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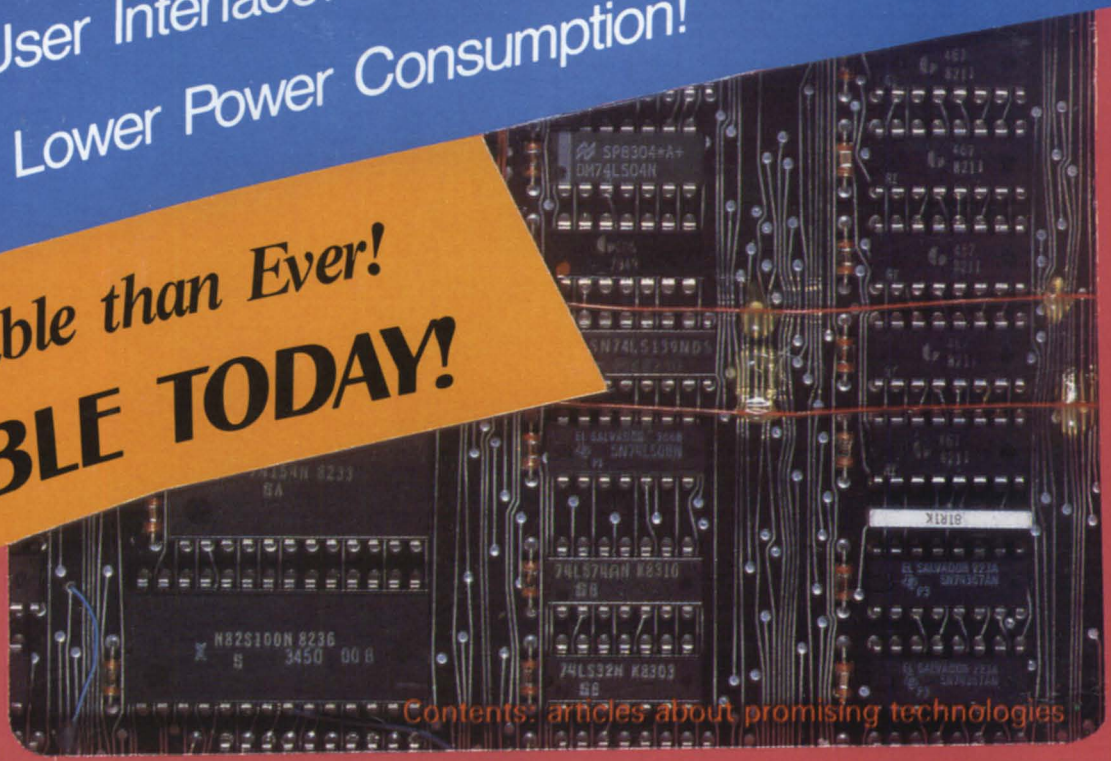

Contents: articles about promising technologies

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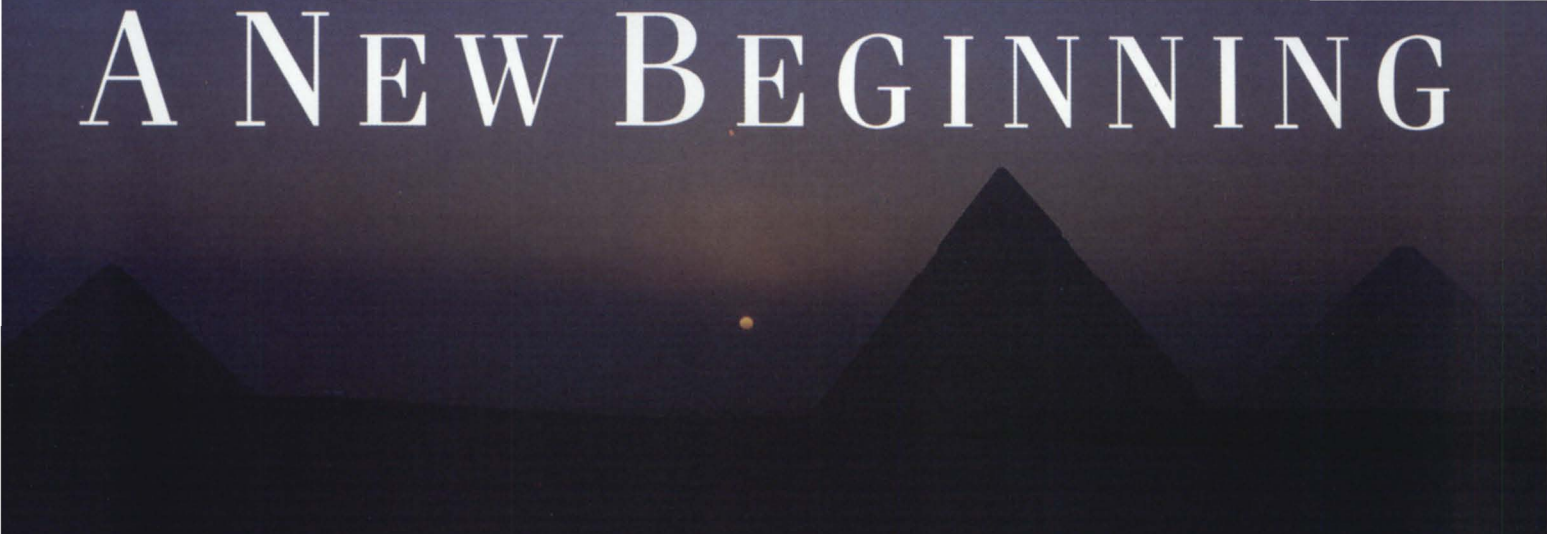

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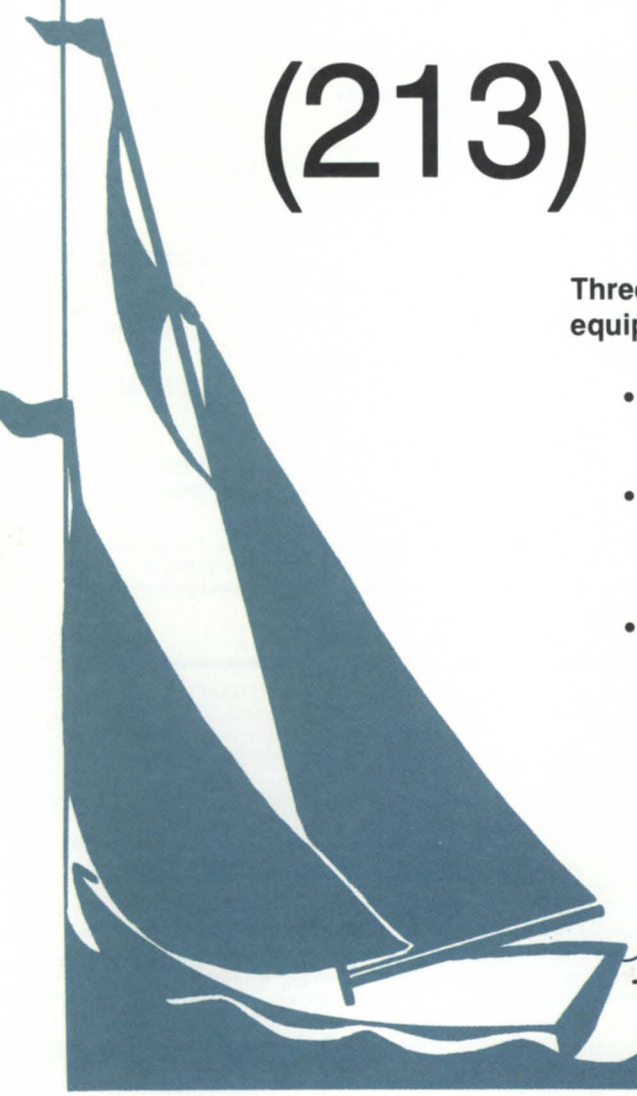

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Focus, the Magazine of the North American Data General Users Group (ISSN 0883-8194) is published monthly by the North American Data General Users Group (NADGUG) in cooperation with Turnkey Publishing. Editorial and Business offices are located at 5332 Thunder Creek Road #105, Austin, Texas 78759-4022, phone 512/345-5316. NADGUG Headquarters are located at NADGUG, c/o Data General Corporation MS C-228, 4400 Computer Drive, Westborough, MA 01580.

Postmaster: send address changes to Subscription Department, Turnkey Publishing, 5332 Thunder Creek Road #105, Austin, TX 78759-4022.

Focus Magazine is distributed to members of the North American Data General Users Group. Membership fees: Individual members $30 per year, Installation members $100 per year. For all memberships outside North America, add $50 to defray costs of mailing. For information on NADGUG membership, call 617/870-7721. Address all other correspondence to Focus Magazine, c/o Turnkey Publishing, 5332 Thunder Creek Road #105, Austin, TX 78759-4022.

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ECT REPORT WORDPERFECT REPORT

WordPerfect® Library Delivers the Mail

The waiting is over. WordPerfect Corporation's recently released Library program is hard at work delivering phone messages, letters, memos, and files to Data General AOS/VS computers all over the country. In addition to the electronic mail features, WordPerfect Library comes with a Calendar, Scheduler, and a shell program to tie everything together.

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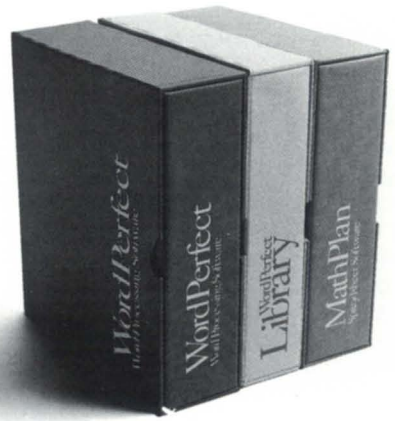

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REPRESENTATION WITHOUT TAXATION

NADGUG serves all DG users—even nonmembers

by Calvin Durden
NADGUG President

There are about 1,000 new members of NADGUG this month. If you're one of them, I know that all of our longstanding members will join me in wishing you welcome.

NADGUG's membership rolls have been growing at a pretty good rate for the last year or so, but getting a thousand new members at one time is still a pretty unusual event. This sudden gain had its start about a year ago when members of the Executive Board began wondering how many DG users are active in regional or special interest groups, but have never joined the national organization. When we compared the membership reports of the RIGs and SIGs to the statistics for NADGUG, it was apparent that we were talking about quite a few people. We thought it would be a good idea to put out the welcome mat for them.

The result was a special offer. Recognized RIGs and SIGs could participate by sending in a list of their active members. The NADGUG staff would review the list, and every user who was not already a NADGUG member would get a free six-month introductory membership.

We still don't know how successful this promotion will be. The initial response looks pretty encouraging, but we won't get the proof of the pudding until we see how many of our introductory members renew their memberships in six months. We're betting that all the benefits NADGUG now offers will win them over.

It was gratifying to see how much cooperation we got from the RIGs and SIGs as we launched this offer. On the other hand, it was disturbing to see how little support the national organization had been getting from DG users who are active at the grass roots level. In some cases, only 11 percent of the members of a regional interest group belonged to NADGUG!

Statistics like that are hard to understand. Anybody who takes the time to be active in a RIG or SIG must already believe in the basic assumption behind any user group: that each of us becomes more effective when we join together to pool our knowledge and state our concerns. So why were so many RIG and SIG members not NADGUG members?

Part of the reason may be that until a few years ago, NADGUG wasn't in a position to offer many tangible benefits to its members. Except for organizing the annual conference, most of what the national organization did was "behind the scenes." That has changed. Now that *Focus* is a monthly magazine, members get a reminder every month of the return they get on their membership investment. We also publish an annual roster of our total membership, and operate two electronic bulletin boards to help users stay in touch and keep informed; other member benefits are on the way.

But let's take a second look at some of the less tangible benefits. Probably the biggest is the influence and credibility our united voices have within Data General. Many of the improvements we have seen in DG service and support, and many of the product enhancements of the past few years, have their roots in the improved communication users now enjoy with Data General.

All DG users benefit from this improved communication—even those who haven't joined NADGUG. In a sense, nonmembers are getting a free ride—it's something like getting the benefits of a representative government without having to pay taxes.

Some RIGs are actively encouraging their members to join NADGUG. The Chicago Area Data General User Group is a leader in this respect: they have unified their dues, so CADGUG membership automatically includes membership in NADGUG. We hope other RIGs and SIGs will follow suit and encourage their members to support the national organization. After all, NADGUG is supporting RIG and SIG activities with start-up funding, support for speakers and publications, reimbursements for representatives to Executive Board meetings, . . . The list goes on.

NADGUG is growing at an impressive rate, but we still have a long way to go. We don't expect people to join out of altruism—NADGUG will continue to provide the kinds of member benefits that DG users will want to pay for. But we do hope that RIGs, SIGs, and individuals will remember both the tangible and intangible benefits of membership. Δ

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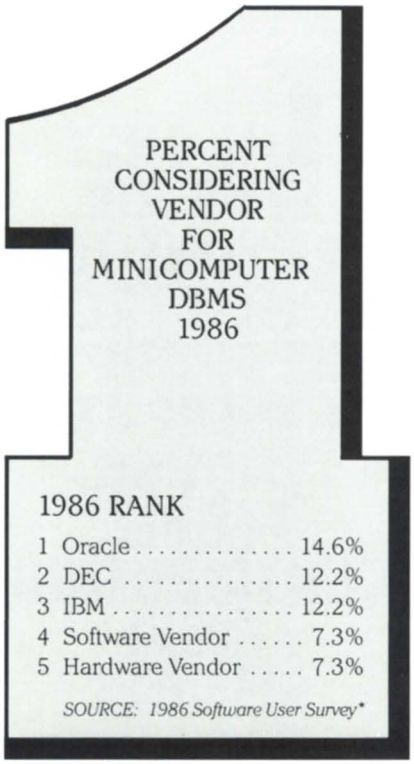

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San Francisco ..... Mar 12, Apr 9, May 7
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CADGUG elects officers, gets INFO briefing

by Dave Angulo, President
Chicago Area Data General Users Group

CADGUG's first meeting of 1987 was held on January 14 at RSB Companies (formerly Republic Service Bureau). I began the meeting by passing out a list of the Area 4 DG management after the recent restructuring (see CADGUG minutes in the February 1987 issue of *Focus*).

Next, amendments to the CADGUG constitution were introduced so they can be voted on in the next meeting (for more details see the executive board report below).

I then made an appeal to members to invest some of their time in the users group—the only way for anyone to benefit from the group is if there is a sufficient number of people contributing their efforts.

There are three committees in need of help. The participation committee needs people to call up CADGUG members before a meeting and remind them of the topic, time, and place of that meeting. People on this committee help prepare, distribute, collect, and tabulate CADGUG's annual survey (and survey some members by phone). They also extend personal invitations and information about CADGUG to new prospective members. Finally, they help the other committees recruit committee members.

The programs committee also needs assistance. This committee sets topics for each meeting, finds a place to host the meetings, and sometimes obtains refreshments. The programs committee is also in charge of the annual dinner meeting.

The final committee needing help is the technical committee. One function of this committee's members is to write articles for the CADGUG newsletter (which is published in *Focus*). They also find technical topics for a select number of meetings, help in technical roundtable discussions, and sponsor technical seminars.

Nominations were reopened, and the proposed slate was elected unanimously. The new officers are Art Lewandowski, president; John Eymann, vice president; Jim Siegman, treasurer; and myself, secretary. As outgoing president, I thanked Art, John, and Jim for the excellent job they had done in 1986.

THE ONLY WAY FOR ANYONE TO BENEFIT FROM THE GROUP IS IF THERE ARE ENOUGH PEOPLE CONTRIBUTING THEIR EFFORTS

The speaker for the night was Tom Koulopoulos of Henco Software. Our host for the evening, RSB Companies, is a hospital cost containment service firm that uses Henco Software's INFO. They had been using an MV/8000, but upgraded it to an MV/20000; they now have both machines running.

An overview of INFO

Koulopoulos began by saying that Henco, located outside of Boston, Massachusetts, has an installed base of over 3,500. Its customers include NASA, Texas A&M University, ARCO, and the EPA (not all of these use DG hardware). INFO runs on the IBM PC, the DG/One, and the entire MV/ family.

INFO has full INFOS II support (ISAM and DBAM) and can read and write to these data bases. It can integrate INFO files and system files, convert files for input into PRESENT, and transfer data to the DG/One and Dasher/One. It can also interface with BLAST and allow users to go directly to the CLI.

Koulopoulos said that INFO's strength lies in its ability to use the English language, allow programming, allow querying via SQL, and support data entry and retrieval. He claimed that it works best by supplementing third-generation languages, where it can improve functionality within a limited time span and budget.

Koulopoulos stated that the programmer still has control over I/O by creating a modular command set. INFO also has the ability to RELATE up to 10 files. These can be INFO, INFOS, flat, or other file types. RELATEing two or more files creates a virtual file by matching fields.

To start a project from scratch, you first define the data base name. You then set up a data dictionary and relate it to any file or data base in any directory on any node (if you have XODIAC). Once all this is done, you can quickly list data.

Once you select some records, you can reselect, add to the selection, get the records, or get the records that weren't selected. When setting up forms, several forms can be defined on a single page, or several pages can be used for a single form. A form can have header, detail, and footer areas.

Forms can be set up to check for numeric/alpha formatting, ranges, and field lengths. If a key for a different record is entered into a form, data from that record can be displayed. For example, if an employee record is being entered and the department code is typed in, the department name can be displayed.

One drawback seemed to be that users must state whether they are doing updates or entries into the forms before they call the form up. Evidently, users can't mix those functions. One of INFO's real strengths, however, is its intimacy with CEO. A user can go into CEO and look at a mail or phone message without leaving INFO.

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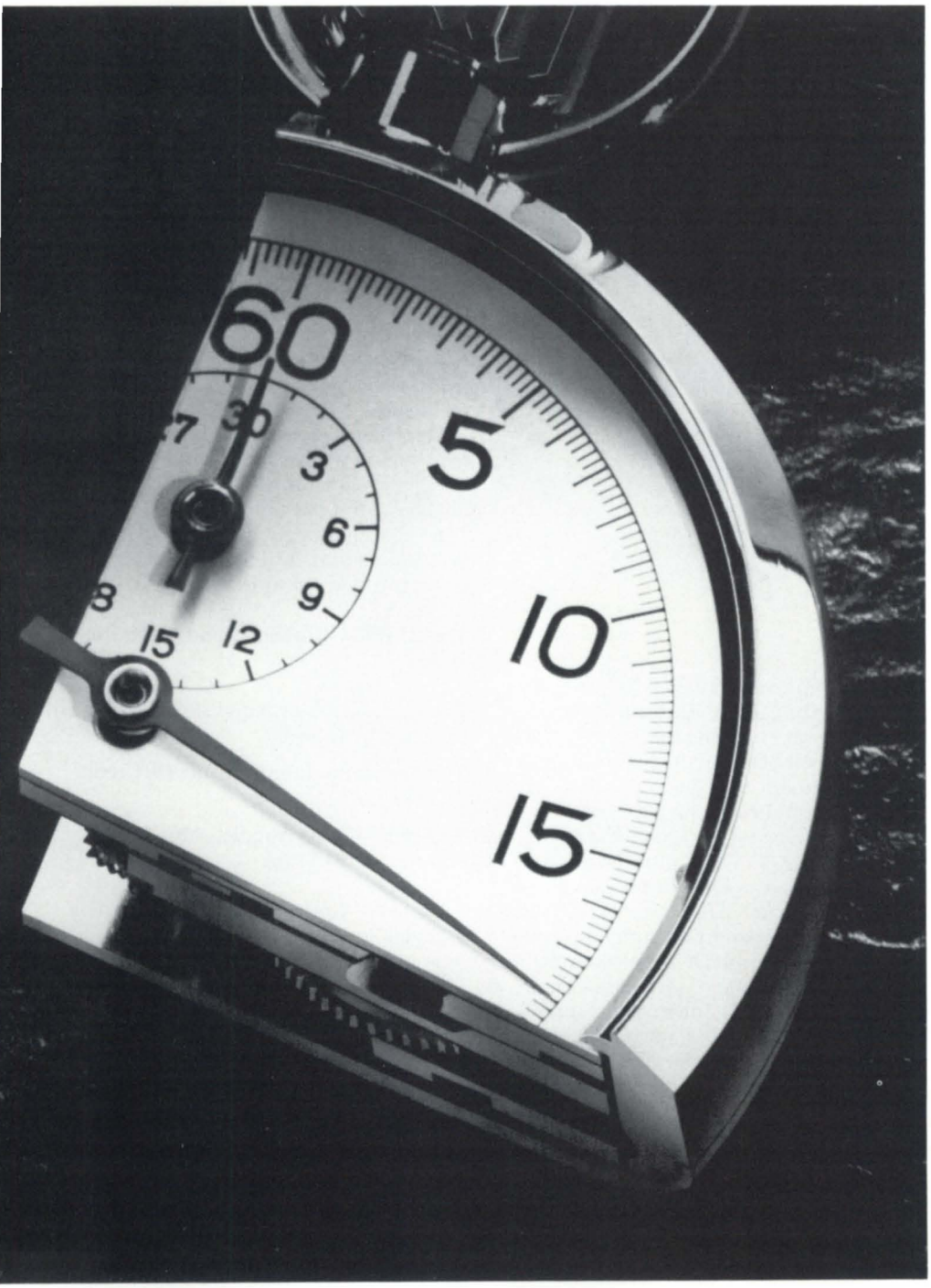

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INFO data bases can also be sent to CEO to be merged with a CEO report. For example, if you want to give raises to some employees and send them letters, you select the employees and send them to the CEO list file. You then enter CEO and merge the INFO list file with a CEO word processing file. The results are individualized letters to each employee, with each letter telling of the raise and giving its amount.

