inter.	0.54	0.56	0.57
	Noninter.	0.017	0.046	0.017
Response time (sec)	Inter.	10.24	9.06	8.15
	Noninter.	188.8	70.1	195.3
Disk response time (sec/disk)	Inter.	4.50	7.29	1.02
	Noninter.	11.5	18.1	2.58

number of terminals. The interactive processes are typically the AOS/VS command line interpreter (CLI) and text editor SED, students' interactive programs, and various utilities. The other class is the noninteractive processes, which we define as "batch type." These are typically compiling and linking jobs.

Measurement data collected

Successful baseline models require two sets of measurement data. One set is the work load measures used to generate the inputs to the queuing network model. The other set is the performance measures, which are used to validate the output of the model. All of these measures are straightforward to collect using standard Data General performance monitors.

We list the sources of measurement data as follows.

1. SYSLOG, the system log facility, records cumulative usage statistics for each process.

2. Monitor, a CPU-oriented software monitor, gives such information as CPU utilization and CPU queue lengths.

3. DISCO, a disk-oriented software monitor, gives such information as disk utilization and disk queue lengths.

4. PED (process environment display), a process-oriented monitor, gives status and usage statistics for each process.

In order to validate our techniques, we performed four different runs. For each run, we collected data; defined, parameterized, and evaluated a baseline model; then compared the model outputs against the available actual performance measurements. In each case, the comparisons were acceptable.

Parameterizing the model

Several simplifications can make parameterizing the model more manageable.

Standard DG monitors cannot give us think time at the terminals, which is one of the needed inputs to the model. (Think time is the amount of time the user spends deciding what to do next at the terminal. Obtaining this is often a problem in any model of interactive work loads.) Data General has a think time monitor, but it is not commercially available at present.

However we can *estimate* a value for the think time, plug it into the model, and evaluate the corresponding model. We compare the model's throughput, which is a key output of the model, with the *measured* value of the throughput from the performance monitors. If the difference is sufficiently close, then we have found a good enough estimate for the think time. If not, we repeat the process with an adjusted value of think time until we obtain agreement on throughput. Although this method may sound like trickery, it works well in practice. Queuing models are, in general, so robust and stable that such iterative adjustment methods are quite useful.

Another common difficulty in modeling studies is apportioning the use of a resource, for example, the CPU, between the two work load classes. This is especially vexing if the performance monitors give only a lump-sum usage, and not explicit usage by class. A standard technique in the modeling literature is to apportion usage for the two classes based on the data that is available. For instance, from SYSLOG we can calculate the total number of CPU-busy seconds for the interactive and the noninteractive classes. The relative ratio of these two busy times can be used to apportion the measured CPU utilization between the two classes. This overcomes the fact that Monitor doesn't report on CPU utilization sepa-

rately by class.

A question that always arises in such studies is how to account for system overhead. By this, we mean the CPU utilization and disk requests due to the *internal* operation of the operating system itself. (The monitors attempt to account for and report on the resource consumption of the operating system when it is acting on behalf of a user process. Such resource consumption is included in the usage figures for the process.) We chose to include all of the operating system overhead in the interactive class. This is partly because our attempts to apportion overhead between classes do not validate well, and partly because the overhead is more interactive in nature than batch in nature. However, including all of the overhead with the interactive class means that the model results should be interpreted for "fat" interactive processes and "lean" noninteractive processes.

Parameterizing a large model is tedious and error prone. Hence, we wrote a front-end data reduction program to scan the monitor output and build a model for us. In addition, we automated the adjustment of think time to quickly find the value of think time that validates the model the best.

For more details of parameterizing a model and other helpful ideas, contact the authors.

Results of baseline model

We evaluated our models with the approximate mean value analysis algorithm. This algorithm is very fast, and it is accurate enough for our purposes (to within a few percent of the exact MVA algorithm).

We programmed these algorithms and a number of variations in Fortran 77. They are available from the authors in a version for the Data General MV series and in a version for IBM PCs.

The following table gives a few results for the model of run 3, which was a 30-minute sample of a typical heavy work load.

Interactive throughput	
Actual measurements:	0.54 interactions/sec
Model results:	0.54 interactions/sec
Noninteractive throughput	
Actual measurements:	0.018 jobs/sec
Model results:	0.017 jobs/sec
CPU utilization	
Actual measurements:	96%
Model results:	93%

In general, the comparisons between actual measured results and model re-

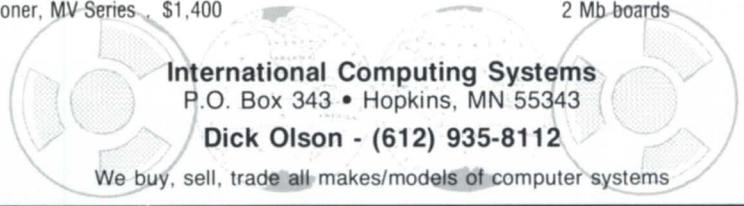
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sults are acceptably good. The relative errors range from 0 percent on interactive throughput to 13 percent on non-interactive CPU queue length.

Thus, the models are good enough for answering capacity planning questions about the CPU or disk, as will be shown later. However, as is often true for queuing network models, capacity planning questions involving main memory, swapping, or alternative scheduling algorithms are not as straightforward to answer with these models. Such questions can however be approached with the techniques discussed in Lazowska.

Projections

We use the baseline model to project the effects of doubling the CPU speed and adding a second disk. We assume that the other input parameters, such as think time and number of processes, stay the same. We are also implicitly assuming that doubling the CPU speed and adding a second disk have a negligible effect on the amount of paging and swapping activity. Such an implicit assumption will be more valid for a system that has enough memory to keep paging to moderate levels.

The results, summarized in Figure 1, show that a faster CPU helps the non-interactive processes significantly, which is not surprising since they are heavily CPU-bound. Throughput for the noninteractive processes improves 171 percent, and response time improves 63 percent. However, the faster CPU does little for the interactive processes. Their throughput improves only 4 percent, and their overall response time improves only 12 percent. In fact, their response time at the disk (sometimes called disk service time) actually increases 62 percent due to competition from the increased activity of the non-interactive processes. These counterintuitive effects would have been difficult to estimate without a good model.

We can also see that adding a second disk, with the load spread evenly between the two disks, actually hurts the noninteractive processes slightly. Their throughput is the same, and their overall response time actually gets 3 percent worse. This is due to increased competition from the interactive processes, which being disk-bound, are helped by the second disk. For these interactive processes, throughput improves 6 percent, and overall response time improves 20 percent. Again, this counterintuitive result would be diffi-

cult to estimate by a seat-of-the-pants approach.

The choice of doubling CPU speed versus adding a second disk depends, in part, on the objectives of the system manager. If the system manager views interactive processes as the only important priority, then adding a second disk is the best choice. However, if the system manager is concerned with overall system performance, then doubling CPU speed is the better alternative. This is especially true considering that most of the noninteractive processes in this work load are created in order to compile or link programs in the service of an interactive user. Hence, the interactive users would be more productive overall if the CPU were sped up, rather than if a second disk were added.

Projections for other options, such as only a 50 percent increase in CPU speed, are easily modeled with the same techniques discussed above. Also, we assume the system has enough main memory to stay out of heavy memory contention states. If this is not the case, then adding memory is very likely the best alternative for improving performance.

Summary

We successfully built a useful model of our MV/4000 system. The process of gathering data and building and validating the models has been valuable for extending our intuition about our computer system. We became more knowledgeable about the relationships between our interactive and noninteractive work loads, especially about the unforeseen effects on each of speeding up the CPU and adding a second disk.

What did we actually do with our system? Since money for more hardware was tight, we off-loaded students to another MV/10000 on campus until we were able to graduate that class, which was unusually large! We're getting along quite well now. Δ

Reference

E.D. Lazowska, J. Zahorjan, G.S. Graham, K.C. Sevcik; *Quantitative System Performance: Computer System Analysis Using Queuing Network Models*. Prentice-Hall, 1984.

Jeff T. Buckwalter is a professor in the Computer Science Department at the University of San Francisco. This article is condensed from the presentation he gave at NADGUG's Conference 87. Arthur Lin is a recent graduate of the U.S.F. computer science master's program.

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A comparison of memory vendors may provide the alternative you are looking for

Once upon a time, CPU and memory were virtually inseparable, and buying them from separate companies was not only foolish, but impossible as well.

However, in the quickly changing computer marketplace, third-party compatible memory has become a viable option. Although for any Data General hardware DG memory is the standard,

another vendor's products may also suit your custom needs. For that reason, here is a chart comparing the options available from five leading companies that sell DG-compatible memory.

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Desktop 20			Model DMM1 512 KB increments to 2 MB (Qty.1)-\$2,700	Model MD023 .5, 1, 2 MB	
Desktop 30				Model MD023 .5, 1, 2 MB	
Eclipse S/20				Model MD023 .5, 1, 2 MB 2MB (Qty.1) - \$1,550	
Eclipse C/30				Model MD023 .5, 1, 2 MB	
S/140	Model EM1 2 MB - \$1,950			Model MS140 .5, 1 MB (Qty. 1) - 2,350	
S/280		Model DR-280 2, 4, 8 MB		Model MV410 2, 4, 8, 16 MB	
MV/4000	Model MVM1 4 MB - \$2,600 6 MB - \$3,900 8 MB - \$5,000	Model DR-280 2, 4, 8 MB		Model MV410 2, 4, 8, 16 MB 8 MB (Qty. 1) - \$6,950	
DS/4200				Model MV410 2, 4, 8, 16 MB	
DS/7500				Model MV780 2, 4, 6, 10 MB	

Data General product	Computer Technology, Inc.	Dataram Corporation	Intelligent Computer Integration	System Controllers and Interface Products	Vanguard International Management Services, Inc.
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THIRD-PARTY MEMORY

There are alternatives for adding memory to your system

by Patrick Carr
Special to Focus

If the performance of your MV system isn't what it used to be, the first place to look is main memory. Typical symptoms of insufficient main memory include the following:

- poor terminal response time
- long batch program execution time
- inability to add more users
- inability to run new applications.

