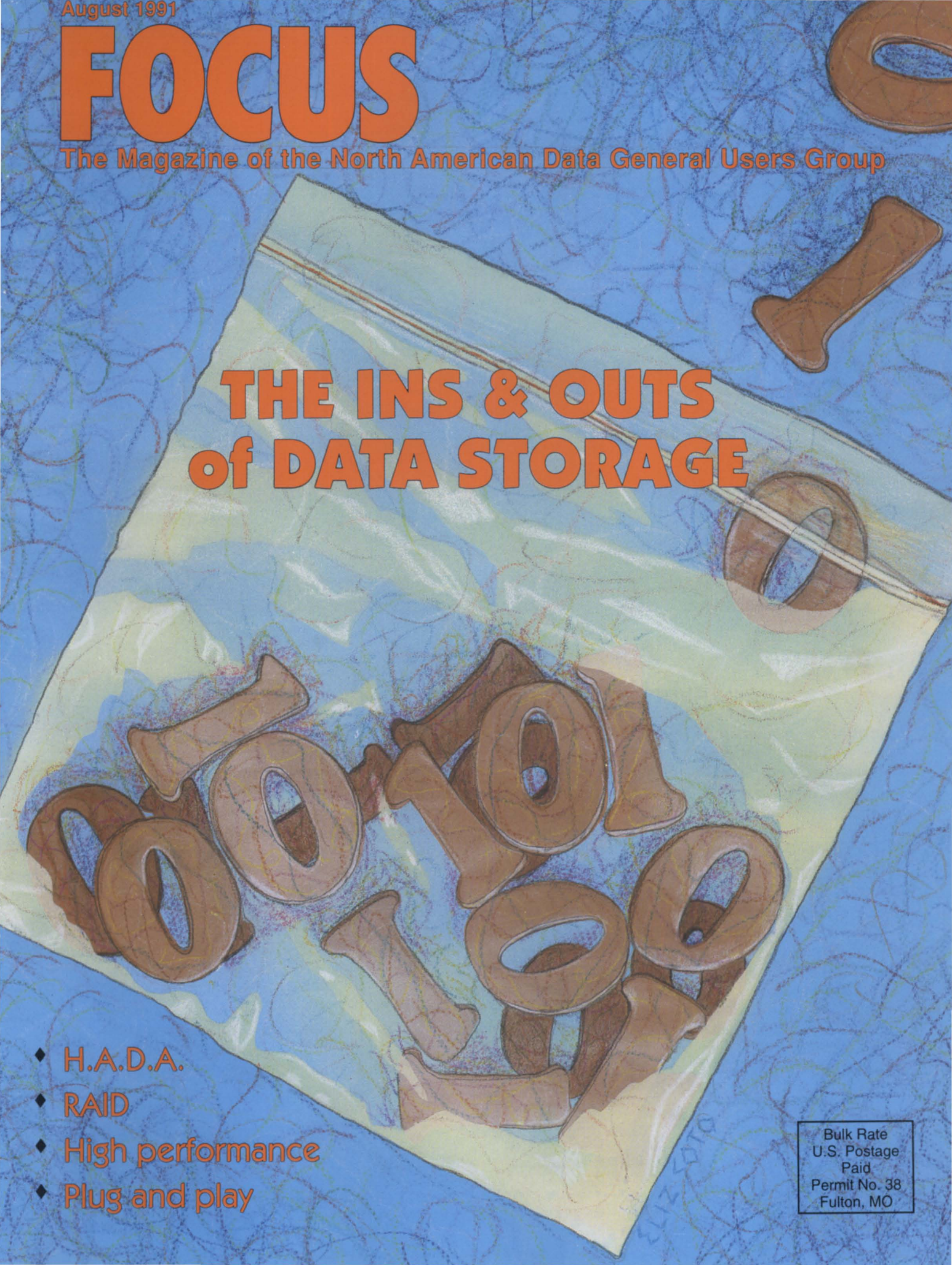
August 1991

FOCUS

The Magazine of the North American Data General Users Group



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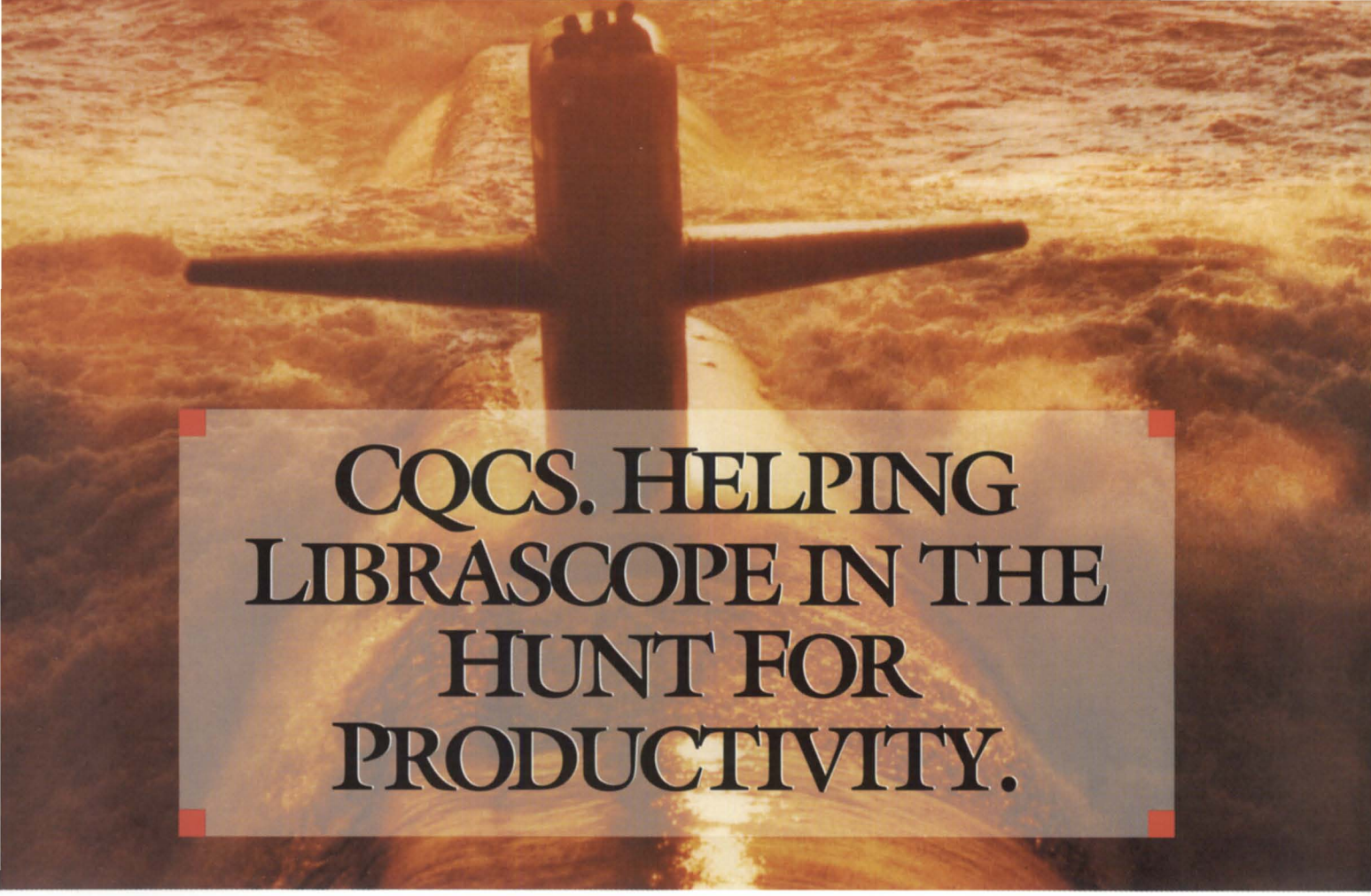

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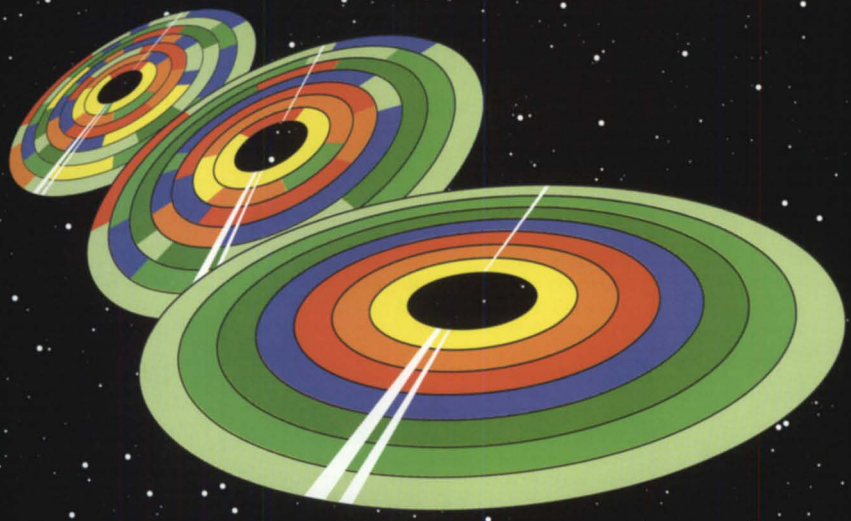

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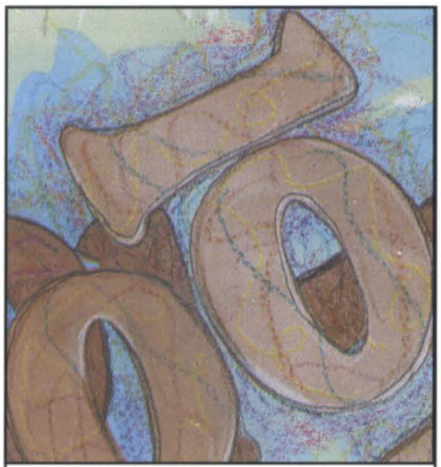

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Volume 7, Issue 8.

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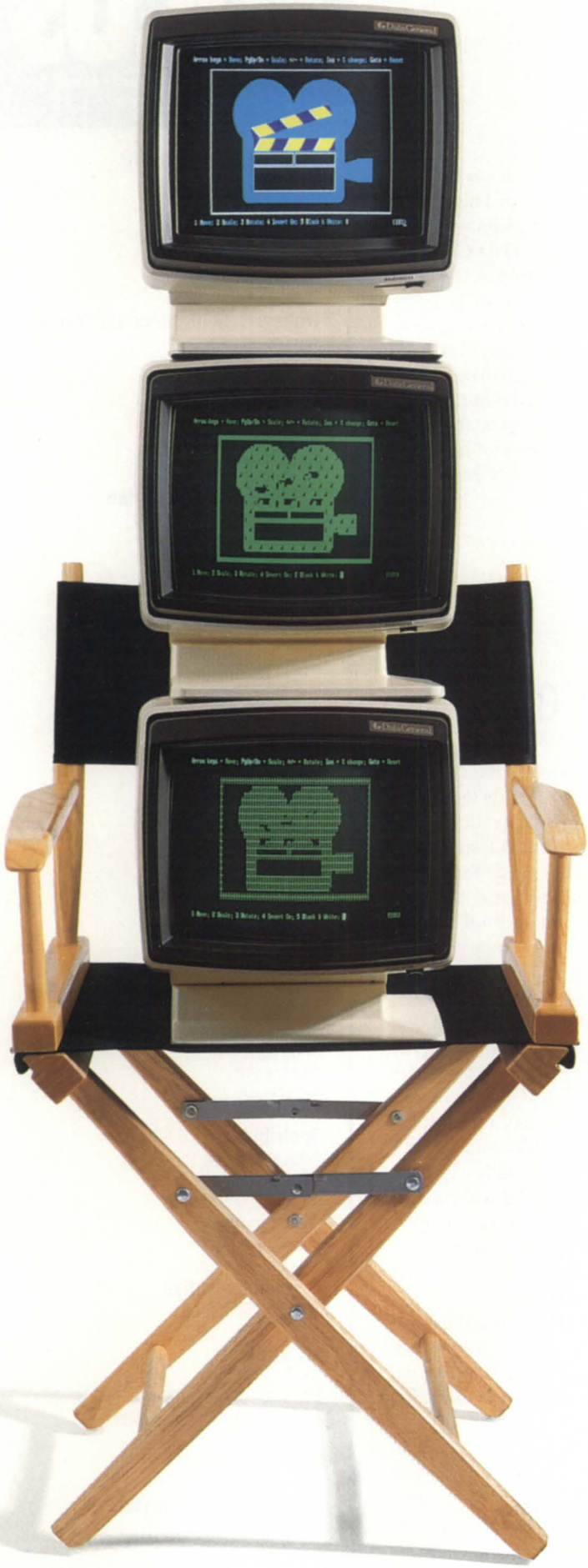

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EDITOR'S NOTE *by Robin Perry*

Back up and back again

This month's focus on storage subsystems generated a lot of interest. In fact, it was one of those issues where I had more qualified people wanting to write on a particular topic than I could accommodate within the allotted pages. A lot of the excitement comes from Data General, which has an apparent winner in its H.A.D.A. storage subsystem. The whole spectrum of data storage subsystems is changing rapidly, with the advent of RAID, SCSI-2, and more storage than you dreamed possible in a hand-held box. As the technology evolves, *Focus* will continue to keep you up to date on the latest developments.

I'd also like to mention a new columnist, Kim Medlin, who is not a new name to longtime *Focus* readers. Kim wrote for *Focus* in years past about Data General's commercial software projects. After a two-year absence, he returns to the pages of *Focus* with a fresh slate of ideas and a witty writing style. On a regular basis beginning this month, Kim will be writing about RAD—rapid application development. Again, we're keeping you informed on the latest technologies that help you get the most from your Data General systems. Δ

LETTERS

Sell customers what they need

I must compliment Gordon Haff on his article in the June issue ("Comparison shopping"). It was well written and very educational. However, I do disagree with a few of his arguments.

1. The 5-year cost figures are slightly inflated, as follows: Used MV/20000 mod 1 systems, with 64 MB of memory, are available in stock through companies such as Hanson Data for $55,000 to $60,000—not $120,000. Also, the annual maintenance price (through third-party providers) can run as low as $550 per month. As a result, the 5-year cost of ownership is actually only $88,000 to $93,000—about 37 percent of the cost of an MV/30 mod 2.

2. I think perhaps the most common reason we have upgraded customers to the MV/15 and MV/20 family is that the customer does not require any more power than that. The single most important statement Gordon makes in his article is ". . . technology by itself is not important. It may be nifty and interesting to talk about but, by itself, it does not help the customer." Is it safe then, to say that the best solution is to sell the customer what he needs?

While the MV/30000 is an exceptional machine, it is certainly not the answer all of the time. Quite frankly, if the customer is upgrading from a machine like the MV/4000, the MV/20000 is a much better choice for his application and needs. Price/performance issues and arguments must start with what the customer needs the iron to do. If, as is sometimes the case, the bells and whistles of the new technology will provide the customer with some real benefit, then the MV/30 may be the way to go.