INFO can run in batch, but only by programming using the Fortran interface (you may wish to do this if you're selecting from a data base with 200,000 records).

Prices are $1,200 for the IBM PC, $8,600 for the MV/2000, $19,500 for the MV/7800, and $30,000 for the MV/20000. Koulopoulos can be reached at Henco at 617/890-8670.

CADGUG executive board meeting

The 1986 fourth-quarter executive board meeting was held on January 7, 1987. Jim Roop, a DG sales rep, talked about DG's upcoming efforts to increase their presence in the Chicago market. These local efforts come under DG's Pegasus and Discover DG programs. They will be kicked off with a week-long event April 6 to 10 at the Marriott, Chicago. The press and consultants will be invited to attend on Tuesday of that week. Wednesday will be a day for the industry sales branch. Roop offered to have DG host the CADGUG meeting that Wednesday night with cocktails and appetizers.

The executive board is trying to make arrangements with an outside auditor to perform the function of CADGUG's audit committee. In other committee business, Paul Gibson will head the participation committee for the next quarter. His term will expire when he gives his report at the next executive board meeting.

Finally, the board unanimously approved submitting two amendments to our constitution to CADGUG members for ratification. The first amendment would open eligibility for office to associate members. We have had two officers who have both held office for many years as associate members without realizing that this violated the constitution. The second amendment would allow absentee voting—another case where the group had unwittingly violated the constitution.

Jim Siegman presented the treasurer's report. The current balance is $1,841.19, and the estimated closing balance for 1987 is $1,155.81. This reflects a $500 loss for the year, as opposed to a projected $1,100 loss. The 1987 budget shows a projected loss of $1,700.

INFO HAS THE ABILITY TO RELATE UP TO 10 FILES. THESE CAN BE INFO, INFOS, FLAT, OR OTHER FILE TYPES.

The improved situation in 1986 over what was budgeted was due to a decrease in the number of individual memberships (where membership benefits are more expensive than the dues), and to the generosity of Brian Johnson in not charging a fee for being our speaker at the dinner meeting. On the other hand, dues from DG and speaker fund reimbursement from NADGUG were not received.

The membership committee reported 126 members and 41 DG employees on the roster. John Eymann, giving the report, said there are 31 additional prospective members—the highest such total ever.

Eymann said that he would start giving the participation committee monthly lists of expiring and prospective memberships. Noting that we find many of our prospective members from meeting attendance sign-in sheets, we decided that the president should remind everyone to sign in at every meeting. We will also ask the DG sales staff to get more involved in generating prospective names and perhaps provide free memberships.

Art Lewandowski reported that the only members of the programs committee were Don Mungoven and Paul Gibson. With Lewandowski leaving the committee to become an officer and Gibson spending more time with the participation committee, members are badly needed.

The committee has been trying to confirm meetings at least two months in advance so that meeting notices will contain information about the upcoming as well as the current meeting. Meetings in the planning stage include February and April, both of which are being handled by the technical committee.

The work on the 1987 dinner meeting will commence shortly so that we can confirm a location and send out notices with plenty of lead time. This lead time is necessary so that follow-ups by the participation committee can occur in the last two to three weeks.

Neil Redshaw was unable to attend the meeting, but sent in a report for the technical committee, which seems to be without members again. The participation committee will help look for new members.

As related earlier, the technical committee is handling the February meeting. No newsletter articles are currently being planned. The open house idea (DB Credit and Sage) has not progressed beyond the previous quarter. A CEO workshop is still being planned for April.

1987 CADGUG officers and committee chairs

President—Art Lewandowski, RSP Companies; 312/420-6800

Vice president—John Eymann, DB Credit; 312/948-7272

Secretary—Dave Angulo, Angulo Consulting; 312/342-7368

Treasurer—Jim Siegman, McDonnell Douglas Automation; 312/318-0700

Past president—Dave Angulo

Program committee—Don Mungoven, QST; 312/930-9400

Technical committee—Neil Redshaw, DB Credit; 312/948-7272

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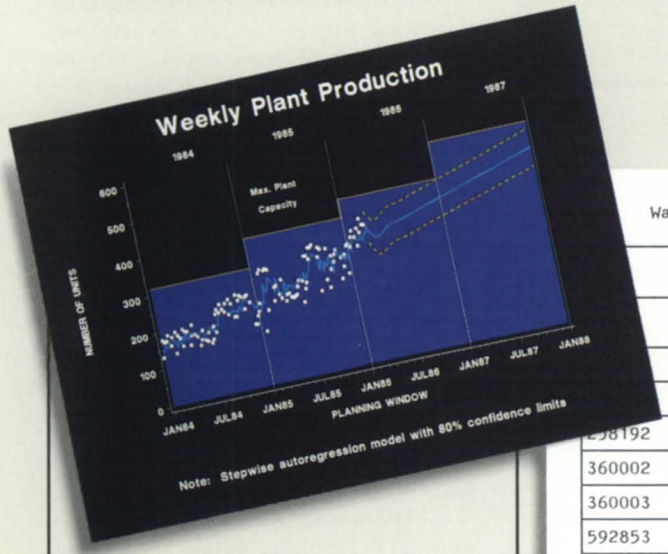

Warehouse Inventory Report - 16JAN87

	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
298192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
360003	15985	500	TUE, FEB 10, 87
592853	469120	20000	WED, FEB 18, 87

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60	6	4	9	6.5	83
70	7	4	10	7.0	85

* Computer Intelligence, January 1986.

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CAN-AM takes flight

by Carolyn Kelly
Focus Staff

Organizers in Buffalo, New York, are sending out approximately 200 invitations to Data General users in the southern Ontario, western New York, and western Pennsylvania area for the first meeting of the Canadian-American regional interest group. At the time this magazine is going to press, the dinner and meeting are scheduled for March 3 at the Hilton in Buffalo.

The first order of business will be to elect officers, establish committees, and meet people. Speakers have not been scheduled as yet. Scot Love, a systems and programming manager in Buffalo's planning division, and John Gogniat, a DG sales representative in the Amherst area, have been the key planners "down to beef or chicken," Love said.

Along with the invitations, prospective members were sent a questionnaire concerning when, where, how often, etc., users are interested in convening. Because

SCOT LOVE AND JOHN GOGNIAT HAVE BEEN THE KEY PLANNERS "DOWN TO BEEF OR CHICKEN"

the RIG covers such a large area, Love hopes that the questionnaire will allow those who cannot make it to the meetings to participate. To insure success for this new group, Love wrote to every RIG and SIG in the country and asked for suggestions on how to start up and maintain a successful interest group.

Once the RIG gets underway, Love wants to activate an SQL SIG, but right now he needs a list of SQL users. He has about 30 names and needs more to get a serious group going.

Anyone interested in either the CAN-AM RIG or the SQL SIG should contact Scot Love, City Hall, Room 428, division of planning, Buffalo, NY 14202; 716/855-5061.

■

Members of another new RIG, the Colorado Data General Users Group (CODGUG) met for the third time January 8 at the offices of the DG technical systems division. The group voted on items approved in advanced by the executive board, including $20 yearly dues (no prorating or refunding). Nominations for officers were presented. Users consenting to take positions are Nancy Walters, president; Terry Spencer, vice president; Chuck Siefke, secretary; Don Davis, treasurer; and Bruce Carey, NADGUG representative.

Ted Stuber talked about data communications and gave a survey of products available in that market. Later, the group broke up into different workshops that included data communications, exploring DG's operating system, data base management systems, performance, and macros.

Meetings are scheduled for the second Thursday of every other month except July. The fourth meeting will be held March 12 at the DG Technical Services Center. The topic for the evening will be "Comparing and Evaluating DBMS." Δ

DG REIGNS

DG helps automate municipal governments

by Carolyn Kelly
Focus Staff

Radio dispatchers in Richmond, Virginia, operate from a new communications center using all new D470 color CRTs

The word "red tape" used to be synonymous with government work, but today mag tapes and disk drives would be a better synonym. As local governments switch from manual to automated operations, Data General computers are being plugged into city halls across the country and are meeting the general approval of users. Although employees complain of some software problems, the computers are managing the reams of paperwork that government regulations require, plus offering some services never before possible.

When Al Devitt, data processing director in Sarpy County, Nebraska, cut the ribbon on the new MV/20000 running AOS/VS, he also cut down on waiting lines to pay for motor vehicle registration. Processing that used to take the old overworked C/350 up to 10 minutes now takes approximately 3 minutes to run.

In the Sarpy County treasurer's office, the computer prints the registration, and computes the taxes and plate fees for vehicles. Then it shunts the tax monies to the proper government division to receive funds. All this used to be done manually, which left a lot of room for error in calculations, according to Kathleen Ingram, county treasurer. The improvements have eliminated a bulky file cabinet system. "I would probably have to have at least eight more people if we were going manual," Ingram said.

The recent installation of the MV/20000 demonstrates the widespread applications available to municipal governments. The machine, which has 80 terminals on-line and 8 MB of memory, services the tax assessor, the treasurer's office, the court system, and the sheriff's department. Specific applications used countywide include: county attorney information; motor vehicle titles, tax assessment, and registration; county budget; claims and warrants; district court case management; child support collection; and a criminal justice information system.

With 38 years of IBM experience behind him, Devitt recommended the DG upgrade to the county when he moved to the town of Papillion in Sarpy County more than a year ago. "The decision has turned out to be a very valid one. I think the transition (was smooth)—and I've been through many of these before. We jumped over about three generations of computers," he said. He projects that the county will be using the MV/20000 for at least five years before any more major hardware upgrades.

It took Devitt and the eight men of the DP staff approximately five months to write all the programs for the conversion. It took another 90 days, from June to September 1986, "from the time the MV was installed until the 350 left the building," Devitt said.

The sheriff's department is using more new applications than any other depart-

ment, and is awaiting more enhancements to be completed by January 1988. "They used to hand-type dozens of reports, for instance, just to book a person in jail. Now they don't handle any paper," said Chuck Paige, assistant director in data processing.

The system now includes a master name index that lists any name put into the computer for any reason, whether as a victim, a witness, a passenger, or a person who reports a crime. An arrest records system compiles all information regarding an arrest, including both a suspect's physical description and information taken by an officer at the time of the arrest incident. The booking/jail management system handles information acquired once a person is in custody—even a suspect's one phone call.

According to Captain Jim Sanderson, the system should soon include a master incident file and a civil process system. By January 1988, a 911-enhanced emergency system will be in effect. As a headline in the *Omaha World-Herald* (November 21, 1986) read, "Computer will save soles on Sarpy's deputies' shoes."

So far, the 20000 handles its workload well. The only hardware problems in six months were one bad board, two microcode changes, and fewer than 10 failures. "Overall," Devitt said, "the machine burned in very well. From a hardware standpoint, it burned in exceptionally well."

Farther south, in Carrollton, Texas, just outside of Dallas, another upgrade in city government offices didn't go as smoothly. Since switching four years ago to an MV/8000 from an MV/4000, employee training has occurred gradually. The bulk of CEO training has taken place in the last six weeks.

The city now operates with about 70 CEO users on 40 terminals. It uses two 354 MB drives, a 602 MB drive, and 10 MB of memory with another 2 MB on order. "We are loading the memory as far as it will go," said Randy Keltner, DP manager.

The MV/8000 handles nearly all of the city's administrative operations, including financial accounting, purchasing processes, payroll, personnel, utility billing, tax billing, and accounts payable. However, unlike Sarpy County, the sheriff's department does not run off of the same system. According to Keltner, "In Texas, it gets real sticky to put a police department on a city administrative system. . . . For security reasons, the DP person in charge of the system has to report to the police chief. I don't want to be called 'Sarge.'"

Keltner likes DG products. He became familiar with them at his last job in Greenville, Texas, about 50 miles north of Carrollton, when the city switched from Honeywell to Data General. Then Duncanville, 20 miles south of Carrollton, also purchased Data General products.

Although the MV upgrade has improved the city's overall efficiency, initial training on CEO, word processing, Decision Base, and Present was ineffective. "They had 15 people in a room with four terminals. That obviously doesn't work," said Keltner. "There was a lot of frustration from the users' side, having the equipment around and nobody knowing how to use it."

Since the beginning of November 1986, 30 people have been trained for office automation. In early December 1986, Keltner sent the CEO office manager to DG's train-

ing center in Boston in order to teach the rest of the staff.

Once everybody gets trained, Keltner anticipates better coordination of activities. For now, some use CEO while others still do things manually. Right now, he'd be happy if everybody just learned to use the conference room scheduler. "When some are keeping manual records and someone else is using CEO, two people show up to use the conference room at the same time. It creates a problem," he said.

About 270 miles away from the suburbs of Dallas, 30,000 residents of La Porte, Texas, are being serviced by 35 users on a four-year-old MV/8000. The machine is used for city taxes, financial accounting, billing utilities, the court system, personnel, purchasing, and CEO. The police department is on-line 24 hours a day.

Al Owens, system analyst, has no complaints in the year since he began working at this position with the city, except for slow response time at peak hours. The city purchased their software from HMS, a vendor that specializes in municipal packages and trains the employees. They also have a maintenance contract with Data General.

"When I've got most of my users on, the computer slows down and sometimes there's a 10- to 15-minute wait," he said.

Owen worked with Data General computers for 10 years while working for Texaco; overall, he still finds it "reliable, durable equipment."

On the East Coast, Durham County, North Carolina, uses three different DG computers—an MV/4000, MV/8000, and MV/10000 running AOS/VS. Programs were written in-house in COBOL. About 250 of the 900 county employees are on-line. Of those, the social services department has the largest share of users—approximately 100.

The computers are used for most of the county's departments (with a few exceptions, such as animal control), including mental health; public health; personnel; the sheriff's department; tax, billing, and collecting; and finance. Likely areas for expansion would be general ledger accounting, purchase orders, county payroll, and more finance uses. Although some employees were sent to DG schools, most of the training took very little time.

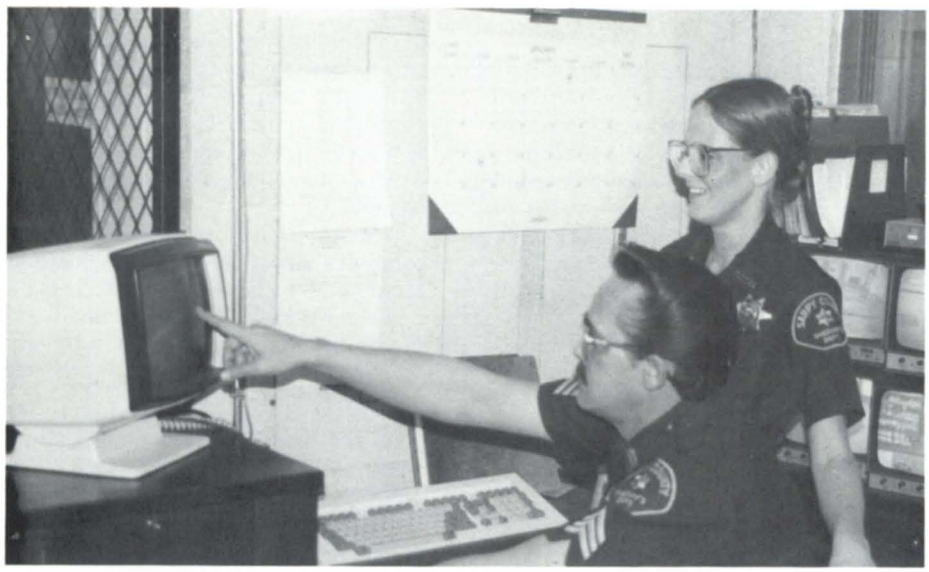
Paul Warren, finance director for four years, was not around in 1980 when the DG system was introduced, replacing a manual administration aided only by leasing computer time.

"The biggest problem we had was probably when the county first went into the computer business. The computer facility was not properly set up. As a result, that created a lot of hardware problems," he said.

An MV/8000 II in Fort Walton Beach, Florida, has been keeping the city running efficiently for the past two years. Purchased from HMS as a turnkey system, the 8000 II runs the city's payroll, personnel, utility billing, CEO, and occupational licensing. The police department operates out of one of three remote sites.

DP Coordinator Donna Gleason is happy with the system's job performance. For example, licensing previously took several hours by hand. "Now we do it in batch jobs about two times a week," she said.

The city is considering upgrades in the public works area, which would include vehicle maintenance and work orders. In



In Sarpy County, Nebraska, Sergeant Fred Rosemann and Deputy Sue Moenssen review arrest and booking records

the meantime, workloads such as accounting and insurance are creatively being put into CEO spreadsheets, according to Gleason.

Some bigger cities are using DGs for more specialized, single-department applications. Buffalo, New York, for example, runs two MV/4000 DCs and an MV/4000 in their community development department. The DG equipment replaced Honeywell level six and level eight equipment. They have had the DCs for about 1½ years and the 4000 for over two years.

One specific use of the machine that will be ready for implementation sometime in 1987 is the Geographic Information System (GIS), an operation that falls under the planning and analysis section of the of the city's planning division. The GIS takes a data base and a mapping component and combines the two to formulate geographical statistics. It may differentiate an area by variables such as taxes, crime rates, fire occurrences, and more.

The computer will generate data that can be accessed two ways, according to Scot Love, systems and programming manager. "You can look at a map on the computer and find your house, and the computer will give you specific information, or you can give the computer your address to find that information," he said.

There are approximately 130 users in the departments of community development, revitalization, and inspection. There are 30 users in the planning division, which is in the community development department. This division communicates with city hall about pertinent information such as crime, fire, and preservation statistics in certain locations. They can give land information such as the length of an area. The division also answers requests from outside the city government, for example, college students or developers.

"The GIS acts as an information center . . . We don't do accounts payable," Love said.

Current software includes Fortran, COBOL, and BASIC. The department is also purchasing the 4GL PowerHouse. They use CEO heavily. "We exploded with the OA; we really raced. Now we need to meet our goals for the data base," he said. When that is accomplished, Love hopes to distribute information instead of waiting for questions to come into the office. It appears computers could make that happen soon.

When querying an SQL table on a trial run of the 4GL PowerHouse, Love saw some promising results. "I saw a demo-created application that took 2½ minutes to do a job that would have taken an experienced guy four weeks. It stunned me. Of course, we used all our defaults. The screen wasn't pretty," Love said.

Although all of the management tools and most of the data base is ready, the planning and analysis section is now working with Data General on the creation of a model to put their data in a workable structure.

In another large city, DG plays a more basic role. Without Data General, Chicago city employees wouldn't get paid as efficiently. For the past year, Chicago has used an MV/8000 for payroll. The city upgraded from a Nixdorf.

They made the switch to the MV/ series when the city's main data center switched to Data General. Other city departments using MV/8000s include inspectional services and human services. The department of health is in the process of acquiring one.

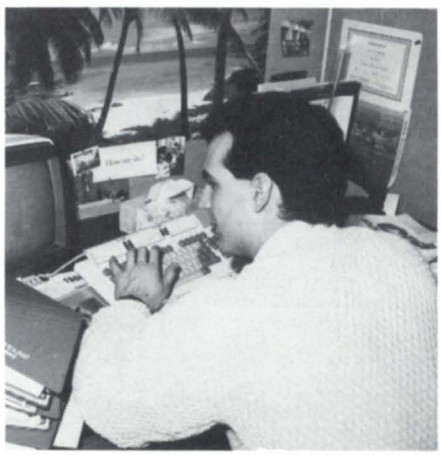
Joe Cherone, principle operations research analyst, recalls some initial problems with the installation when only 2 MB out of 4 MB were being utilized. "The thing almost ground to a halt. We complained a lot to the software support. We were making a lot of noise. We had the hardware people here almost every other day . . . But now it chugs along just fine," he said.

Payroll acts as a front end operating out of the building next door to city hall. It also uses the computer for billing purposes for items such as building inspections and landing fees at O'Hare Airport. Minor applications include data inquiry, general ledger, and most CEO applications.

Minor enhancement possibilities are a 354 disk, 3 MB, a letter-quality printer, and a laser printer.