Adding main memory is often the best approach to performance tuning. No other hardware or software changes are required, and your system will be back in operation in a matter of minutes.

If you're considering a memory upgrade, you may be interested to know that several third-party vendors now provide memory boards that are compatible with DG systems. Compatible memory vendors have become a major force in marketplaces such as DEC, IBM, and most recently Data General. Their presence has contributed to a general improvement in product quality, delivery schedules, and pricing levels.

Savings

Oftentimes, the primary reason users cite for purchasing memory from a third-party vendor is price. Plug-compatible products are typically priced 25 percent lower than Data General's list price, and sometimes even lower. Certain vendors offer a matching discount program that ensures a consistent level of savings no matter what quantity discount you receive from DG.

In addition to the savings on the initial purchase price, many third-party

vendors provide a lifetime warranty. This can translate into a savings of thousands of dollars in monthly maintenance fees. As a result, the *total cost of ownership* over a period of five years for a third-party memory board can be less than half that of a comparable upgrade from the host vendor.

Design

In some instances, the memory product from a third-party vendor is better designed. For instance, Dataram's MV/7800-compatible memory is based on 1 megabit RAMs—four times the density of the chips used by DG. As a result, the board has fewer components and requires less power and cooling than its DG equivalent.

Other examples of design advantages include the ability to upgrade beyond the published maximum system capacity and the availability of more board capacity options tailored to the upgrade needs of the user.

Third-party memory boards are designed to be 100 percent hardware- and software-compatible with Data General processors, and the additional memory has no effect on a Data General service contract.

Additionally, some vendors provide an on-board enable/disable switch that allows these board to be taken off line when troubleshooting the system. When disabled, diagnostics may be run as if the board was not present in the system. This feature eliminates the possibility of finger-pointing in case a problem arises and the field engineer thinks the third-party memory may be at fault.

The basic building blocks of main memory—Dynamic RAMs—are a proven technology. Failure rates for these components are extremely low. As a result, memory boards are reliable components in your system, so there is little technological risk in purchasing memory from a third-party vendor.

In short, compatible manufacturers offer an efficient means of improving

system performance at an attractive price.

Choosing your vendor

As with any major purchase, it is important to analyze not only the product but the company and its support program as well.

Price is quite important; you should obtain the best value available. However, price shouldn't be the sole purchasing criterion. A word of caution: if a vendor quotes a price substantially below the competitors' price, that organization's ability to provide long-term product support (e.g., a lifetime warranty) should be questioned. When a company operates on thin margins, something has to give.

You should ask questions about the vendor's history and reputation. How long has this vendor been in the memory business? What are their annual revenues? Is the company publicly traded? Does the breadth of its memory product line indicate a commitment to the DG marketplace?

Memory upgrades entail a significant investment in a product that you should expect to use for several years. You should feel confident that your vendor will support its products over the long term. Ask for references—they should be offered gladly.

The degree of product support may vary considerably. The better support programs include a lifetime warranty, before-return replacement, user installation instructions (or vendor installation service), and free phone-in technical assistance.

These support programs eliminate some concerns about product service and reliability. In practice, it's rarely necessary to use some of these programs because of the low failure rate of memory products. Δ

Patrick Carr is the product manager at Dataram Corp., P.O. Box 7528, Princeton, NJ 08543-7528; 800/822-0071 or 609/799-0071. Dataram offers DG-compatible memory products.

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Assembly language for the beginner. Part III of V

In the two previous articles of this series, I presented an overview of the structure of an AOS[VS] .PR file and summarized the essential elements of an assembly language program, including the basic MV instruction set. In this article, I will discuss AOS[VS] system calls.

AOS[VS] system calls

There is nothing magic about a system call. It is simply a subroutine that resides in the kernel of the operating system. Some system calls only require one or two parameters (arguments), and in these cases, the values can be loaded into the four accumulators. However, most system calls require the caller to specify many parameters or specifications; AOS[VS] uses the system call packet to pass these values to the subroutine. A packet is a table (or array) of values, and the system call is made by supplying the system call name and the name (address) of the packet.

System calls are easy to make: just fill in the packet, load the accumulators, and away you go. The *System Concepts* manual tells you how to use the system calls, and the *System Call Dictionary* (which is huge!) provides explicit details on each system call, i.e., how to fill in the packets. Most CLI commands are simply direct implementations of a system call: the CLI just builds the packet and loads up the accumulators for you. Programs primarily made up of system calls are ideal candidates for writing in assembly language; even if a particular high-level language (HLL) has a mechanism for making system calls, an HLL program will have more overhead than the equivalent assembly language program.

Consider the AOS[VS] system call to open a file. Following the instructions in the reference manual (dig it out so you can follow this), the ?OPEN system call is executed as follows:

```

...           ;set up the packet PKT
WSUB 0,0      ;clear accumulator 0 (reserved)
WSUB 1,1      ;clear accumulator 1 (reserved)
?OPEN PKT    ;do it

```

```

WBR OOPS     ;?open error
LJMP ALLOK   ;?open success

```

If the system call fails, it returns an error code in accumulator 0 and executes the next instruction following the system call. This *must* be a one-word instruction, and is usually something like WBR, which branches to an error handler. If the system call succeeds, it will execute the instruction that follows the error return. This instruction may be any length.

Each system call has a name and number (from 0 to 552 octal), and these are defined in SYSID.32.SR. In this example, ?OPEN is system call number 300 (octal). Since MASM's symbol table (MASM.PS) contains all of the symbols defined in PARU.32.SR and SYSID.32.SR, it translates the above to:

```

WSUB 0,0      ;clear accumulator 0
WSUB 1,1      ;clear accumulator 1
LLEF 2,PKT    ;get address of PKT
XJSR @6       ;go to AOS[VS]
300           ; and do system call number '300'
WBR OOPS      ;error return

```

Memory location 6 is magic: it contains the address of the system call processor within AOS[VS]. The XJSR instruction tells the program to go to whatever address it finds in memory location 6. When it gets there, it uses the system call number (300) that follows the XJSR instruction to dispatch to the code for the ?OPEN system call.

As seen above, ?OPEN requires you to supply an argument that is the name of a table of 11 parameters, most of which are 16-bit values (there are four 32-bit values). Some of the entries are filled in before the system call is made (i.e., the name of the file to open), and others are filled in by the system call itself (i.e., the channel number used to open the file). Although the packet appears to have many unused elements, they are used by the corresponding ?CLOSE, ?READ, and ?WRITE system calls that share the same packet.

If you prefer to write non-maintainable code, you can define the packet contents as follows:

```

Method 1
PKT:  .WORD  0
      .WORD  0
      .WORD  0
      .WORD -1
      .DWORD -1

```

```
.WORD 0
.WORD -1
.WORD 0
.WORD 0
.DWORD 0
.DWORD XXX*2
.DWORD -1
XXX: .TXT "FOO"
```

As you can see, none of the 11 entries actually needs a name, only the start of the table. PKT is assigned a memory location, and each .WORD or .DWORD declaration that follows reserves a 16- or 32-bit word of memory. Some of the values are set to 0 or -1, and the second to last one is loaded with the byte address of the text string that contains the name of the file (FOO) to be opened.

On the other hand, if you want your code to be easy to read and modify, you would define the packet using system-defined offsets:

```
Method 2
PKT: .BLK ?IOSZ ;INTEGER*2 PKT(0:?IOSZ-1)
.LOC PKT+?ICH .WORD 0 ;DATA PKT(?ICH)/0/
.LOC PKT+?ISTI .WORD 0 ;DATA PKT(?ISTI)/0/
.LOC PKT+?ISTO .WORD 0 ;DATA PKT(?ISTO)/0/
.LOC PKT+?IMRS .WORD -1 ;DATA PKT(?IMRS)/0/
.LOC PKT+?IBAD .DWORD -1
.LOC PKT+?IRES .WORD 0 ;DATA PKT(?IRES)/0/
.LOC PKT+?IRCL .WORD -1 ;DATA PKT(?IRCL)/0/
.LOC PKT+?IRLR .WORD 0 ;DATA PKT(?IRLR)/0/
.LOC PKT+?IRNW .WORD 0 ;DATA PKT(?IRNW)/0/
.LOC PKT+?IRNH .DWORD 0
.LOC PKT+?IFNP .DWORD XXX*2
.LOC PKT+?IDEL .DWORD -1
.LOC PKT+?IOSZ ;advance to end of packet
```

With this method, system-defined values are used to define the packet size (array dimension) and offsets (subscripts). The .LOC declaration simply specifies the memory location as a sum of the address of the PKT and the particular offset. When you use .LOC in this manner, you don't need to know the actual order of the values in the table, just use the symbolic offsets as described in the *System Call Dictionary*. For example, ?IRCL is defined (in PARU.32.SR) as 7.

The equivalent Fortran code is shown on the right for INTEGER*2 values. The 32-bit values would be DATA-initialized to INTEGER*4 values, which are EQUIVALENCED to PKT, for example:

```
INTEGER*4 IFNP
EQUIVALENCE (PKT(?IFNP),IFNP)
DATA IFNP/0/
```

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Method 2 has the following advantages.

1. It doesn't need comments, because the .LOC expressions are self-documenting.

2. It allocates the space required for the packet in a declaration (.BLK ?IOSZ), which is separate from and not dependent on the statements that define the contents of the packet. Method 1 defines the length of the packet implicitly by the number of .WORD or .DWORD declarations. If any are missing, the packet will be defined improperly and may overlap the variables that follow it.