Technology being what it is, the MV/30 will soon be obsolete as well, and a few years down the road we will be having the same argument about why the new MV is a better choice than the MV/30. Assuming that the customer really has a need to be concerned about scalability and growth potential, the ideal solution may well be to convert to Unix (odds are he will eventually, anyway), and purchase a more open architecture like Aviion, Sun, MIPS, etc. In this way, the customer will allow himself the most options in the future.

Perhaps the key to the entire issue is not an MV/30 vs. an MV/20, but proprietary architecture and operating systems vs. open architecture and operating systems.

Sincerely,
Richard Mooney
Engineering Manager
Hanson Data Systems, Inc.

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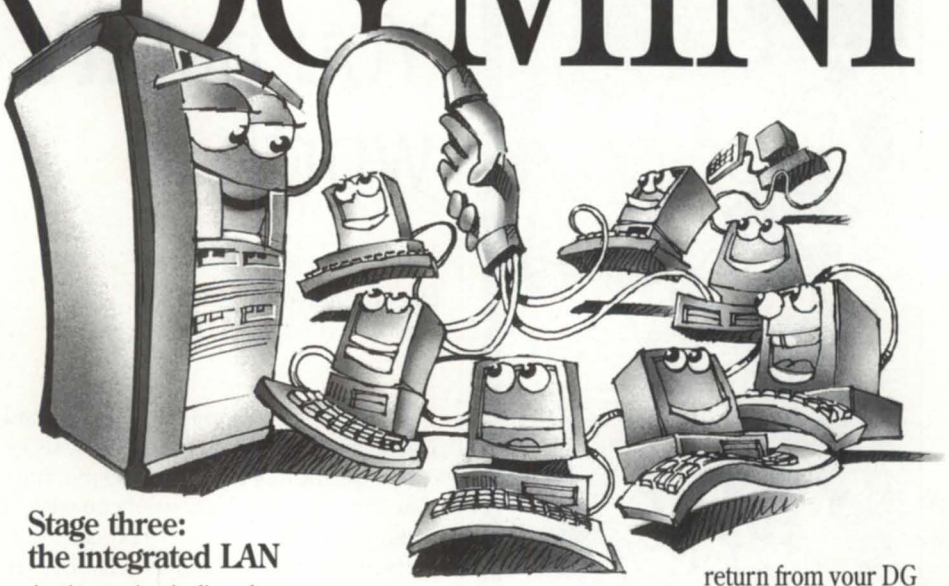

Linking your mini to your PCs isn't all that difficult.

And building a micro-mini LAN may be simpler than you think.

If you have a Data General minicomputer and a growing number of PCs, integration can make your life easier. But how far do you go? And how much do you spend?

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A completely integrated PC workstation can thread its way happily through everything you've got, including a vast array of DG, DOS and UNIX software. Now it's time for truly distributed applications. For CEO users, PC/Mail is already here. And later this year, we'll deliver the AOS/VS version of Portable NetWare. Even Data General looks to RDS for integration solutions.

There's a bible on the subject.

We wrote it. It's called *Report on PC Integration*, and the 1991 edition is just out. Read its 116 pages, and you'll really understand the opportunities and priorities involved in getting the most return from your DG mini. Most of the press run is already spoken for, but there are a few copies left. Get right back to us, and we'll send you one.

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You bet it's worth it

by Jan Grossman
Special to Focus

Thoughts of summer bring to mind weekends at the lake and backyard barbecues. But summer is also budget planning time at many organizations. If you wish to include the NADGUG 91 conference in your organization's budget, chances are that you will need to justify the expense to your management.

People attend conferences for one of two reasons: to solve an immediate problem, or to gain some long-term benefit. An immediate problem could be your search for a certain product—a 4GL, for example—and you know that several companies will be exhibiting their 4GL products at the conference. You can meet with the salespeople and have a hands-on demonstration. You save time by previewing a number of products at the same location, and you save money by investing in the product that is best suited to your company's needs.

"You know that the products are out there and you see the advertisements, but to me it's not sellable until I can get my hands on it and talk to the salesperson. We have bought a lot of things as a result of going to NADGUG," says Ramona Brown, MIS director for the City of San Marcos, Texas.

Long-term benefits include keeping abreast of technology and making contacts for future reference. The number one reason to justify attending a conference, in fact, is to keep informed about the most current technologies available. A convention manager from a Chicago-based association management firm reports, "People have told me that when they miss an important annual industry conference, they lose a whole year [of technical knowledge] in their business."

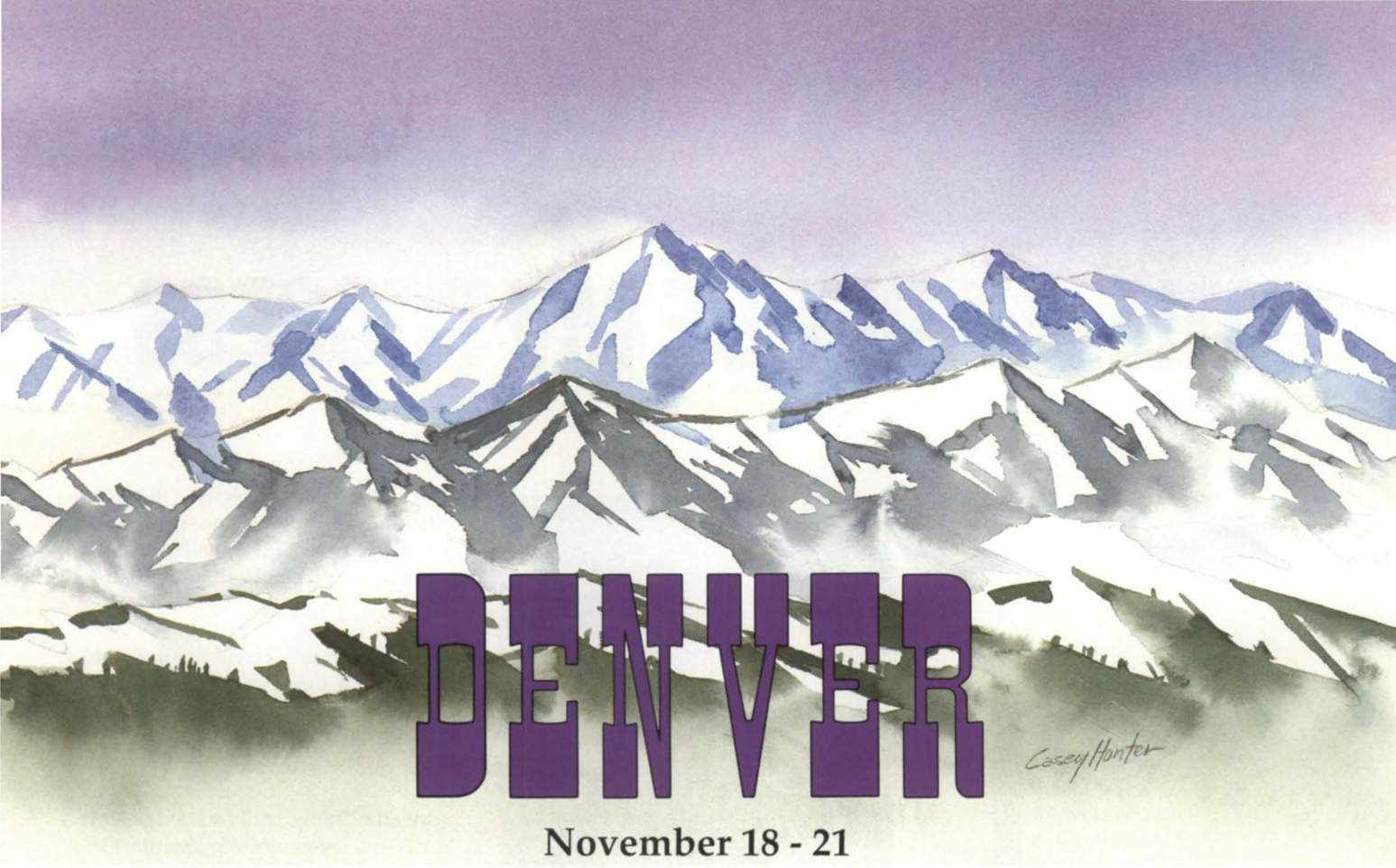
Networking opportunities abound at NADGUG. You meet with and discuss problems with people who have similar systems. People you meet at the conference may be of great value later on. You can call on a peer to discuss a solution to a problem, instead of hiring an expensive consultant. Just by talking with others in your profession, you can stimulate creative ideas to implement when you get back from the conference.

Data General senior management, software managers and developers, engineers, and marketing and sales staff attend NADGUG, and they are available to talk to you. Where else but NADGUG can you speak to Data General's senior managers face-to-face, people you would have difficulty reaching by telephone?

After the conference, experts recommend that you share your newfound knowledge with your colleagues. Upon returning, before you start answering all those e-mail messages that stacked up while you were out, take the time to organize the notes, business cards, session handouts, and literature that you brought home from the conference. Sharing information with your boss and coworkers will help in justifying attendance at future conferences.

It's not that management doesn't realize the value of attending conferences such as ours. It's just that in this day and age of belt-tightening and frugality, organizations may begin to think that cutting back on conferences is a relatively painless way to reduce expenses. I politely disagree with that kind of thinking. It is precisely times like these when attending a conference is of the most value. See you in Denver November 18-21! Δ

Jan Grossman, information services manager at H.A. Holden, Inc., of Minneapolis, is treasurer of NADGUG and serves as the 1991 conference chairperson. The NADGUG 91 conference will be held November 18-21 in Denver, Colorado, at the Colorado Convention Center. The conference hotline is 800/932-6663, or 508/443-3330 outside the U.S.



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Cool off and network!
The "Mile High City" offers much to do and see, so come and enjoy yourself and gain valuable information in the process. Take advantage of the second year the NADGUG conference will be held concurrently with DG's reseller conference (SOURCE 91) and DG's annual sales and systems meeting. Browse through the exhibit hall which offers products and services from over 75 vendors. Network with other DG users and be part of the largest DG conference in the world!

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NADGUG 91 will put you on track for the future. Be there and find out for yourself the rich resource this conference is to the Data General community. If you are a NADGUG member a registration kit will automatically be sent to you. If you are not a member, call our Hotline at 800/932-6663 or 508/443-3330 to request a kit. See you in Denver!

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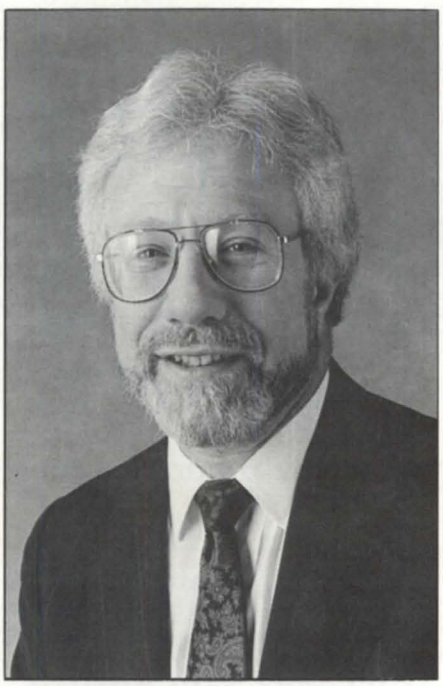
THE SECRET OF MV SUCCESS

SYNOPSIS

What drives the division responsible for the majority of Data General revenue? How does a proprietary product succeed in a world that's rushing toward open systems? Learn how the Eclipse Business Unit develops and markets new products in the follwing interview with Joel Schwartz.



Joel Schwartz

by Robin Perry
Focus staff

While the Aviion seems to capture all the glory, the real story behind Data General's fast start in 1991 is the Eclipse Business Unit. Where some observers expected DG's proprietary Eclipse MV line to fall to the wayside after the arrival of the Aviion and DG's plunge into open systems, on the contrary, MV sales have held steady for the past three quarters.

Entrusted with MV hardware development, software development, and product marketing is the Eclipse Business Unit, a tightly focused group of individuals within Data General who are dedicated to the MV's long-term survival. In some respects, as you'll see in the following interview, MV customers never had it so good. Joel Schwartz, DG vice president and general manager of the EBU, recently spoke with *Focus* to let us know what the organization has been doing since it was established in October of 1990, and to reveal the secret to its success. Highlights are listed below.

FOCUS: When the second quarter results came out, I think everyone was quite pleased, even surprised maybe, that MV sales had held steady for three quarters. How was this achieved?

Schwartz: Things really started off at the NADGUG users meeting [Seattle, October 1990] when we formally introduced the fact that there was going to be this new organization called the Eclipse Business Unit. That was sort of the kickoff of what we hope is going to be a very demonstrable and long-term commitment to the MV business.

In the next couple of months after that, we spent a lot of time out visiting with customers, talking to them, sharing with them our long-term strategy, letting them tell us what we were doing right and what we were doing wrong. Really giving them an opportunity to talk to some people that could make things happen. I think that certainly seemed to alleviate a lot of concerns people had as to whether or not we had a long-term strategy, and whether or not there was going to be a lot more products coming. The second thing is we started delivering against some of that; so it wasn't just a lot of talk, it was reality.

Probably the first, most visible sign on the hardware side was the MV/30000. It met its performance goals. It went in very cleanly. We shipped it around the world; it wasn't just a U.S. product. I'd say initially half the sales, in the first quarter anyway, went outside the United States. In fact, it got to the point where we couldn't build them fast enough to handle the orders. So that was a key step.

Then a little bit further along we intro-

WASHI wish list

by Robin Perry • Focus staff

(Editor's note: Data General was scheduled to unveil a series of MV products in mid-July. The following article, written in June, is based on information provided by Joel Schwartz, general manager of the Eclipse Business Unit, and Joe Mettee, director of Product Marketing.)

Data General is offering three new MV products based on WASHI technology: the MV/9600, the MV/9300, and the MV/5600. All three machines are available as board-level upgrades to existing DG hardware.

The MV/9500, one of two WASHI-chip-based products announced in April 1990, will split into two products, the MV/9600 and the MV/9300. The MV/9600, based on a faster implementation of the WASHI chip, will have a 40-percent performance improvement over the MV/9500. The 32 MB MV/9600, priced at approximately $90,000, will cost approximately $1,000 less than the 32 MB MV/9500.

The MV/9300 is a 3 MIPS machine with performance similar to the MV/3500, but at a substantially lower price. It will replace the MV/7800 XP. The MV/9300 has approximately 60 percent of the performance of the MV/9600, at about 60 percent of the price. The MV/9300 is directed primarily at customers with low-end MVs and Novas who have delayed upgrading to the MV/9500 for pricing reasons.

The MV/5600 is a replacement for the MV/5500 DC, the other WASHI-based MV. It will have approximately a 40-percent performance improvement, plus a better-performing disk I/O subsystem and more flexibility in the system configuration. Cost will be approximately 5 percent more than the MV/5500.