An application for federal housing in Phoenix, Arizona, gets a person's name on a waiting list by way of a DG MV/4000. The city's urban development and housing department upgraded in February 1984 from an S/120. They bought the DG hardware when they purchased software through an OEM.

The system keeps track of tenant files and tenant applications for housing such as conventional, elderly, or section eight housing. About 90 percent of the processing is for low-income housing. The computer also maintains landlord records for the landlord payment system, generates



Programmer Paul Bonvissuto works at his DG terminal in Buffalo's planning division

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checks to subsidize payment to landlords, and runs maintenance work orders and inventory. The department also records tenant accounts receivable and tenant billing for the projects that the city owns and operates.

"I'd say the bulk of the machine is an accounting system. The rest of it is mainly a data records management type of system for both our tenants and our landlords," said Rob Kogen, MIS coordinator.

There are 41 terminals for the 300 people in the department, and five remote sites. "The rest of them are supplemented by PCs because the MV/4000 just can't handle it. The system we're running is at a very high overhead . . . VS BASIC is a non-DG product similar to BASIC, but it was designed before the MV/ system. It functions as both a language and a teleprocessor, and that causes the high overhead. The TP defines and controls the terminals. We're running the system on AOS/VS, but everything is the son of VS Basic," he said.

Overall, Kogen is pleased with the system. "Everything is really menu-driven. You're not tied in, like IBM screen-bound types of systems. . . . The system has a lot of flexibility," he said. He also likes the macros, which his users have found easy to design and use.

A bank holdup would appear on the screen in red, while a disabled motorist, considered a non-emergency, would appear in light blue

He expects expansion of the system for work orders and inventory. Also, they should be getting into a general ledger and accounting system for the department to monitor expenses and revenues and track and record property inspections.

Right now, the department is looking for funding for an upgrade that has already been approved by management. "Originally, it was to be an MV/10000, but since the 15 is a better deal, both financially and performance-wise, it will most likely go to a 15," Kogen said.

In Richmond, Virginia, when employees who operate the 911 emergency system see red, they don't get mad, they get to work. The new color-coded system run by an S/280 using RDOS recommends what police units to dispatch in the vicinity and prioritizes the calls according to color. For example, a bank holdup would appear on the screen in red, while a disabled motorist, considered a non-emergency, would appear in light blue.

"The graphics are really nice. The screen looks really pretty," said Bill Hobgood, the senior programmer who wrote the programs. "This system has cut a couple of minutes off of in-house time. It would take about three minutes to write that information down. Now it takes about 30 seconds to a minute," Hobgood said. That extra time could save a life, he said.

There are 67 users total on-line during the four shifts in a 24-hour period. About 15 people are usually on at one time. Of those, about six answer 911 calls.

The city is planning to upgrade next year to an MV/ series computer that will interface with a mobile digital terminal (from another company). This could link police officers to the system from their cars. Δ

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R&D Q&A

The systems division tries to take a proven concept—and execute it magnificently

by Greg Farman
Focus Staff

The following interview was conducted with Don Lewine, a senior technical consultant in Data General's system development division. Working closely with Vice President Tom West, it's Don's job to keep tabs on promising technologies and to help formulate DG's response to them.

Q. When IBM introduced its reduced instruction set computer (RISC), many of us thought about the old Nova. What are the advantages of a reduced instruction set? Are they significant enough to cause developers to rethink the instructions used by DG products?

A. The current crop of RISC computers is quite successful, and it's successful for pretty much the same reasons the Nova was. What Ed de Castro did with the original Nova was to implement a set of instructions that was extremely well-matched to the current technology. The trouble with that approach is that it's hard to keep it compatible as the technology changes over time. If we were starting from scratch on the MV/ series, it would be more RISC-like, but we have a commitment to keep our new products compatible so customers can continue to run their software. If you concentrate only on the technological aspects, you run the risk of developing products that are a technical success, but a commercial failure.

Q. That's an interesting distinction. Can you give me an example of a product that succeeded in a technical sense, but was a commercial failure?

A. IBM's System 38 is an example. It looked like it would be the basis for a whole line of new computers, and I suppose that there were quite a few of them actually installed just by virtue of the size of IBM. But it was a dead end.

Q. DG obviously wants to avoid that. How is the research and development effort at Data General organized, and what kinds of projects get top priority? For instance, how interested is Data General in long-range research into exotic research such as photon computers?

A. We are comfortable handling R & D projects that might take from take 18 months to three years to complete. I guess you could say we're careful about the kinds of risks we take. We're willing to take enormous risks on a specific technology—for instance, we were willing to bet the farm that Motorola would be able to produce the gate arrays we wanted for the MV/20000 before we even saw a prototype. But we avoid doing pioneering research, because it's so difficult to pick a winning technology five or six years before it becomes practical. Instead, we emphasize good engineering and manufacturing—we take a proven concept and execute it magnificently.

Q. When somebody describes a computer system as "state of the art," I'm never sure what they mean. What do you think are the principle requirements to qualify a minicomputer as "state of the art" today?

A. "State of the art" is mainly a marketing and public relations term used to describe your own products. It could mean anything. If somebody used it when they were talking about something based on core memory, I might get a little suspicious, though. . . .

In general, if people are talking about a state of the art minicomputer, they probably mean that it uses contemporary components (such as gate arrays and 256 KB or 1 MB memory chips) and has a small number of components and boards. That would give it a good ratio of MIPS per cubic foot.

Q. While you're defining things, I run into a lot of terms in product literature that I don't understand. Things like VLSI, gate array, ECL/TTL, FAST, AS, highly pipelined architecture, and so on. Is it possible to explain any of these in a few words?

A. VLSI stands for very large scale integration, and it's another overused term. Basically, it means "chip." It was used to distinguish the relatively simple chips that had only a few transistors from those that had a lot, but now we're dealing with chips that have hundreds of thousands of transistors. The next level of integration will be at the wafer scale, where you'll basically have everything for an entire CPU on a single wafer. Trilogy tried to accomplish that, but wasn't able to. Everybody expected them to run into manufacturing difficulties, but the hardest problem they ran into was with timing: they weren't able to keep all the parts working together properly.

Gate array is a very interesting technology. It's a kind of chip that lets you arrange how it works so it will suit your own needs. You might think of it as a circuit board filled with sockets into which you can plug a limited number of components and then wire the connections between them. Since it's a volume product, you get a good price on it, but you can modify it to your own specifications.

ECL/TTL, FAST, and AS just refer to different kinds of electrical switches used in the transistors. More meaningful terms would be "bipolar," which means the transistor carries a current, and "CMOS," which doesn't actually carry the current, but just controls it. Bipolar is attractive when you need very high speed, but CMOS is better when you're looking for lower power consumption and heat, and greater density.

Pipelined architecture takes advantage of the fact that each instruction the computer executes takes several steps. It has to read the instruction, get the data, do

Data General MV/4000, MV/10000 and S-280 Users.

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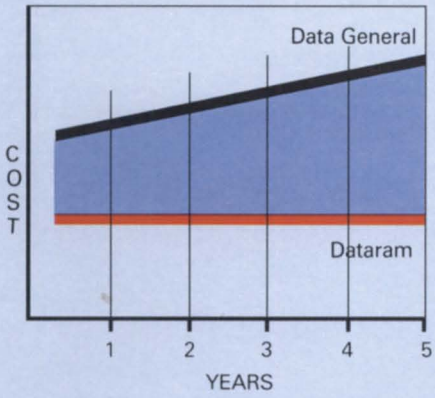

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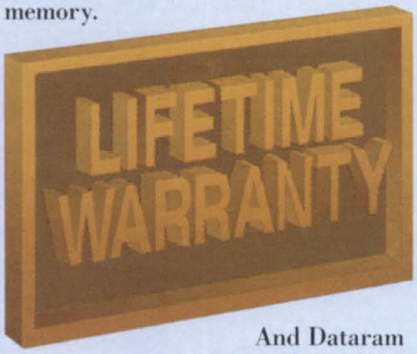

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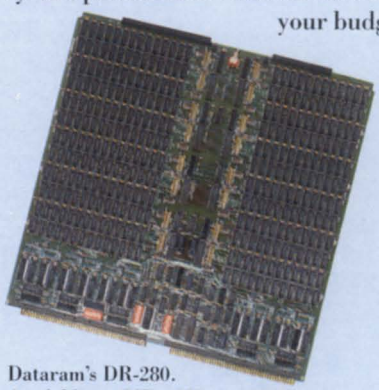

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something with it, and so on. If you're very careful, you can overlap the separate steps and actually be executing more than one instruction at a time, which can make a big improvement in performance. The trick to this is that some instructions will alter the execution of the instructions that follow, so it can be difficult to make it work properly.

Q. And how does the development division go about making sure that it will work properly?
A. Almost as soon as we begin to work on a new machine, we can start simulating it in software. Long before we ever commit it to silicon, we have a good idea of what to expect, and we know that it will be an MV. Of course, there are always surprises, but with each generation we produce, we get better at it.

Q. DG's Sunnyvale division appears to have been redirected from producing high-volume components toward special-purpose proprietary chips. What types of semiconductor components will DG continue to produce at Sunnyvale?
A. We stay away from the price war part of the industry, where there are several manufacturers fighting for market share for products that have very slim margins. We'd rather buy from them than compete with them, and that makes just about all of the semiconductor manufacturers our suppliers. As for our own chip production, we concentrate on things that will give us an advantage for our own products, but wouldn't be attractive for anybody else to manufacture in volume. An example would be a memory bus driver with special electrical characteristics to give our finished computers better performance.

Q. Considering the dual processor architecture of the MV/20000, is it likely that we could see three or more DG processors coupled in the same way in years to come?
A. There are very substantial advantages in doing so, because you're able to increase your performance in a modular fashion without having to replace the whole computer. If you're talking about coupling only four or eight processors, the technical hurdles aren't too great. That's something that could be done within two to four years. However, if you're talking about putting 128 processors together, that's still a university problem. It was fashionable a few years ago to talk about putting together huge arrays of 8088 processors—which are almost free now—to get the power of an IBM mainframe or a Cray. What they discovered is that there are lots of bottlenecks at that scale— providing things like cooling, power, packaging, and so on, make it a tough problem.

Q. If you had three or more DG CPUs coupled together, it seems likely users would need more memory than the maximum capacity of the MV/20000. What is a reasonable upper limit on memory in the next generation of minicomputers?
A. I think it's reasonable within the next few years to think that you could put a gigabyte of memory on an MV machine, and with a few more modifications, maybe 4 gigabytes. That seems like a pretty huge number, but stop to think that the current limit is 64 megabytes. When I got started in this industry, there probably weren't 64 megabytes of memory on all the com-

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puters in the world. We see indications that those same trends will continue.

Q. The MV/20000 seems to go a long way toward the kind of fault-tolerant machine that companies like Tandem are marketing. What additional steps would have to be taken to make it a true fault-tolerant machine?
A. We think that the kind of absolute guarantee that the computer will never stop running is very expensive. For instance, with Tandem, you might have to have four processors running on every job. We don't anticipate providing that kind of redundancy. On the other hand, if all you really need is very high availability, then that's something you can expect fairly soon. By that, I mean the system could crash occasionally, but there would be enough hardware redundancy and software capability to restart within a few minutes and keep on processing from where you went down.

Q. The next question comes from a reader, Kim D. Geiger: The advent of the 80386 microchip will greatly reduce the cost of computers capable of handling large numbers of users. How will DG respond to this new product development?
A. I guess I disagree with his premise that the 80386 will reduce the cost of systems. The actual cost of the processor is insignificant when compared to the rest of a multiuser system, so the 80386 won't make much difference here. It will probably do very well in the Compaq part of the market, where people essentially just want a PC with lots more power.

Q. Many analysts are saying DG supports the broadest range of industry standards for communicating documents and data between systems. To me, it looks like there are so many "standards" that users will still have a big problem deciding between them. In your view, which of the emerging standards have the best prospects for acceptance by users?
A. We take the reverse view. First, we look at the market and our customer requests, and decide which are widely accepted enough for us to invest in. Personally, I think the Open Systems Interconnect model will catch on in a number of dialects, and for Unix you have TCP/IP. For mail, the X.400 specifications look pretty promising.

Q. There is also quite a variety of products and standards emerging for peripheral devices. Which of them will have the greatest impact on products offered and/or supported by Data General?
A. There are quite a few. We're doing a lot with the SCSI family, but you really have to test each disk to see if it will work with your system and software, because there are so many implementations of the standard.

Q. How long will it be until optical disk technology becomes practical for the ordinary applications that now require magnetic disks?
A. Optical disks are already working well

(continued on page 58)

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Ada: THE TIME HAS COME

The Department of Defense has adopted a solution for the software crisis

by Richard A Lehman
Special to Focus

"About the use of language: it is impossible to sharpen a pencil with a blunt axe. It is equally vain to try to do it with 10 blunt axes instead."
—Edward Dijkstra, 1983

More than just another computer language, Ada is spawning programming techniques and products that promise to revolutionize software development. As the United States Department of Defense's standard language for software development, Ada has the potential to promote productivity and portability of both software and human resources. And with the weight of the Department of Defense behind it, Ada is gathering momentum to carry out its potential. Governments and industry everywhere are sponsoring massive efforts to develop new methods and tools to support full use of the language.

This article addresses some of the topics in software design using Ada and the software engineering technologies that Ada supports, as well as the Data General Ada Development Environment (ADE).

The programming language Ada is the result of an effort by the U.S. Department of Defense (DOD) to control the increasing cost of its software—better known as the software crisis. A study conducted between 1973 and 1974 revealed that the department was spending $3 billion each year on computer software, over half of it for embedded computers. An embedded computer is one that forms part of a larger system, such as a radar system or a miles-per-gallon calculator in your new car.

According to the 1973-1974 study, software was accounting for a growing portion of the total cost of such systems. In fact, the ratio of software to hardware costs was skyrocketing. System reliability and customer satisfaction were inversely proportional to the size of the software system, and maintenance and operations costs were accounting for as much as 90 percent of the entire life cycle of a project.

Most of this cost was in the maintenance of old software (written in more than 500 variations of different languages) rather than in the development of new software. The overwhelming majority of this work was performed not by government personnel, but by contractors—and most of the work was so specialized that the original developers of a system controlled the market for all future contracts to maintain that system.

The programming language Ada is the result of an effort by the U.S. Department of Defense (DOD) to control the increasing cost of its software better known as the software crisis

The DOD recognized the need for a standard high-order language along with standards for software development environments in order to reduce compiler and tool development costs, to improve software and programmer portability, and to reduce the total software life cycle costs.

Its answer was Ada, developed under the direction of the DOD through competition and committee reviews. Before 1979, four companies responded to the DOD's request to design a new language for embedded systems. From the four original language proposals, the field was narrowed to two finalists: "Green," developed by Honeywell-Bull, and "Red," by Intermetrics. Through competition and extensive reviews around the world, "Green" was finally selected as the standard.

Honeywell-Bull of France had used Pascal as a starting point in developing Ada, and the language reflects its heritage. Attributes of the language include strongly typed variables, structured support through the use of procedures and blocks, and enumeration of data types.

At the same time, a study was done to develop a programming environment that would complement the facilities provided by the Ada programming language. This environment would support development and maintenance of Ada applications and encapsulate host/target environments. This is why Ada is considered more than just another programming language. It is a tool for modern software engineering developed to support the several hundred embedded computer systems that are developed and maintained by the DOD.

Probably the most unique feature of the Ada programming language is the fact that the word "Ada" is a registered trademark of the United States Department of Defense. Ada is identified as ANSI/MIL-STD 1815A-1983 and has recently been adopted by the International Standards Organization as announced by the Ada Joint Program Office (AJPO). The AJPO Ada Validation Facility is responsible for validating a compiler before a software vendor can market a product with the DOD's registered trademark. The Ada compiler must pass thousands of tests called the Ada Compiler Validation Capability (ACVC).

These ACVC tests must be rerun every year to keep the Ada compiler validated. This is the mechanism by which the Department of Defense ensures that a software system delivered today will conform to software engineering changes many years into the future.

Not only has Ada been mandated by the DOD for mission-critical embedded soft-

ware systems, but the U.S. Army has stipulated that Ada be used in all new software systems and any old systems that undergo a 40 percent revision. Ada has been used for relational data base systems, banking environments, process control, data communications systems, inventory control, and numerous other applications.

Ada is a software tool. One of the driving forces behind the development of a single high-order language was the desire to develop a common set of language-oriented tools. A defined set of these tools is called the Ada Programming Support Environment (APSE). The purpose of the APSE is to provide support for the entire project team throughout the life of a software system. An APSE might include design tools, a syntax directed editor, compilers for various embedded targets, symbolic debuggers, configuration management tools, and Ada text formatters.

How are the latest products working out? Industry is now into the second generation of Ada compilers. The first generation was the rush by the vendors to get a compiler certified. This second generation is producing more mature compiler products. When the first Ada compilers hit the street, people complained about how slow they were. Complaints are now directed to topics concerning portability issues, implementation issues, and runtime support. In the next few years, advances in Ada compiler technology are expected to meet or surpass the performance of older, mature compilers such as Fortran or COBOL.

Data General's Ada product is the Ada Development Environment (ADE). The ADE is a comprehensive Ada programming environment to support program development and maintenance activities. It consists of a validated Ada compiler, as well as associated tools to support software engineering development, including the Ada Loader, Ada Debugger, Pretty Printer (text formatter), Configuration Control Manager, and others (see Figure 1).

Approximately three years ago, the Data General/Rolm Ada compiler was the first Ada compiler certified by the DOD. (The first certificate was the University of New York for an Ada interpreter.) Since then more than 75 compilers have been certified by over 30 different software vendors.

The current revision of ADE is available as a software package or as part of a fully integrated Ada Work Environment system that includes a 32-bit Eclipse MV/ family computer, peripherals, software, training, and support. This revision of ADE is validated for the entire Eclipse MV/family under AOS/VS and AOS/RT32; it can also be targeted at Rolm Mil-Spec computer systems.

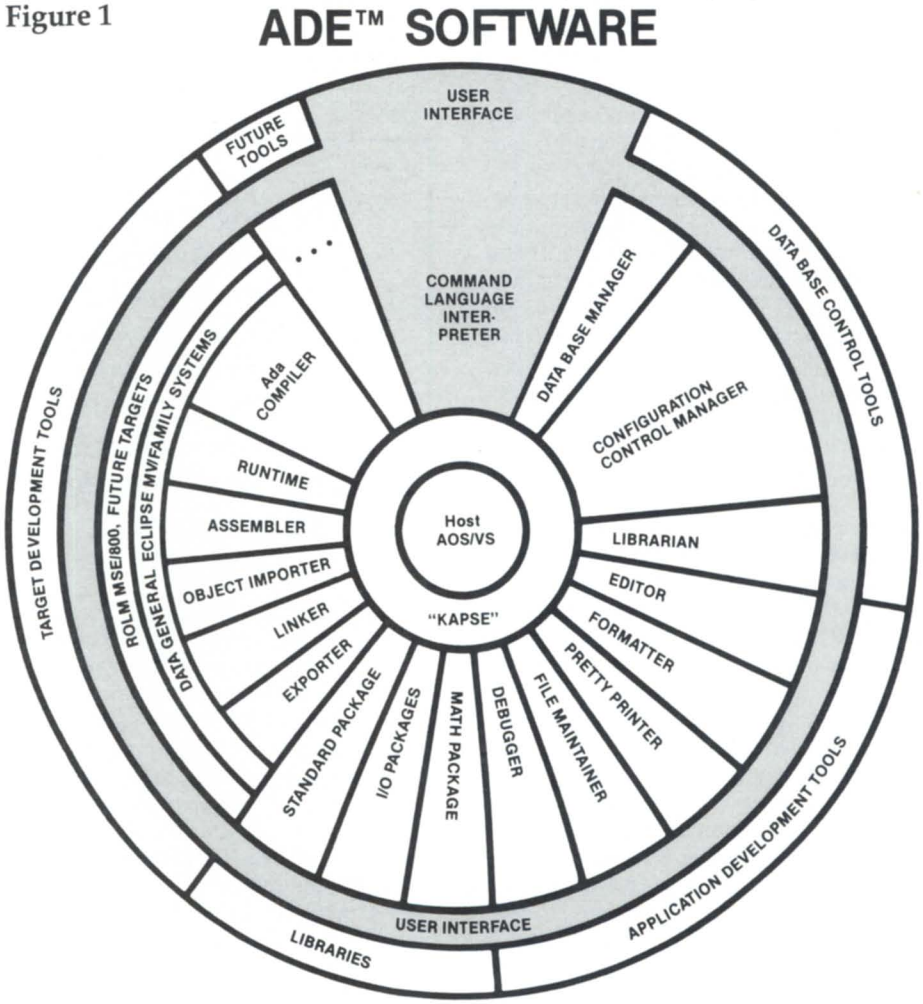
Data General is about to release rev 2.40 of the Ada compiler. This new release has a compilation speed 40 percent faster than rev 2.30. Major changes were made to the tasking environment. They include: tasking I/O up to 50 percent faster, parameterless rendezvous times up to 100 percent faster, and others.