3. Every single packet entry must be specified with .WORD or .DWORD because they are placeholders, but in method 2, ?IOSZ reserves the required block and only the non-zero values need to be specified (any of the .WORD 0 or .DWORD 0 declarations can be omitted).

4. Method 1 assumes the order of the values in the packet is correct, but method 2 ensures the order is correct by using system-defined offsets (subscripts).

5. Method 2 can use the same PKT+?XXX expression in memory reference instructions as in the .LOC packet declarations, thus ensuring readable code:

```
LWLDA 0,PKT+?IFNP ;get byte address of filename
```

Next month, I will consolidate the material printed so far by presenting a simple assembly language program that can be used instead of writing a more difficult and awkward CLI macro. The program will allow you to send a message to a USERNAME, rather than to a PID or CONSOLE. Δ

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CROSS YOUR FINGERS

Some keyboard functions require extra hands

For some time, we have been using CEO Connection on IBM PCs, ATs, and XTs to access CEO (Data General's Comprehensive Electronic Office product). To say the transition from the Dasher series of keyboards to the IBM keyboards wasn't easy is an understatement.

The biggest problem was the location of the keys. Besides the obvious typographical errors that occurred, it was difficult to do some of the functions previously done on the Dasher terminals because of the lack of familiar, time-saving keys such as word-forward, EOL (erase end of line), and home (to go to the home position). After a few calls to the support center in Atlanta and then to Software Development in Westboro, we discovered that the functionality was still there, it just required different keystrokes.

It was difficult for people to remember these new keystrokes, so I came up with a comparison chart for all the keyboards being used. (See Figure 1.) The user-defined function keys were the most difficult to get used to. When we were all using the Dasher terminals, we came up with a standard set of user-defined keys that most people would use. The decision-making process was very scientific—it was easier to press CTRL-SHIFT keys with the left hand, so we chose to use our right hands to access the function keys F11-F15. That way, we didn't have to cross our right hands over our left hands to perform the function.

This seemed to be a logical solution, so from that day on, function keys F11-F15 served as our standard global function keys. (This was taught to all new CEO users.) We reasoned that when you

Figure 1: Keyboard comparison chart

Data General 410 and 460 keyboard	IBM PC keyboard	PC AT keyboard	PC XT keyboard
	CTRL SCROLL LOCK	CTRL PAUSE	CTRL SCROLL LOCK
ERASE PAGE	CTRL L	CTRL L	CTRL L
	ALT	ALT	ALT
	Num Lock	Num Lock	Num Lock
;	;	;	;
"	"	"	"
^	^	^	^
&	&	&	&
*	*	*	*
((((
))))
-	-	-	-
+ =	+ =	+ =	+ =

log on to another terminal and you don't have your template with you, the template on the terminal you are working on will probably have the same functions keys that you are used to using.

This logic worked well until we acquired CEO Connection. I like CEO Connection as an emulator package, except for access to user-defined keys F11-F15. Now, you have to use your toes to press all the keys necessary to access

Data General 410 and 460 keyboard	IBM PC keyboard	PC AT keyboard	PC XT keyboard
CR	CTRL	CTRL	CTRL
HOLD	Scroll Lock		Scroll Lock
TAB		TAB	
DEL		BACKSPACE	
ALPHA LOCK	Caps Lock	Caps Lock	Caps Lock
NEWLINE		ENTER	ENTER
↑	8	↑	8
↓	2	↓	2
←	4	←	4
→	6	→	6
ERASE EOL	CTRL	K	CTRL
HOME	CTRL	H	CTRL
C1	HOME	HOME	HOME
SHIFT	C1	CTRL	CTRL
CURSOR	ALT	C	ALT
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CMD	ERASE PAGE	ALT	ALT

*Using numeric keypad with num lock off

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the once easily accessible keys that I had recommended.

Since the original PC keyboard had only 10 function keys, pressing the ALT key turns F1 into F11, F2 into F12, etc. To get the next row of commands on the template, the ALT and SHIFT keys are required with the function key. The next row requires the ALT and CTRL keys. But when you come to the user-defined keys on F11-F15, you must press the ALT-SHIFT-CTRL plus the proper function key to use the command. That requires a complete shift of hands to the left side of the keyboard, or digital dexterity, to accomplish. (My users aren't happy about the suggestion, but they're living with it.)

I'd like to share with you the user-defined keys that were suggested as standards.

F11—Return to main menu. Command definition starts from main menu. Keystrokes: none.

This is the hardest to teach someone. If the system returns to the main menu to begin keystrokes, there are no more keystrokes necessary. All that is required in the keystroke prompt is to hit ESC twice.

F12—Edit current document. Command definition starts from main menu. Keystrokes: 2 NEWLINE EXECUTE.

This will take you to the last document you edited.

F13—List all documents. Command definition starts from main menu. Keystrokes: 5 NEWLINE 4 NEWLINE 1 NEWLINE)= NEWLINE ! NEWLINE EXECUTE.

This command uses the search facility and searches from the lowest character in the hierarchy of characters through your private cabinet and lists every document you have created; however, it only lists the first 100 on the screen.

F14—View inbox. Command definition starts from activity where invoked. Keystrokes: INTERRUPT 3 NEWLINE 1 NEWLINE NEW NEWLINE.

This command accesses the inbox through the INTERRUPT function key (F5), then goes through all new messages.

F15—Log off CEO. Command definition starts from main menu. Keystrokes: CANCEL/EXIT Y NEWLINE.

This command returns you to the main menu, then logs you off the CEO system.

I have found some other commands to be quite useful, also. However, I put those in as commands, rather than user-defined keys. Some of them in-

clude the following.

Underline one word—Command definition starts from activity where invoked. Keystrokes: TEXT ATTRIBUTE WORDFORWARD (←←TEXT ATTRIBUTE.

This command underlines one word at a time by placing the cursor on the first character of the word. It uses the word-forward key and two back-arrows to return to the last character of the word. It works on a word of any length, but you must be careful of words with commas and periods following them.

Access user directory—Command definition starts from activity where invoked. Keystrokes: INTERRUPT 6 NEWLINE FIND.

This command will access the user directory through the INTERRUPT facility, then prompt you with "Find Whom." Just enter the name you are looking for and hit return.

Standard memo format—Command definition starts from activity where invoked. Keystrokes: READ KIRIAN NEWLINE FORMATS NEWLINE MEMO NEWLINE / \ FORMAT RULER COPY 2 NEWLINE \ / DELETE EXECUTE NEWLINE.

To use this command, you need to create a new document and then activate the command. It will read in a previously created document that has the appropriate format from the drawer (KIRIAN), folder (FORMATS), and document (MEMO). Then place the cursor on the first format ruler, copy the second format ruler onto it, and delete the second format ruler. Note that the / \ and \ / are up- and down-arrows, respectively.

One user created a command to read all monthly reports from her staff into a document (she uses the name junk1, junk2, etc., then the search facility reads them in), finds all format rulers, deletes them, and prints them on her default printer. The entire procedure takes about 16 minutes, and she can work on other activities during that time. She said it saves her approximately two hours of time.

User commands are fun to use and create. They save time in the long run, though it may take a while to get them to do what you want them to do. Δ

Charlene Kirian is PC/OA instructor for the Online Computer Library Center, Inc., 6565 Frantz Rd., Dublin, OH 43017; 614/764-6435. She also serves as the education director for NADGUG's OASIS (Office Automation Special Interest Group).

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REFRESH MY MEMORY

B.J. reflects on changes in past two years for twin MV/4000s

:THE YEAR IN REVIEW

It's New Year's Day, and I've been voluntarily exiled to the office as one of the world's handful of football widowers. My girlfriend is a fan; I'm not.

Anyway, I started thinking over the changes that have happened to the two MV/4000s in the past year. We went from AOS/VS 6.06 to AOS/VS 7.54 about this time last year. After a year of running first 7.54, then 7.56 and 7.57, I can attest to the extremely small number of problems we've encountered.

On the application software side, the most significant change was the conversion of several thousand COBOL programs to shared libraries and inner-ring libraries (see my June 1987 *Focus* column). The results have been beyond our wildest expectations. The savings in memory at runtime decreased the working set size dramatically, thereby avoiding a serious memory contention problem. And the savings in disk kept us from having to add almost .5 GB worth of additional drives. The execution time penalty has been negligible, partly because we now PROC/BSON the inner-ring library program at UP time in order to keep the inner-ring library code pages in the LRU (least recently used) between batch jobs (see my December 1987 *Focus* column).

Less dramatic, but no less valuable, was a round of histogramming and system call logging done last fall. The histogramming identified numerous instances of unnecessary MOVE statements in the innermost loops of critical (sub)programs. Execution time decreases of 20 to 25 percent were not unusual.

The system call logging pinpointed a problem caused by an unnecessary SWITCH clause in the SPECIAL-NAMES section of an inner-ring library routine. This caused a ?GTMES system call each time the subroutine was executed, resulting in considerable disruption to interactive users and a lot of squandered CPU time.

System call logging also pinpointed the reason for some excessive disk activity that was caused by defaulting the buffer sizes of the majority of sequential output files generated by the COBOL programs. Fixing this problem by

cranking up the buffer sizes resulted in reduced runtimes, disk I/O rates, and total disk accesses. Not bad for a one-line source change and a recompile.

Somewhat less simple, but far more rewarding, was a scheme we developed to speed up DIRECT input files. The changes resulted in decreased elapsed job times by anywhere from a factor of two to a factor of three! Additionally, the jobs went from 100 percent CPU to 50 percent, which meant that a second job could be run simultaneously (on a different disk unit) with little impact on the first job. That effectively doubled the system throughput for batch—on top of the initial factor gain of two to three! The downside was that we had to resort to a one-page assembly language subroutine callable from COBOL to get around a crock in the language, and write a relatively complex READ NEXT RECORD subroutine to accomplish the blocking/deblocking (written in COBOL).