The three new products reflect the flexibility of packaging, fast development time, and performance improvements allowed by the WASHI, which contains 32-bit CPU architecture on a single chip. Δ

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MV20000 Model 1 to Model 2 upgrade	SAVE $
MV15000 Model 20 8MB	SAVE $
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MV10000 4MB Meter high cabinet	$3,500
MV8000-II 8MB Meter high cabinet	2,500
MV9500 8MB AOS/VS II	47,000
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MV8000 Model 9300	950
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MV7800XP 4MB	7,500
MV4000 2MB	700
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MV2000 Enhanced 4MB 160 MB disk	3,200
MPT100 Dual floppy	350
MP100 8520-D	350
S-140 256KB Floating point	1,500
Desktop 10 Floppy, 15MB disk	875
Desktop 20 Floppy, 15MB disk	1,295
S-120 256K 16 slot	550
S-280 2MB	1,900

Processor Options:

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8819 Second IOC for MV10000	1,800
8762 Expansion chassis MV10,8,4,S280	3,500
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4463-ZT USAM-4	$275
4380 ISC-2 (Synch)	600
4370 IAC-16 RS232, 20MA, W TCB	1,350
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6169-X D211 Monitor with keyboard	165
6391-X D214 Monitor with keyboard	200
6392-X D215 Monitor with keyboard	225
6393-X D411 Monitor with keyboard	175
6394-X D461 Monitor with keyboard	375
6500 D216 Monitor with keyboard	380
6682-A D217 Monitor with keyboard	395
6567 D412 Monitor with keyboard	475
6568 D462 Monitor with keyboard	795

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duced some software products, particularly the CEO Object Office, which showed that we weren't just doing moderate enhancements to CEO, but we really have a leadership product. We won major pieces of business and new accounts with that as our lead product.

Words are important, but there's nothing like a product to speak for you. Good begets good. As you start doing well and the word gets around, people get to understand your strategy. I think all that goes a long way towards establishing credibility, and I think that's what happened.

FOCUS: You say you won major pieces of business and new accounts. What percent of MV sales are to new MV customers?

Schwartz: We estimate about 25 percent of our sales on an annual basis go to new accounts. It primarily divides itself in two fashions. First, [are sales] through our VARs. On the average, approximately 50 percent of the VAR business is sold to new, first-time accounts. The other 50 percent goes to upgrades in the installed base. In addition to that, our primary new accounts through our direct sales force are through CEO-based opportunities.

Particularly with CEO Object Office, we have a leadership product that competes extremely well against all the OA vendors. It integrates PCs in a way that no one else does, at least at this point. It's imported over a whole variety of industry-standard LANs, so they're not tied anymore to either our proprietary LAN technology or anybody else's. We have a lead product and we want business. So when you put it all together, it represents probably a little over 25 percent of all our sales.

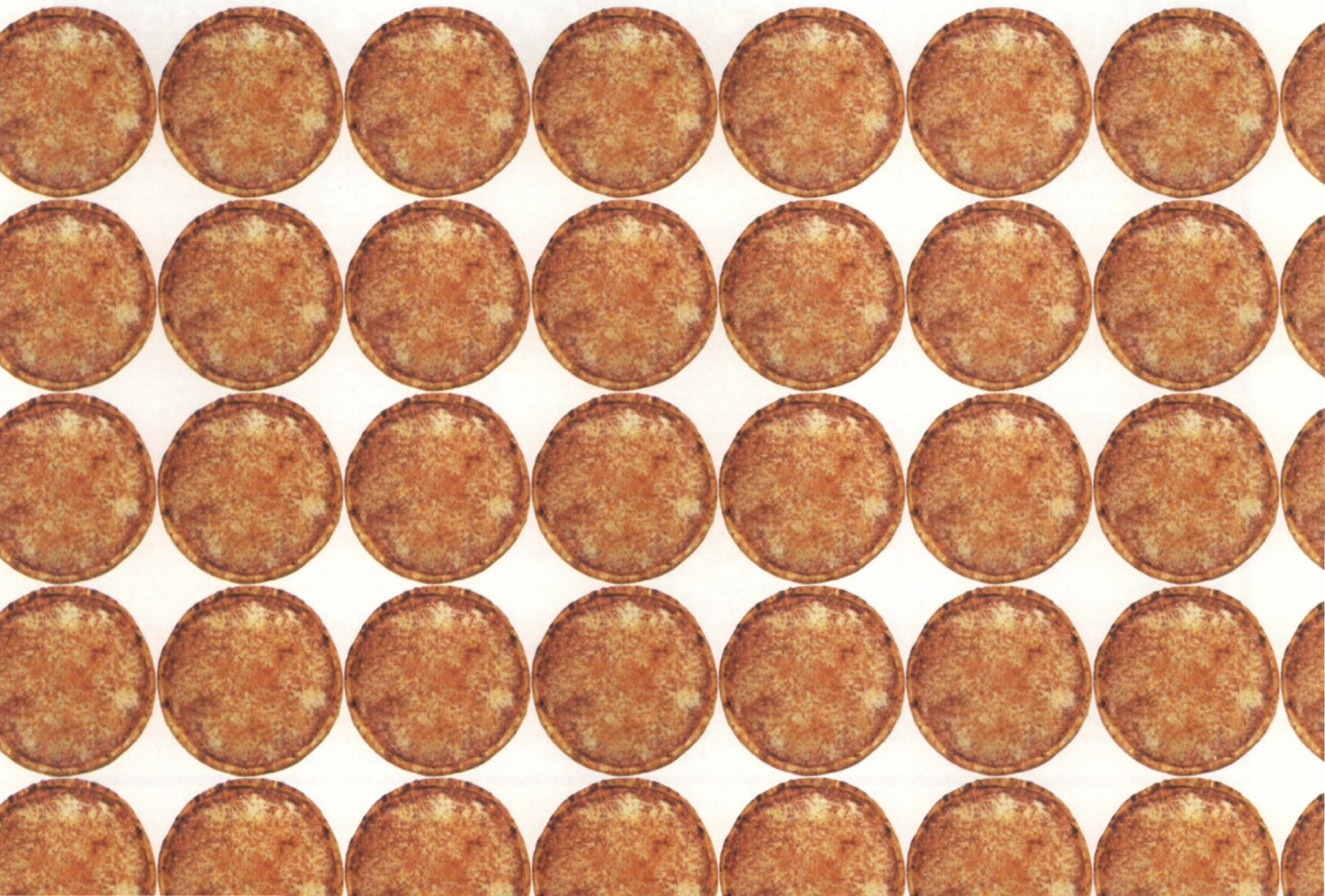
FOCUS: It seems like most of DG's marketing emphasis is on Aviion systems, at least in your print and television ads. How are you reaching the MV market?

Schwartz: It's fair to say that a lot of our visible marketing activity is directed to Aviion sales, because Aviion is our lead product with regard to new account penetration. Therefore, we have to be a lot more visible in terms of marketing those products because people don't know about us.

On the other hand, I think there's a lot of [MV-related] marketing activity that goes on that is not so, if you want, *externally* visible, but is very directed toward our customer base and our VARs. If you looked at all the marketing activity in the company, I think you would find it basically equal in terms of overall activity.

Let's deal with new accounts on the MV side. Again, since a high percentage of that is done through VARs, a lot of our work is in really supporting the VARs in their sales. On the CEO side, a lot of this is done through seminars, lead-generation programs, and following up on those leads. Most of these are fairly substantive deals.

FOCUS: You have a new vice president of the EBU, Gerald Paul. How does he fit into the structure, and are you going to change any way the unit's organized?



Schwartz: No organizational change at all. When we initially put the organization together, Michael Schneider, who is a long-time DG person, and has operated across a variety of different jobs for Data General, was asked on an acting basis to become head of R&D for the new organization while we began a search to find an industry leading career development person. Michael, although he has managed R&D activities on and off for the company, is not a career R&D man. We wanted to find a top career R&D person.

I think if you'll check Gerry's reputation in the industry, you'll see that we really got a winner to join this team, and I'm really pleased that we were able to attract him. As an aside, it speaks highly for the successes we've been having in the business for the last six months that we were able to get someone, who I think probably had his choice of opportunities, to come in and head the R&D for the group. I think it was a dynamite win all around.

FOCUS: What kinds of new MV products are coming down the road?

Schwartz: Let me back up and tell you one of the kinds of messages we give to the customers, and that's a good lead-in to the new products.

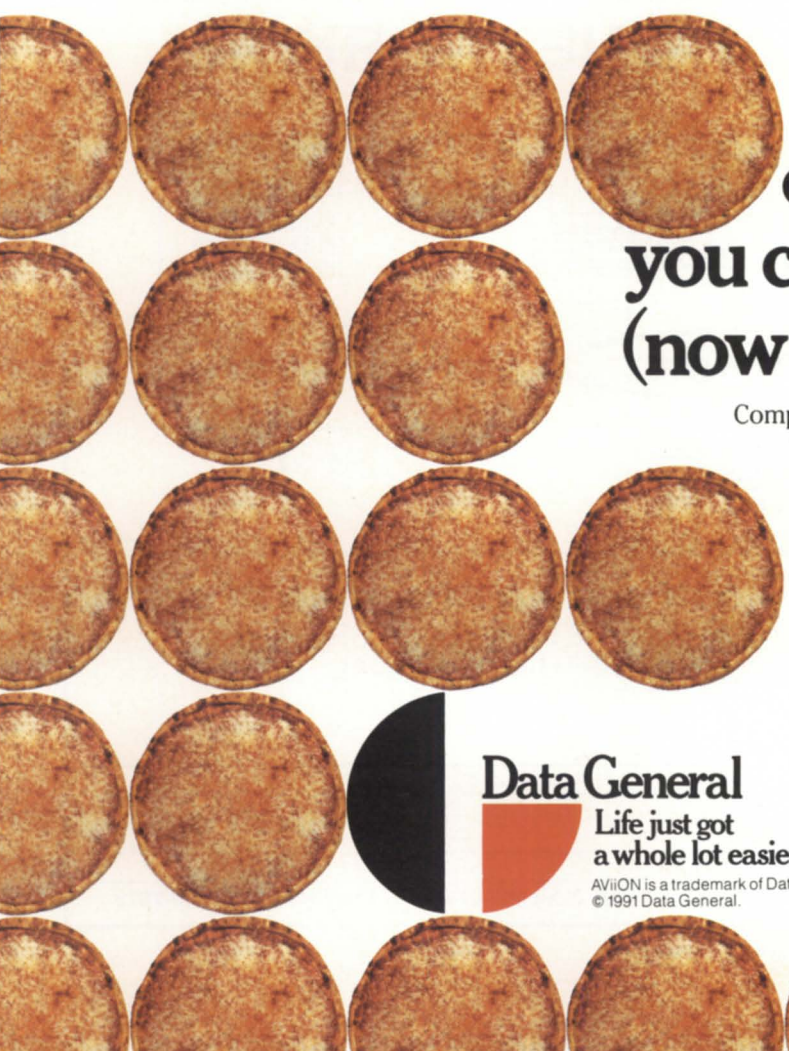
Since one of the key issues that we have is "What can we expect in the way of new products?" and at the same time, we can't print out all our new products—that wouldn't be too good for the company—we [set up] an envelope for them. We said that it's our objective to deliver products in advance of this envelope on an ongoing basis.

Our product plans go out about every five years. Those plans get updated about every six months, and therefore we have this rolling five-year hardware development plan. Within that plan, here's the general kind of price/performance you can expect to see. On the low- and mid-range systems of the product line, to deliver at least a 40 percent price/performance improvement every two years. And on the high end, double the price/performance every three years. That's the general envelope.

Internally, we set somewhat more aggressive goals for ourselves. They are to do essentially the same in 18 months. Now, the first demonstration of that is going to be a new set of products that we're announcing in early July. There's an MV/9600, an MV/9300, and an MV/5600. These products are all essentially available 15 months after the products that they're replacing. Not only did we do better than 18 months, it looks like we're going to hit it in 15 months.

FOCUS: How were you able to complete these products ahead of your time goals?

Schwartz: There's nothing like setting internal goals for your development group. I think by doing that and by building off the very large investment we made in the WASHI chip set [we were able to deliver the products quickly]. This is going to be an ongoing kind of thing. The net result is



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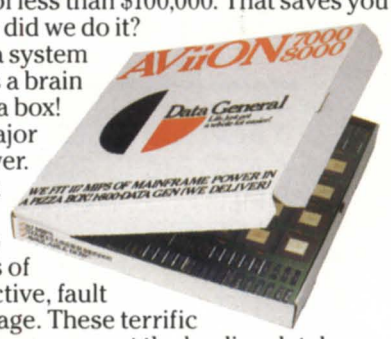

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that people are going to continue to see this kind of product cycle.

It's somewhat of a new thing for DG. I haven't been with DG for eons and eons, but I haven't talked to anyone who's said we've been able to shorten our product cycles. People have an idea that the only way to have short product cycles is to use commodity microprocessors. Well, here we're showing you that that's clearly not the case, and it's well ahead of what DEC's doing, which is kind of the model that we look at relative to product development, using a proprietary architecture. So, it's a combination of enthusiasm, good goals, and a real heavy investment in technology.

FOCUS: It seems like the Eclipse Business Unit has rediscovered CEO. Why the sudden emphasis on it?

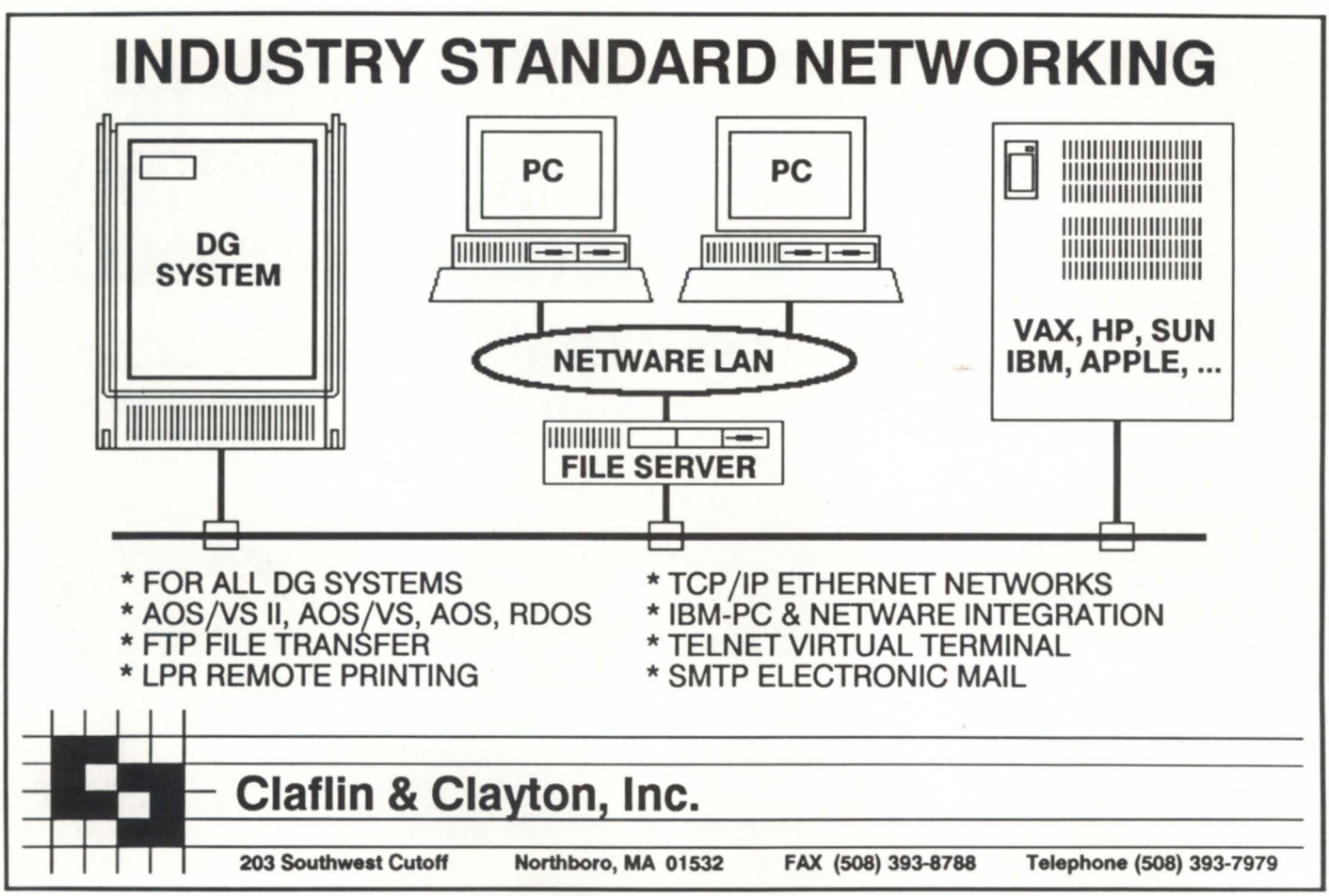
Schwartz: We have a base now that is approaching 500,000 users. I can tell you I've visited most of the big ones myself, and they're extremely happy users. They always have more things that they want. They haven't really had the opportunity [in the past] to talk to anyone where they felt it was easy to communicate where they want the product to go, with the sense that something is actually going to happen as a result of their talking to them.