Over 120 software trouble reports (STRs) have been fixed in rev 2.40, including all outstanding STRs within the tasking kernel. One of these major tasking fixes was within the DELAY statement. Features within the environment have also been enhanced. These include the Library Manager, Autobuild Tools, and Chapter 13 enhancements. These enhancements to the Ada product are very welcome at this time, in that Data General has not allowed their product to evolve and mature very much since it was originally released. Data General is now playing catch-up with other Ada compiler vendors and hopes to become a leading Ada player in the near future.

At this point you might ask, "Why do I need Ada?" The answer: "for the same reasons that the Department of Defense decided it needed Ada—to reduce your total software life cycle costs." Ada supports all of the modern software engineering concepts of portability, modularity, and reusability. The modern definition of software engineering is the establishment and use of sound engineering principles, methods, and tools to support processing that is correct, modifiable, reliable, efficient, and understandable throughout the life cycle of the application.

Ada is also useful for relatively short programs, and makes prototyping a program very easy. These short programs can be re-

Figure 1



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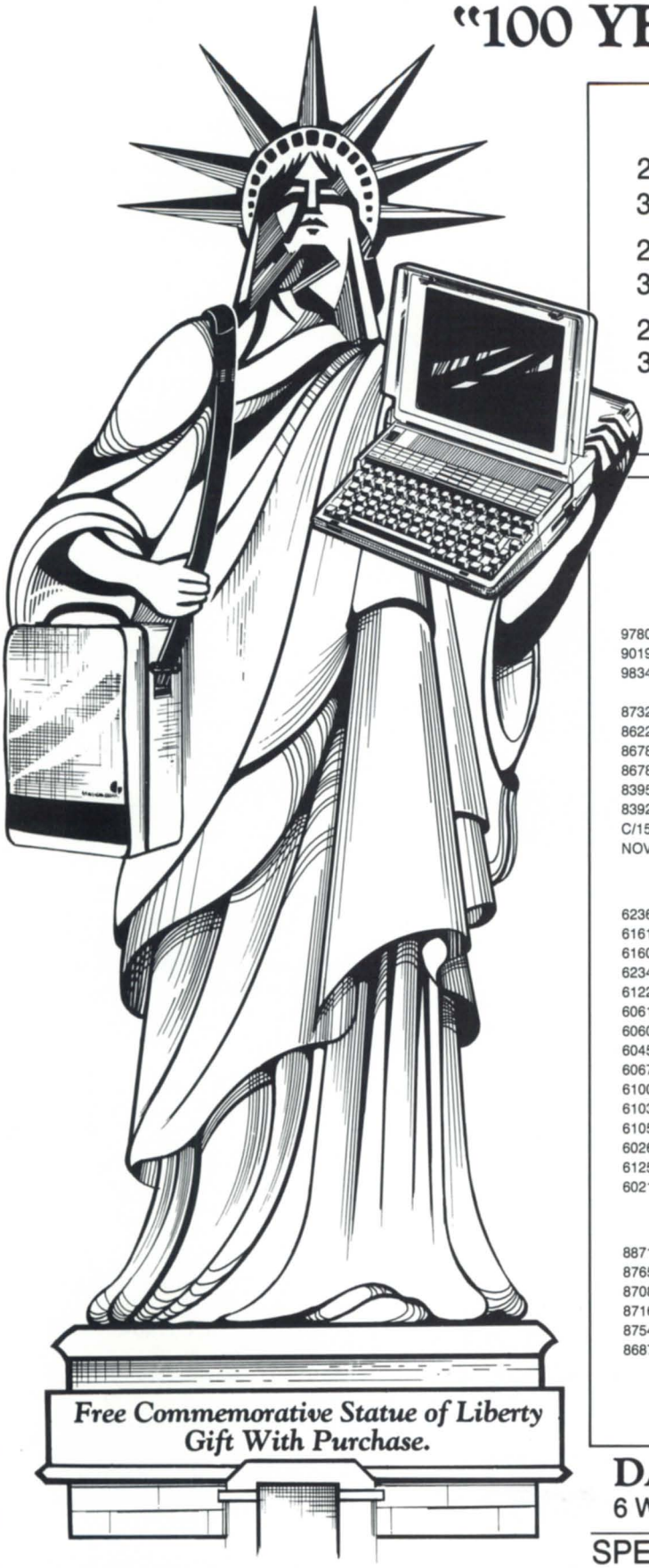

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used to develop a more mature deliverable software package as the life cycle of a project progresses. The use of packages and separate compilation units supports and enforces these concepts of prototyping and reusability.

Ada is a general-purpose programming language with considerable expressive power. This has brought an awareness that the techniques used for software systems being developed today may not be adequate for the future. Its unique features and support for modern software engineering principles make it the first language to hold real promise for computer-aided software engineering environments and a reusable software components industry.

In the near future, software engineers will be able to pick software parts from a catalog, much as a hardware engineer chooses parts from a catalog to build a system. Software engineering is becoming too costly to evolve any other way. Δ

Richard A Lehman is the Ada task manager for the avionics systems department with Lockheed Engineering Management and Services Co., which provides Ada research assistance to NASA at the Johnson Spacecraft Center. He can be reached at MC-C07A; 2400 NASA Road 1, Houston, TX 77058; 713/483-8329.

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4GL APPLICATION DEVELOPMENT GUIDELINES

To make the best use of 4GL flexibility, remember the lessons of the past

by Marc Praly
Special to Focus

To get the most from a fourth-generation language (4GL), project managers must be prepared to discard many of the methods appropriate to system development with third-generation languages.

In their place, project managers should expect to use a new approach to system development; as 4GLs simplify the work of application creation and maintenance, they simplify the work of system development as well.

The following application development guidelines are different from traditional methodologies. They include both a roadmap of procedures to follow, and a checklist of principles to implement along the way. Together, they describe the steps and principles that lead to a successful 4GL application.

Project managers can tailor the guidelines to suit their unique programming environments. This allows them to take advantage of the natural strengths of 4GLs, whether the systems being built with them are large or small.

My "seven star checklist" details the main principles of 4GL application development:

★ Modeling—involves definition of the relationship between data analysis and business functions.

★ Functional prototyping—manifests or translates users' requirements, and acts as a catalyst in refining the users' requirements.

★ Controlled iterative development—deals with the evolution of the functional prototype and beta testing.

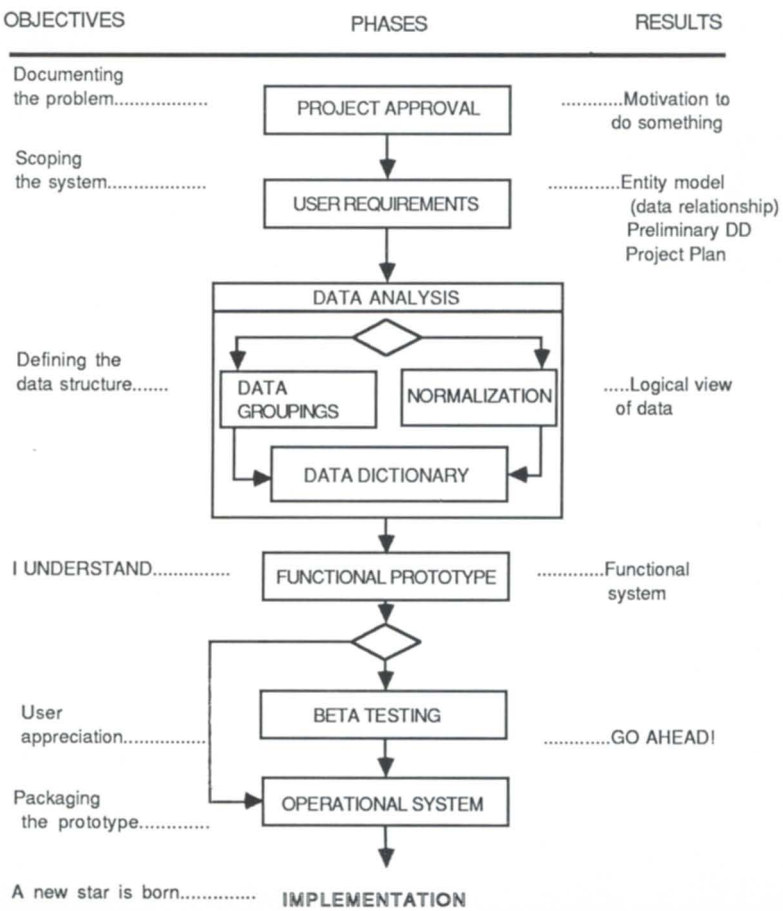
★ Phased approach—deals with the development of a system in phases in conjunction with the separate activities of the development process.

★ Packaging the prototype—covers the remaining functions to be developed, discusses optimization, system-wide testing, and production system preparation.

★ Systems and programming standards—concern menus, screens, reports, and naming conventions. They also discuss environmental factors during development, testing, and production.

★ General plans—discuss the controls over the project in terms of prototyping, testing, conversion, and implementation. These controls must be specified early in the development process in a project master plan. This plan is useful in obtaining project approval since the current system, company objectives, user requirements, and project data and documentation are defined in it. The master plan summarizes the system overview and discusses project controls—status reports, prototype reviews and requests, and so on.

HOW TO APPLY THE SEVEN STAR PRINCIPLES AND DEFINE AN APPROACH



Getting approval for a project is the first step in applying the principles. It involves documenting requests and reviewing objectives. Today's project managers require an understanding of the point of view of their organization and their management. They must be able to identify and organize system end-users in preparation for prototyping.

The manager's preliminary analysis summarizes a system's basic requirements and constraints—its impact on an organization—and gives an overview of both its manual and automated parts. Then the feasibility of the system can be assessed, and an estimate can be made of the time and resources required to complete it.

The manager must also review and receive approval for the project, satisfying the requirement that it be consistent with corporate philosophy and objectives. The role of the project manager includes setting up a user committee, getting a firm commitment from management, opening communication channels, and defining the project and team structure.

With these preliminaries taken care of, the next step is to document user requirements.

First, determine the current business functions, study the flow of data of the existing system, and identify key users.

Go to the users and document their requirements. Make a summary list that describes the scope of your system, showing how it meets users' needs. The manager must talk to the users to benefit from their satisfaction later on.

In determining the scope of the system, define the entities and basic data relationships for the system's entity model. An entity model is a graphic representation of entities. An entity is a thing (like a customer or a product) that represents data elements. The entity model is a logical view of the organization of data.

Next, define the elements that make up a preliminary data dictionary. User requirements will have provided a good idea of what these elements should be.

Document the system's technical requirements, including both hardware and software. Review system and programming standards and identify external interfaces. Then, list the requirements for support and conversion. With the information the project team has gathered, they can now produce a project master plan and make a presentation to the user committee which helps carry the project to the next phase.

Data analysis means defining the system's data structure in detail. At this point there are two possibilities.

First, suppose a good entity model has already been defined and accepted by the users. In this case, you must create the data groupings, define keys, and carry out optimization and validation against the users' requirements. Data groupings, in this context, refer to the distribution of elements in the entity model. Data groupings are most efficient when you have good access to, and contact with, the users.

Second, suppose you don't have good access to users, or the entity model hasn't been clearly defined and can't be used. You must then proceed with normalization. The following, in order, are the basic steps

to follow: list all data elements, identify primary keys, separate repeating groups of elements, analyze "data to key" dependency, and draw a relationship diagram.

The normalization process helps meet two objectives: it helps obtain detailed knowledge of data, and it helps define the data groupings that will contain nonredundant data.

The final benefit of data analysis is that it allows you to take a big step toward finalizing the contents of your data dictionary.

The functional prototype matches a firm's internal organization with its information requirements. The object in creating a prototype is for the user to understand and confirm these requirements. This step involves both physical data base design and conceptual design. The conceptual design includes a review of business functions and relates these to the physical/logical data model. The system architecture (the system of menus and screens) should reflect this. At the same time, the system designer creates the development, testing, production, and conversion environments.

A functional prototype consists of menus, functions, and on-line help. Having developed it, you must win the confidence of the user and support his or her attempts to use it. This prototype must be developed very quickly to maintain the users' interest, and must be a clear reflection of their requirements. The idea of producing a prototype is to translate words into code without detailed specifications.

A process of iterative development should now begin. This process includes demonstrations, reviews, the collection of user feedback, and program changes. You must avoid too many iterations and agree with the users in advance on their number. The project manager plays an important role here, because this is the only person who has control of the project. A "we" approach is critical to successful prototyping.

If you decide to conduct a beta test, you can prepare, at the same time, the plans to implement it. Complete the procedures guide, which describes the purpose and function of the system, not just the operator's tutorial.

Finally, when you review the functional prototype with the user committee, you must confirm the commitment for the beta test. But don't forget to carry out system testing.

Beta testing requires that the users agree to try the system and implement a production version of it. The beta test includes the following: installing the hardware, if necessary, as well as the software; data conversion; user training; and security reviews. You may also want to finalize forms and procedures.

Performance should be analyzed and a mechanism should be set up to resolve problems, route change requests, and make provisions for new system releases.

The operational system is a packaged version of the prototype. To complete it, review the prototype and documentation for all remaining untested functions. Build external interfaces and develop secondary functions—any remaining reports, security (if not complete at this point), and

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WHEN TWO IS BETTER THAN TWO

AOS/VS and multi-processors. Part I

by J. R. Gilgis
Special to Focus

This is the first in a two-part series, to be concluded next month.

On November 18, 1985, Data General announced the Eclipse MV/20000 Model 1 and Model 2. The MV/20000 Model 1 is the uni-processor version rated at 6.44 single precision and 4.95 double precision mega-Whetstones. The MV/20000 Model 2 is the dual-processor, tightly coupled version rated at 12.42 single precision and 9.72 double precision mega-Whetstones. Both versions are supported by Data General's AOS/VS operating system.

This article will be divided into three parts:

1. The benefits of a tightly coupled multi-processor.
2. Overview of the MV/20000 hardware and software.
3. General performance discussion.

Next month I will conclude by discussing the machine's performance on a series of controlled tests as well as its performance on an INFOS mix and a CEO mix while varying the number of users.

Why a tightly coupled multi-processor?

The MV/20000 Model 2 is tightly coupled, which means that both processors access the same memory system using a high-speed backplane bus. For contrast, in a loosely coupled system, each processor, referred to as a "node," has its own memory system and the nodes communicate usually via some lower speed connection such as a local area network (LAN).

From a user's perspective, the tightly coupled arrangement has a number of advantages over a loosely coupled arrangement:

1. Both processors appear as a single processing unit.
2. The system balances both batch and interactive jobs between processors automatically.
3. It shares files and data bases automatically.
4. Physical memory sharing and usage is efficient.
5. There is no duplication of peripherals.
6. There is an easy upgrade path from uni- to dual-processor.
7. There is only one operator console.
8. System management is much easier.

These advantages can be grouped into two categories—ease of use and price/performance.

Once the system has been initialized, both processors in a Model 2 appear as a single unit. The user doesn't have to assign jobs to a specific processor, since the operating system automatically load-balances processes between the two processors. Each processor will execute the highest priority job that is ready to run and not already executing. However, if the users or system managers wish, they can control assignment of jobs to a particular processor. If the system manager wants to divide jobs between processors, the Class Assignment and Scheduling Program (CLASP) is available. The default, though, is that the system will automatically load-balance jobs between processors on the system, running the highest priority jobs first.

A loosely coupled environment provides much less flexibility. Some systems may provide load balancing for batch jobs. In the worst case, the jobs run only on the node on which they were submitted or started. The elapsed time for a job is determined by the load on that node. If the user is unhappy with the performance of a job or a particular node, he or she must terminate the job, log onto another node (less loaded, with any luck), and start the job over. To do this, however, any files or data bases that the job needs must be accessible from that node, also. So, in a loosely coupled environment, the user must make the decisions and monitor the job's performance. None of this is necessary with AOS/VS and the MV/20000 Model 2. The operating system automatically load balances the jobs between the two processors.

Under AOS/VS on the MV/20000 Model 2, files and data bases are automatically shared between the two processors, because there is only a single operating system running both processors. The file system, data base servers, etc., are common to both processors. In the loosely coupled system, this is not the case. The loosely coupled system needs disk or file servers to provide access to common files; or some type of remote access to the node that owns the file or data base; or replicated copies of the files or data base. These create a performance problem for the user of the file or data base and/or an update/error recovery problem for the system manager. None of this is necessary on the MV/20000 Model 2, since the file system and data bases are viewed as one by both processors.

Physical memory is shared between both processors on the MV/20000 Model 2, so there is no need for the user to determine which processor has the most memory to execute the job. In a loosely coupled arrangement, unless each node has the same amount of memory, the user may have to make this decision. At any given time, on some nodes, there may be surplus memory (some of it being unused), and on other nodes, there may be too little memory (with the system paging and swapping to satisfy the users' needs). On the MV/20000 Model 2, since memory is shared between both processors, the customer only has to purchase sufficient memory to solve the total user community's needs—it need not be sub-divided between processors. If additional memory is ever needed, it only has to be added to a single system—not multiple memory boards for multiple nodes.

Another ease-of-use feature is the ease of upgrade from a Model 1 to Model 2. This entails only the purchase of a second single-board CPU (and the floating point unit (FPU) if the uni-processor version had a hardware FPU). The new board(s) are simply plugged into the molded chassis slots and the system is re-booted. If at the time of upgrade, the customer intends also to increase the number of users on the system, there might be a need to add additional memory or disks to support those new users. Note that this is a performance issue, not a necessity.

From a software standpoint, the upgrade is just as easy. No re-sysgen is necessary. The system manager just issues a single CLI command—JPINIT 1—and the second processor is functionally in the system.

The MV/20000 Model 2 is much easier to manage than a loosely coupled arrangement, simply because the system manager views it as a single system with a single operator console. It may have many more users, but many activities need only be done once, as compared to a loosely coupled arrangement where they need to be done multiple times for different nodes, possibly from different operator consoles. Network management is also not needed for the two processors to communicate. Matters could be made worse in a loosely coupled arrangement if all the nodes have to be upgraded at the same time, making the system partially (or totally) unusable until all nodes have been upgraded.

The MV/20000 Model 2 brings a number of benefits to the customer. First, compared with two separate systems, there is no need to replicate peripherals: the customer just buys the peripherals necessary for a single system—not extra tape drives and disks to configure each system equally. The same applies to both memory and chassis.

Second, it is easier for the customer to start small with a single processor then later upgrade it to a dual-processor system.

Third, since all the files and data bases are local access from both processors, the file access times are approximately the same as for a uni-processor with the same load. In a loosely coupled arrangement, various files may exist on various nodes, or they may exist on a common disk or file server. In either case, there are additional delays for remote data accesses since both the requests and the data must be handled by multiple nodes and transported across a communications link, such as a LAN. This is not as simple as reading data from a disk. These additional delays do not exist on the MV/20000 Model 2 under AOS/VS, since all data is accessed locally by either processor.

The MV/20000 hardware and software

To understand fully the performance of the Model 2, you must conceptually understand the hardware architectural design and also the software usage of this design. This section won't make you a hardware engineer or a software designer, but it will allow you to understand how the hardware and software work together.

Hardware overview: The MV/20000 Model 2 consists of two single-board CPUs connected in a tightly coupled arrangement sharing a common memory subsystem. The memory subsystem can be expanded up to 64 MB. It uses double-bit ERCC memory correction that allows for correction of hard/hard, and hard/soft, double-bit errors. The I/O subsystem, also implemented on a single PC board, can consist of one, two, or three I/O channels, the first two providing both I/O buses—burst multiplexor channel (BMC) and data channel; the third providing data channel only. The PC board also supplies the system with a time-of-day clock (backed up by battery) and the remote diagnostics processor.

An initial MV/20000 system can consist of either one or two processors and, optionally, their respective hardware FPUs. If the hardware FPUs do exist, there must be the same number as there are processors. The two CPUs are arranged as equals, which means that either processor can access any area of memory or any I/O device. In the event of a single CPU failure, the system can be rebooted as a uni-processor using the non-failing CPU.

Each processor has its own 16 KB write-through data cache. The write-through nature of this data cache means that write operations immediately update main memory. Each processor also has its own 4 KB instruction cache.

Serializable instructions: Certain instructions on the MV/20000 Model 2 are referred to as "serializable" and do a read-modify-write of memory. "Serializable" means that there can only be one of these instructions executing in the system at any one time. The serializable instructions are ISZ and DSZ (all types except ISZTS and DSZTS); SZBO and WSZBO; and WMESS. Additionally, the instructions DEQUE, ENQH, and ENQT are serializable with respect to themselves and each other. Serializable instructions should only be used when the memory location could be accessed from multiple paths at the same time. Instructions such as XWDSZ should not be used for "loop counters" in single threaded paths.

Software overview: The Model 2 is supported by AOS/VS rev 7.53, or greater, which has been running for over 1½ years on an in-house dual-processor testbed and later on the actual Model 2.