Speaking of the disk world, by isolating all the on-line users on a single disk unit with the batch files and source/COPY file directory relegated to three other units, the on-line users were barely aware of the fact that four batch streams were often running. The elimination of unnecessary system calls by the batch jobs also played a big part in achieving this effect (see my May 1986 *Focus* column about the disruptive effect of excessive system calls on interactive users).

Finally, a new policy of running a utility (a set of macros, actually) to reorganize file element sizes and directory hash-frame sizes each weekend has resulted in a nearly optimal disk situation. Whether or not the effect is worth the effort is still a debate topic around here. It's probably a waste of time for 99 percent of the files involved; we all know which small set of files and directories are the bad guys.

So much for the year in review.

:FRIDAY THE 13TH:PART XXIV

This horror story is intended to force a few of you to review your backup strategy.

About three or four times a year I get

a phone call from someone inquiring if I can help them recover the files from a disk pack that was inadvertently scribbled on by a field service engineer. My standard answer is yes, but only if you send a retainer fee of \$10,000 and your firstborn child as collateral against charges in excess of the 10 grand. So far, no takers.

I've always told the students in my seminars and clients that precious disk data files should be treated the same way when field service arrives as the Christians treated their virgin daughters when the Mongols were at the gates of the city: hide them somewhere safe.

On December 17, an engineer from a generally reliable, but somewhat sloppy, third-party field service organization was scheduled to do a preventive maintenance on both MV/4000s. The particular engineer who was scheduled to do the PM has always made me nervous, so I captured an incremental backup of my critical stuff just before he arrived. Within 20 minutes, the engineer had written random data all over the eight 277 MB Fujitsus—on both systems! Suddenly, we were looking at 2.216 GB worth of trashed disks.

Our backup strategy is to capture an archive backup every Friday at midnight and incremental backups Monday through Thursday at midnight. The screw-up occurred on a Thursday afternoon at 1:30 p.m. As soon as the engineer fled, we sent the programmers home early, dispatched an operator to retrieve the latest archive and incremental tapes from the off-site storage room about a block away, and started the parallel reloads on both systems. It took just under three hours, including the DFMTR/FULLS using the old, bad block tables. There were no tape errors, and we were back on the air by 5 p.m. Hanging over my desk is a headline I clipped from a long-forgotten ad that appeared a few years ago. It reads: *"Blessed are the pessimists; for they hath made backups."*

Exasperated 1:16

I know that some of you are going to ask, "Does the same third-party field service organization still service the

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systems?" Yes. Even the best FSEs have zapped a disk or two during their careers. I know that I've zapped my share. The question to ask yourself is "Would my backup strategy have done as well under similar circumstances?"

:TAPE ERRORS

Speaking of tape errors, I've had several questions lately that indicate a lot of you don't understand how AOS[VS] handles tape errors. So here's a mini-tutorial on the logic involved.

The AOS[VS] tape-driver software is pretty smart; it always keeps track of its position on the reel. That means that it *always* knows which file number it's on and which record within the file it's positioned at (before, actually). That's why there's no need to manually rewind the tape when you reference a different file from the last one you referenced.

For example, if you've just read file 3, and you then reference file 1, the tape driver knows that it simply needs to space (not read!) backward over files 3 and 2 to file 1. If the next file you reference is file 5, it knows to space (not read!) forward over files 2, 3, and 4. Anytime you reference file 0, the drive rewinds, unless the controller indicates that the drive is already at BOT. Also, before going to any new position on the tape, the driver always looks at the BOT status to see if you switched reels. If so, it changes its internal position to file 0, record 0, and acts accordingly.

So what happens when you get a tape error? Well, it depends on whether you were reading or writing at the time.

If you're writing, the driver doesn't try to write the record a second time. Instead, it backspaces over the record it was trying to write and erases a length of tape at least as long as the record it was trying to write (each erase zaps about three inches of tape; multiple erases may be needed), and tries the write again. It will continue to repeat this scheme until (1) it succeeds in writing the record, or (2) some number of attempts (15?) fail. Failure is signaled to the program by returning the "?" error code; otherwise, the program continues normally, unaware that any retries took place. A soft or hard report, as appropriate, is made to @CON0 and/or SYSLOG/ERROR.LOG.

If you're reading and the read fails, the driver backspaces over the offending record and tries again. It will continue to retry until (1) it succeeds in reading the record, or (2) some number

of attempts (15?) fail. Failure is signaled to the program by returning an error code; otherwise, the program continues normally, unaware that any retries took place. A soft or hard report, as appropriate, is made to @CON0 and/or SYSLOG/ERROR.LOG.

However, the driver's error-handling logic has one quirk that has puzzled and frustrated many users. It's possible

for a read or a write to terminate with a "bad tape" status from the controller. This is the controller's way of saying that things went so badly that it can't be sure that it stopped the tape between two records; it may be sitting in the middle of a record. The only recourse AOS[VS] has at this point is to backspace to the beginning of the file, then space forward over the interven-

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ing records, counting them as it goes, until it gets to the record in question. Then it can either try to erase some tape and retry the write (writing), or try to read the record again (reading).

No soft/hard error report will occur until the driver either succeeds or exhausts its retry count. This explains those times when you've seen the tape backspace to the beginning of the

tape, then space forward back out to where it was, perhaps several times, before emitting the soft/hard tape-error message. Again, the program involved will be unaware that anything has happened unless the retries fail.

Is it possible to write a program that enhances the error handling provided by the operating system driver? The answer is yes, but no DG utilities that

I'm aware of do it. In the case of write errors, there's not much you could do anyway except indicate to the user that the reel should be discarded and the program should be run again from scratch. In the case of read errors, there are two possibilities: you can direct the operating system to try another full set of retries, or you can direct it to skip over the bad record and continue reading (assuming the error was not a "bad tape" error). Additionally, you could use physical tape I/O system calls to put the drive in stupid mode and take over all error handling yourself. If either of these alternatives interests you, check out the ?BLKIO, ?RDB/?WRB, and ?PRDB/?PWRB system calls in the *System Call Dictionary*.

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:RAM.DISKS

For some reason, the subject of RAM disks has come up several times in the last few months. I thought that RAM disks in the DG world had gone the way of fixed-head disks, but I guess I was wrong. Here is my two cents' worth.

RAM disks are only useful (1) on systems with really small address spaces when the size of your programs exceeds the address space (e.g., programs with overlays on 16-bit systems) and when the operating system is too stupid to keep the inactive overlays in memory (AOS[VS] is smart, RDOS can be smart if you use virtual overlays, MS-DOS is a cretin), or (2) as a sort of electronic CPR (cardiopulmonary resuscitation) on systems with poorly implemented software that does excessive disk I/O, and no one wants (or is able) to fix the real problem by changing the programs.

AOS[VS] automatically keeps inactive overlays from 16-bit programs (like the CLI) in the least recently used page pool. This assumes that the overlays were specified as shared at link time (it's the default) and that you have enough extra memory to allow AOS[VS] to support an LRU at least as big as the overlay file. That's almost always the case. AOS[VS] also provides facilities for the programmer to specify that frequently used pages of application data files be kept in the LRU.

There is a rumor floating around that systems with too much memory may actually take longer to obtain a page from the LRU than to read the page from a normal disk, not to mention a RAM disk. As far as I have been able to determine, the rumor is absolutely false. There used to be a problem with

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the way AOS[VS] located pages in the LRU, which could cause such a problem on over-configured systems, but it was fixed a long time ago (1982?) when the LRU algorithm was changed to use a hashing scheme for locating an LRU page instead of searching the entire LRU chain sequentially from most recently used through least recently used.

Does this mean that hooking a RAM disk up to the average AOS[VS] system won't speed things up? No, of course it will. But the effect will only be for those files that you're able to fit onto the relatively small RAM disk, and that may be only a small fraction of the total I/O on your system during the course of the day. I don't know of any general-case system where a RAM disk will change the average response time from appalling to snappy.

What about using the RAM disk for :BOTH (:PAGE and :SWAP)? Well, if you're out of memory to the point where paging and swapping is a bottleneck, the real solution is to invest your bucks in some memory boards, not in a RAM disk for :BOTH. Using a RAM disk for :BOTH is like wasting time drowning your campfire just before fleeing a forest fire.

Of course, there's always the case of a system that's already at maximum memory. Is a RAM disk for :BOTH the solution in this case? Nope, more likely it's just a Band-Aid. By definition, if paging and swapping I/O is significant, the LRU is at zero, and you are already foregoing the considerable advantage that a healthy-sized LRU can have on shared-page I/O. What you really need is more free memory for AOS[VS] to devote to the LRU. That means either taking some users out to the parking lot and shooting them (messy, but cheap) or upgrading to a CPU that can handle more memory (clean, but expensive).

In summary, when are RAM disks useful? The only unconditional case that I know of is on RDOS systems, because RDOS has no general notion of cached I/O for shared overlays and data files. Δ

Copyright © 1988 by B.J. Inc. All rights reserved. Brian Johnson is the president of B.J. Inc., a San Francisco-based consultancy specializing in system auditing, system management, and performance analysis. He can be reached at 109 Minna St., Suite 215, San Francisco, CA 94105; 415/550-1444, telex 296544.

PIPES, GATES, AND TABLES

A sundry of techniques to help you

Pipes can get rid of batch overhead

I have been experimenting with an interesting technique lately. It has solved a number of minor issues on our system and has given me a slight boost in personal productivity. Basically, the technique creates a "permanent" batch stream for my personal use. There isn't anything wrong with the AOS/VS batch streams; both will leave your terminal available for immediate use. There are other techniques available to allow this, the most popular being a technique that Brian Johnson presented in the August 1987 issue of *Focus* (see SPAWN.CLI, page 39, Figure 5).