I've had development managers out visiting a lot of these accounts around the world. Again, this is a little bit different from outside advertising. This is going into the base and giving them an opportunity to help design the product. By and large, the things that are important to some customers are important to other customers as well. So, it's pretty easy to come up with a design based on where your customers think you ought to go. So that was number one, just getting out there.

The second thing is, particularly with Object Office, we've developed a philosophy where we support industry standard LANs. We have a broader support on the LAN side than any of our competitors. Now, there's a real feeling of openness. They're not just locked into our proprietary PC*I architecture. And if they want PC*I, that's fine, we'll give it to them. Whatever you want, if it's an industry standard, we'll support it.

The other thing is, I think we were fortunate in selecting Newwave and Windows 3 technology as the front end of the PC. By doing that, number one, we didn't have to re-invent the wheel in terms of a lot of development work that HP's [Hewlett-Packard] put into the management side. Secondly, Windows is hot, as you well know, and all the PC software developers are writing their development applications for Windows. So here we are early on with a Window-based product.

With the proliferation of PCs in our accounts in the last couple of years, and following that with the proliferation of LANs, here we come along and can show how to tie them together. It turns out that we have hit it right. When we go out and show it to customers and demonstrate it to them, they seem to love it.



Circle 5 on reader service card.

FOCUS: What kinds questions are customers asking you? What kind of products are they looking for from DG?

Schwartz: I would say that, interestingly enough, that the questions tend to be from a product perspective. The questions tend to be 70 percent software related and 30 percent hardware related. Their underlying hardware concerns are "What are you doing?" When we go through the scenario I described to you earlier, where we start demonstrating the products, I also mention that we have the high-end [MV] project under development, and although it is not imminently here, it does represent the single largest development project in DG.

To most customers, given the choice of how our money is spent, on a TV ad, versus on an MV/40000 replacement, the answers are pretty straightforward. Again, it's a different story than on the Aviion side. When they hear that that's the case, I think a lot of their hardware issues become secondary, and now they really want to talk about software.

So the questions tend to kind of be along those lines. As I mentioned earlier, one of the ways to make them feel even more comfortable regarding product directions, is to set up technology meetings between our development people and the customers. We've been doing a lot of that.

FOCUS: What is a technology meeting?

Schwartz: Let's assume the customer will [tell us] the three areas of most concern, desires, etc. Then we will have our development managers in each of those areas come and spend a day or two with the account.

First of all, most of the development managers want to get close to and understand how their product is used; and secondly, customers really like to talk to the people who make it happen. That's what I mean by technology days. It's a little bit of formal presentations, but mostly a lot of interaction, sitting around the table, going and seeing how the systems are used.

We have other things that we've been doing. We've been running in the United States, in the last quarter and into the end of this quarter, 10 to 15 seminars around the country that are tailored to a given customer base. They are organized through our local sales people, depending on the type of installed base they have in their geography. We may focus on things like interoperability or hardware upgrades. We have about six or seven different topics. Generally, we work with the sales force and pick topics that seem to make the most sense for our customer base, and invite those customers in and give the presentations.

FOCUS: Is this a project of the Eclipse Business Unit only?

Schwartz: Anything that has to do with marketing of Eclipse products, either to new customers or to the customer base, is driven from the Eclipse Business Unit, from Dave Ellenberger's Group specifically, the Eclipse Marketing Group. In some senses, we *are* the company when it comes to the MVs. Δ

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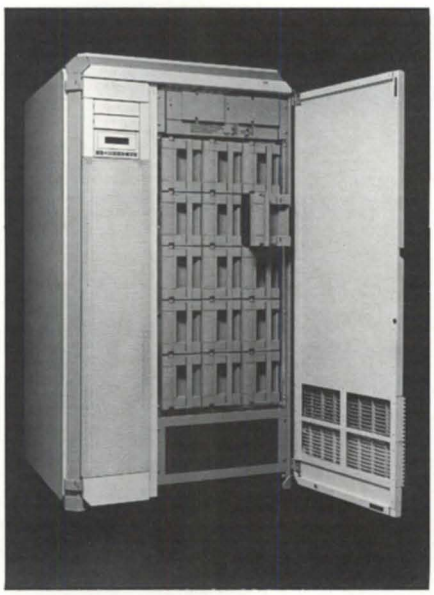
Plan for redundancy

SYNOPSIS

RAID subsystems are powerful mass storage products offering an unmatched combination of high availability, data security, and high performance. This article introduces you to RAID technology and to Data General's new disk array product line.



The H.A.D.A. disk subsystem is 60 inches tall, 30 inches wide, and 24 inches deep.

by Ronnie Todisco
Special to Focus

Since the March 13 announcement of Data General's new H.A.D.A. (high availability disk array) and CSS2/CSS2/DC disk array subsystems, an overwhelming interest has developed in this new, flexible approach to mass storage. Data General's disk arrays are among the first in the industry to successfully implement RAID (redundant arrays of inexpensive disks) technology.

These scalable, high-performance subsystems harness the speed and storage capacity of inexpensive, 5.25-inch drives, and combine them with an intelligent controller to address many of the shortcomings of standard disk subsystems. Designed to boost the performance of Data General's Aviion high-speed computer systems, the disk array subsystems promise to be a popular choice for Data General customers in the future.

What are redundant disk arrays?

A disk array combines a group of disk drives with a controller to manage the drives' operations. Data General's disk array subsystems are controlled by the input-output processor (IOP), an intelligent device (based on the AMD 29000 RISC microprocessor) that is designed to support multiple disk configurations. The disk array subsystem gives users the same data storage capacity offered by a large single drive, but with improved performance.

This improved performance stems from the disk array's multiple-bus architecture, which enables it to handle several data retrieval/storage requests simultaneously and independently. Supported by a software "device driver" and individual controllers, the disk drives perform overlapped seeks, increasing overall disk I/O speed. Thus, disk arrays address a key restraint on computer system throughput—the relatively slow rate at which mass storage devices transfer data to the CPU.

There are other benefits of disk array systems as well. The small drives take up less computer floor space and cost less than large disk drives, offering substantial improvements in cost per megabyte, power consumption, and cooling requirements.

Disk arrays have a disadvantage as well, however. They have an increased probability of failure, in that each drive must be functioning for the array subsystem to operate. If one drive fails, all of the data in the entire array becomes unavailable. Disk array configurations using RAID principles are able to solve this problem.

In a RAID configuration, a portion of the disk resources are dedicated to data redundancy. One method used is to duplicate one disk's data onto another disk. In this situation, if either drive fails, the other drive is still available and the data is accessible. In other cases, the redundant disk resources are used to store parity information that can be used to reconstruct a drive's data if the drive fails and its data becomes unavailable.

Parity information is stored at the same time the data is written. The redundant disk resources compensate for the failed drive and allow the array to remain on-line. Users can

still access all the array's data and run their applications. This makes RAID subsystems more reliable than standard disk arrays. For a RAID subsystem to fail, two or more of the disks in the array group must be inoperable at the same time. The chances of this happening are very slim. With redundant disk arrays, data availability (the length of time the array's data is accessible) is measured in decades, a period extending well beyond the computer system's useful life.

Redundant disk arrays maintain data integrity by restoring the failed drive's data, thereby guarding against permanent data loss. Once the failed drive is replaced, its data is automatically reconstructed from the contents of the other disks and stored on the new disk, making an exact replica of the original. With Data General disk arrays, this occurs without host system intervention.

The RAID levels most often used in the industry are Levels 1, 3, and 5. Data General's new disk array subsystems support Levels 1 and 5, which are the levels best suited for the commercial marketplace.

In a RAID Level 1 array configuration, data redundancy is achieved through transparent disk mirroring, rather than using parity. Disks are matched up in pairs—a data disk and a redundant (mirror) disk that is an exact copy of the data disk. Every time the controller is instructed to write new data, it writes to both disks simultaneously. If the data disk fails, its data can still be retrieved from the operational mirror drive. RAID Level 1 provides similar performance to conventional disk subsystems. Disk mirroring is the traditional approach used to guarantee data integrity; the technology is well understood. However, customers must buy twice the number of disks they need with a RAID Level 1 configuration. This is a more expensive solution than other RAID configurations.

RAID Level 5 disk arrays use parity to maintain data redundancy, but without using a dedicated parity drive as in some RAID levels. Rather, the controller reads/writes data *and* parity across all the disks within an array group, interleaving parity on all the group's disks. Data is written to one drive while its parity is written to another drive. By supporting rotating parity recording, RAID Level 5 eliminates the system bottlenecking that occurs when multiple parity write requests queue up to a single dedicated parity drive.

In a five-disk array, each drive in the array stores 80 percent data and 20 percent parity for the other drives within its group. Thus, the disk overhead for parity is lower for RAID Level 5 than for Level 1, only 20 percent for a five-drive array, making RAID Level 5 subsystems more cost effective. Another characteristic of a RAID Level 5 array is its use of data striping—dividing data in multiple pieces and transferring the pieces to multiple drives in parallel—to improve data transfer rates and ensure even data distribution across all disks.

Data General's disk array subsystems

Data General offers two separate disk array subsystems—the High Availability Disk Array (H.A.D.A.) subsystem and the Combined Storage Subsystem 2 (CSS2) disk array subsystem. Both subsystems can be configured in the way that best suits the customer's application. They can address the physical disk drives individually, as a mirrored pair (RAID Level 1), or as a RAID Level 5 disk array group. They can even support all three configu-

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rations simultaneously within a single array subsystem to support the exact needs of the customer.

The H.A.D.A. is capable of up to 400 peak and 170 sustained input/output (I/O) operations per second, depending on server, subsystem, and application configuration. It features an award-winning design and a small footprint—only five square feet of floor space. Created for environments requiring continuous data access and large storage capacity, the H.A.D.A. subsystem can be configured with up to 30 drives, for a maximum data storage capacity of 30 GB. H.A.D.A. supports tape drives without a separate tape controller, integrating data backup capabilities into the system. Flexible and scalable, H.A.D.A. supports dual host capability so it can be accessed by two servers.

Another important feature of the H.A.D.A. subsystem is its ability to be repaired under power without affecting system operation. For example, a faulty disk drive can be removed and replaced *under power by the customer* without interrupting the application's ability to access data. In addition, the H.A.D.A. subsystem features redundant power options, data buses, and cooling fans. The result is virtually 100 percent data reliability and availability.

For customers who need a lower-cost alternative to the H.A.D.A. subsystem and don't require repair under power capabilities, there's the CSS2 (rackmount) or CSS2/DC (stand-alone chassis) disk array subsystem. Redundant data storage capacity ranges from 4 to 12 GB on the rackmount CSS2 and 2 to 4 GB on the stand-alone CSS2/DC. The subsystem performs up to 250 peak and 100 sustained I/O operations per second, depending on configuration.

Redundant disk array subsystems are powerful mass storage products offering an unmatched combination of high availability, data security, and high performance. Data General has adopted RAID technology, coupled with features such as repair under power and tape support, as a key product line to provide the level of performance that its systems will need in the 1990s. Δ

Ronnie Todisco works in Data General's Corporate Marketing group. She is responsible for peripheral product marketing programs.

Hi ho, Silver!

Data General's High Density Disk Array (H.A.D.A.) subsystem was recognized with a Silver Award from the Industrial Designers of America (IDSA) 1991 Industrial Design Excellence Awards. Although the Silver is not the top award, the designation is significant. Out of more than 680 entries, the IDSA gave out 20 Gold IDEAS, 43 Silvers, and 54 Bronzes.

The IDEA award ceremonies will be held August 21, in Boston, as part of the opening events of the IDSA national conference. Δ

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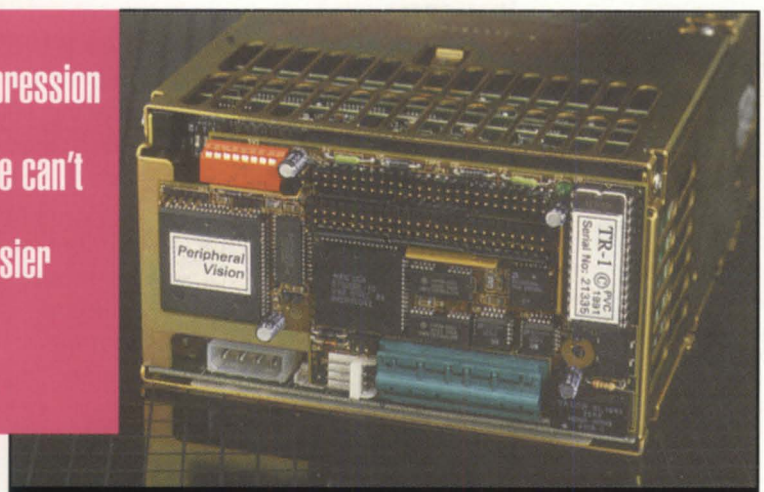

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RAID is coming

SYNOPSIS

No matter how impressive the manufacturer's reliability claims, there will always be an expected failure rate for your CPU and disk drives. So do the right thing: choose your level and go on a RAID.

by Clyde Sparks
Special to Focus

During the years 1974 to 1984, CPUs improved in performance by 40 percent per year. Disk drive capacity and price kept pace, but disk *performance* improved only 7 percent per year. Since 1984, single-chip CPU performance has increased at even a faster rate. An I/O crisis is quickly approaching.