AOS/VS 7.50 on the Model 2 is nearly peer/peer, versus master/slave. In a fully peer/peer implementation, all functions can execute on any of the processors in the system. In a master/slave implementation, the master is the only processor that can execute all the functions. Generally, the slave is told which job to execute by the master, it must communicate with the master when it can no longer execute that job, and it must wait for the master to assign it the next job.

In some other multi-processor systems, the slave cannot execute any system code or system calls—these must all be done by the master. The slave, then, is usually only efficient in a technical environment where it has a number of compute-bound jobs to execute. If the master/slave software architecture applies also to the hardware and the master processor fails, the complete system might become unusable.

As mentioned above, AOS/VS 7.50 on the Model 2 is nearly peer/peer. The processor that is initially booted is referred to as the "initial" processor. A common copy of the operating system is executed on both processors, maximizing the use of system memory. Both processors will schedule themselves—there is no need for either processor to wait for the other to schedule it when it can no longer execute its current job. Both processors can execute most of the frequently used system code and system calls. Additionally, if the "initial" processor fails, the system can be rebooted as a uni-processor using the non-failing processor.

There are a few functions that are currently only executed on the "initial" processor (also referred to as the Mother or main processor). These include some system functions, processes, and system calls. Many of these areas are under discussion for enhancement in future revisions in order to minimize the functions that must execute on the "initial" processor. The utility MP_DISPLAY, included in the AOS/VS performance monitor package, will display the percentage of CPU time used in all the above areas.

System functions that are restricted to the initial processor only become a significant issue when there is very little idle time on that processor. AOS/VS provides automatic load balancing between processors for the functions that can execute anywhere. So, if the "initial" processor-only load goes up by 10 percent, the other processor will increase its "run-anywhere" processing by up to 10 percent to compensate.

Given the extreme case that the initial processor-only requests amount to 120 percent of the processor, then some requests are going to have to wait, and this might have an effect on the productivity of the other processor. In monitoring this under heavy load, the most I have ever observed is a 20 to 40 percent total usage for initial processor-only activities, so this doesn't appear to be a major issue.

The list of system functions that will execute only on the "initial" processor includes:

1. Interrupt handling—note that even with a large number of consoles, this doesn't usually have a major impact on system performance since intelligent asynchronous controllers (IACs) usually only generate interrupts on request completions, not on each character.
2. Disk manager—handles file I/O and unit pre/post-processing.
3. Core manager—primarily handles process swapping.
4. System manager—handles unit type device, SCP, and mirror errors; SYSLOG logging; and mirror operations.

The heaviest load on the initial processor will be generated by the interrupt handler and the disk manager. The utility,

MP_DISPLAY, will display the percentage of CPU usage for each of the above areas, as well as the traditional "total user," "total system," and "total idle."

The processes that will only execute on the "initial" processor consist of two types—ones that will always execute there and ones that will be locked to the "initial" processor while a specific request is outstanding. These are:

1. Peripheral Manager (PMGR)—Pid 1—always executes there.

2. Any process with an ?IDEF outstanding executes there for the duration of the ?IDEF request. Once the last ?IRMV has been executed for a process, it can execute anywhere again. For processes such as XTS, the ?IDEF is outstanding for the total time the process is executing, so it will stay locked onto the "initial" processor.

For most systems, the processes that fall into the second category are limited to XTS, SDLC, and XDLC.

The PED utility with the "/MPROCESS" switch will highlight any process that falls into the "initial processor-only" category. The utility MP_DISPLAY will display, in addition to the traditional "total user" CPU time, a sub-category of "Mom user," which is the CPU time used by any process that can only execute on the initial processor. All of the other processes will randomly execute on either of the two processors depending on whether they are the highest priority ready-to-run job when that processor selects a job to execute.

System calls can be subdivided into one of three groups, depending on the resources that the system call requires. These groups are:

A. System calls that will execute totally on either processor. Some examples of these are ?MEMI, ?PSTAT, ?GTOD, ?SIGWT, ?MBTC, ?MTFC, ?BLK, ?TPORT, ?GUNM, ?RSEND, ?PRCNX, ?WIRE, ?DELAY, etc. Note that usually ?ISEND, ?IREC, and ?IS.R fall into this category but could become a type B if the message must be spooled to disk.

B. System calls that will execute on either processor down to the point of the actual file system (FS) request. Some examples are ?RDB, ?WRB, ?SPAGE, ?FLUSH, ?RPAGE, Page Fault, etc. Note that this system call/FS transition point is the same as on the uni-processor, so there is no additional overhead to switch to the initial processor. To minimize overhead even further, if no request to the FS is necessary, such as when the data is already in memory, the system call will execute totally on either processor (same as A above).

C. System calls that will only execute on the "initial" processor. Some examples are ?CREATE, ?PROC, ?DELETE, ?CHAIN, ?OPEN, ?CLOSE, ?FSTAT, ?GNFN, etc. Most of these calls make heavy use of the file system. Because of the lack of software locks in the file system, it was more expedient initially to restrict them to the "initial" processor.

System calls that will execute on either processor, groups A and B, make up approximately 50 percent of the system calls by count and about 80 percent by frequency of execution. For this case also, the utility, MP_DISPLAY, will display the percentage of CPU time spent executing "Sys Calls" (groups A and B and the percentage of CPU time spent executing "Mom Sys Calls" (group C)).

The frequency of execution percentages was determined by monitoring systems doing actual office automation and time-sharing activities over a period of several days. The total number of each system call was counted. These calls were then totaled by group and the percentages calculated. Most of the system calls in group C had a very low average usage percentage with the exception of ?GOPEN, ?CLOSE, ?STMAP, ?GNFN, and ?FSTAT. But even in these cases, a user would issue a single ?GOPEN (group C) for a file (~1.96 percent of total system calls), then do a number of ?RDB/?WRB (group B) requests (~8.98 percent), then finally issue a single ?CLOSE (group C) for the file (~1.78 percent).

General performance discussion

When measuring the performance of any system, a number of factors must be taken into account. Some of these are under the control of the hardware/software designer, others are under the control of the user. These factors are hardware/microcode implementation, software implementation, job mix being executed, and system configuration. The total effect of each of these factors is what is measured as the performance of a specific benchmark or job mix.

The first two factors, hardware/microcode implementation and software implementation, are not under the control of the user. For these, the user hopes that hardware designers did their best to minimize any bus collisions, maximize concurrent instruction execution, etc., and that software designers did their best to minimize both lock collisions and frequency of "initial processor-only" requests. The various controlled tests to be discussed next month give an indication of how well the designers carried out the implementation.

The job mix being executed is under control of the user. The performance of any given mix can vary depending on the total number of jobs; the type of jobs (whether compute or I/O bound); whether the mix does multi-tasking or multi-processing; the amount of idle time remaining on each processor; and other factors. In performance testing, it is best to use a mix that is as close as possible to the final application, and then vary the load up and down while monitoring system performance. Remember that since AOS/VS schedules processes on the two processors, the dual processor doesn't provide any increased performance for the single process environment.

The last factor, system configuration, is also under the control of the user. The goal with configuration in performance testing is to try to eliminate the effects of all factors other than the one being tested. The traditional bottlenecks are CPU usage, memory usage, and I/O usage.

The first two are fairly straightforward. The memory usage bottlenecks can be eliminated by having sufficient memory to prevent the system from going into memory contention, i.e., the AOS/VS counter NPFFW will always be equal to 0. Current revisions of AOS/VS will not degrade system performance if there are large areas of unused memory. CPU usage can be factored out by increasing the test load until there is no CPU time left.

The I/O usage factor is more complicated. Users are usually concerned with two types of I/O—terminal I/O and disk block I/O. Disk block I/O is the major problem, so we paid particular attention to it in our performance analysis. Disk block I/O performance can be affected by the number of disk controllers; the number of disks on each controller; the load on each of the disks; and, in some cases, the placement of the data file on the disk. The disk block I/O can be monitored using DISCO, a utility included in the AOS/VS performance monitor package.

There are three areas needing careful monitoring: balancing requests between disk drives, adjusting requests among disk drives on the same controller, and monitoring the seek distances.

Differences in these areas can have a dramatic effect on performance. In the CEO test case, which will be discussed next month, if 80 scripts are executed on seven Argus spindles, the uni-processor to dual-processor ratio was measured at 1.708. If the data distribution is changed and nine Argus spindles are used, the uni- to dual-processor ratio now increases to 1.819. The addition of two more Argus spindles eliminated some of the I/O bottleneck, allow-

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BY GEORGE HENNE

WEIGHING THE UPGRADE OPTIONS

It's now considerably less expensive to upgrade from RDOS Business BASIC

One of my first columns in *Focus* was on the pros and cons of converting from RDOS Business BASIC to AOS or AOS/VS Business BASIC (October 1985). It's about time I updated that column.

Most Business BASIC users are still running on some sort of Nova or Eclipse with good old RDOS. I've got nothing against RDOS, but it has been far surpassed as an operating system for running BBASIC.

RDOS, the "Real-Time Disk Operating System," has been around nearly as long as Data General. It was designed in the days when programmers tried to write systems that could get by with 48 KB because memory upgrades were so expensive. Once you got to 64 KB, you were maxed out. We believed then that 16-bit machines would never go beyond that—and besides, what possible use could there be for that much memory?

AOS, the "Advanced Operating System," came along in the mid-70s to answer just that question. It featured clever buffering, fancy scheduling, and did lots of things we bit-pickers knew belonged in our application software, not the operating system.

Besides, it didn't seem to work that well. The zillions of lines of new code hadn't been debugged, and the operating system seemed to use up all the memory for itself. It even had trouble when given a full half-megabyte!

Meanwhile, RDOS chugged along. A new rev used a paging mechanism to go to 256 KB, and eventually 2 MB. It was almost totally dependable, and its faults were like cracks in old leather: deep with history and tradition. Some said that if Data General had been less restrictive, RDOS could have been the standard operating system for micros when they came along, instead of MS-DOS or CPM. Interesting thought . . .

When the MV/8000 made its debut, AOS was brought into the 32-bit environment as AOS/VS. The code works well now. It still loves memory, but two and four and even ten MB boards are cheap and readily available. Programmers have now decided they love it because it does what all operating systems should do: it makes programmers' lives easier. AOS has fallen by the wayside.

The most important thing about AOS/VS is its ability to deliver performance far beyond what RDOS could ever have been modified to do. For the future, AOS/VS has the potential for even more improvement.

What does all of this have to do with BBASIC? Well, studies seem to indicate that up to a third of you are out there looking for some sort of upgrade in any given year. Quite simply, AOS/VS systems now deliver by far the best price-performance in the Data General line. I think it would be foolish to consider anything else seriously in your upgrade plans.

The design of AOS/VS and the MV/ series hardware is well suited for running BBASIC. Some good work was done bringing the language over to take full advantage of the increased power of the operating system. For example, terminal handling by RDOS Business BASIC is handled by BBASIC itself, simply because when it was written, the RDOS terminal drivers didn't work well enough. However, in AOS/VS this work is done by the PMGR, a part of the operating system that is far more powerful than anything attempted in RDOS.

The end result is that on machines that are identical except for the operating system, AOS BBASIC has been clocked as almost 50 percent faster than RDOS!

When we last looked at this topic, the costs of going to AOS or AOS/VS were not that different. That's all changed now: Data General has pretty much stopped making larger 16-bit Eclipses, and announced that no further significant development will be done to AOS. The cheaper maintenance prices on 32-bit equipment mean that the MV/ series with AOS/VS is the only way to go.

I always thought RDOS would outlive AOS, and it seems it has. RDOS now exists on the MV/2000 DC. However, I do not recommend it for BBASIC users in most cases: you lose a lot of the advantages of the 32-bit architecture by not running AOS/VS.

Why is AOS/VS so much better? To begin with, it was designed for true multi-processing. Without the limitation of a 64 KB address space, more than one job can be active at a time: jobs are much less often "locked out" while waiting for other jobs to finish their system calls. The AOS/VS terminal handler also downloads a lot of work onto the IAC. In RDOS, every character coming or going to a terminal interrupts the CPU with a separate system call. You can imagine what a display at 9600 baud does to the CPU! An IAC allows a single system call to send a whole burst of data. This is not magic: an IAC-16 has a complete 16-bit CPU on board to do the work, relieving the main CPU.

There are many other reasons as well. More memory can be used for more buffers, cutting down on disk accesses in heavily used files. Larger available space for programs cuts down on CHAIN statements and allows more complex programming. When larger disk blocks are being read and written (2048 instead of 512), disk operations are speeded up, especially index files.

So, now you're sold on moving to AOS/VS. What sort of machine should you upgrade to? As usual in the computer business, there are several answers, none of them obviously right. So, let's look at a couple of situations. (All prices in these comparisons are rough: you may need some different equipment for your own site. Also, I've ignored details such as cabinetry, battery backup, installation charges, etc.)

Suppose, first, that you've got a typical small system: a Nova 4 with 25 MB of disk, floppy backup, and about five terminals. You may have heard that Nova BBASIC will go Category C soon, and won't be really supported by Data General any longer. Besides, you're bursting at the seams. The accounting department wants three more terminals, and you're out of disk. So, what are your options?

The MV/2000 DC is the smallest member in Data General's 32-bit family, and it's more than $20,000 cheaper than last time I made these comparisons. While it still comes with a cartridge tape at present, there are rumors of a standard streamer tape. When it

comes out, I recommend spending the extra money to get one. I don't know any good reason for the diskette drive: as far as I know it comes with it, and it can't be deleted. Printers and modems could also be a headache.

Figure 1: Upgrade from Nova to MV/2000

MV/2000 DC with 2 MB memory, 70 MB disk drive, 737 KB diskette drive	19,500
12 MB cartridge tape	1,500
16 asynch port multiplexor	2,250
AOS/VS operating system start-up services	2,208
AOS/VS Business BASIC license	400
AOS/VS Business BASIC services package	1,600
	$27,458

On the other hand, the MV/2000 DC will give a you a big boost in performance. Even after the increased disk space AOS/VS will use, you'll have twice as much disk. The speed of almost everything will increase dramatically. Without further expansion, you'll be able to go up to 16 terminals and printers.

Suppose, though, you feel the MV/2000 DC architecture, with its absolute limit of 24 terminals and 320 MB of disk, is too restrictive, or you're skeptical of the cartridge tape's ability to back up a data base larger than 70 MB. (You should be!) A year ago you would have had to consider the MV/4000, but now the MV/7800 fills this range of the product line.

Figure 2: Upgrade from Nova to MV/7800

MV/7800 with 2 MB upgrade including AOS/VS license	11,200
IAC-16 lines for RS-232 or 20ma	5,850
354 MB disk drive	25,000
1600 BPI streaming tape drive	6,800
AOS/VS installation package	6,300
AOS/VS BBASIC license	2,200
AOS/VS BBASIC installation package	1,600
	$58,950

The newer processor results in a savings of about $10,000 since my last column, but there is a big difference: this time we've got 354 megabytes of disk, instead of only 73. The smallest disk DG currently sells for the MV/7800 is the 354. Upgrading from the Nova, we've exchanged the disk and switched to tape for backup. The 25 megabyte drives are slow, and diskette was always a silly way to back up. It should also be noted that MV/ series machines may mean a change to your printer interface.

If you got an MV/7800 DC instead of the MV/7800, you'd get almost as much performance and could buy smaller drives. On the other hand, the whole premise here is that we want a full size expandible system.

The MV/7800 lets you plug in almost anything Data General sells: multiple disk drives, 592 megabytes each; tape drives that write out 6250 bits-per-inch, 125 inches-per-second; and lots more

terminals. You can even run CEO. We don't know what the limit for BBASIC terminals on an MV/7800 is yet: somewhere around 30.

But what if you already have an Eclipse S/140 and enough disk and tape capacity for your projected needs? Unlike the Nova, it could be upgraded to run AOS. But, based on our previous discussion about the future of that operating system, it makes more sense to go to AOS/VS.

Figure 3: Upgrade from S/140 to MV/7800

MV/7800 with 2 megabytes upgrade including AOS/VS license	10,000
IAC-16 RS-232 and 20ma	5,850
AOS/VS installation package	6,300
AOS/VS Business BASIC license	2,200
AOS/VS BBASIC installation	1,600
	$25,950

This is $10,000 cheaper than it cost to convert an S/140 to run AOS last time! We find BBASIC runs well under AOS/VS for up to 16 terminals or so if you have 2 megabytes of memory. How much you'll need depends on your application. In any of these upgrades, you may be able to get credit for trading in your old Business BASIC license, which will save you some money.

The MV/7800 brings you into the mainstream of Data General's 32-bit technology. It includes a BMC (Burst Multiplex Channel) for higher disk performance, and is an all around faster machine than the S/140. BBASIC benchmarks rate it about twice as fast as the RDOS S/140.

There is still some concern about how well the MV/7800 works with Business BASIC. Some users have reported it runs much slower than the MV/4000, while others say it's about the same. The three we've installed seem to run about the same as the MV/4000. People who have tested B32 on the MV/7800 report that it really flies.

There are of course many other considerations in the conversion: Who's going to do it? It should be straightforward, but what if the people who wrote the original programs used undocumented tricks and weird RDOS system calls? What if programs don't exist anymore (and only *optimized* versions are left)? What if the programmers are gone? How do you learn about AOS/VS?

These problems are not insurmountable. If you're worried, get help from a company that has done these conversions before. In any case, all of our users who have done the conversion have been extremely happy with the results, and feel the effort involved in conversion was well worth it. Δ

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BY TIM BOYER

VIVE LA DIF!

How to avoid re-keying data for your PC spreadsheets

Data Interchange Format was developed as a simple way of moving information that can be read, or at least translated by, many different spreadsheets

A few months ago, I mentioned using REORG to send data to microcomputers, to be used in Lotus. One of our concerns was deciding how to get the data into Lotus-readable format. We decided to go with DIF-type files.

DIF (Data Interchange Format) was developed by Software Arts as a simple way of moving information that can be read (or at least translated) by many different spreadsheets. Lotus, Symphony, Jazz, Framework, VisiCalc, TK!Solver—all can make use of DIF files. This means that we didn't have to standardize on a spreadsheet—if I get my boss the Macintosh that he's been bugging me for, I don't have to translate all of our files for him, and I can take the files home and work on them on my good ol' CP/M system.

The format is standard, and any changes have to be cleared through the DIF Clearinghouse. Finally, something in this industry that really *is* standard! Not only that, but the format is fairly simple. It uses only printable ASCII characters, so there's no escape code or control sequences to worry about. DIF provides for its own end-of-file marker, so you don't have to worry about filling up a record with control-Zs.

We'll be writing to a sequential file and using REORG to convert it into a line sequential file (for reasons that will become apparent). I'll use as an example a customer sales report. The printout would look something like this:

```
CUST-#  |  CUST. NAME  |  SALES YTD
--------------------------------------
12345   |  ABC CORP.   |  8,765.43
23456   |  XYZ, INC.   |  3,456.78
```

and so on.

A DIF file consists of header items, to tell the program what to do with the data and data items. The first header item is

```
TABLE
0,1
'' ''
```

This signals the beginning of a DIF file. To get the double quotes, you need to MOVE '' '' '' '' '' '' TO DF RECORD.

Next, the DIF format requires the number of tuples. For some reason, the people who wrote this standard decided on their own nomenclature. Tuples is simply the number of fields in the record—three in our example. So:

```
TUPLES
0,3
'' ''
```

Then come vectors, which are the number of records to be transferred. This is why we can't simply open the file as line sequential—you'll have to rewrite this number once you determine how many records have been processed. The alternative would be to go through the file twice, counting records on the first pass and writing the DIF file on the second. I've found that method to be too time-consuming, but if you're working with a short file, two passes may be the way to go. If you're going to count the records and rewrite the value, you'll want to leave the value zero at this time:

```
VECTORS
0,0
'' ''
```

If you knew how many records you were going to write, you would put that number after the zero—e.g., "0,450."

The next step is to write the header fields for the data.

```
LABEL
1,0
''CUST-#''
LABEL
2,0
''CUSTOMER NAME''
LABEL
3,0
''SALES YTD''
```

The number under LABEL refers to the position of the header. CUST-# is over field #1, CUSTOMER NAME is over #2, and so on. The quotes must appear around the string, so the ICOBOL statement is

```
MOVE '' '' ''CUST-#'' '' ''
 TO DIF-RECORD.
```

Finally, the next entry tells DIF that the grunt work is over and the computer is going to start doing the work. The format is

```
DATA
0,0
'' ''
```

To write the data, you have to put a BOT (Beginning of Tuple) marker at the front of each record, followed by the actual data. The DIF format for the first record would look like this:

```
-1,0
BOT
1,0
12345
1,0
ABC CORP.
0,8765.43
V
```

Let's examine the format a little more closely. The first data item is the customer number, which is written to the DIF file as

```
1,0
12345
```

The "1,0" signals that a string item is going to follow, and the next record written is the value of that string. Customer sales, on the other hand, appear like this:

```
0,8765.43
V
```

The leading "0" means that the next value is numeric and to ignore the next line. With

numeric items, the next line is always a "V."