Before you say it, I know that AOS/VS provides me with up to 100 batch streams (after rev 7), so why would I need to figure out a way to create my own? The advantage of using this batch stream rather than the AOS/VS batch stream is that it avoids the heavy resource usage of an EXEC logon for every job. Since most of the jobs that I do in batch will run in less than five to seven minutes, this represents a significant savings. If your batch jobs tend to run for hours though, this technique won't buy you anything.

The technique is similar in concept to using the SPAWN.CLI that B.J. introduced in his column, but takes a slightly different approach. B.J.'s macro eliminated the costly overhead of the EXEC logons by running the process as an unblocked son to your CLI process. However, it still has to create a process for each job submitted. This is still a fairly hefty use of resources, although not nearly as heavy as the system batch streams. Instead of creating a son CLI process for each job, my technique creates a single CLI process, and you can send commands to it using AOS/VS pipes.

What's the catch? Since this method has less set-up overhead than the AOS/VS batch streams or B.J.'s SPAWN macro, what do I pay? The CLI uses 18 shared and 2 unshared pages of memory. Assuming your system typically has a number of CLI processes sitting around, the shared pages are already loaded. Therefore, the memory cost is 2 pages minimum, and up to 14 pages maximum (until the CLI is rewritten for the 32-bit address space). Also, since there will be more processes and more tasks pending, the system tables will be slightly larger.

Of course, the disk has to make room for those pipe files created, which may take as many as a dozen or two blocks each, although normally each would take only one 2 KB element. The way I see it, the price I have to pay is so small that on our system I don't think we could measure it. There is one restriction that might cause some minor headaches. If you kill your process and log off, whatever job is running in your personal batch stream gets terminated first. That makes this technique useful only for jobs that run less than 10 minutes.

Now that I gave the what and why, let's take a look at how. In my start-up macro, I automatically create a son process so that it will always be available to me. The macro is shown in Figure 1, but the key lines of the macro are:

```
CREATE/TYPE=PIP JKS.BATCH.INPUT
PROC/INPUT=JKS.BATCH.INPUT/OUTPUT=
JKS.BATCH.OUTPUT/SONS :CLI.PR
```

This generates a second CLI process on the system that will watch the input pipe named JKS.BATCH.INPUT for command lines.

Now that the process has been established, how do we use it? It's easy to send a command to it; just write it to the input pipe. Suppose you wanted to run an ICOBOL compile. Normally, you would enter ICX (program). To send it to the AOS/VS batch stream, you would enter QBATCH ICX (program). However, there are other considerations, such as current directory and searchlist. The QBATCH command solves this by inserting three commands before your job: DIRECTORY, SEARCHLIST, and DEFACL. Figure 2 shows a completed macro for submitting a command to address these issues and also the current super-user and superprocess states.

Figure 1: START_BATCH.CLI

```
push ; prompt pop
dir :UDD:[!user]
[!nequal,[!path =batch_input.pipe],]
  delete/2=error =batch_input.pipe
[!end]
create/2=error =batch_input.pipe
delete/2=ignore batch_output.file
create/2=error batch_output.file
process/input=batch_input.pipe/output=batch_output.file&
/sons/priority=300/name=[!user]_batch/superuser :CLI.PR
pause 2
pop
```

What do I use it for? I do most of my compiles in the batch stream. Also, if I am finished programming for a while, I can start a backup of my work running in batch, leaving me free to set up the next project, clean out a directory, or even indulge in a game. However, I don't recommend the latter as a normal procedure, since it tends to negate all productivity gains achieved by using this procedure.

Before I finish, I would like to point out a few things in the macros. The process command in START_BATCH.CLI must have the input and output switches. In order to do anything useful, you will most likely need the sons, chlogical, and maybe the super switches. The name switch helps identify the process for PED watchers, and the priority switch makes your system respond better to interactive folks. To terminate your batch process, enter BATCH BYE. The SEND command in the BATCH.CLI is also optional and can be taken out if the messages annoy you or are not normally needed right away. As written, any job sent to the batch stream must not allow input, or the program should expect to find it in a disk file.

Figure 2: BATCH.CLI

```

push ; prompt pop
dir :UDD:[!user]
list batch_input.pipe
write/ push
write/ prompt pop
write/ directory [!directory/p]
write/ searchlist [!searchlist]
write/ defacl [!defacl]
superuser/s
[!equal,[!string],ON]
  write/ superuser on
[!end]
superprocess/s
[!equal,[!string],ON]
  write/ superprocess on
[!end]
write/ %1-%
write/ send [!pid] **** BATCH JOB COMPLETE ****
write/ pop
pop
    
```

Open up your GATE

One of the mysteries I will never understand is why DG/ GATE sets up your modems to pulse dial instead of touch-tone dial by default. When the tariffs were set up, all phone com-

panies were required to provide pulse service with touch-tone service as an option. However, I'd be willing to bet that at least 98 percent of the country has touch-tone service, so it would seem better to set the default to tone dialing with an option for using pulse for the few people that actually are forced to use it.

However, there are two ways to have GATE use touch tones. The first and easiest way is to prefix your phone numbers with a "T" in the GATE phone book. This will override the default. There is a second way to do it: patch the GATE.PR program to have the proper default. I prefer the latter method. There can be a down side though. Data General takes a dim view of supporting software that has been tampered with by the user, so if you elect the latter route, keep an original copy of your program in case you ever need it for support purposes.

The following commands will patch rev 2.35 of GATE.PR for AOS/VS using FED. If you've never used FED, don't be afraid. We are only going to execute three commands. After making sure you have a good backup, DIR to your GATE directory and enter X FED GATE.PR. After FED starts, enter XUNLK+24/ without a (NEWLINE). As soon as you hit the "/" key, FED will display 042120.. If you get anything else, hit (NEWLINE), otherwise enter 042124 and then hit (NEWLINE). You should get the FED prompt back. Now hit (ESC) and "Z," and you'll be back in CLI with GATE set up for touch-tone dialing. It's as simple as twiddling a bit (as a matter of fact, that's all you did!).

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Finding a table I like

In Las Vegas, I learned the importance of finding a good table. For Christmas, we ordered a new kitchen table (I hope the old one will be used for my computer that needs it). However, handling a table of data in the CLI has always been a challenge with several solutions, none of which are overwhelmingly simple, efficient, or compact. There are some things the CLI just wasn't designed to do, but being the tenacious programmers that we are, we do it anyway.

The original day-of-week macro published last year used one method of dealing with a table of data. This is the most direct method and probably executes the fastest, since it means creating a bunch of files where part of the name is a table entry, and the data in the file is the table entry. For example, a file named MONTHNUMBER.JAN would have 01 in it for data. The short day-of-week macro used in the find-the-error contest last summer demonstrated another method, one that was much more direct—simply providing a bunch of nested [!equal] statements. Although quick and straightforward, it isn't suited for all purposes.

The data file method used by day-of-week bothers me because of the incredible number of little files that could end up in the macros directory. For example, the original day-of-week that used Zeller's congruence has a table for months and a table for days. The 19 files occupied 38 KB of disk, plus directory overhead. The nested [!equal] has the disadvantage of not being suited for tables of various size.

Therefore, I came up with an alternative method for handling table lookups with macros. My goals were to have as few files as possible and a fairly simple macro that would allow for editing the table without recoding part of the control logic (such as adding another level of [!equal] statements). I wasn't concerned about execution speed, and if you are, then this method isn't what you are looking for.

It works rather simply. It was actually demonstrated a couple months ago with the macros in my January 1988 column called "Elementary Education." The technique involves calling a macro and passing it all the parameters for the table on the command line. However, these parameters will be stored in a text file on disk that any user can build with SED, CEO, CRTEDIT (yes it lives in AOS/V5), Wordperfect, or whatever. To show how this technique is used, I built a table file called MONTH.TABLE.DATA that contains the following:

```
jan,01,feb,02,mar,03,apr,04,&
may,05,jun,06,jul,07,aug,08,&
sep,09,oct,10,nov,11,dec,12&
```

Then I wrote a macro called MONTHLOOKUP.CLI (see Figure 3). It takes the first argument and scans the table. If either the month abbreviation or the month number match, both [!string] and [!var0] will be set to the appropriate values. If they are not in the table, it leaves them blank. Thus, you can implement a table of varying size and have it scan, no matter

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Figure 3: MONTH_LOOKUP.CLI

```
[!equal,%0/repeat%,.]
string/k
var0 0
%0%/repeat %1% [month_table.data]
[!else]
comment Alpha compare for month name
[!equal %1% %2%]
string %2%
var0 %3%
[!else]
comment Numeric compare for month number
[!eq %1% %3%]
string %2%
var0 %3%
[!end]
[!else]
comment no match, continue if table isn't exhausted
[!equal,%4%,.]
%0\%/repeat %1% %4-%
[!end]
[!end]
[!end]
```

how long it is, without rewriting the macro. (Actually, there is a limit to how long it is, but for most simple lookups like this, there won't be a problem.) One last note about this particular example: it is actually performing lookups on two tables, since it can go from month name to number, or number to name. The original day-of-week method would take 24 data files (48 KB of disk), and the contest method would require a 24-level deep [!equal]/[!else] construct. Although this method is probably the slowest in execution, it makes up for it in flexibility.

Tax-time challenge

How about a simple contest again? How about a macro that takes the taxable income, compares it against a table that lists tax rates and brackets (as in circular E or schedules X, Y, and Z), calculates your income tax, and displays the result rounded to the nearest whole dollar. Entries must be received by April 15, and in order to save wear and tear on the fingertips, it will be limited to 100 lines. You may use one or two table files (if you decide to include both single and married tables). Entries that produce incorrect results will be eliminated.

The winner will receive a year's supply of IRS forms 1040 and a \$25 consolation prize from Focus. Δ

Jim Siegman is a contributing editor to Focus, chairman of the NADGUG audit committee, and treasurer of the Chicago Area Data General Users Group. Send comments or questions to Datamark Corp., 3700 W. Devon, Suite E, Lincolnwood, IL 60659; 312/673-1700.