A second major problem is the reliability of secondary storage. Today, even a small data processing shop can have many gigabytes of on-line storage. Although disk reliability has improved, the average failure rate for disk drives is about 5 percent per year. This means that a sizeable chunk of data will be lost each year as part of the *normal* failure rate. Also, if we design a system that uses more disks, we will see more failures. Thus sets the stage for the argument between RAID vs. SLED.

What is RAID?

In 1987, a paper was written at UC-Berkeley entitled, "A Case for Redundant Arrays of Inexpensive Disks (RAID)" (by David A. Patterson, Garth Gibson, and Randy H. Katz). The article contrasted SLED (single large expensive disk) and RAID technologies. The authors wrote down all the different ways they could think of to connect disks. A number 1 through 5 was given to each configuration. Next, they discussed benefits of each architecture.

Let's briefly describe each RAID configuration.

RAID 0: A stack of small disks that logically appear as a single large disk. Technically, this is not a RAID system because there is no redundancy (plus, it wasn't described in the Berkeley paper), but it has become a commonly used term in the industry. Sometimes RAID 0 is a stripped stack.

RAID 1: Mirrored disks. All primary disks are duplicated. This RAID level gives

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Amdahl's Law:

$$S = \frac{1}{(1-f) + (f/k)}$$

where S = effective speedup, f = fraction of work in faster mode, and k = speedup while in faster mode.

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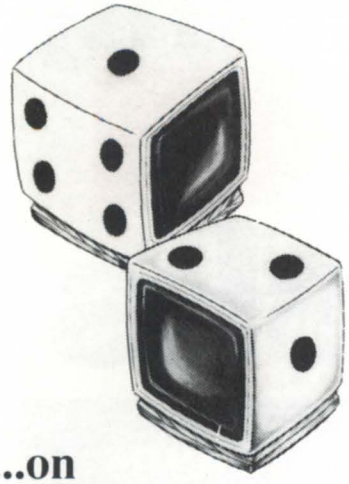

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the highest performance. Data writes can be done in parallel to each mirror so there is no time penalty. Data reads can actually be performed faster than a single disk. Each mirror receives the read command and a race between them allows faster response. Even a slight difference in the rotational position can save several milliseconds per read. The price you pay is that you need twice as many disks. Put another way, it would seem that you are wasting half of the purchased storage area. There is, however, a valuable *second* use for the extra drives—concurrent backup.

RAID 2: Uses the Hamming code for error corrections. Enough check disks are needed to fix any error, including an error on a check disk. For a group size of 10, you need 4 check disks for a total of 14 disks. This is the most expensive and least used RAID configuration.

RAID 3: Parallel transfer disk array. Only one check disk is needed, a parity disk. Most of the disks in the RAID 2 system were needed to determine which disk had failed, but this information is usually available to the controller. Therefore, you really need only one parity disk to allow data correction in the event of a drive failure.

This level of RAID is the most cost-effective, but has serious performance problems in the Transaction Processing (TP) environment. Every WRITE must be preceded with a READ to calculate the new parity.

RAID 4: Independent reads and writes. Level 4 tries to overcome the TP performance issue. Individual TP data is not spread across multiple disks. In level 4, a small write uses two disks to perform four accesses—two reads and two writes—while a small read involves only one read on disk. Note: this is still slow compared to level 1 (see below).

RAID 5: No single check disk (spread data/parity over all disks). The parity check information is spread throughout the disk array group. This system gives better performance than levels 2, 3, or 4, but still below level 1.

Some recent offerings

Data General has announced two SCSI-based disk arrays for the Aviion system. The CSS2 disk array subsystem, model 7922, and the high availability disk array (H.A.D.A.) subsystem.

The CSS2 disk array works with Aviion 5200, 6200, 6200-20, and 7000 series machines. This unit is based on the 7417 intelligent IOP and is capable of RAID 1 and 5. While operating in the RAID 5 configuration, there is a performance degradation. For a data base write to take place, the following steps must occur: 1) read data and parity drives, 2) recalculate the new parity, and 3) write the data and the parity.

The H.A.D.A. is a much more elaborate subsystem. The unit can be attached to the AV 6200, 6200-20, and 8000 systems. RAID levels 1, 3, and 5 are supported. Once again, while operating in the higher RAID configurations, there is a performance degradation. This system features the ability to allow a trained customer to replace a bad drive while the system is operating. The data on the replacement drive is automatically rebuilt by the system using a rebuild rate that is customer-selectable.

Delphi Data's RAIDer is a RAID 1 device that includes a 16 to 256 MB DRAM cache and state-of-the-art 486 compute engine. The caching allows for extremely high I/O performance. For example, all data writes go directly from the host into a pending write queue, with no disk seeks or latencies to slow down the operation. Later, the physical writes are sent to the disk during brief idle periods. Disk reads are cached in the large memory space using the LRU algorithm. A read hit is serviced (including 4 block transfer) in under 2 ms. Repair-under-power is available depending on the configuration of the RAIDer system.

Backups

Having disk redundancy doesn't mean that you can avoid your normal backups. Precautions must be taken to avoid loss of data from a variety of unlikely but still possible events. Fire, for example, even if it's not on your property, can cause data loss from water damage. Earthquakes can crash running disks. And if two or more drives are affected, the RAID technologies described would be of no help. You would have to restore from a backup.

Most RAID systems make no special consideration for backups. Some systems do leave room in the enclosures for tape drives, but it is up to the host computer to

Figure 1: Ranking the RAIDs

RAID level	Cost/MB user data	Storage density	Bandwidth performance	Transaction performance	Data availability
RAID 0	1	1	.25	1	.0005
RAID 1	.5	.5	.25	.6	1
RAID 3	.8	.8	1	.2	.99
RAID 4	.8	.8	.25	.45	.99
RAID 5	.8	.8	.25	.5	.99

Higher ratings are better for all columns

Assumptions:
1. 10-drive configuration
2. Controller cost = 16 percent of drive cost
3. Transaction performance reflects 1 KB blocks, 70 percent read ratio
4. Data availability reflects 24-hour repair time
5. Data availability ratings based on 60 million-hour objective.

Source: NCR Corp.

run a backup procedure to save the data. This usually requires the system to be in a mode that limits user access during the backup procedure.

The Delphi Data RAIDer system allows backups to be performed in a concurrent mode by using the secondary mirror as a source for the backup. Upon completion of the backup, the secondary mirror is attached and a bitmap controlled re-sync started. A RAIDer system can appear to the host computer as one or more SCSI IDs, allowing up to seven RAIDer units to be attached to a single SCSI host controller.

Reliability measurements

A final word regarding claimed MTBF (mean time between failures). For the last couple of decades, the standard way in which new disk drive reliability was measured used a statistical method based on the reliability of the drive's component parts. After the drive was in the field for a time, actual failure data, sometimes combined with accelerated life testing, would be used to update the MTBF numbers.

About 18 months ago, a major disk manufacturing firm changed all this. This off-shore company counts every drive it manufactures as running 24 hours per day, seven days a week, commencing immediately after the drive is built. If the drive sits in a warehouse for six weeks before someone buys it, those hours still count as running hours. Next, a failure is counted only if the manufacturer receives back a drive that has failed, and the claimed failure can be reproduced by the manufacturer. If a third party fixes the drive, it won't be counted as having failed.

As you may suspect, the company's disk drive MTBF went from the then industry norm of about 50,000 hours to an incredible 150,000 almost overnight. Currently, the rate is more than 200,000 hours (approximately 23 years) and still growing. Because of the competitiveness of the disk drive marketplace, it won't be long before everybody will adopt this system or one just as inflationary.

Conclusion

The SCSI (small computer system interface) standard seems to have won out over all other peripheral buses. IBM has selected the bus for its high-end PS/2 line, its entire RS/6000 line, and most of the AS/400 line. All other major computer manufacturers have followed suit. This is good news to computer users. Engineers around the world now can spend the time and money to develop sophisticated peripherals like the ones we have discussed, knowing that a large open systems market exists. The intelligent SCSI bus will allow limitless distributed processing to be engineered into tomorrow's high-speed storage devices. Δ

Clyde Sparks is a founder and current vice president for Delphi Data. He can be reached at Delphi Data, 9069 Cajalco Road, Corona, CA 91719; phone: 714/279-7955.

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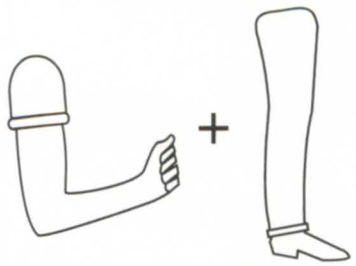

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High-performance peripherals:

or what to know before you buy

SYNOPSIS

If your computer system is out of balance, if it seems the poor thing needs 27 hours to process 24 hours' worth of data, perhaps that underachiever needs help. So, if you add one of those flashy new tape systems, how much earlier will you get to go home at night? Well, it depends.

by John Fahlstrom
Special to Focus

Let's take a journey through the looking glass, but watch out—your mileage may vary!

In the course of my employment, I have had the opportunity to meet with Data General users throughout the United States and Canada. Questions and concerns about overall system performance are commonly posed relating to peripheral technology.

Of course, peripherals are only one part of the total system. Overall performance is a result of the interaction of several factors, including

- CPU power
- Memory available
- Operating system, application programs, and system load
- Peripheral subsystem technology.

Some users are not concerned with system performance at all. Their processors have the power to complete jobs as fast as required; memory is available to keep response times down; and the application programs are well serviced by the disk and tape storage devices so that data is always available for processing when requested by the operating system.

Sounds like an ideal system configuration doesn't it? To disbelievers, I say that such users do exist . . . . I know. I met one once in 1987.

But seriously, most users seem to outgrow this ideal system configuration. The number of jobs increases, users are added to the system, data bases grow. You find yourself working longer hours to complete reports, staying late to finish backups, adding extra shifts of operators.

This is assuming that you started with a balanced system in the first place—a dangerous assumption to make. Is an MV/15000 Mod 20, running on an Argus 354 or a pair of CSS disks, living up to its potential? That depends on the system load, applications, and other factors listed above.

In situations where performance is an issue, systems often prove to be I/O-bound or disk-bound, meaning the CPU and application programs are waiting for data to be retrieved from disk to memory for processing, and waiting for the results to be written back to disk along with associated directory updates.

There can be a lot of waiting going on in a Data General MV minicomputer! MVs are powerful machines with tremendous processing capability and a marvelous multitasking operating system. I think that most users would be amazed were it possible to provide disk subsystems that serviced the CPU so quickly that the system was always processor- or memory-bound.

Backup software and disk type

Enough of generalities. The ideal system user as described above really does not have much reason to spend time talking to a peripheral subsystem vendor. The user interested in spending time with me usually has a problem to solve and is looking for some system performance consulting.

A typical question is: "If I add one of those new cartridge tape subsystems (either 8mm helical scan or 4mm DAT), how much faster will my backups run?"

The answer is: "It depends." Depends on what? Depends on the backup software and the disks running on your system.

For instance, in Zetaco's R&D lab, an MV/15000 backing up an Argus disk via Dump II/Load II yielded a data transfer rate of no greater than about 100 KB/sec to the reel-to-reel tape subsystem on a sustained basis. When the Argus disks were replaced with a high performance SCSI disk or with a Data General Shadow disk, throughput to the tape increased by 80 percent, with a proportional decrease in backup times. Why is this so? Because the backup program must go to the disk, organize files, and dump in a logical manner to tape. From this we see that disk performance is a significant factor in backup performance (Figure 1, page 24).

The best way to increase throughput further was to organize files in a contiguous fashion on the disk, by using a disk optimizer. In Zetaco's R&D lab, a throughput increase of another 30 percent was gained with contiguous files.

If you use PCopy or some other dump backup method that simply copies the data bit for bit and does not involve a logical process, your throughput to the tape can be much greater. But most users who wish to decrease backup times to tape would benefit from using faster disk drives if they are using

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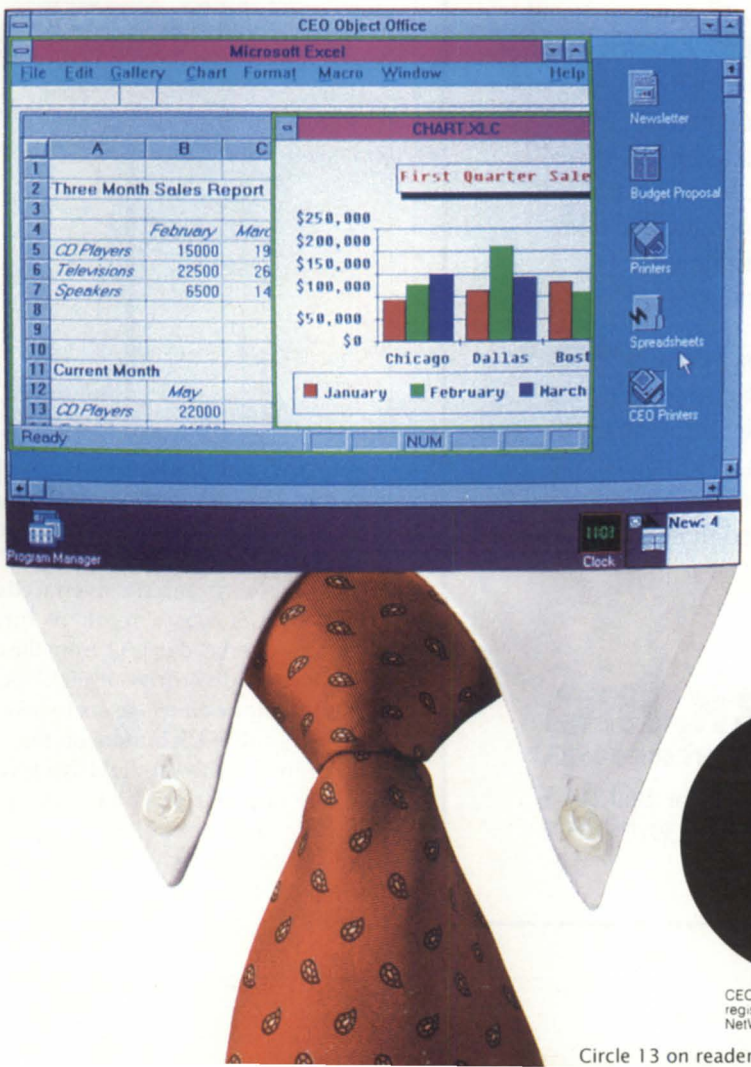

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Dump II or Dump III.

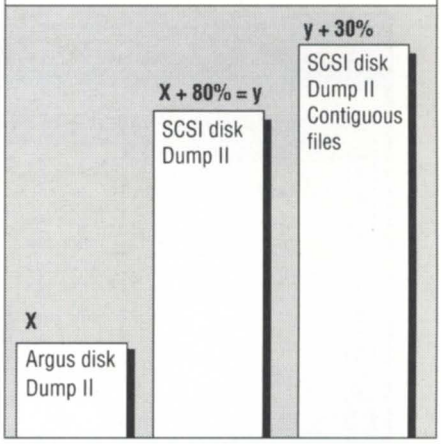
Over the years, users have asked OEMs to integrate the latest in peripheral technology to help alleviate the I/O bottleneck in system performance. This was true in the days of the non-DPJ controllers, such as the BMX-3, as it is today. In fact, some users point out correctly that the BMX-3 coupled with a fast SMD disk is one of the highest-performance disk subsystems available. This is true in a single-tasking world. If a user has only one job running at a time, there is no penalty to having the operating system remain involved in the I/O control process, as it does under these device drivers.