The ICOBOL code looks simpler. I've got this in working storage:

```
01 NUMERIC-LINE.
 03 FILLER PIC X(2)
  VALUE ''0,''.
 03 NUMERIC-VALUE PIC
  9(8)V9(2)-.
```

and the code looks like this:

```
PRINT-CUSTOMERS.
MOVE ''-1,0'' TO
 DIF-RECORD.
WRITE DIF-RECORD.
MOVE ''BOT'' TO
 DIF-RECORD.
WRITE DIF-RECORD.

MOVE ''1,0'' TO
 DIF-RECORD.
WRITE DIF-RECORD.
MOVE CUSTOMER-NUMBER
 TO DIF-RECORD.
WRITE DIF-RECORD.

MOVE ''1,0'' TO
 DIF-RECORD.
WRITE DIF-RECORD.

MOVE CUSTOMER-NAME TO
 DIF-RECORD.
WRITE DIF-RECORD.

MOVE CUSTOMER-SALES-YTD
 TO NUMERIC-VALUE.
WRITE DIF-RECORD FROM
 NUMERIC-LINE.
MOVE ''V'' TO DIF-RECORD.
WRITE DIF-RECORD.

ADD 1 TO NUMBER-
 OF-RECORDS.

READ CUSTOMER-FILE
 NEXT RECORD.
```

The DIF format doesn't look for end-of-file markers, so when all of your records are written, you need to tell it so.

```
MOVE ''-1,0'' TO
 DIF-RECORD.
WRITE DIF-RECORD.
MOVE ''EOD'' TO
 DIF-RECORD.
WRITE DIF-RECORD.
```

The file is now complete. To correct the number of records, you must close the file, reopen it I-O, read eight records, and then

```
MOVE NUMBER-OF-RECORDS
 TO NUMERIC-VALUE.
REWRITE DIF-RECORD FROM
 NUMERIC-LINE.
```

The above code is very straightforward, and will produce files that just about any spreadsheet can use. There's only one minor problem—it doesn't work.

Now, before you start writing nasty letters, let me explain. It *will* work, but something additional is needed—variable-length sequential records.

You're probably not as familiar with variable-length records as I am. I read the half paragraph in the Programmer's Reference last month, which has no explanation and no examples, so that makes me an expert. I then proceeded to play around with the file structure until the DIF program worked. I have no idea if I'm using this type of file in the way that I should, but I'm judging the results in true programmers' fashion—the code works, so I'm not going to change it.

When a program reads the DIF files, it expects the control statements (VALUE,

TUPLES, etc.) and numeric values to be the only thing on the line. When RDOS writes a fixed-length sequential record, it pads the record with spaces. Some method must be found to get rid of those, and variable-length records is the easiest way.

The SELECT statement for a variable file is identical to that of a fixed-length file. The FD that I use looks like this:

```
FD DIF-FILE
RECORD CONTAINS 1 TO
 80 CHARACTERS
RECORDING MODE IS
 VARIABLE
LABEL RECORDS ARE
 STANDARD.

01 DIF-1  PIC X(1).
01 DIF-2  PIC X(2).
01 DIF-3  PIC X(3).
01 DIF-4  PIC X(4).
01 DIF-5  PIC X(5).
01 DIF-6  PIC X(6).
01 DIF-7  PIC X(7).
01 DIF-8  PIC X(8).
01 DIF-14 PIC X(14).
01 DIF-RECORD PIC X(80).
```

Now, instead of writing DIF-RECORD each time, I move the value to the appropriate length record and write it. The main loop of the program then becomes

```
MOVE ''-1,0'' TO DIF-4.
WRITE DIF-4.
MOVE ''BOT'' TO DIF-3.
WRITE DIF-3.

MOVE ''1,0'' TO DIF-3.
WRITE DIF-3.
MOVE CUSTOMER-NUMBER TO
 DIF-RECORD.
WRITE DIF-RECORD.

MOVE ''1,0'' TO DIF-3.
WRITE DIF-3.
MOVE CUSTOMER-NAME TO
 DIF-RECORD.
WRITE DIF-RECORD.

MOVE CUSTOMER-SALES-YTD
 TO NUMERIC-VALUE.
WRITE DIF-14 FROM
 NUMERIC-LINE.
MOVE ''V'' TO DIF-1.
WRITE DIF-1.
```

When all of this is finished, you'll have a file that looks like Figure 1. Then, simply use REORG and transfer that file to your PC.

```
REORG/A DIFFILE/V QTY:4
```

This translates your variable-length sequential file into a line sequential file, and sends it along your QTY line. The TRANS utility in Lotus will now be able to read in the file and convert it. Writing the DIF file is quick—1,600 records processed in under 2½ minutes. If that doesn't seem very fast, remember that you have to write eight output records for each of those processed.

If all of the above looks too complicated, it's really like any computer program—a pain to get going, but well worth it once it's running. And once you have the first program up and running, it's a simple matter to adapt it to all of your others. If you have someone keypunching figures into

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Circle 2 on reader service card

Lotus from a computer printout—and I've seen a number of companies do just that—now is the time to automate the process and free up some time.

There are some RDOS people out there (myself included) who are desperately seeking XMODEM or Kermit. If anyone knows where to find RDOS versions of those file transfer programs, please get in touch with me. Or, if anyone has an RDOS C compiler and would be willing to run some code through it for us, give me a call. Δ

Figure 1: completed DIF file

```
TABLE
0,1
'' ''
TUPLES
0,3
'' ''
VECTORS
0,2
'' ''
LABEL
1,0
''CUST-#''
LABEL
2,0
''CUSTOMER NAME''
LABEL
3,0
''SALES YTD''
DATA
0,0
'' ''
-1,0
BOT
1,0
12345
1,0
ABC CORP.
0,8765.43
V
-1,0
BOT
1,0
23456
1,0
XYZ, INC.
0,3456.78
V
-1,0
EOD
'' ''
```

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BY TIM MANESS

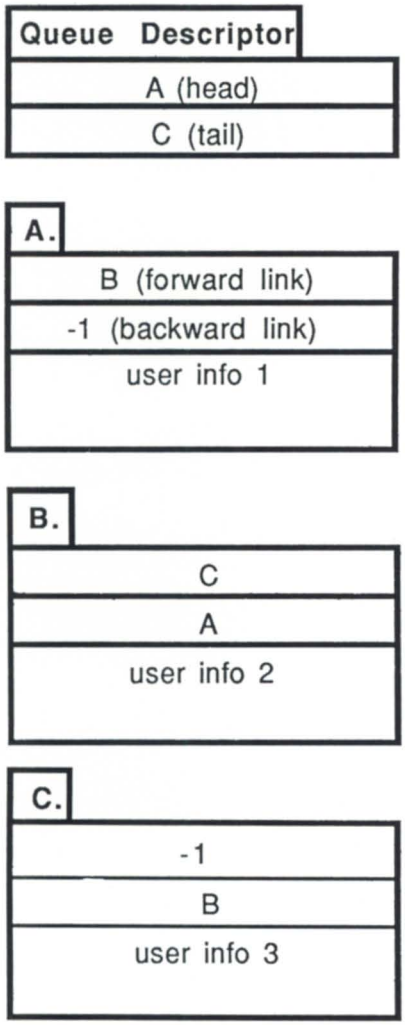
ON QUEUE

Here's an alternative way to implement queues for managing intertask communication

In the February 1987 issue of *Focus*, there was an excellent article by Karen Jackson on using queues for intertask communication (page 16). We also use queues at DMS Systems, and I thought I would offer an alternative implementation of the queuing mechanism. The MV/ machines have several instructions specifically for queue management that can make life easier (and your programs much quicker) by avoiding the need to write these routines in a high-level language.

Basically, a queue is a double-linked list of entries (called data elements) that has a head and a tail (i.e., a beginning and an end). Associated with each queue is a queue descriptor. The queue descriptor is two 32-bit words. The first is the address of the entry that is the head of the queue, and the second is the address of the entry that is the tail of the queue. Figure 1 shows a queue with three data elements. The queue descriptor contains the address of the head of the queue (address A) and the address of the tail of the queue (address C).

Figure 1



The instructions available for managing queues include:

ENQH—Enqueue a data element at the head of a queue
ENQT—Enqueue a data element at the tail of a queue
DEQUE—Remove a queue element

Using these instructions, you can develop code to implement FIFO queues, FILO queues, and other interesting variations. The other variations include priority based queues. In order to implement this type of queue, you must insert and delete elements from a queue from other than the head and tail. This means that the queue must be searched; the other queuing instructions that are available are used for searches. For now, we'll just consider the FIFO case where data elements are added to one end (the tail) and removed from the other end (the head).

In this short Fortran 77 example, we have a queue consisting of data elements that are three words long. This means that there is one word of user information. Task 1 puts an entry on the queue, and task 2 takes it off. The dequeue instruction

Figure 2: Interface to the ENQT instruction

```
; ENQUEUE32.SR -- Interface to the MV ENQT instruction
;
; CALLING SEQUENCE:
;      CALL ENQUEUE (QDESC,DATA_EL)
;
; ARGUMENTS:
; QDESC    2 WORD ARRAY CONTAINING THE QUEUE DESCRIPTOR
; DATA_EL  ARRAY CONTAINING THE DATA ELEMENT (1ST TWO WORDS OF
;          WHICH ARE USED AS THE FORWARD AND BACKWARD LINKS)

                .TITLE ENQUEUE
                .ENT ENQUEUE
                .NREL

QDESC=ARG1
DATA_EL=ARG2

ENQUEUE:  WSAVR 0
                XWLDA   0,QDESC,3    ; QUEUE DESCRIPTOR
                WADC    1,1          ; -1 -> ADD TO TAIL
          XWLDA       2,DATA_EL,3    ; ADDR OF ELEMENT TO ADD
                ENQT                 ; DO IT
                NOP                  ; WE DON'T CARE IF EMPTY
WRTN
                .END
```

receives an address; because of the limitations of Fortran, however, the calling program gets the user information back, rather than the address of the data element. Note that this example ignores all the locking that Karen explained in last month's article.

Figure 2 is the assembly language routine that interfaces with the ENQT (enqueue at the tail) instruction.

The routine shown in Figure 3 will dequeue a data element from the head of the queue. As mentioned before, the routine returns the user information instead of the address of the data element.

Because of this awkwardness dealing with addresses in Fortran, we usually have a number we use as an array subscript into the real user information. For example, if you are using queues to manage a set of buffers, the user information would be the buffer number rather than the actual buffer of data.

TASK 1

```
common /exq/ queue
(3,200), qdesc(2)
data qdesc /2*-1/
 . . .

c Queue an element
  call enqueue (qdesc,
  queue(1,i))
  . . .
```

TASK 2

```
  common /exq/ queue
  (3,200), qdesc(2)
   . . .

  call dequeue (qdesc,
  info)
   . . .
```

Figure 3: Interface to the DEQUE instruction

```
; DEQUEUE32.SR -- Interface to the MV DEQUE instruction
;
; CALLING SEQUENCE:
;      CALL DEQUEUE (QDESC,INFO,ICC)
;
; ARGUMENTS:
; QDESC     2 WORD ARRAY CONTAINING THE QUEUE DESCRIPTOR
; INFO      INTEGER TO CONTAIN THE USER INFORMATION
; ICC       CONDITION CODE, 0 -> OK, -1 -> QUEUE WAS EMPTY

            .TITLE DEQUEUE
                   .ENT DEQUEUE
                   .NREL

QDESC=ARG1
INFO=ARG2
ICC=ARG3

DEQUEUE:           WSAVR 0
                   XWLDA   0,QDESC,3    ; QUEUE DESCRIPTOR
                   WADC    1,1          ; -1 -> DEQUEUE FROM HEAD
                   DEQUE                ; DO IT
                   WBR     MAYBE        ; MIGHT BE EMPTY OR LAST
                   WMOV      1,2
GOOD:
                   XWLDA   0,4,2        ; 1ST AFTER 2 WORD HEADER
                                        ; IS THE USER INFORMATION
                   XWSTA   0,@DE_SUB,3  ; GIVE IT BACK
                   WXOR    0,0
                   XWSTA   0,@ICC,3     ; ICC = 0 -> OK
                   WRTN
MAYBE:
                   WMOV    1,2          ; MAKE A COPY OF AC1
                   WSALA   -1,1         ; COMPLEMENT AC1 AND ADD
                                        ; -1 TO IT
                   WBR       GOOD       ; NON ZERO RESULT

FAILURE:
                   WADC      1,1
                   XWSTA   1,@ICC,3     ; -1 -> NOTHING TO DEQUEUE
                   WRTN
                   .END
```

You can use the queuing primitives to build up fairly complex schemes for managing resources; By utilizing these instructions, these schemes will be efficient.

■

I want to thank Lamar Bevil of Protective Management Corporation, Moy Chambers of McLean Financial, and Bill Ashley of Allied Group Insurance Trust for reading my December 1986 article and sending me letters for my Christmas stocking. Sometimes I agree with Lamar's third rule of system management: "If it works as well as those wildly optimistic projections in the sales literature, it doesn't deserve any attention whatsoever." But there are always a few exceptions, and I thank you all very much.

Also, based on my mail, I'm less annoyed at DG's credit department—it seems that they treat everyone equally badly. Someone wrote to say, "I've done bigger orders with strangers over the phone than DG will do with 'approved credit'."

■

After waiting so long for rev 7 of AOS/VS, we received ours on December 14, 1986. After installing it and running for about 12 days, we decided to move back to rev 6 for a while. We have an MV/4000 with 4 megabytes of memory; with the new revision of AOS/VS, we seemed to lose about 1 megabyte more to the system. The system seemed to be using about 2.5 megabytes under rev 7 compared with a little more than 1 megabyte under rev 6. That extra megabyte is the one we need to get any performance out of our system at all. So, we'll use rev 6 until we get some new memory.

■

Craig Smith at Texaco's Freeport Service Center spoke with me about the new MV/15000. This is the line of machines that replaced the MV/8000 and MV/10000. There are three machines in the series: the model 8 (a 2.8 MIPS machine), the model 10 (4.3 MIPS), and model 20 (6.4 MIPS). One of the features of this series is that the CPUs are interchangeable. This means that it is possible to upgrade from a model 8 to a model 10 or 20 by just changing one board. Craig said it really did take just 20 minutes to upgrade from a model 10 to a model 20. The cost for an upgrade from model 10 to model 20 is about $87,000. This is substantial savings over previous upgrade options.

The original installation of the model 10 at Texaco was accomplished over one weekend by cabling the peripherals from the MV/10000 to the MV/15000 and bringing the new machine up. They didn't even have to generate a new system.

Unfortunately, I was unable to get any numbers from the benchmarks they ran in time for this article, so we'll continue this discussion next month.

The MV/15000 looks like a winning series. Our company has been waiting to get a machine that will grow as needed without having to throw it all away every two years. I'm definitely planning to get an MV/15000. Δ

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PLEASE REMOVE THE WRITE-RING

Two routines make tape handling safer and more efficient

Well, as you may have noticed from the past few issues of *Focus* and *Data Base Monthly*, we now have several methods of implementing a "day-of-week" function thanks to material presented by Jim Siegman, Lynn Lively, Tom Robinson (December, *DBM*), and myself. If you don't have something similar on your system by now, where have you been?! Although there was some overlap of material, it shows that there are quite a few people out there with good ideas.

This month I'll present two subroutines: REWIND_TAPE and RING_IS_IN. REWIND_TAPE physically rewinds a tape, and RING_IS_IN checks for the presence of a write-ring on a tape.

First, let's review some of the ways in which tapes can be accessed by programs on AOS{/VS}. When you write programs that read or write tapes, you open a channel (either an AOS{/VS} channel or a high-level language channel like Fortran's logical unit number) to a file. Tapes are treated just like files on AOS{/VS}: referring to "@MTB0:23" is identical to ":PER:MTB0:23", which in turn is similar to a file called "23" in directory ":PER:MTB0". When you reach the end of a tape file, you cannot read past it (just like a disk file). Instead, you must close the channel and reopen it using the name of the next sequential file on the tape (i.e., "@MTB0:24").

If you are using AOS{/VS} system calls (?READ,?RDB/?PRDB) to read or write the tape, then you can ?OPEN or ?GOPEN the tape drive (unit) without specifying a file number: the file number is specified as an integer on subsequent read or write operations. This requires a bit more effort and bookkeeping than on some operating systems, which allow you to read and detect an end of file and then continue reading on the next file.

However, the advantage is that any AOS{/VS} tape file can be directly accessed in any order simply by specifying the file number in the file name or system call packet. Many systems only permit sequential access to files on a tape, requiring that the application program rewind the tape and skip ahead over end-of-file marks until the appropriate file is found.

The REWIND_TAPE and RING_IS_IN routines ultimately use AOS{/VS} channels to perform their functions. There are several ways to write these routines, and they depend on the methods you use to read or write tapes. If you perform tape I/O using AOS{/VS} system calls (?READ/?WRITE, ?RDB/?WRB, ?PRDB/?PWRB), then you can use the AOS{/VS} channels returned by ?OPEN or ?GOPEN. If you use Fortran READ/WRITE statements for tape I/O, then you can use the F77 IO_CHAN function to look up the equivalent AOS{/VS} channel number for an F77 logical unit number. It doesn't matter whether or not you've opened the drive (i.e., "@MTB0") or a file on the tape drive ("@MTB0:23").

Sometimes I use a drive name and specify the file numbers internally, and sometimes I specify the tape file name explicitly. If I know the tape structure, i.e., which file numbers to read or write, then the user only needs to specify the tape drive number and I do the rest. This simplifies the drive specification from the user's point of view, especially since we only have two tape drives, 0 and 1.

I've written two very simple routines (not presented here because you can write them easily) for switching back and forth between tape file names and file numbers. TAPE_FILENAME name accepts a tape drive number and file number and builds the actual tape file name:

```
character*32 filename
call TAPE_FILENAME(3,24,
 filename)
```

returns file name="@MTB3:24".

Conversely, TAPE_NUMBERS accepts a tape file name and returns the equivalent tape drive and file number:

```
call TAPE_NUMBERS
 (''@MTB12:3'',ndrive,ifile)
```

returns ndrive=12 and ifile=3.

If you use the MOUNT command, i.e.:

```
) MOUNT MY_TAPE
 ''please mount tape ABC123''
```

then EXEC creates a LNK entry (MY_TAPE) for you, and you'll have to look up the path name of the file, i.e., MY_TAPE: 12 may resolve to @MTB0:12.

Now let's look at the rewind function. Although the CLI REWIND command will physically rewind a tape, a Fortran REWIND statement just resets the internal file pointer regardless of whether the file is disk or tape. In the case of a tape file, the tape doesn't actually move until the next READ or WRITE is executed. For those of you who use batch mode or to whom the system is just a machine in another room or building, it probably doesn't matter whether or not the tape rewinds—let the operator worry about that (actually, DISMOUNT rewinds the tape).

On the other hand, if you mount your own tapes and are processing many of them, processing delays and waiting can be reduced if the program starts the tape rewinding as soon as processing is complete. If the program is interactive and the user has a few options to select with dialogue or menus, then you can start the tape rewinding while the interaction is taking place; when the dialogue has been completed, the tape will be already rewound and ready for immediate reading or writing. This eliminates those dead times in programs where nothing happens until the tape moves to the correct file and block.

Subroutine REWIND_TAPE will physically rewind a tape (Figure 1). It accepts a single integer argument: if the argument is negative, it is considered to be an AOS{/VS} channel number, otherwise it is a tape drive number (0-7 for @MTB0-@MTB7 or 10-17 for @MTB10-@MTB17).

If the argument is a drive number, REWIND_TAPE rewinds the tape by opening a channel to file 0 (you should close any open channels on that drive first) and positioning to block 0 of file 0.

If the argument is a channel number, then REWIND_TAPE assumes that you mean to position to block 0 of the current file. In that case, the tape won't actually rewind to BOT unless that file was specified as file 0 when it was opened, either explicitly specified as @MTBx:0 or implicitly

as @MTBx. You can use DG's F77 IO_CHAN function to look up the equivalent AOS{/VS}channel number for a Fortran logical unit number.

The position operation in either case doesn't "pend" (unlike a read or write), and returns immediately to the calling routine after starting the rewind operation.

Another method of rewinding a tape from within a program uses the CLI subroutine (see my column in the July 1986 issue of *Focus*, page 33) to start up a CLI process to issue the CLI REWIND command:

```
. . .
call CLI(''rewind @mtb0;
 bye/l=@null'')
stop
end
```

This method isn't as efficient because it incurs additional overhead in creating the CLI process.