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PRESENT PERFECT

More on Present

If you're interested in commercial/business software development, you probably enjoyed the November 1987 issue of *Focus* featuring articles on data base management. What a wealth of information!

One article in particular ("Present-

PRMENU so that validation can occur for dates, etc. PRMENU then automatically calls Present and executes the macro to completion. (For the sake of brevity, I won't mention PRMENU's other features here.)

Entering a menu option number is much simpler than typing a series of Present commands. Also, PRMENU can easily be integrated with existing applications.

Automatic creation of the definition file

Present interprets your data source by using a .DF file (DF stands for definition file). Dennis mentioned in his article that creating the definition files is "somewhat time-consuming." This depends on the number of definitions you have to create. If you have hundreds or thousands of lines of COBOL record layouts to convert to Present's .DF format, you have a significant task awaiting you.

Good ol' Atlanta to the rescue! To quickly translate COBOL record layouts to Present .DFS, SPSD developed the CBLTOPRES utility. An example will quickly illustrate the value of CBLTOPRES. Let's say you have a COBOL record layout such as the one shown in Figure 3.

To translate this COBOL record layout to .DF format, all you have to do is run CBLTOPRES. Figure 4 shows the unaltered output of CBLTOPRES using the above record layout.

This file requires a slight modification: the addition of definition lines to define what data management system the record describes (INFOS, MINISAM, sequential, etc.) at the beginning of the .DF file. CBLTOPRES can't obtain that information from the COBOL record layout, so you'll have to supply it yourself. Assuming you had a lot of record layouts to translate into Present .DF format, CBLTOPRES could shorten a job that

ing..." by Dennis Berman) did a great job of discussing Present's features and capabilities. On page 68, Dennis said, "Good ol' Atlanta came out with add-ons like PRMENU that help you keep track of your macros."

Good ol' Atlanta is us—Data General's Software Products and Services Division (SPSD). I thought you'd be interested in seeing some Present utilities and perhaps an advanced Present technique or two to boot.

Good ol' Atlanta Present utilities

There are two of them. The first, PRMENU, is an SPSD utility designed to make a nontechnical end-user's interface to CLI Present more palatable. End-users usually don't enjoy typing the sometimes cryptic keywords that Present requires. Keywords like FETCH, GO, MACROS, and MDIR aren't easily memorized by end-users, especially when they use Present infrequently. End-users are accustomed to a menu interface, so SPSD created PRMENU.

PRMENU automatically builds an on-line menu of Present macros from a specified AOS directory. For example, if a directory contains what is shown in Figure 1 and PRMENU is executed in that directory, a screen similar to Figure 2 would be displayed.

You select the number corresponding to the report to be generated. You enter all Present input parameters while in

Figure 1: AOS directory

Directory :MYDIR:MACRO_DIRECTORY

BAR_REV_BY_PERIOD.PR.MAC	UDF 3-SEP-87 14:12:40 978
TXN_LOG_CUSTOM.PR.MAC	UDF 17-OCT-87 18:40:22 1891
WORK_ORDERS_DETAIL.PR.MAC	UDF 17-OCT-87 18:46:22 4052
WORK_ORDERS_INVOICE_RPT.PR.MAC	UDF 17-OCT-87 19:00:50 2203
WORK_ORDERS_SUMMARY.PR.MAC	UDF 17-OCT-87 19:03:36 1731

Figure 2: Present menu

PRMENU 1.24 PRESENT MENU

1. BAR REV BY PERIOD
2. TXN LOG CUSTOM
3. WORK ORDERS DETAIL
4. WORK ORDERS INVOICE RPT
5. WORK ORDERS SUMMARY

Enter report number: PRESENT,
Refresh screen

Figure 3: COBOL record layout

```

01 EMP-REC.
  05 EM-EMP-KEY.
    10 EM-OFFICE-ID                               PIC X(02).
    10 EM-EMP-ID.
      15 EM-EMP-ID1                               PIC X(01).
      15 EM-EMP-ID2                               PIC X(01).
  05 EM-ALT-KEY.
    10 EM-USERNAME                               PIC X(15).
  05 EM-DATA.
    10 EM-EMP-NAME                               PIC X(30).
    10 EM-EMP-CHARGES                             PIC S9(07)V99.
    10 EM-SELECTION-PASSWORD                       PIC X(08).
    10 EM-PHONE.
      15 EM-PHONE-1                               PIC 9(03).
      15 EM-PHONE-2                               PIC 9(03).
      15 EM-PHONE-3                               PIC 9(04).
    10 EM-DTLM.
      15 EM-DLM                                   PIC 9(06).
      15 EM-TLM                                   PIC 9(06).
    
```

took several days into a simple process taking only minutes. I call that a valuable utility!

Unfortunately, I've run out of room for this article, and I never covered ad-

vanced Present techniques, such as Present "if" statements, one input parameter that allows selection of either one specified value or all records, or plotting a graph over a time line with-

out a gap between years. If you're interested in seeing some of these techniques, let me know and I'll serve them right up.

Conference 87 blackjack wrap-up

According to my rough estimate, approximately 25 percent of all Conference 87 participants attended my blackjack seminar in Las Vegas. I hope everyone found it rewarding. Many of you tried your skill (and luck) with the MV blackjack computer program running at the NADGUG booth. I'm only sorry the payoffs weren't more tangible. I've received requests for the software from all over the country. I hope you enjoy MV blackjack on your system. Let me know if I can be of any assistance. Good luck. Δ

Kim L. Medlin heads special projects for the Commercial Software Development Group of Data General's Software Products and Services Division. He can be reached at Data General Corp., 3617 Parkway Ln., Norcross, GA 30092; 404/448-6072 ext. 2007.

Figure 4: CBLTOPRES output

```

01 EMP_REC,
  05 EM_EMP_KEY,
    10 EM_OFFICE_ID          CHAR(02),
    10 EM_EMP_ID,
      15 EM_EMP_ID1         CHAR(01),
      15 EM_EMP_ID2         CHAR(01),
  05 EM_ALT_KEY,
    10 EM_USERNAME          CHAR(15),
  05 EM_DATA,
    10 EM_EMP_NAME          CHAR(30),
    10 EM_EMP_CHARGES        UNPACKED DECIMAL(07,2),
    10 EM_SELECTION_PASSWORD CHAR(08),
    10 EM_PHONE,
      15 EM_PHONE.1         UNPACKED DECIMAL UNSIGNED(03),
      15 EM_PHONE.2         UNPACKED DECIMAL UNSIGNED(03),
      15 EM_PHONE.3         UNPACKED DECIMAL UNSIGNED(04),
  10 EM_DTLM,
      15 EM_DLM              UNPACKED DECIMAL UNSIGNED(06),
      15 EM_TLM              UNPACKED DECIMAL UNSIGNED(06).
    
```

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THUMBS UP

Book on assembly language gets a favorable review

by Tom Gutnick
Special to Focus

Machine Organization and Assembly Language Using Data General AOS and AOS/VS Systems. Stuart Smith and James Harp. Lexington, Massachusetts; Ginn Press, 1986. ISBN 0-536-05320-0. 231 pages. \$29.95.

For years I have threatened to write a textbook on Eclipse assembly language programming. All the schools and colleges that use Data General comput-

ers to teach programming have long needed one. As a result, I was excited when I found out that somebody else had finally written one.

One of the nice things about writing for a magazine like *Focus* is that I get to stand on my soapbox and tell you how I think *Machine Organization and Assembly Language* should have been written. I was hoping for a textbook on Eclipse assembly language programming, but I found a textbook on basic assembly language concepts, incidentally using the Eclipse instruction set. (It's a subtle distinction, admittedly, and I begrudgingly concede that I can't fault the authors for taking that approach.)

The authors state that the goal of their book is to provide "a gentle introduction to some fundamentals." To do so, they have presented a greatly simplified view of the Eclipse computer—which is one of the strengths of the book. However, when the simplified approach turns too simplistic, the book is weakened.

The authors assume that their students already understand basic concepts of high-level language program-

ming, but have had no exposure to the machine level. Thus, the first seven chapters stick to a limited set of eight instructions. (Six of these instructions are actually part of the original Nova instruction set, and the other two are 16-bit Eclipse instructions; 32-bit instructions are not used.)

(Note: With all the hoopla concerning today's new RISC (reduced instruction set computer) technologies, I find it interesting that the Nova family provided quintessential RISC technology nearly 20 years ago!)

The third chapter starts getting meaty. The reader's first view of the computer is simply a processor with the ZREL memory partition of 256 16-bit words. At this point, the instruction set consists of the Load Accumulator and Store Accumulator instructions. The authors do a good job of showing hand-assembly techniques, building up from the OP codes and memory displacement.

At this point, I take issue with the authors' simple approach. One of the challenges in preparing any book or course on assembler programming is making it possible for the students to

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begin writing programs when only a few instructions have been introduced. Programs are of limited value without I/O, yet performing I/O is one of the most complex topics to be treated. Most of the better texts and courses I've seen have handled this situation by providing a few canned macros to do some basic I/O, such as reading or writing a single byte to or from an accumulator. (Data General offers courses—which I teach on occasion—on Eclipse and Eclipse MV assembler programming. This is the approach we take, and we have found it to be very effective.)

The authors have taken a radically different approach. No I/O facilities are presented until the end of the book. Instead, the students are instructed to use the machine debugger to modify and examine memory locations. Inflicting the AOS or AOS/VS debugger on students who have just been exposed to their first assembly language program is likely to be a source of great confusion.

During the next few chapters, the computer subset is gradually built up. Chapter 4 introduces the idea of the Arithmetic Logic Unit (ALU), along with the Increment and Complement instructions. The students see how to add and subtract by repeated use of these instructions. I feel the presentation here is too simplistic; why not just show the Add instruction?