However, most DG users now live in a multitasking world. The purpose of the DPJ device is to offload the overhead of I/O tasks to the controller and to free the operating system for processing other jobs. This is why the Argus controllers from Data General and the Argus-emulating controllers have higher overhead than the Vulcan, Kismet, Zebra (and emulating) controllers.

Thus, a system running multiple processes on multiple disk drives will benefit by offloading I/O control to individual disk controllers. This is the benefit of running a DPJ-driven disk.

In the days of SMD disks, performance was dictated mostly by the physical specifications of the drive, such as average seek time and rotational latency, with data transfer times and controller overhead being relatively minor factors. Controllers worked with multiple drives to overlap seek times, but couldn't "hide" the latency that users tended to experience on each disk access. It seems pretty obvious, even to us non-techies, that an SMD disk with 16 ms average seek time and 8.3 ms latency might outperform an Argus disk with 21 ms seek time and 10 ms latency.

Figure 1: Disk performance vs. backup performance



This does not imply that Argus disks are no good; it's simply that disk technology continues to progress after a particular design goes to production.

The evolution from SMD-interfaced disk drives to SCSI was a result of further offloading overhead of I/O, from the controller to the disk drive itself. Modern SCSI technology allows users to take advantage of full track buffers on the disk, and the intelligence at the drive level to take care of disk reads and writes independently of the controller.

Advancements in chip technology have allowed us to double the speed of the controller, SCSI disk average seek times

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are now down in the 11 ms range, latency as fast as 6.26 ms, and SCSI data transfer rates are up to 5 MB/sec.

New drive technology from the major disk drive makers will result in even faster seek times, lower rotational latency and data transfer rates of 10 MB/sec, as well as implementations of SCSI-2 commands. SCSI-1 and SCSI-2 devices and controllers can coexist on the bus to protect your investment in previous SCSI device technology.

Figure 2: Real world example

	Argus	330 MB disk	% improvement
Disk service	85-95 ms	18-25 ms	74%
Print job	8 minutes	3 minutes	62%

Weighing performance factors

So how do you determine the relative importance of disk performance factors as they relate to overall system performance?

Of all the factors affecting disk subsystem performance, seek time typically accounts for about 50 percent of total I/O time; therefore, it follows that improvement in disk drive seek time will have a substantial effect on subsystem performance to the system. That is, if you want the data faster, get disk drives with faster actuators.

What effect does lower rotational latency have? Less than with SMD technology, but still a significant factor. With high performance SCSI technology, the rotational latency is partially hidden in a multidrive subsystem. Since SCSI drives incorporate full track buffers, the controller reads from and writes to the buffer, many times without waiting for a specific sector to pass under the head.

What about higher data transfer rates? A typical AOS/VS (either Classic or AOS/VS II) disk I/O request is for a four-sector (2K) transfer. The disk heads are frequently repositioned and data is gathered in small blocks from various disk files. Under these conditions, at a data transfer rate of 5 MB/sec, transfer time is less than 2 percent of total subsystem performance. Doubling transfer rates can only decrease this to 1 percent of total subsystem performance, with almost no improvement for the user. Higher transfer rates would make a bigger difference to users who transfer large contiguous blocks of data, but not in the typical AOS/VS environment.

The other major factor in subsystem performance is controller overhead. With faster chip sets available and more intelligence placed on the drives, it might be possible to drive controller overhead down from 20 percent to the 10-15 percent range. But there is a limit to how fast any controller can deal with the O/S and the disks attached on the other end under the DPJ device driver.

What this means to the system user is that for the foreseeable future, faster disk seek times will be the driving force in better subsystem performance with a minor impact made in better rotational latency, and almost no noticeable impact through faster transfer rates or

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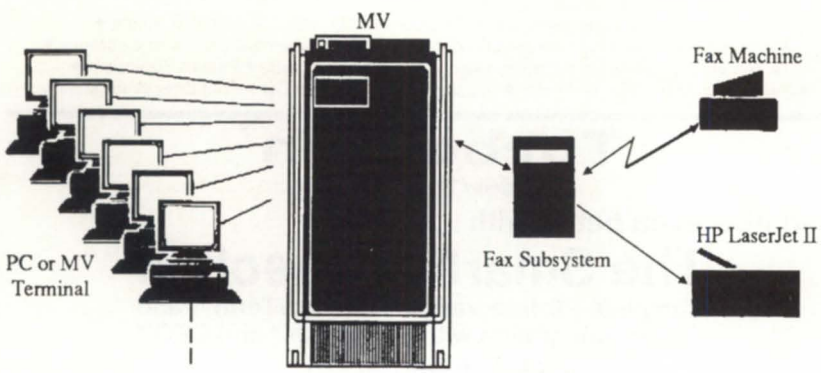

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lower controller overhead.

Return from the looking glass

Consider the real-world numbers experienced by AOS/VS system users (Figure 2, page 25). One site with an MV/20000 Mod II replaced Argus and CSS technology with 330 MB disks at 10.7 ms. This system runs 24 hours every day, heavily loaded. Disk service time as reported by DISCO went from a range of 85 to 95 ms to a range of 18 to 25 ms. Print jobs that used to take 8 minutes now run in about three minutes. A performance increase would also have been realized by upgrading to RAMS disks (perhaps not so dramatic) and it is up to each user to compare price/performance in any upgrade decision.

Another customer replaced Argus technology with the 330 MB drives on an MV/10000. His experience was a decrease in service times from 30 to 40 ms range to a range of 20 to 25 ms. Is this significant? Only you can decide. This system was not as heavily loaded as the one in the first example, so performance improvement was less dramatic.

My last example is that of a customer who also replaced Argus drives with the 330 MB disks. Every week his shop ran a batch job that took four hours. After upgrading to a faster disk, the job completed in less than two hours. It was difficult to believe (but it's true) that, even in batch applications, fast disks have a major effect on overall system performance.

Remember, your mileage may vary. Each system is unique, and variables such as memory, number of processes, application programs, and CPU utilization all affect system performance. However, if it seems that your system has outgrown the "perfect balance;" if it feels like you need 27 hours to process 24 hours worth of data; if your data base files have grown faster and larger than the federal budget deficit, you will most likely see dramatic benefits from upgrading to faster I/O systems. It may even speed up your tape backups as well! Δ

As Zetaco's manager of Distributor Sales, John Fahlstrom has traveled extensively throughout the U.S. and Canada, talking about disk and tape subsystems to Data General users (and whoever will listen). He has been heavily involved in peripheral technology since 1978. He may be reached at 612/890-5135.

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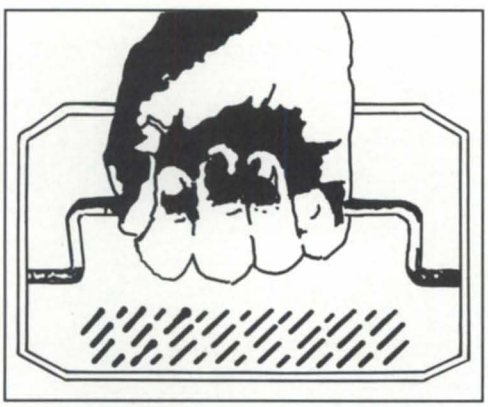
More than a security precaution

SYNOPSIS

We've come a long way with high-capacity, removable storage disks. And with ever-increasing needs for security, versatility, reliability, and convenience, there are more reasons than ever to go with the "plug and play" solution.



by Robert J. McGowan
Special to Focus

Remember when the only high-capacity disk drive available was one incorporating a removable disk pack? How about the old Zebras that provided a then-unbelievable 96 or 192 MB on a single spindle? (No insult intended to those still using them.) Or the Vulcan with 277 MB—now *that* was some kind of storage, especially when you put four on a single controller.

As compatible controllers were introduced from pioneers such as Zetaco (then Custom Systems, Inc.) and Spectra-Logic, and even Xylogics (remember the Model 850?), industry-standard drives like the 9762 (80 MB) and 9766 (300 MB) were used in several different emulations. The battle for higher performance, lower cost, and "true emulation" was on. Well, the technology has changed, and Winchester (fixed media) drives have evolved to speeds and MTBFs (mean time between failures) beyond our then-wildest imaginations. So now we ask: are there still valid reasons for using removable-media disk drives?

Removable media, as referred to above, means that only the disk platters (the disk pack)—the surfaces on which the data are stored—are inserted and removed into and from the disk drive. The disk drive includes all of the mechanical and electronic parts and assemblies that lock the pack in place, position the heads over the data surfaces on the platters, and perform read and write operations as instructed by the CPU via the disk controller.

Removable media of the 1990s are entirely different. The disk pack, heads, and much of the mechanics and electronics that perform read and write operations are part of a single module called the "head disk assembly" (HDA), also commonly known as the "data module." The HDA, like earlier disk packs, comes in a variety of sizes: 3.5-inch to 14-inch are most common in the DG world; removable HDAs are primarily 3.5-inch and 5.25-inch. Capacities commonly range from 50 MB to 2 GB.

The mechanics of installing and removing HDAs are totally different as well. No longer must the user power-down the drive, open the door, and unscrew the pack. Today, it is as simple as pushing a button or moving a lever. The entire HDA simply slides out. Many chassis do not require power-down for HDA removal. The entire process of changing the HDA on a removable disk takes less time than changing a Zebra disk pack. We've come a long way, baby.

There are several reasons a user would consider (or even prefer) removable media over fixed media. Some of the most common applications are as follows:

Security: This is probably the most common reason that removable disk technology exists. Some users (the federal government being the largest) have highly sensitive material data stored on disks. Generally classified or secret information needs to be locked in a safe or otherwise secured each night, or even at the end of each shift. In the private sector this equates to corporate financial data, new engineering specifications, drawings, patents, or customer account information. Being able to remove the entire HDA ensures maximum security. Once the system is shut down with the HDA removed, there is no data remaining resident anywhere on the system.

Backup: Disk-to-removable-disk backup is becoming more common as the cost of disk drives continues to come down. Disk-to-disk is without exception the fastest way to back up a system. Some users are keeping their older, obsolete CPUs and installing a removable disk enclosure on them. Once the removable HDA on the main system finishes receiving the backup data, it is swapped with a fresh HDA. The disk-to-tape backup is performed on the off-line system. The result: more uptime for the main system and a true disk copy to retain until the tape backup is verified.

Multiple data bases: Oftentimes, customers cannot afford to continue adding disk drives as they subdivide and expand their data bases. This is especially true when the new data base is accessed only

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two or three times a year (for quarterly or annual report generation, process analysis, etc.). So, in lieu of scheduling five, ten, or even more tapes to be loaded down when the data base is needed, users install removable drive enclosures and simply plug in the particular HDA they require for that data base. Savings in labor and improved efficiency make this a very viable option for users in the financial, manufacturing, and process control industries. Additionally, with disk capacities of up to 2 GB per HDA, there is a significant reduction in tape quantities as well as tape storage areas.

User self-maintenance: The high cost of disk maintenance, coupled with extended warranties available on the newest disk drive technology, has more and more users investigating "self-maintenance" on their peripherals. Users have discovered that replacing older technologies (Zebra, Vulcan, Kismet, Argus, and many industry-standard drives that have high monthly maintenance charges, poor reliability, and extended repair times) with newer, removable technologies can in fact reduce monthly costs, improve performance, and increase system availability. When purchased with spares and training, users virtually eliminate the need for monthly disk drive maintenance. They benefit from MTBFs in excess of 100,000 hours for greater reliability. The MTTR (mean time to repair)—the time it takes to replace the drive and begin rebuilding the system—is usually less than 30 minutes. There is no waiting for an FE to arrive, with or without parts. Again, the benefit is more uptime.

So what's the big deal?

If a user's application is not highly sensitive or if backup is already being done efficiently and cost effectively; if loading data from tape or adding more disks is addressing the need to expand the data base; if downtime is affordable while waiting for the arrival of a field engineer or if there is a technically oriented person who could be trained to replace disk drives, then the "deal" isn't so big. However, if any one or more of these scenarios don't apply (or if you have one of your own), it may be worth inviting your favorite hardware supplier over for a consultation.

The technology is here today. It is proven, and it does provide solutions to these problems. Manufacturers such as MDB Systems (Irvine, California) and Trimm Industries (North Hollywood, California) are among many companies that have engineered and implemented practical solutions to these very real problems. Other companies have integrated the controllers, disk drives, and software to offer "plug and play" solutions to the end user. Δ

Robert J. McGowan is president of the Peripherals Division of BL Associates. He has been in the high technology industry since 1971. Having specialized in data communications and network control systems through 1980, he has since become a leading authority on Data General compatible equipment and services. He can be reached at BL Associates, 145 Webster Street, Suite C, Hanover, MA 02339; 617/982-9664.