The second subroutine I want to present is RING_IS_IN. This function checks for the presence of a write-ring in a tape. We process many raw field tapes from our airborne data acquisition system. The data on these tapes is expensive to collect, and the tapes are irreplaceable. Years ago, when I started out to write the processing programs for these tapes, one of the first tasks was to figure out how to make sure that no field tape was ever mounted on a tape drive with a write-ring in place. Initially, before ?PRDB was available and when I had only one tape drive, I used direct assembly-language instructions, but when I acquired a second drive on the same controller, I ran into some problems with this rather cavalier approach. It seems that AOS{/VS} doesn't appreciate users doing their own I/O instructions to devices it thinks it controls.

This tape-ring information is not available from the CLI or high-level languages; even ?READ/?WRITE and ?RDB/WRB can't detect the presence of a write-ring. Only ?PRDB/?PWRB can do that. Function RING_IS_IN looks up the tape controller status word, but in order to do so, it must read or write a block. Obviously, the logical thing to do is read a block. We can't just say "read the next block," however, because the ?PRDB system call requires an absolute block number. Therefore we read file 0, block 0.

Depending on how the AOS{/VS} channel was opened, there are two possible results: (1) If opened to a tape unit, i.e., @MTB0, then reading block 0 of file 0 will effectively rewind the tape. (2) If opened to a tape file, i.e., @MTB0:23, the file number will be ignored and block 0 of the current tape file will be read.

In either case, the tape will be rewound to the beginning of the file; this is satisfactory because the tape-ring check is usually done before reading the tape.

The DIA status word is returned in offset ?PCS1 of the packet, and the DIC status word is returned in offset ?PCS2. The structure of the DIA status word is shown in Figure 2.

You can write similar routines to check other bits in the DIA and DIC status words.

You can also write an almost identical routine called TAPE_IS_OFFLINE that checks DG bit 15 (F77 bit 0), although the

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Figure 1: REWIND_TAPE

```
    subroutine REWIND_TAPE(ndrive)

    include        "qsym.f77.in"
    integer*4      ndrive
    integer*2      opkt(0:?oplt-1)!0:5 for ?gopen
    integer*2      rpkt(0:?pblt-1)!0:7 for ?rdb
    integer*2      buffer          !small buffer
    integer*4      wa_buffer
    equivalence    (wa_buffer,rpkt(?pcad))
    integer*4      ac0,ac1,ac2,ier
    character*7    name            !@mtb17<0>
    integer*4      ichan           !aos/vs channel
    integer*4      isys            !f77 intrinsic

c>>>begin
c-->if < 0, then ndrive is an aos/vs channel,
        otherwise open
    if(ndrive.lt.0) then
        ichan=-ndrive              !make positive
    else
      if(ndrive.ge.10) then
        name="@MTB1"//char(ndrive-10+60k)//"<0>"
      else
        name="@MTB"//char(ndrive+60k)//"<0>"
      end if
      opkt(?opfl)=  ?opme          !flag bits
      opkt(?opty)=  ?fmtu          !magnetic tape
      opkt(?opeh)=  0                    !n/a
      opkt(?opeh+1)=0
      opkt(?opfc)=  0
      opkt(?opfc+1)=0                    !reserved

      ac0=byteaddr(name)           !unit name
      ac1=-1                       !any channel
      ac2=wordaddr(opkt)
      ier=isys(?gopen,ac0,ac1,ac2)
      if(ier.ne.0)      return     !ignore error
      ichan=opkt(?opfl)            !get channel no.
    end if

c-->position to file 0, block 0    !0
    rpkt(?psti)=0                  !no read
    rpkt(?psto)=0                  !reserved
    wa_buffer=wordaddr(buffer)
    rpkt(?prnh)=0                  !file 0
    rpkt(?prnl)=0                  !block 0
    rpkt(?prcl)=2                  !2-byte buffer
    rpkt(?pres)=0                  !reserved
    ac0=0                          !reserved
    ac1=ichan                      !aos/vs channel
    ac2=wordaddr(rpkt)
    ier=isys(?rdb,ac0,ac1,ac2)
    return                         !ignore any error

    end
```

Figure 2: DIA status word structure

DG Bit No.	F77BTEST Bit No.	Description
0	15	error
1	14	data late
2	13	rewinding
3	12	illegal
4	11	high density (always 1)
5	10	data error
6	9	EOT (end-of-tape)
7	8	EOF (end-of-file)
8	7	BOT (load point)
9	6	9 track
10	5	bad tape
11	4	reserved
12	3	status changed
13	2	write-lock (1=no ring)
14	1	odd character
15	0	unit ready

Figure 3: RING_IS_IN

```
    logical function RING_IS_IN(aosvs_channel)

    include        "qsym.f77.in"
    integer        aosvs_channel
    integer*2      buffer                !small buffer
    integer*2      pkt(0:?ppblt-1)       !0:15
    integer*4      wa_buffer
    equivalence    (wa_buffer,pkt(?pcad))
    integer*4      ac0,ac1,ac2,ier
    integer*4      isys                  !f77 intrinsic
    logical        btest                 !f77 intrinsic

c>>>begin
c-->build packet
    pkt(?psti)=0                         !read 1 block
    pkt(?psto)=0                         !reserved
    wa_buffer=wordaddr(buffer)
    pkt(?prnh)=0                         !current file
    pkt(?prnl)=0                         !read block 0
    pkt(?prcl)=2                         !read 2 bytes

c-->read block 0
    ac0=0
    ac1=aosvs_channel
    ac2=wordaddr(pkt)
    ier=isys(?prdb,ac0,ac1,ac2)

c-->check bit (xxxxxxxxxxxxxOxx)
    if(ier.eq.0) then
        RING_IS_IN=.not.btest2(pkt(?pcs1),int2(2))
    else
        RING_IS_IN=.false.               !assume out
    end if
    return

    end
```

IOSTAT option in the F77 OPEN statement can be used to perform this function also (if the drive is off-line, then ?ERUOL will be returned). In fact, the OPEN must be successful before IO__CHAN will return a correct AOS{/VS}channel for use in the RING__IS__IN function.

In my tape processing programs, I tell the user to mount the tape and hit NEWLINE when ready (see subroutine HANG in the July 1986 issue of *Focus*, page 36). I then open the tape drive and check for the ?ERUOL error on the open. If the drive is off-line, then the program tells the user to put the drive on-line. The program loops in this manner until the drive is on-line. Then I use the RING__IS__IN routine to check the write-ring. If the tape is to be "read only" and the ring is in, the program tells the user to remove the ring. If the tape is to be written on, and the ring is missing, then the program will tell the user to insert a ring.

Each time NEWLINE is hit, signifying compliance, the ring is checked again. In either case, the program won't proceed until the write-ring has been either removed or inserted as required. In the case of programs that write on tapes, this avoids programs dying with tacky messages like "PHYSICAL WRITE-LOCK", which is certainly not very user-friendly:

```
ier=1
do while(ier.ne.0)
 open(20,file=''@mtb0'',
  iostat=ier, . . . )
 if(ier.eq.?eruol) then
  write(10,*)''put drive on-line,
   'NL' when ready''
  read(11,fmt=''(a)'') idummy
 else
  call errcode(ier)
  !die on unknown error
 end if
end do

ichan=IO_CHAN(20)

do while(RING_IS_IN(ichan))
  write(10,*)''remove ring,
   'NL' when ready''
  read(11,fmt=''(a)'') idummy
end do

read(20, . . . . .
```

The system isn't perfect—since we don't use the MOUNT command, the tape is vulnerable from the moment it is mounted until the program OPENs the tape for exclusive access. During that period, there is no protection from a careless user doing a DUMP command using the wrong tape drive name. If we used the CLI MOUNT command, then it would "lock" the tape drive from other users, but it still wouldn't protect the users from themselves.

However, with RING__IS__IN, I feel much more secure about our valuable field tapes, because users know that they won't be able to process any field tape that has a write-ring in it. They therefore tend to always check the write-ring first. Δ

John A. Grant is a geophysicist with the Geological Survey of Canada. He is also a contributing editor for Focus magazine and "system manager, chief cook, and bottle washer" for the Exploration Geophysics subdivision's MV/4000. He may be contacted at 601 Booth Street, Room 591, Ottawa, Ontario, K1A 0E8; 613/996-2325.

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OA TODAY

BY CHARLENE KIRIAN

DEAR CHARLENE . . .

Charlene's back, and helping CEO users cope

Dear Charlene,

I've noticed your column hasn't appeared in the last couple issues of *Focus*. Have you been taken captive by a hostile band of CEO users?

Just Curious

Dear Curious,

Hang onto the ransom money. I'm alive and well. After an operation to remove a literal "pain-in-the-back," I'm back to work. Thanks for your concern.

Dear Charlene,

When using CEO Connection to do file transfers, I keep getting FTCU errors. What am I doing wrong?

Foiled Filer

Dear Foiled,

I know how irritating those errors can be. Before you throw out the terminal, though, be sure that all the files necessary for firing up DG BLAST are accessible on the host processor. You might also check your memory requirements and the disk space available on your PC. If everything checks out, gather all the details of what you did, what type of equipment you're using, which error number is popping up, then pick up your phone and dial 1-800-DG-HELPS. The Support Plus maintenance agreement will help you through those trying times. Good luck!

Dear Charlene,

I have to send reports out to different groups of people in the company. I get so tired of typing their names and sending the same document 20 times. How can I speed up this process?

Monotonous Mailer

Dear Monotonous,

All the names of staff members that have accounts can be put into a mailing list within CEO. When you need to send the same document to all of them, just type the name of the mailing list and it will automatically be distributed to each individual. And if you have certain groups that only get some special materials, keep them separated into different mailing lists, which can then be embedded within the master mailing list. It will save you an abundance of time.

Dear Charlene,

My boss tells me I have to send 100 personalized invitations to our customers by tomorrow. Since I'm also responsible for getting all the food and entertainment planned, how am I ever going to write out all those letters? Help!

Frazzled Fingers

Dear Frazzled,

Your boss certainly doesn't expect you to write all those invitations by hand. Show him/her how efficient you are by using the List Processing function of CEO. By creating one basic "text" document, and one list document containing names and addresses for all of those invited, you can merge the two documents and have your 100 personalized invitations in the mail by noon tomorrow. You can even sort them by zip code using the sort/select feature (just in case you ever need a favor from the mailroom staff).

Dear Charlene,

When working with a particularly large document, I was going to SAVE a large portion of it for future use. But instead of pressing COPY, I pressed DELETE and the text disappeared. I was so frustrated at that point, I just gave up and went home. Now I have to start all over.

Waylaid Words

Dear Waylaid,

Such a sad story. But if you had just pressed COMMAND (F2), then typed UNDO, all those lost words would have reappeared magically. You better brush up on your functions available through the COMMAND key. Better luck next time.

Dear Charlene,

There's a certain format my boss prefers when sending correspondence. It's nothing really special, but it is mandatory that this format is used. Is there any easy way to specify these special printing instructions without having to set them up anew each time I create a document?

Pooped Printer

Dear Pooped,

By creating a Print Layout within the utilities menu, the format that you specify can be used each time you print a new document, without specifying the print setup each time. If you need to change a portion of it for a particular document, it still allows you to change, without changing the original layout.

Dear Charlene,

I'm getting ready to load a new revision of CEO, but I'd like to find out if there are any "gotchas" waiting for me. How can I do this?

Worried Watchdog

Dear Worried,

I suggest you call the Atlanta Customer Support Center and ask one of the CEO specialists. I've found them to be honest in telling users if they need to watch out for certain things. Or, if you subscribe to OIS (On-line Information Service), dial up and log on to the system for detailed information. Another avenue to pursue is calling a couple of your OASIS (Office Automation Special Interest Subcommittee) acquaintances. They're always willing to help each other. If you're not a member, contact me again and I'll send you information on joining.

Dear Charlene,

There are so many times I repeat the same series of keystrokes within a document. I just wish there was some easier and quicker way to do this.

Shortcut Searcher

Dear Searcher,

You desperately need some training in the use of user commands. By recording those often-used keystrokes in a command, or assigning that command to a function key, you will cut your processing time considerably. I know of one user who created a monthly report by user commands only. She created commands to combine all the staff reports, delete the old documents, and print out the new report within 16 minutes. I was impressed.

If you have any questions you'd like to have answered, or problems that you haven't been able to solve, send them to Dear Charlene, c/o Focus Magazine. Δ

Charlene Kirian is OA training specialist for the On-line Computer Library Center, Inc., 6565 Frantz Road, Dublin, OH 43017; 614/764-6435. She also serves as president of NADGUG's OASIS Office Automation Special Interest Subcommittee and is a contributing editor for Focus.

BY BRIAN JOHNSON

LAW OF DIMINISHING RESOURCES

Why new revs put greater demands on system resources

:++RESOURCES

This month I'm going to cover a topic that has been on my mind for a long time. The events of the past few days have conspired to get me to finally write about it.

I had already written most of a column when the time came to upgrade the MV/4000 I use from 6.06 to 7.54. I did the upgrade sooner than I usually do, because of some positive comments about the upgrade on the RDS/NADGUG bulletin board and because I had been running 7.51 on an MV/2000 for several months with only a few problems. As a result of the upgrade, the existing column got impaled on the Future Topics spike and replaced with this one.

Aside: anybody who doesn't check the RDS/NADGUG bulletin board before upgrading anything is brain damaged. The phone number is listed under "On-line Help" on the table of contents, page 2. All you pay for is the phone call.

GORY_DETAILS

I use a pair of MV/4000s hooked together using an MCA with XODIAC and XTS. Last weekend I upgraded one of the systems to AOS/VS 7.54 from AOS/VS 6.06. The upgrade went extremely smoothly. On Monday morning, most of the users didn't even notice the new rev. Very refreshing. It makes rev 7 worth the wait.

I had intended to upgrade both systems, but one of the systems had two long-running batch jobs, so I gave up and went home. I was running :PERFMGR on Monday morning and noticed that my available memory had fallen significantly. It occurred to me that this presented a unique opportunity to compare AOS/VS 7.54 to 6.06 under ideal circumstances: both machines are configured identically. So I hung around Monday night after everybody went home, and I ran two tests.

Table 1: Additional resources used by AOS/VS rev 7.54

Test 1	AOS/VS	Shared	Unshared		Total
7.54, 17 PIDs:	878KB	958KB	1570KB	=	3406KB
6.06, 17 PIDs:	740KB	798KB	1152KB	=	2690KB
Difference:	+138KB	+160KB	+418KB		+716KB

Test 2	AOS/VS	Shared	Unshared		Total
7.54, 68 PIDs:	1012KB	1028KB	4084KB	=	6124KB
6.06, 68 PIDs:	876KB	800KB	2852KB	=	4528KB
Difference:	+146KB	+228KB	+1232KB	=	+1606KB

7.54 Incremental cost per PID: (1606-716)/51 = +17KB/PID

Figure 1: The benchmark

```
COMMENT ********************************
COMMENT * BJ's INFOS CPU-time benchmark *
COMMENT ********************************

COMMENT NOTE: This benchmark is relatively immune to disk
COMMENT    speed, system load, and INFOS page size.
COMMENT    Its primary purpose is to measure CPU time
COMMENT    consumed by INFOS during two common INFOS
COMMENT    operations: sequential writes and sequential
COMMENT    reads, both using single-level keys. It
COMMENT    assumes that AOS/VS, AGENT, and SORT CPU
COMMENT    time are negligible. Histograms have
COMMENT    indicated that this is indeed true.

COMMENT See if we need to make the sequential input file.
[!EQUAL,[!PATHNAME PATHNAMES.SEQ],]
COMMENT Replace ":D3:UDD:BJ:" with some directory pathname
COMMENT    that contains at least a few thousand file names
COMMENT    beneath it.
FILESTATUS/CPL=1/L=PATHNAMES.SEQ/NHEADER :D3:UDD:BJ:#
[!END]

COMMENT Delete the existing INFOS file.
[!NEQUAL,[!FILENAME PATHNAMES.DB],]
IDELETE/V PATHNAMES.DB
[!END]

COMMENT (Re)create the INFOS file.
X/M ICREATE
PATHNAMES
<insert 23 or more blank lines at this point>
)
COMMENT Load the INFOS file.
X/M SORT/C
INPUT FILE IS "PATHNAMES.SEQ",
RECS ARE DATASENS UPTO 256 CHARS.
OUTPUT INFOS INDEX IS "PATHNAMES",
RECORD IS 1/LAST, PATH IS *.
KEY 1/LAST.
COPY.
END.
)
WRITE Secs/record = Copy pass CPU time/record count
WRITE

COMMENT Read all the records sequentially.
X/M SORT/C
INPUT INFOS INDEX IS "PATHNAMES",
PATH IS *, RECORD,
RECS ARE VARIABLE UPTO 256 CHARS.
OUTPUT FILE IS "@NULL",
RECS ARE VARIABLE UPTO 256 CHARS.
COPY.
END.
)
WRITE Secs/record = Copy pass CPU time/record count
WRITE

COMMENT That's All Folks!
WRITE Done!
)
```

In the first test, I simply rebooted both systems and used :PERFMGR to measure the memory consumption with only one person logged on (me). In the second test, I PROCed up 51 CLIs (I intended to do 50, but I screwed up) doing PAUSE 1024 to measure the incremental memory cost of a process due to the system and AGENTs. Since the CLI and AGENT were already in memory (51 times), the difference in memory would be simply the additional unshared pages consumed by each systems' table space, the CLI, and its AGENT in ring 3.

The results of the test are shown in Table 1.

:QUINCY

From the results, it appears that for my initial process load (EXEC, 1 XLPT, XODIAC, XTS, :PERFMGR, WPEXC, and my CLI), the difference required simply to boot is about three quarters of a megabyte. At the level of 50 more processes the additional cost per PID for 7.54 is 17 KB, or 1.7 MB per 100 PIDs.

A check of .PR file sizes showed that EXEC.PR has grown by a factor of 6 in size, going from a 16-bit to a 32-bit process. AGENT.PR has grown by 45 percent, and XLPT and the CLI have remained pretty much unchanged.

:POST_MORTEM

What's it all mean? Well, it's pretty obvious that if you're currently swapping heavily or you have lots of excess memory, then you'll see little difference upgrading to 7.54. Your performance will remain lousy or excellent respectively. However, if you're one of those poor souls who's only swapping occasionally, rev 7.54 will change your performance dramatically.

How did this happen? Is this all part of a massive conspiracy by DG to sell you more memory? I have a hard time believing that the "What will we do next?" group in the marketing department has their act that together. After all, look at what they did with media interchange on the MV/2000. I suggest we check to see if they indulged in insider-trading on file transfer software packages. I doubt it.

Nope, what's actually happening is two things; the market expects and demands (via their RFPs, RFQs, and dollars) more and better functionality, and DG's internal goals for software development conflict with your goals as a user of their system software.

Let me give you a few examples of the market forces. Every year at the NADGUG national conference lots of users plead for increased functionality in the CLI, specifically, named variables and strings, looping, added pseudo-ops, and an expanded address space so that ridiculously overfilled directories can be listed without causing the CLI to restart. CEO users have a wish list about a mile long. Prospective customers are demanding graphics with windowing, networking with everything including their microwave ovens and blenders, twelfth-generation languages with relational data bases, and systems that are easier to use and manage (hence the new System Management Interface).

All of this stuff costs. It costs increased disk I/O, increased CPU consumption, and increased base and per-user memory consumption. However, none of these pressures are unique to DG. Any of you old-timers remember when Unix supported 32 users comfortably on an un-

mapped 64 KB PDP 11/40? Try getting a Unix system to run 32 users with less than a couple of megabytes today. Not a chance. So at least in this case, the only thing we can say is "Mea culpa."

In terms of DG's goals versus users' goals, the cause is a bit different, but the effect is the same. DG runs a large programming shop. It is in their best interest to control the costs of developing and maintaining the mountain of software products they offer. In addition, they have a staffing problem in that the supply of competent systems programmers is limited and other players are competing for the scarce resource.

Put yourself in the position of the head of software development at DG. You find yourself surrounded by mountains of machine language code, and the personnel department is having a hard time coming up with good PL/I and C programmers. Forget finding people who already know DG's or anybody else's instruction set. The local colleges and universities are cranking out Pascal and C programmers like crazy. The only machine language they've seen was in a "History of Programming" course back in their sophomore year.

What do you do? Simple: you start converting the machine code into PL/I or C or whatever else the personnel department says is in long supply before the last of your machine language coders retires to the Old Programmer's Home, dies at his tube, or voluntarily commits himself to the Funny Farm.

So, what's so bad about PL/I and C? Isn't Unix written in C? Yes, it is, except for a few low-level routines that interface with the hardware, and a handful of routines that were determined to be bottlenecks worthy of hand-coded machine language. But Unix C has several advantages: its runtime libraries are quite small because the language was designed to map quite nicely onto the PDP 11 instruction set, and its libraries don't have the burden of overgeneralization to support inter-language calls.