Chapter 5 covers control structures. The subset computer now includes a program counter, which can be modified by Jump or Skip instructions. Now, we're really cooking! I especially appreciate how the authors use comments to clearly delineate the underlying if-then-else structures in their example programs.

Chapter 6 covers logical operations. The And instruction is introduced, and the authors show how the And and Complement instructions can be used together to simulate an inclusive Or instruction. (Again, I object.)

Chapter 7 adds the Logical Shift instruction, and shows how to accomplish logical rotations and byte swapping with the limited instruction set covered so far.

Chapter 8 covers the various addressing modes of the Eclipse. In general, the explanation of effective addressing is well done. In particular, I found the explanations of zero-relative and PC-relative addressing to be unusually clear.

Chapter 9 finally gets into all the options of the ALC instructions—the shift

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operation, the carry initialization, the no-load and skip options; overflow and the carry bit are explained. I heartily approve of waiting this long before discussing the carry bit.

Chapter 10 gives the instructions for multiplication and division. Thank goodness they didn't make us go through repeated addition first. Chapter 11 explains the concept of stack ma-

nipulation. I was disappointed that the discussion of stack overflow didn't also mention the possibility of stack underflow.

Chapter 12 introduces the Jump to Subroutine, and Chapter 13 (finally) provides a cursory look at the operating system calls for some simple I/O. (It was a good idea not to mention the basic I/O instructions in an introductory

course. How many of us are ever going to write a device driver?) This chapter provides a useful "canned" packet for doing console I/O, and a good explanation of how to convert data between its binary and ASCII representations.

On the other hand, the explanation of how byte pointers are formed is weak. I would explain the construction of the byte pointer first, and only then give the rule about multiplying a word address by two. And why go through Move and masking operations when we've got Load Byte and Store Byte instructions available?

Chapter 14 provides a clear explanation of floating-point numbers and arithmetic, and chapter 15 provides a (too brief) look at macros.

Now for some minor quibbles. Rather than typesetting the book, it appears that the publisher reproduced the output of a letter-quality printer on 8½-inch x 11-inch sheets and bound them in a spiral. That isn't necessarily bad—it's a comparatively inexpensive way of getting a book with a limited audience into print—but 77-character columns aren't easy to read. A two-column layout would have been much more reader-friendly.

I am also bothered that the authors don't distinguish clearly between hardware architecture and operating system. They refer to AOS and AOS/VS computers, when in fact, they are teaching the instruction set of the Eclipse computer. (It's the same instruction set, with the same coding techniques, even when running RDOS or MP/AOS—or even MUMPS or Unix.) Are there really that many 16-bit Eclipses still being used in computer science labs? (As proof of my point, the authors' instructions for linking, debugging, and the like are for AOS/VS only.) If I wrote such a book, I'd stick with just the 32-bit instruction set.

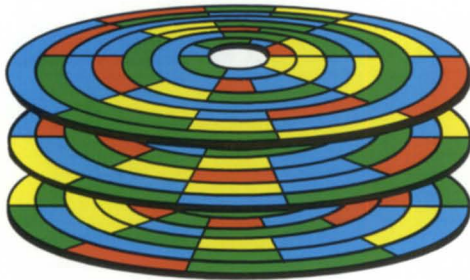
It's probably obvious to you by now that this book wasn't the answer to my dreams. I may yet write my own, but in the meantime, this book does accomplish much of what it needs to, and I have no qualms about recommending it as the text for a college-level course. If I were a movie critic, I'd give it a qualified "thumbs up." Δ

Tom Gutnick is a regional systems engineering consultant in Data General's Washington, D.C., office. He specializes in system performance and security issues. He can be reached at 703/827-9600.

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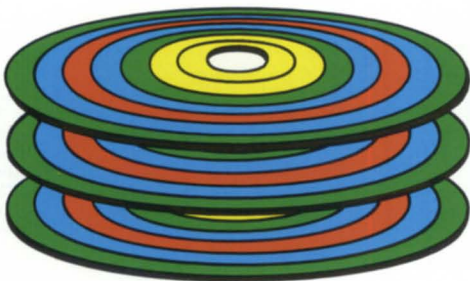
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Powerhouse DG gets new features

Ottawa, Ont.—Cognos has released an upgrade to the 5.00 version of Powerhouse, its fourth-generation language, which supports both Data General's relational data base, *DG/SQL*, and its standard *INFOS II* file system on MV mini-computers.

Version 5.00 D introduces two new commands. Show description, available in the dictionary reporter, provides a full description for any specified dictionary entity, and the revise command links Powerhouse to the system editor to give users access to source code files for editing.

Other technical features have been added to help implement data processing applications.

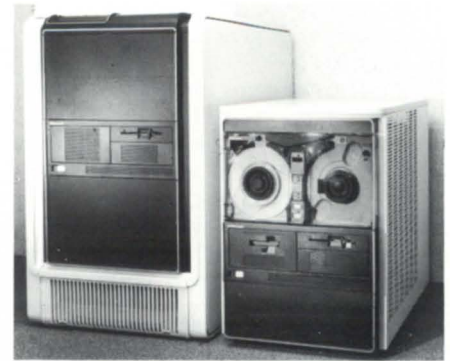
Cognos Corp., 2 Corporate Place, I-95, Peabody, MA 01960; 617/720-1503. Δ

DG expands rack-mount processor family

Westboro—Data General has introduced the rack-mount Eclipse MV/1400 RM computer and an enhanced version of the rack-mount Eclipse MV/2000 RM computer. Each computer occupies seven inches of vertical rack space, and is mounted on slides for easy system upgrade and maintenance.

All Eclipse MV/1400 and MV/2000 computer systems are now available in rack-mount configurations at about the same price as under-the-desk units. In addition, the rack-mount computers are optionally available with a streaming tape subsystem.

The MV/1400 RM is the lowest-cost rack-mount entry point into the MV product line, and supports up to eight users. The base system board features a CMOS gate array, 32-bit CPU with integrated FPU; real-time clock and pro-



grammable interval timer; disk, diskette, and cartridge tape interfaces; time-of-boot clock/calendar; 10 serial ports; a parallel printer port; and 4 MB of memory. Memory can be expanded in 2 MB or 4 MB increments to a maximum of 8 MB.

Two option cards may be added, including one memory expansion card and one or two of the following cards (two if there is no expansion memory): local bus synchronous controller, local bus LAN controller, local bus DG/StarLAN

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controller, and general-purpose local bus interface.

MV/1400 RM systems can be configured with one Winchester disk drive; 38, 70, or 160 MB; and a choice of removable magnetic media (a 737 KB diskette drive or a 21 MB cartridge tape drive). The diskette drive is also available as a system add-on. The MV/1400 RMT is the MV/1400 RM processor packaged with a

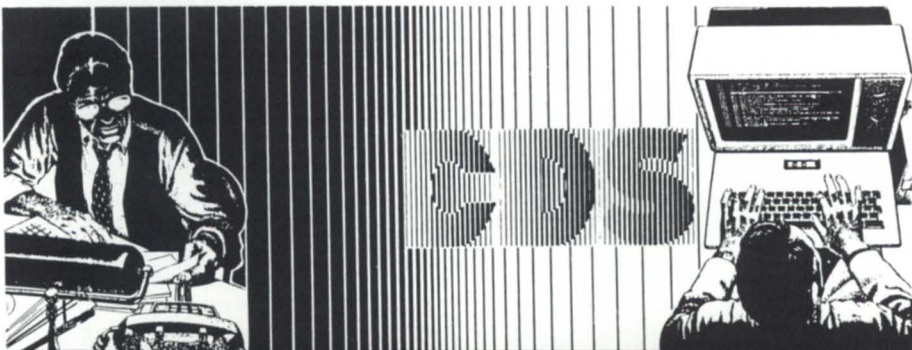
1600-bpi phase-encoded magnetic tape drive.

The MV/2000 RM has been enhanced to include 4 MB of base system memory. It supports as many as 24 users, depending on the application. Memory may be expanded up to a maximum of 12 MB, and up to four option cards are allowed.

The MV/1400 RM and MV/2000 RM are supported by AOS/VS, DG/UX, AOS/RT-32,

and DG/RDOS. Dimensions are 19 inches wide x 7 inches high x 26 inches deep.

List prices for the MV/1400 RM begin at \$9,995 for a 4 MB, 38 MB disk, 737 KB floppy diskette configuration, with operating license. The MV/1400 RMT (includes the MV/1400 RM computer and a 1600-bpi streaming tape subsystem in a 29-inch high cabinet) is \$18,370. All systems are available within 45 days after receipt of order. Δ



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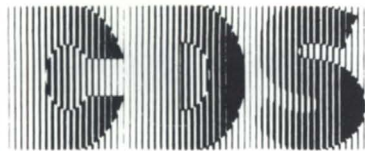
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PC/Mail gives PCs access to CEO mail

Corte Madera, CA—Rational Data Systems (RDS) is now shipping PC/Mail, a new software product that gives users of IBM or compatible PCs access to the electronic mail facilities of Data General's comprehensive electronic office (CEO) over a local area network.

PC/Mail utilizes Lotus-style menus and pop-up windows, but the format is similar to that of CEO. With PC/Mail, a user can view the CEO inbox; read, forward, save, and reply; compose and send new messages; and delete old messages. Users can mail MS-DOS files through CEO from one PC to another. Because mailed files aren't modified, they can be spreadsheets, word processing documents, or programs.

PC/Mail can be used in two PC-integration environments: in conjunction with the RDS Netlink (an add-on to Data General's PC1 platform), or in conjunction with RDS's PC/VS high-performance alternative. PC/Mail operates in conjunction with the Notifier, a pop-up window that alerts a PC user of newly arrived CEO mail messages. The Notifier is part of both Netlink and PC/VS.