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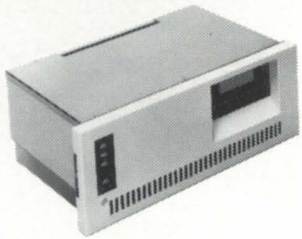

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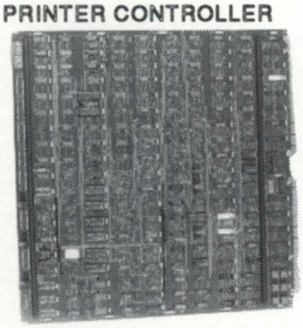

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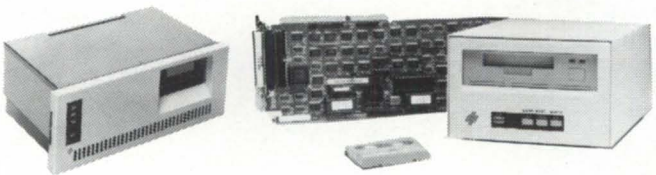

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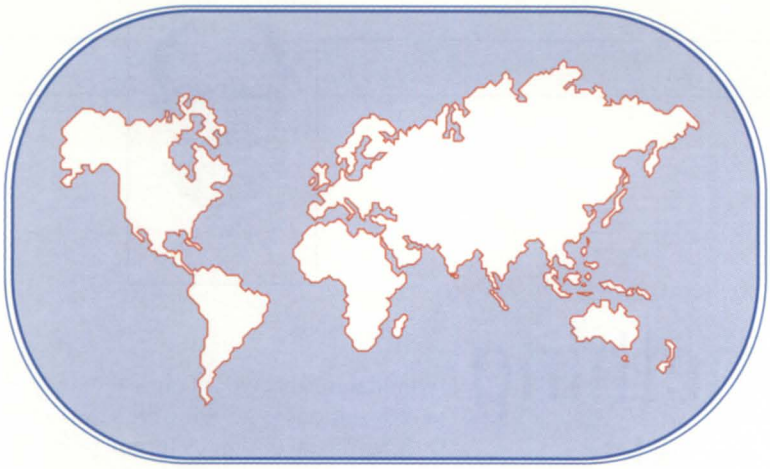

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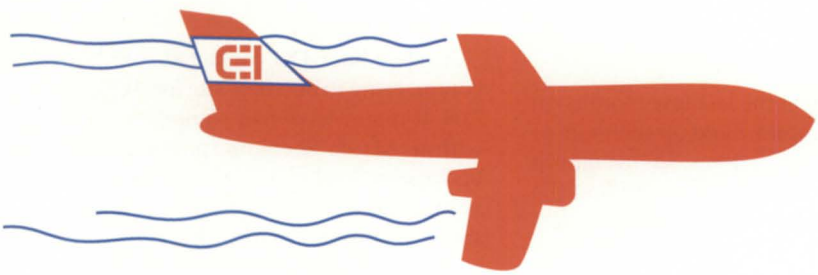

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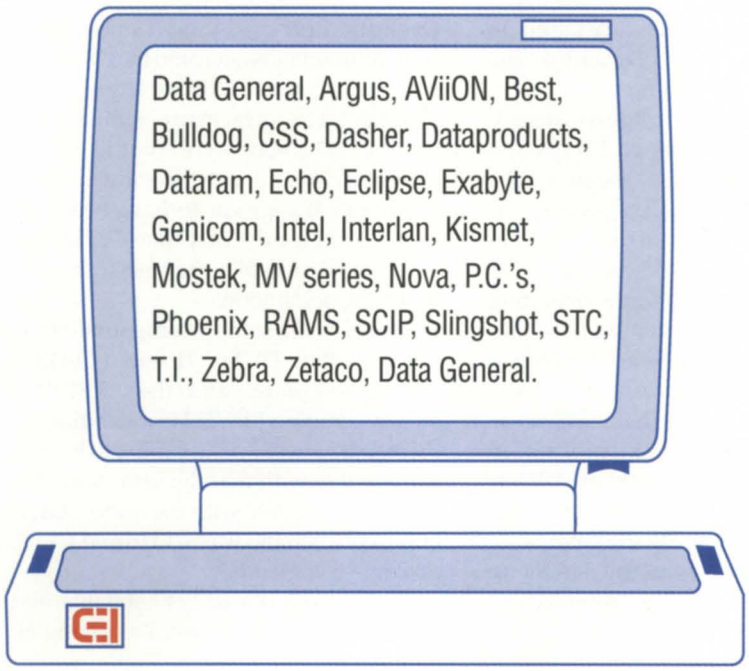

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And now for something completely different . . .

SYNOPSIS

BJ embraces miscellany this month: AOS/VS 7.69 assessment (it's a winner), a cautionary tale about Infos performance (moral: watch your INFOS.VM file), and a delightfully simple (and inexpensive) adapter for hooking up printers to DG systems. Also, a handy utility for restoring file virginity.

Because I spent the last few months on Infos, my topic spike filled up with a lot of small miscellaneous items, so this month I'm going to pop a few of them off of the spike and present an information buffet.

:CONVENTIONAL_WISDOM

A few weeks ago an article appeared in one of the trade papers extolling DG's apparent return to profitability based on two consecutive quarters of black ink. The article really got my dander up.

The columnist gave the figures for proprietary vs. Aviion sales and remarked that DG's proprietary line seemed to be dying a slower death than expected.

Gee, I'm really sorry that there's a lot of us who still think that MVs and AOS/VS have it all over that sleazy little operating system for propeller heads that the faddists have mindlessly embraced. Maybe if it had spoolers, a batch stream or two, and a few of the other things that make sense to a commercial user—and that it's been promising for 10 years without delivering—we might not be so tenaciously clinging to what is supposedly the past.

The other thing that gets my dander up is a couple of reports I've received recently from customers who tried to place orders for additional MVs, or for upgrades, and had trouble finding somebody at the local office who didn't want to lecture them on how they were making a serious mistake by not jumping on the Unix bandwagon with the rest of the lemmings and open systems pipe dreamers.

Maybe somebody in DG will wake up and notice that most of the black ink in the last two quarters was the result of the Ancient Iron (no relation to the Holy City motorcycle club of the same name). One would think that would cause them to put a little effort into growing the sales of the Eclipse Business Unit instead of puzzling over why the sales aren't declining as rapidly as they had anticipated.

:7.69_BETA

A while back DG contacted me about volunteering to be a beta site for AOS/VS 7.69. It might have had something to do with my March '91 column panning AOS/VS 7.68 for an obvious lack of QA testing as evidenced by a bunch of CLI32 bugs and a very frail set of EXEC co-ops. By now, some of you will probably be receiving the real 7.69 shipments (I'm writing this in late May).

Anyway, the tape arrived earlier this week and I plugged it in. It's now about 400 CX commands later, and the OPerators have yet to confuse EXEC or any of the co-ops enough to get them to commit suicide like the 7.68 co-ops were wont to do.

In addition, all but the most obscure bugs in CLI32 appear to have been corrected. And for the first time CLI32 now knows how to display the hash frame size of directories; hooray.

There are still some incompatibilities in the way that DUMP_II and LOAD_II handle templates and the /RECENT switch compared to CLI16's handling of them, but I guess I'm just going to have to learn to live with that the same way that I've learned to live with the minor differences between the way CLI16 and CLI32 do some commands.

On the basis of excellent stability and extremely low bug count, I'm giving an enthusiastic thumbs up to 7.69.

Note: If you are upgrading from rev 7.67, or earlier, you'll find that rev 7.69 takes approximately one-third of a megabyte more memory due simply to the size of EXEC's new co-op processes. That's roughly the size of about three CLI32 processes, or one to two typical application PIDs.

:FILE_TRANSFER

If, like me, you do a lot of file transfer-

ring between PCs and MVs and you have noticed that even with error free modems there are occasional errors that require blocks to be retransmitted, I may have a solution for you.

The problem is caused by the casual disregard with which many PC software packages treat the CPU's interrupt logic, especially TSRs, software disk caches, Desqview, and Windows 3. Some autosense VGA boards also can cause problems. All of these items either turn interrupts off for extended periods of time, or they jiggle the CPU's reset signal to switch from expanded/extended memory mode back to real mode. The net result is missed characters, especially at 9,600 baud or higher. I've even seen the problem at 2,400 baud on slower PCs, and even on a 386SX running at 16 MHz.

Try replacing the typical 8250 UART chip in your PC's serial card with National Semi's NS16550AFN chip. It's available at most retail chip stores and costs about $12. Accept no substitutes. This chip is pin-compatible with standard UARTs, but has a built-in, 16-character buffer that can be enabled by the PC file transfer software. Luckily, the two packages I use most of the time, Omen Technology's SZ/RZ and rev 3.0 of Pereline Data System's Pereline terminal emulator, both automatically detect the chip and enable its buffer logic. Since I replaced my UART chip with this thing I've had zero retransmissions.

Best 12 bucks I've ever spent.

:INFOS_ABERRATION

I had the occasion to track down a bizarre performance problem at a client's site recently, and the cause turned out to be something related to the way Infos deals with misbehaving programs.

The system is a large mixed data entry, accounting, and word processing system that uses a combination of mostly B32, a few PL/I programs, and Wordperfect 4.05. The symptoms were that occasionally the system performance would simply go into the dumper, with no significant increase in the PID count or in the system activity. Only a system reboot seemed to cure the problem.

The first pass at diagnosis yielded the fact that the major difference between normal and in the dumper was a giant jump in the percentage of system CPU. Further analysis indicated that the poor performance was accompanied by a jump in the system call rate from 50 to 75 per second up to 400 to 500 per second, and an increase in the logical page fault rate from 10 to 15 per second up to 400 to 450 per second. Bear in mind that page faults can be caused two ways: as a result of real page faults, and as a result of shared page I/O requests, like those used by Infos to access data bases. A check of PERFMON showed no memory contention and a static PID count, so real page faults were ruled out as a cause. An examination of the display from PED/FTPS/FTLS showed only 0 or 1 physical faults per second for each process using Infos, but 40 to 60 logical faults per second. Other processes not using Infos had zero physical and logical fault rates.

An examination of the systemwide per-

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ring CPU histogram indicated very little Infos activity in ring 4; about 8 percent of total CPU consumption, and about 12 percent ring 7 activity. The rest of the usage, about 80 percent, was in ring 0 (the kernel) and ring 3 (the AGENT). The low Infos usage initially led me to suspect that Infos was not the cause of the high system call and logical page fault rate. My first reaction was to suspect B32, but eventually I noticed on a PED/FTLS display that the PL/I programs were also generating high logical page fault rates, so that let B32 off the hook.

The only thing the B32 and PL/I programs have in common is their use of Infos, so obviously the cause had to be related to Infos in spite of its low CPU consumption. It's as if Infos local servers were suddenly chasing their tails, with a ?SPAGE in the middle of the loop.

The next step was half lucky guess, and half dumb luck. Assuming that Infos was the culprit, what would cause Infos to do lots of logical faults? The only two possibilities are data base accesses and virtual memory file accesses.

I ruled out data base accesses because the Infos CPU usage was so low. From experience, I know that the Infos CPU consumption associated with data base operations is considerable, yet Infos CPU usage was minimal, and each data base access can generate only a handful (three or four) shared page I/O requests. At 500 logical faults per second, that would mean that Infos was doing about 200 data base accesses per second using only 8 percent of the CPU. That's clearly impossible.

I'm a little rusty on Infos VM file usage, since the last time I spent any time with the Infos internals documentation was back around rev 2.3 or so. But I know that the VM file is a shared file that is created by the Infos global server and then included in the address space of all the Infos local servers in users' ring 4s. For no particular reason, I checked the size of the INFOS.VM file and was surprised to find that it was over a megabyte. Back home on my system I know that it averages something in the neighborhood of 200 KB, so something was suspicious.

I remember from Infos school that the local servers don't bring the entire VM file into memory, in the interest of minimizing the working set size of the client PID. Presumably, they read in a reasonable size chunk of it and then they page through it as required using ?SPAGE system calls. The VM file contains everything there is to know about all open Infos volumes, and the list structures used by the local servers to assert locks. These structure lists can become quite fragmented depending on the number of data bases and volumes open, the number of PIDs accessing Infos files, and the number of locks active.

On the theory that the VM file had become fragmented somehow, causing it to grow abnormally large, I had the client log off all the Infos users so that no Infos files were open (verified via CONTROL @INFOS USERS), and then had them all log back on and resume working. No reboot was involved.

Voila! System call rate and logical page fault rates went back to normal, lots of idle

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CPU was available, and response time was peachy.

Later, the client discovered that someone had recently been testing a new program against the live data base and had inadvertently locked about 10,000 records without unlocking them. That ballooned the VM file up beyond a megabyte and fragmented most of the structures created within the VM file from that point on, causing all other PIDs accessing Infos to have to page through the VM file to follow the fragmented structure lists. Even after the aberrant program terminated and closed its copy of the data base, releasing all the lock structures, the VM remained fragmented. Getting Infos back to an open data base count of zero effectively released all the VM structures and started Infos out with an empty VM file.

Moral: keep an eye on your INFOS.VM file. A sudden spurt in the size compared to normal may mean the program has a bug in it that is causing it to leave lots of locked records around. You might not otherwise notice if the locked records are not accessed by any other programs. It's especially easy to have this problem if you use locks in report programs that read large numbers of keys and records. In general, locks are not a good idea in report programs anyway; if you run into a locked key or record you should just report it and then either wait for it or skip it.

:LINE_PRINTERS

Today I needed to hook up a new Laserjet III to the system using a data channel line printer controller. You may find the details interesting.

Before powering the MV down to install the data channel printer controller and its internal cable, I VSGENed a new system specifying the new printer controller as an LPE printer. I chose LPE because I know that LPB printers require the presence of a Data Products-compatible direct access vertical forms unit (DAVFU) in the printer, and LPE printers do not. The Laserjet does not have a Data Products-compatible DAVFU. If you have a printer VSGENed as an LPB and you get a line of trash, usually @'s, at the top of each job, then you need to re-VSGEN the printer as an LPE.

The next problem involved finding a cable to hook the printer up to the MV. The Laserjet has the usual 36-pin Centronics style connector for parallel hookups. I have drawers filled with old PC parallel printer cables, a couple of DG external printer cables with Winchester style connectors, but no DG external printer cable with 36-pin Centronics style connectors. I checked the DG Direct catalog and found that an 18-inch external printer cable goes for $60. Yeah, sure. So I hopped on the bike, motored over to Radio Shack, and picked up a programmable RS-232 adapter; part no. 276-1403, $9.95. That's a little box with two 25-pin connectors, one male and one female, connected by a little printed circuit board with lots of holes in it and a little bag with 25 jumper wires. After a few minutes with the soldering iron and using the chart shown in Figure 1, I had an adapter that allowed me to use "standard" PC parallel printer cables to hook

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up printers to DG systems. Neat.

Then I shut down the MV, changed the jumper on the parallel printer controller for Centronics style strobe polarity, and installed the controller. Centronics compatible interfaces use "negative true" logic (aka "active low") for the strobe signal, and the Data Products-compatible interfaces used by most DG printers use "positive true" logic (aka "active high"). Hence the need for the option change.

I fired the system up and, voila, the Laserjet works like a champ.

You may be asking yourself, why did I go to the trouble to buy a parallel controller for the Laserjet? Simple: the Laserjet III is a 19 ppm printer and can easily keep a 19,200 baud port busy full-time when printing documents that are proportionally spaced (like Wordperfect or CEO documents). The system overhead to run a 19,200 baud serial port is considerably greater than the overhead to run the same data through a data channel controller. Not only that, but if you happen to connect the printer to an IAC that also has humans on it, the humans will notice spongy I/O when the printer is running full blast. If there are two high-speed printers on that IAC running at 19,200 baud at the same time, then the results will be disastrous for the humans on that IAC.

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Figure 1: DG DB25 to PC DB25 parallel printer adapter wire list

DG (M)	PC (F)	DG SIGNAL	PC SIGNAL
1	11	READY	BUSY
3	10	DEMAND	-ACK
5	1	-STROBE	-STROBE
7	2	DATA1	DATA1
9	3	DATA2	DATA2
11	4	DATA3	DATA3
13	5	DATA4	DATA4
15	6	DATA5	DATA5
17	7	DATA6	DATA6
19	8	DATA7	DATA7
21	13	ON-LINE	SELECT
23	9	DATA8	DATA8
Evens	18-25	GROUND	GROUND

Leave the following pins open:

DG (M)	PC (F)	DG SIGNAL	PC SIGNAL
25		Unused	
	12	Unused	PAPEROUT
	14	Unused	-AUTOFEED
	15	Unused	-ERROR
	16	Unused	-INIT
	17	Unused	-SELIN

Notes:

-NAME indicates negative true logic.

Note that your DG printer controller or microcode (MV/1xxx and MV/2xxx) must be set for negative strobe polarity (i.e., Centronics). The default is positive (i.e., Data Products) for most DG printers.

slots, check out the triple-line printer controller offered by Dataplus. It gives you three data channel controllers on a single board. As it happens, that's the board that I just installed.