Try writing a one-line COBOL, C, or PL/I program and linking it on AOS/VS with a load map. Take a look at the size of the shared code area. I just did it, and a one-line COBOL program caused 60 KB of libraries to get loaded. I remember back in the early 1970s when I was assisting some guys at Xerox PARC to get the BCPL compiler (a predecessor of C) ported to RDOS. Its runtime library was about 300 bytes and consisted mostly of things that the Nova instruction set couldn't handle easily, like XOR and byte addressing.

It's exactly this set of conflicting issues that has caused some manufacturers to implement system programming languages for in-house use only or for limited release.

OK, that explains how memory usage has ballooned over the years. To some extent it also explains how disk usage has gone up. After all, those larger programs have to be dragged into memory from the disk at some point. But what about CPU consumption?

Well, one of the risks of implementing things in high-level languages is that the terseness of the language syntax tends to hide the generated code size and CPU cost from the coder. Therefore, it is much more incumbent upon the developers who use high-level languages to analyze the performance of their software more closely than a machine language coder needs to. Unfortunately, the pressure of deadlines and

STRs inevitably causes this effort to get pushed way too deep on the "Things to do today" stack.

:CASE_STUDY

As an example of these trends, take what's happened to INFOS over the last few years during the time when it got recoded into a high-level language and changed from a global server (one-time memory cost) to a local inner-ring server (per-PID memory cost). Over time DG's most widely used file management system has changed from being almost IPC and I/O-bound to badly CPU-bound.

I ran a short benchmark (see Figure 1) on my MV/4000 using INFOS 4.02—it shows that a single-keyed sequential write takes 29 ms. of CPU, and a single-keyed sequential read takes 19 ms. of CPU. That translates to 34 and 53 keys/records per second, respectively, with nothing else going on and zero idle CPU. A histogram of the process during the benchmark shows several sharp peaks in ring 3 which coincide with small sections of INFOS code doing character move sequences. The INFOS source code is probably some innocuous-looking two or three lines of code, but it accounts for about 40 percent of where INFOS spends its time. This is a classic case of a candidate for hand-coded optimization using machine language.

:NET_NET

Increased memory consumption by system software is inevitable. It's too bad that the maximum memory available on certain CPU model numbers is not cranked up to compensate for it. As a result, some of you are going to find yourself stuck on rev 5 or 6 until you can afford to spring for a bigger processor.

It's OK to code system functions in high-level languages if critical regions get some attention paid to them. If INFOS is any indication of the state of system software in general, then the same attention probably needs to be paid to other products as well. High-level language implementations take more memory, but as long as the cost of memory and the capacity of the processor to hold it rise in step, that is not too serious a problem. CPU also tends to go up as the products are recoded into higher level languages, partly due to increased program size (where there's code, there's CPU consumed), and partly due to how easy it is to write simple constructs that consume lots of CPU.

Personally, I can't see how a piece of code that will be executed an infinite number of times during its lifetime can be coded in anything but machine language. That covers things like critical regions of the operating system, PMGR, AGENT, XLPT, and the language runtime libraries.

Now you know why I'm not the director of software development at a Fortune 500 company. Δ

 B.J. is the president of B.J. Inc., a San Francisco-based consultancy specializing in system auditing, system management, and performance analysis. He is also a contributing editor to Focus Magazine. He can be reached at 109 Minna St., Suite 215, San Francisco, CA 94105; 415/550-1444, Telex 296544.

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Dataram introduces low-cost add-on memory

Princeton, NJ—An add-on memory product called the DR-280 has been introduced by Dataram Corporation.

Compatible with Data General's MV/4000, MV/10000, and S/280 systems, the DR-280 is available in 2 MB, 4 MB, and 8 MB versions, all 256 KB based. The additional memory provided by the DR-280 may be useful to Data General computer users who want to improve response time, run existing applications quicker, serve additional users without impairing performance, or add new applications.

Patrick Carr, product manager, said, "We believe the DR-280 addresses performance problems by adding power to the existing system and prolonging its life at an affordable cost."

According to Dataram, the DR-280 is priced 40 percent below comparable add-on memory products. The company also offers a lifetime warranty for the DR-280.

Additional features of the product include:

•A memory disable switch, easily accessible from the rear card edge, which allows for the electrical disabling of memory without having to physically remove the board. By taking the Dataram module off-line when troubleshooting, confusion over the source of a problem is eliminated.

•An allocation of boundaries to comply with that of the existing system configuration. Therefore, Dataram memory can be easily added to an MV/4000, MV/10000, or S/280 without having to reconfigure the existing memory.

•User accessible memory starting address switch. A cutout through the DR-280 protective shield is aligned with the memory starting address switch. The protective shield does not have to be completely removed to set the switch.

According to Barry Blumber, marketing director, "The DR-280 fills a growing need in the marketplace for owners of Data General computers who want to considerably improve their data processing performance and extend the life of their hardware in a cost-effective manner."

Dataram Corporation, P.O. Box 7528, Princeton, NJ 08543-7528; 609/799-0071. Δ

Switched line/leased line security modem

Youngstown, OH—The 424 Line Backer is the latest in the 424 series of V.22bis/212A 2400 bps modems offered by Western DataCom.

The Line Backer's non-volatile memory allows user configuration as either a two-wire dial-up modem with call back security or a four-wire lease line modem with two-wire dial backup.

When configured for call back security, the Line Backer will challenge all dial-up entries for a user phone number. Upon reception of a valid number, the user will be instructed to hang up and wait for a call back. The modem will then drop the line and call the number of the user site. Upon connection, the user will be prompted to enter his or her access code for call back

back verification. Simple password protection can also supported by this operating mode.

Up to 56 access codes/phone numbers can be edited by using the menu-driven editor. Switching from learn mode to run mode and back again is controlled by the only switch on the modem.

When the Line Backer is installed in a four wire leased line connection, it constantly monitors the link for carrier. In the event of a leased line crash, an automatic dial backup procedure will occur over the switched network; however the Line Backer can also be configured for manual dial backup.

During both automatic and manual dial backup, call progress (as well as the status of the leased line) is sent to the user's terminal.

Extensive diagnostics, complete network node functionality, and speed conversion are among the features of the product. All modems that meet Bell 103, 212A, or CCITT V.22bis over two-wire switched lines or four-wire leased lines are fully compatible.

The unit price is $795.

Western DataCom, 5083 Market Street, Youngstown, OH 44512; 216/788-6583, Telex 910-333-8609. Δ

Launch of disaster recovery service for Data General users

New York—Track Data Corporation has announced the formation of Fast Track Systems, Inc. The new company provides comprehensive, fully supported disaster recovery services for all Data General users.

"As computer systems switched from batch to on-line environments," said Barry Hertz, president of Track Data Corporation, "companies began to rely more and more on their information systems. With this reliance came the need to insure the survival of the business in the face of a disaster."

Citing a study from the University of Minnesota MIS Research Center, Hertz said that a typical company could lose up to 60 percent of its operational effectiveness if its computer service was out for four days, and that by the end of the second week the company would be functioning at 10 percent.

Disaster recovery is a methodology that defines the steps to be taken to ensure the timely and orderly restoration of an organization's data processing capability. According to Hertz, the only cost-justifiable method to ensure continued data processing is a fully equipped hot site.

Fast Track has hot sites in New York City and Chicago that are fully equipped with multiple MV/10000 processors, disk drives, tape drives, CRTs, printers, and full telecommunications capability. Clients can communicate with the hot sites from remote locations or can utilize the available office space at each location.

To meet the needs of those clients who require close proximity of their computer center to their operations, Fast Track also has Mobile Recovery Centers. Hertz said, "These units are portable, self-contained computer rooms that can be transported directly to the user's site." The unit is complete with air conditioning, desks, telephone connections, all electrical hookups,

AD INDEX

PRODUCT SPOTLIGHT

bathroom, and raised flooring. In addition, a power generator is available if necessary. These Mobile Recovery Units can be fully configured with a Data General computer to provide fully portable, mobile hot sites.

Fast Track Systems, 61 Broadway, New York, NY 10006; 212/422-9880. Δ

Eagle announces Extender utility

Salina, KS—Eagle Software, Inc. has introduced the Extender, a new utility for the VS Toolbox, bringing the total to 16 utilities.

When an INFOS index or data base volume has reached its maximum size and an additional page is needed, INFOS tries to allocate that page in the next volume. If only one volume exists, or all volumes have reached their maximum size, INFOS is unable to allocate the new page and returns the error "All volumes at maximum size."

The Extender will add a volume to an existing INFOS index or data base. This allows the user to continue using the file without needing to re-create it.

Companies that have already purchased the Toolbox will receive the Extender for no additional charge.

Eagle Software, Inc., P.O. Box 16, Salina, KS 67402-0016; 913/823-7257. Δ

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backup and recovery, for instance. System test all modules, perform volume testing and tuning, and plan your installations. (You could use the beta installation plan for this last.)

Implementation demands that attention be paid to the production environment, conversion, system startup and delivery, problem resolution, and documentation change requests.

With careful attention to the users' requirements and needs throughout the project, user acceptance and satisfaction are assured. A new star is born the moment the system is implemented.

Thanks to 4GLs we can now adopt a more flexible approach than was possible with the third-generation, one that really suits the size and environment of a project.

But, let's not forget to carry with us what we learned yesterday. We need to live on sound principles to become successful system developers. What counts, after all, are efficient systems and user satisfaction. Δ

Senior product manager Marc Praly joined Cognos Inc. as a senior consultant in 1979. He has been in the information management field since 1967. He can be reached at Cognos Inc., 3755 Riverside Drive, Ottawa, Ontario, Canada K1G 3N3.

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in certain applications, but the next technology will be magneto-optics. These will be magnetic disks that handle reads and writes with lasers, giving lots of capacity and high performance. We expect the technology to become available within one to three years, and to be dominant within five to six years.

Q. It's part of your job to stay abreast of recent developments in the industry. In your view, what are the most exciting and/or significant developments of the last few years? How are these likely to affect the products coming on the market in the next few years?

A. The PC and the Macintosh have already made big changes to the human interface, and all future computer products are going to have to reflect this trend. There will be a lot more of them, they'll be networked together, and they'll be more responsive to the user. Networking and interconnectivity will continue to be a major emphasis. In software, Unix hasn't caught on the way a lot of people were predicting it would, but it is still a very significant development.

In pure technology, high-density CMOS will soon let us put more than a million transistors on a single chip. I'd say we should expect the same curve for price, density, and performance to continue for the next several years. Δ

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FOCUS ON: PROMISING TECHNOLOGIES

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ing the second processor to perform more efficiently.

Placement of a data file on the disk cannot be very easily controlled by the user. If heavy I/O activity is being done to a data file, the key point is that the placement of the data file must be consistent between application test executions. If the data file spans two cylinders for one test run, it should span two cylinders for any other test run. It is not obvious that this would make a large difference in test execution time, but it can.

For example, using our Contest Disktest, (on an Eclipse MV/4000 system in this case), and writing 20 sectors to a 20-sector data file, if the data file resides wholly on a single cylinder, the test has an average test time of 245 seconds. If the data file spans two cylinders, the test has an average test time of 325 seconds. This I/O activity may be more extreme than most application programs, but to produce consistent results, the data file must be consistent between test executions.

Data placement consistency can be achieved by either not deleting the data file(s) between test executions, or PCOPYing to the disk before each test execution so that the data file(s) always reside in the same place on the disk.

The main bottleneck areas—CPU, memory, and I/O—need to be considered whenever the system configuration is changed. For example, when upgrading from a uni-processor to a dual-processor, if additional load is going to be added, consideration needs to be given to whether more memory, more disk drives, or a redistribution of the files/data bases on the existing disk drives need to occur to use the second processor more efficiently. Technically, the only change that needs to be made to use the second CPU is the plugging in of the second CPU (and possible FPU) board and issuing the CLI JPINIT command. In actuality, other configuration changes may be needed to get the maximum efficiency out of that second processor. Δ

J. R. Gilgis is a programming staff specialist for Data General operating software development.

WordPerfect Corporation is moving ahead quickly with its strategy of providing integrated office automation products across hardware environments. Starting from its original WordPerfect word processor for the DG environment, the company preserved the same file structures when it expanded into the IBM PC arena a few years ago. When they developed their MathPlan spreadsheet, they used similar function key layouts and compatible file structures. Then in the DG 32-bit environment they added OA functions with their Library product, which is now installed at more than 100 sites.

The latest step was to produce a version of their word processor to run on DEC's VAX machines. Released in mid-February, the DEC version won an award at DEXPO as the best word processor of the year—even before it was actually being shipped. Now the company is porting its Library mail facility to VAX, and is working on an IBM mainframe version for release late this year. A company spokesperson says WordPerfect will continue to develop and test products in the DG environment while working to port them to other environments. The company will soon introduce a Toolkit product to aid users who want to integrate other software with WordPerfect Library.

According to W.E. Pete Peterson, WordPerfect's executive vice president, total sales for the year were $52,239,238—and it was the first year DG sales exceeded $1 million.

■

Doug Kaye's mood matched the soaring stock market in mid-January. His company, Rational Data Systems, had just sold 10,000 copies of its PC/VS software to the E.F. Hutton company. Hutton has bought 10,000 PC AT compatibles from NCR, and is putting one on the desk of each of its brokers worldwide. PC/VS will be used to link the ATs with the approximately 450 MV/series machines that E.F. Hutton uses in the middle tier of its network. According to Kaye, Hutton is the ideal client: "They're technically sophisticated, and they *want* to work with you." They also write big orders.

■

MAXON Computer Systems has bought a 50 percent share in CMS/Data Corporation of Tallahassee, Florida. CMS/Data, with 60 employees and sales of more than $5 million, has provided office automation and data processing for the legal profession for more than eight years. Through its CLO (Comprehensive Law Office) product, it is one of the largest suppliers of WordPerfect word processing on DG systems.

MAXON reports that the CMS/Data management team will not change, but that the two companies expect to reduce operating costs by combining their sales, service, and R&D.

■

Desktop publishing is expected to be a market worth more than $5 billion by 1990. DG recently got in the act by signing an independent software vendor agreement with Intercon Associates. Intercon's Office/Publisher software integrates with CEO; it accepts CEO documents, then recomposes, paginates, and produces graphics-quality output with popular laser printers or phototypesetting machines. Prices for Office/Publisher start at $5,000 for an MV/2000 DC system.

■

The UK Users Group will hold its annual conference April 2-3 in Birmingham, England. Brian Cooper, chairman of the group, who was putting the finishing touches on the conference program at press time, said one of the highlights would be a lecture on software licensing—a touchy subject for European users.

Cooper added that the UK Users Group will pay for two of its members to attend NADGUG's Conference 87 in Las Vegas next October. They're also working on arrangements to charter a plane for the 50 or so UK members who would like to come to the Las Vegas meeting if the price is right. Officers of NADGUG and the UK group are hoping that this kind of international sharing will become routine in years to come. Anyone wishing to attend the UK conference can get information from Chairman Cooper, c/o Tarmac Roadstone Holdings Ltd., Roadstone House, 50 Waterloo Road, Wolverhampton WV1 4RU, United Kingdom; Telex 339825 TARMAC G.

■

The Tax Reform Act of 1986 gave DG's earnings for the first quarter of fiscal 1987 a boost. A nonrecurring tax credit raised net income to $3.3 million ($.11 per share), which compares to $1.1 million ($.04 per share) for the same period last year. The first quarter figures included a loss of $2.9 million resulting from DG's equity in an unconsolidated affiliate.

"Equipment revenues were down 7.4 percent from our previous quarter," said President Edson D. de Castro. "This underscores the fact that we have yet to see any sign of improvement in industry-wide demand." He added that DG is continuing to increase staffing of its field sales and system engineering organizations while concentrating on high-growth markets and new product introductions.

■

DG's new Conversion Assistance Center in Cambridge, Massachusetts, is part of an effort to recruit new value-added resellers (VARs). The center is equipped and staffed to help VARs convert their software to run on DG machines or to integrate their vertical application software with CEO. "Our overall objective is to become the vendor of choice for prospective VARs," said J. David Lyons, vice president of DG's Business Group. DG is also forming four regional VAR councils in the U.S. and one in Canada, and is enhancing its On-Line Solutions Directory of VAR and independent software vendor (ISV) products that support DG hardware.

■

The Sysgen Group of Ronkonkoma, New York, is completing a private placement of stock through Trikon Investment Corporation of Jacksonville, Florida. The group has acquired three computer-related businesses: Sysgen Data, a seven-year-old reseller of DG equipment, Microland Exchange, a two-year-old distributor of IBM and compatible PCs, and Sysgen Recovery Services, a newly created disaster planning and recovery service for DG installations. Raphael M. Feldman, the founder of these companies, will be board chairman. Dr. William Queen, former president of Corbel & Company of Jacksonville, Florida, will serve as president and CEO.

■

Ralph Gallizzi and JoAnn Gentile, both formerly with the Pinzone Companies, have formed Compuplan International, a new company based in Desoto, a suburb of Dallas, Texas. The firm will specialize in selling and leasing new and used DG equipment, PCs, and communications devices, and providing depot repair, maintenance, and configuration services.

■

A letter is going out to McDonnell Douglas' Unigraphics customers to say that the company will no longer be an OEM for Data General equipment, although it will continue to sell Unigraphics software for DG systems. The letter makes a commitment to enhance the software through at least one more rev, and to provide maintenance through 1988 at a minimum. Δ

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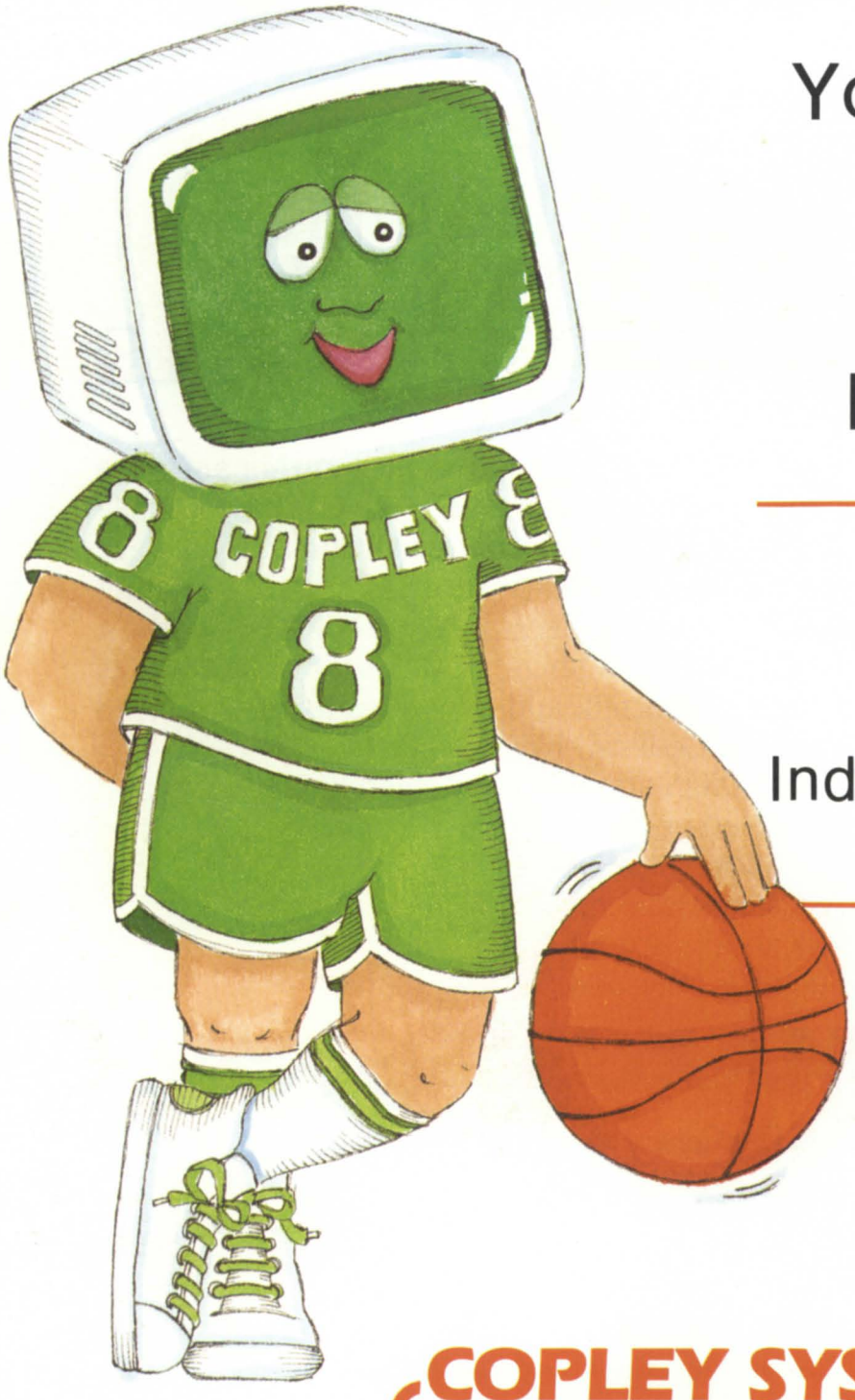

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