PC/Mail was implemented using Data General's CEO Toolkit and Agent User Interface (AUI) and PC/VS's remote Inter-Process Communication (IPC) interface. The AUI is normally only available to programs running on the host MV minicomputer, but PC/VS's remote IPC interface supports distributed processing between MS-DOS applications and AOS/VS processes. Therefore, PC/VS allows PC/Mail users to make AUI requests, i.e., send a CEO mail message from the PC workstation. PC/Mail offloads much of the overhead of mail operations from the host MV minicomputer, because there is no need to run the CEO control program (CEO_CP.PR) on the MV.

Rational Data Systems, 5725 Paradise Dr., Corte Madera, CA 94925; 415/924-0840. Δ

Circle 7 on reader service card.

Interface announces new SLIM product

Farmington Hills, MI—Interface Electronics has announced SLIM-3, another product in its family of 16-line intelligent multiplexors. SLIM-3 incorporates the front-end design of the previous IAC-compatible devices with a more flexible back-end design.

SLIM-3 supports both the RS-232 and the RS-422 interface on a switch-selectable basis. Standard DG diagnostics and utilities are still supported by all SLIM products.

Full modem control capabilities are available on 4 of the 16 ports to enable users to maximize the port/slot ratio. Traditional IAC-8 requirements may be minimized with the use of an intelligent TCP (terminal control panel) that incorporates modular telephone jack design and traditional RS-232/422 connections.

SLIM-3's power requirement is lower than the IAC-16's through the incorporation of CMOS technology on every

board. The SLIM-3 has a power requirement of 6.5 amps.

A reset switch allows the user to manually reset the SLIM on a device-code by device-code basis to avoid system I/O resets.

There is a five-year warranty on all SLIM-3S.

Interface Electronics, 37500 Enterprise Ct., Farmington Hills, MI 48331; 313/553-9820. Δ



Adapter interfaces SMD controllers to ESDI drives

Sunnyvale, CA—5¼-inch Winchester disk drives can be interfaced to SMD



disk controllers using the SMD/ESDI Adapter from BTI Computer Systems. System installations with 8-inch and 14-inch storage module drives can make use of the storage capacity (up to 390 MB) and reliability of the Winchester.

The SMD/ESDI Adapter is available either as a standalone interface board or as part of a complete Adapter Assembly that is designed to replace a CDC series 9715 eight-inch FSD. Two Adapter Assemblies can be installed in the space occupied by one eight-inch FSD. For example, with a 390 MB, 5¼-inch drive in each Adapter Assembly, 780 MB of storage can be installed in the space required for one 340 MB eight-inch storage module drive.

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Circle 25 on reader service card.

The Adapter Assembly includes the SMD/ESDI interface board and a power supply within a fan-cooled housing that accommodates the 5¼-inch disk drive. The Assembly is equipped with rear-panel connectors for the SMD controller and rack-mount slides.

The SMD/ESDI Adapter provides a transparent interface between the SMD controller and the ESDI drive. The data

transfer rate between controller and drive is unaffected, and the user doesn't need to make any changes to the SMD controller or ESDI drive hardware, or to the operating software.

The model 8615 Adapter interface board is priced at \$400 for quantities up to 99, and \$300 for quantities of more than 100. The end-user price for the model 8610 Adapter Assembly is

\$3,000. Prices to resellers start at \$1,500 for quantities fewer than 10, and \$1,000 for quantities of more than 100.

BTI Computer Systems, 870 W. Maude Ave., Sunnyvale, CA 94086; 408/733-1122.

Δ

Printronix ships new matrix line printer



Irvine, CA—Printronix is shipping a new 1200-line-per-minute P9102 matrix line printer.

The P9102 incorporates new design features. The variable speed shuttle system enables the P9102 to produce multiple printing and graphics densities. Users can mix different type pitches and combine text and graphics on the same print line. Functionality includes super/subscripts, bold, double-wide, and double-high characters. For matching type style and speed to different applications, the P9102 has five print modes. Additionally, the P9102 offers nine multinational and downloadable character sets.

The P9102's new counterbalanced shuttle system lowers shuttle vibration and reduces acceleration. A cool-running hammer band is combined with the new tapered-base hammers. At less than 55 dBA, the P9102 is a quiet printer.

Its auto-ranging input voltage selection for 110 V or 220 V applications eliminates the need to change fuses or voltage taps. After plugging in the P9102, the proper voltage will be applied. Operators have easy access to the hammer bank for cleaning and maintenance. If service is required, the P9102's design provides for fault isolation. Internal diagnostics and a 32-digit display assist the technician, reducing service time.

Printronix, Inc., 17500 Cartwright Rd., P.O. Box 19559, Irvine, CA 92713-9559; 714/863-1900, telex 910/595-2535.

Δ

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Data General reported that earnings for the first quarter of 1988 were more than three times better than a year ago. With foreign sales buoyed by the falling dollar, DG posted net income of \$12.4 million, or \$.43 a share. Analysts said that the results were slightly better than expected, and DG President Edson D. de Castro said he was "reasonably comfortable" with the outlook, despite uncertainty in the financial markets. Forty-five percent of DG's revenue came from international sales, compared to 40 percent last year.

DG was not alone in reporting stronger earnings. Prime, Unisys, Apple, and several other vendors likewise had good quarters, which indicates the computer industry is continuing a broad recovery—despite disappointing results at IBM.

Data General recently signed a petition along with several other computer companies in an effort to subdue the momentum of AT&T and Sun Microsystems's partnership in the Unix market. Following a meeting held January 7 at a DEC laboratory in Palo Alto, California, a letter was sent to AT&T requesting that engineers from other computer companies be allowed to have input on the direction the popular Unix software will head.

Signing with Data General on the letter were NCR, Unisys, Prime, and Tandem.

It seems that 1988 is The Year of the VAR in the mainstream as well as in the Data General marketplace. According to a recent article in *Computer Systems News*, VARs will recognize service and consulting as their best asset, because "End-users are beginning to understand that everything is the software." As a result, they predict that VARs' services will become much more specialized in order to survive.

"**The Data General difference**" is the theme of a new series of advertisements that has appeared or will be appearing in the *Wall Street Journal*, *Businessweek*, *Computerworld*, *Datamation*, *MIS Week*, and others. The campaign emphasizes Data General's efforts to help customers solve problems. You will also find DG advertisements in the February issue of *Sports Illustrated* promoting DG's involvement in the 1988 Olympics.

Egan Systems had barely completed the paperwork for its leveraged buyout agreement with Diplomat Electronics when news came that Data General was terminating its contracts with electronics distributors. It was a major shock at the time, but Ed Egan's company is now joining forces with Envyr, a North Carolina company that specializes in languages and interpreters, to reenter the DG market. (DG users may remember Envyr's president, Ralph Jordan, from his days with DG's ICOBOL group at Research Triangle Park.) Egan Systems is now marketing Envyr's ICOBOL compiler, which produces ICOBOL object code that runs under Unix.

Another former distributor for Data General, Copley Systems, has signed a value-added reseller agreement with Prime Computers to help Prime push its new Unix products. They will act as the middlemen to smaller VARs until they have enough business to become full-fledged VARs. Positioning itself in the Unix arena, Copley is expected to announce a separate distributorship with AT&T.

There was a time when people thought of computer and electronics companies as "clean" industries that didn't cause pollution. AT&T recently announced a new process for cleaning electronics parts that may help restore that image. The process uses a substance manufactured from orange peels, paper by-products, or pine stumps to replace CFC-113, one of the family of chlorofluorocarbons that is implicated in the depletion of the ozone layer of the earth's stratosphere.

If you haven't heard about NADGUG's spring board meeting in Philadelphia, February 25 and 26, you haven't been reading your latest issues of *Focus*. Held in the downtown Wyndham Franklin Plaza Hotel, the two-day meeting is open to any RIG/SIG representatives and the Executive Board. The agenda covers the minutes from the fall board meeting, the Treasurer's report, a report from Data General, committee meetings and reports, and the proposed agenda for the 1988 fall board meeting.

The spring board meeting is always held in the same city as the upcoming NADGUG conference, so details on the site and sights will be forthcoming.

If you haven't checked into it, you are long overdue. Several additions have been made to the NADGUG software library since the listing in the January issue, bringing the total to 15. Macbook (short for macro, not Macintosh) is a collection of macros from the Colorado users group that can be used as a template for managing a system. Tom Stamm has contributed a Macintosh program written in Pascal that reads and writes DG dump files. It can dump and load AOS/VS-compatible dump files on a Mac.

A Look file program has been included for examining text files. It is like Type, but it can move forward, backward, and search a file. It can be in two files at once, or in two places in the same document at the same time. Last, but undoubtedly not least, librarian Randy Berndt has included a games directory, a compilation of approximately 25 different games from several sources. Some of the more taxing fare includes Adventure, Ferret, Monopoly, Murder Mystery Mansion, Quest, Space Invaders, and Star Trek.

According to Randy, the library has outgrown a 600-foot tape, so those interested in receiving the collection should send a 1200-foot tape to Randy Berndt, American Urological Association, 6750 W. Loop South, #900, Bellaire, Texas 77401, or call 713/665-7500.

Keep looking in *Focus* for updated listings of the library.

Data General made a healthy showing in the international market after winning a \$1.5 million contract from four Finnish companies, beating out DEC, IBM, and Hewlett-Packard. DG will build and supply occupational health care data systems for the Union Bank of Finland, Finland's largest bank; Neste Oy, a petroleum manufacturer; and paper and pulp companies Enso-Gutzeit Oy and Kymmene Oy. The system will predict and prevent illnesses brought about by working conditions.

The conditions of the contract call for a turnkey system that supports 10 to 50 users, communications with IBM systems, and integrated office automation capability. Data General Finland will design the customized Information System for Occupational Care (ISO Care) using Cognos's Powerhouse fourth-generation language on MV/7800 and MV/2000 DC computers. The project is scheduled for completion in February.

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