:VIRGINIZE

One of the handier utilities around our shop is a program called VIRGINIZE. It originally started out life as a CLI macro, and then eventually got rewritten in Assembly language for performance reasons, but it can be implemented just as easily in any language that allows direct access to system calls. On the face of it, VIRGINIZE isn't a very flashy program, but it sure does get used a lot on my system.

Here's what VIRGINIZE does: when you type "VIRGINIZE *pathname*" it checks to see if *pathname*.VIR exists. If not, it creates it as an exact replica of *pathname*, including file type, record format, TCR, ACL, UDA, and PERMANENCE, and then copies the data from *pathname* using ?BLKIO and its "read next allocated element" option to preserve any sparseness. The output message is "Creating *pathname*.VIR . . ." .

If the .VIR file exists, then VIRGINIZE compares *pathname* to the .VIR version. If *pathname* is more recent based on TCRs, or has the same TCR but is longer, then the .VIR file is re-created and *pathname*'s data is copied to it (as above). The output message is "Updating *pathname*.VIR . . . " .

If the .VIR file TCR and length match that of *pathname*, then *pathname* is re-created and *pathname*.VIR's data is copied to it. The output message is "Restoring *pathname* . . ." .

The net effect is that *pathname* is restored to its virgin state, or a new .VIR version is created from the newer and/or longer, and presumably virgin, *pathname*.

We use VIRGINIZE before patching files, so that we can retain a copy sans patches, and we use it before debugging a .PR file so that any inadvertent modifications made in the shared partition do not show up in the .PR file the next time we XEQ or DEB it. I also use it when doing experimental editing of text files, especially when SPEEDing them (bizarre accidents are real easy in SPEED while researching complex loops; one missing or misplaced escape character and the file is mush).

I'd be happy to provide a listing here of the equivalent program written in C, or some other reasonable language, but I've run out of space again this month. So I guess you'll just have to attempt it from the description given above, or you can download a copy of AOSVS:UTILS:VIRGINIZ from the :SYSMGR BBS.

You're welcome. Δ

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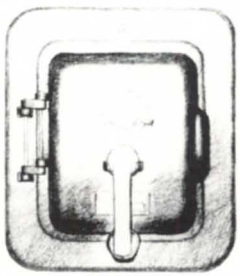

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Disk headaches

SYNOPSIS

Wow 'em with performance, but reliability will ultimately save your system and your sanity. Heed the author's warnings about simplicity and sensibility, and perhaps you may avoid a late-night battle with the Beast.

Advances in disk technology are continuing at a bewildering pace. There are issues of platter size: should you choose 11.0-, 5.25-, 3.5-, or 2-inch disk drives? There are issues of protocol: SCSI or SMD? Throw in data transfer rates, average access time, and mean time between failures and you have enough variables to give yourself a headache.

In my college days, my professors always told me that when faced with a myriad of data, always start by making simplifying assumptions. If the simplified model works well, then one has saved oneself a significant amount of work. In regard to external disk drives for Unix machines, useful rules of thumb for today's Unix environment are 5.25-inch format, at least 600 MB capacity (1 GB of capacity is preferred), a parallel SCSI interface with a maximum transfer rate of at least 3 MB per second, average access time of less than 20 ms, and a mean time between failures (MTBF) in excess of 100,000 hours. If you are looking for internal swapping disks, then you should be looking at 3.5-inch drives that can hold at least 200 MB and an MTBF of at least 100,000 hours.

If the disks you want to buy fit these parameters, then you will be purchasing high-performance, proven technology with a minimum amount of risk. Disks with 11.0- and 8.0-inch platters are obsolete. Disks that are much faster than 12.0 ms have yet to have their reliability proven in the marketplace.

At this point I would like to emphasize the effect of reliability on your mental health. As far as I am concerned, the most important factor with regard to disk selection is reliability. I would rather have above-average reliability and average performance than superb performance and average reliability. (I consider average reliability in today's marketplace to be at least 100,000 MTBF.)

Not everyone agrees with my emphasis on reliability. I had lunch recently with the president of a company that manufactures disk drive subsystems. He had difficulty understanding why anyone would *not* want as much disk performance as possible, even if it meant sacrificing reliability. I could tell that he must never have had to face down the Beast by himself. What is the Beast? I will describe it to you:

It is 3 a.m. Last night, just as you were ready to go home, a critical disk crashed. You have been working alone on recovering the system for 10 hours. Dinner consisted of an apple pie and a Snickers from the vending machine, washed down by copious amounts of Mountain Dew. You spent several hours moving files so that you will have enough space to read in the backup tape. Unfortunately, just moments ago the primary backup tape had a nonrecoverable hard error just before reaching the data you needed. It had been running for almost two hours. Horsefeathers! Your heart is beginning to beat faster, and there is a sinking sensation in the pit of your stomach. You hope the secondary backup tape will work. You are tired and cold. The drone of the air conditioning system rings in your ears. You would rather be home asleep, but instead you know you have to be at your best. One mistake and you know the system will be down until noon at least.

At this point you munch on some Peanut M&Ms and chug another "Dew" to try to shake the fatigue from your mind. Finally, after taking a deep breath, you load the secondary backup tape. After what seems like an eternity, the restoration runs to completion. A small smile comes over your face. Tonight you have faced the Beast and won. Briefly, you remember the times when you have not always been so fortunate. But the pain of past defeats is short-lived. Tonight, as the adrenalin surge slowly recedes, you savor your small victory. After another hour of checking your work, you are ready to go home. You head into the parking lot as the first light of the new day appears on the horizon and you say good morning to the "early bird" users as they arrive at work. As you begin to drive home for a well-deserved rest, you ask yourself, "How can anyone in their right mind get up before 7 a.m.?"

The above scenario is less likely to happen now that disk mirroring is available, disks are more reliable, and tapes drives are faster and have greater capacity. However, having to face the Beast is definitely near the bottom of an experienced system

manager's list of favorite activities. And anyone who has ever had to face the Beast knows the importance of reliable equipment and well-tested, thorough backup procedures.

I hope that as a result of reading this column, the reader will begin to understand why I am so excited about the new Data General Reliable Array of Inexpensive Disks (RAID) technology. It has an MTBF in excess of 1,000,000 hours. The use of RAID technology should greatly reduce the chance that I will ever need to see the Beast again because of a disk hardware failure. One spare disk drive on the shelf, combined with Data General's RAID technology, should be even more effective in controlling the Beast than garlic is in combatting vampires.

Probability and MTBF

It is important to note that just because each of your disk drives had an MTBF of 100,000 hours does not mean that 100,000 hours will pass before you ever have a disk failure at your site. In fact, if you have 10 drives, each with an MTBF of 100,000 hours, you probably will have at least one disk failure within 14 months. The mathematics used to calculate this failure is as follows: the probability of any disk failing is 1 - (1/100,000) = 0.99999. The probability of not having a failure among 10 disk drives is $(0.99999)^{10}$ = 0.999900004. The MTBF for such a system is 1/(1 - 0.999900004) = 10,000.4 hours = 416.7 days. A good rule of thumb, given that all of your drives are of equal reliability, is to divide the number of MTBF hours by the number of drives.

No more free lunches

One of my favorite methods of obtaining free lunches from Data General sales personnel has been eliminated. All I had to do was bet salespeople that they could not tell me the MTBF of DG disk drives. What the salespeople learned was that, technically, they had the capability of telling me the MTBF of their drives, but corporate policy would not allow them to give me this information. This policy earned me several free lunches and it also cost Data General several hundred thousand dollars in sales because I refuse to purchase any disk drive from any company that will not tell me the MTBF of its disk drives.

Recently, I learned that DG has modified its MTBF disclosure policy. What is now in place is the advanced reliability calculation (ARC) policy. Under this policy, Data General will tell a user the reliability values of any piece of equipment it sells, however, it will do so only if the user is willing to sign a nondisclosure agreement concerning these reliability figures. I feel this is a reasonable compromise. The user can obtain critical reliability information and Data General does not have to worry that its reliability information will become public knowledge. Δ

David Novy is a technical computing specialist at 3M in St. Paul, Minnesota. He is past chairman of the AOS/VS special interest group and current chairman of NADGUG's SIG/UX.

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Totally RAD

SYNOPSIS

Feeling philosophical today? Try these on: RAD is rapid, but compared to what? And when is a language not really a language? Get hip with the concepts and cogitate for a moment the enormous potential of 4GL and SQL tools combined with the new muscle of today's hardware platforms. The software development revolution is here. Be ready to take advantage of it.

by Kim Medlin
Special to Focus

What comes to mind when you think of "RAD"? A California surfer dude describing the last awesome wave? Be careful with your lingo at the next office party because all hip software developers know that RAD stands for rapid application development. There, if this article doesn't help you in any other way, perhaps I've just saved you from a potential data processing social faux pas!

What is rapid?

If RAD means rapid application development, what is meant by "rapid?" After all, "rapid" is a relative concept. In other words, RAD is rapid when compared to what?

A historical perspective shows that dramatic improvements in programming languages have occurred before. Compared to the first generation of hard-wired logic, Assembly language programming was a great improvement in development productivity. Later, third-generation languages (3GLs) like Cobol and Fortran once again compressed the development life cycle significantly. Likewise, RAD provides a developmental productivity increase when compared to 3GLs *in certain situations*. (Those last three words are critical. More on this later.)

What is fueling this most recent revolution of application development methodology? The answer lies in two distinct data processing technologies that only recently have found common ground in the worlds of advanced software functionality and high-speed hardware performance. In other words, advanced software concepts frequently have waited decades for hardware technology to catch up and provide acceptable performance. In the case of RAD, the two critical pieces of software now viable are

1) Fourth generation languages (4GLs), and
2) Relational data base management systems (RDBMS).

I know what you must be thinking: these concepts aren't new! After all, the marketing blitz for these products has been in full swing for years. However, let's make one thing clear. I'm not from the world of full-color glossy advertising. I live in the real world of delivering usable software applications. Only recent advances in hardware speeds have allowed the promise of these two components to become a practical reality in the software development arena.

What is a fourth-generation language? or, when is a language not really a language?

Without first-hand experience, I accept the notion that hardwiring a computer's logic was the first generation in the family tree of programming languages. And you must admit that Assembly language was truly a generation ahead of its predecessor. And, of course, Grace Hopper's Cobol, the founding father of 3GLs, still holds the world record for language longevity.

These three programming models are termed "generations" because each new level was built upon the framework of its predecessor. So at first glance it appears that 4GLs follow this logical progression, because they are programmed in 3GLs. But consider this . . . what will fifth-generation languages be written in? 4GLs? Hardly! I therefore propose that 4GLs aren't programming languages at all! My theory is that:

4GLs are not languages. They are development tools, written in 3GLs, that increase developer productivity.

(However, to maintain terminology that is consistent with the current DP vernacular, I will refer to 4GLs as languages.)

The key concept separating 3GLs from 4GLs is that when using a 4GL, the developer indicates "what" a program is supposed to accomplish. This is unlike all previous languages in which the steps of a program told the computer "how" to accomplish a task. This higher level of functionality implies a degree of knowledge that 4GL tools possess. Specifically, 4GL tools are designed to provide standard business data processing functions such as

- Forms-level data entry
- Interactive menus
- Pick lists
- On-line help
- Reporting
- Business graphics.

The basic rule, then, is that a 4GL is a candidate language for an application if the 4GL under consideration provides a large percentage of the business functions required by the application.

A corollary to the above rule states that a 4GL is generally not appropriate for a specific application function when

1) The 4GL doesn't automatically facilitate that function, or
2) Performance must be maximized.

Under those circumstances, a 3GL is a more likely choice than a 4GL.

Note: I realize that it sounds intuitively obvious to state that "4GLs should be used when it makes sense." However, if you attempt to force-fit a 4GL to accomplish a function that it is not designed to accomplish, you can easily spend *more* time writing that function than if you had used a 3GL! The trick is to use the proper tools for the task at hand. 4GLs are not always appropriate.

Many industry-leading 4GL offerings are available on Data General platforms. Most of them are supplied by third-party vendors such as Ingres, Sybase, and Informix.

The DBMS

Applications developed with a 4GL are often called "data driven" because it is the actual structure of the data that can determine the complexity of implementing a specific function. Therefore, proper data base design for a 4GL environment is absolutely, positively crucial!

Many 4GLs employ the Structured Query Language (SQL) as their relational data base language. SQL (pronounced SEE-quel) is the current ANSI standard for data base access. Utilizing SQL with 4GLs is a natural fit since physical SQL data structures usually are very similar to the logical data design, thus making data-driven 4GL applications generally intuitive to develop.

And in summary . . .

This article merely scratches the surface of rapid application development. Future topics to be discussed include

- Structured analysis
- CASE tools
- Data base design techniques
- Prototyping
- SQL syntax tutorial
- SQL tips and techniques
- Product evaluations
- Development estimating methods
- Reporting and query capabilities

. . . to name a few.

The age of software development within a short timeframe is here! The promise of 4GLs/SQL combined with the muscle of current hardware platforms have been united. They enable software developers to produce volumes of quality application software in a relatively short period of time. I don't know what the next generation of development tools will be. But RAD technology is here today. Also, Data General plays an active role in supporting RAD products on a variety of platforms. Therefore, as software developers using DG systems, we should take full advantage of RAD ASAP. Δ

Kim Medlin is a Software Development Section manager with Data General's Solution Services group in Atlanta, Georgia. Solution Services specializes in custom software design, development, implementation, and consulting. Kim's address is 3617 Parkway Lane, Norcross, GA 30092. He can be reached at 404/448-6072 extension 2007.

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Life in the fast lane

SYNOPSIS

What is quite a bit smaller than a bread box, worth more than its weight in gold, and lurks at the center of a brilliant and frightening Silicon Valley plot? Hint: it's inside your PC.

No doubt about it, business is cutthroat in Silicon Valley. This month's column, about Intel and its domination of the PC CPU chip marketplace, not only demonstrates the nature of the chip business, it may also help you develop your PC purchasing plans for the next 12 to 24 months.

The 8088, the basis for the original PC, was obviously a big success for Intel. Once started, there was no stopping the growth of the PC market, and Intel's ties to IBM's manufacturing and Microsoft's operating systems guaranteed it a healthy future.

The 80286 chip and the IBM PC/AT were supposed to be even more successful than their predecessors, but some engineering brain damage ensured that the '286 represented only a marginal improvement over the original 8088/8086. The 80386, however, is a big step forward. Its memory management almost lets you forget that the chip is still based on segmented memory—something that should have died a slow and painful death many years ago. In any case, the 80386 is clearly a hit.

In order to fill the gap between the fastest 80286 chips and the 80386, Intel introduced the 80386/SX—a 32-bit '386 with a smaller, 16-bit external bus. The '386/SX is slower and less expensive than the full-blown 80386/DX.

As an interesting twist in the semiconductor business, Intel (like most other manufacturers) needed to guarantee that a second source was available for the 80386. Such "second sourcing" is required before certain customers will buy the product at all. This is insurance for these customers against the possibility of delays in delivery or other problems with the primary supplier.

Advanced Micro Devices (AMD) was given the rights to manufacture the 80386 in a technology exchange with Intel. What Intel had not counted on was that AMD would be able to produce a chip that reliably ran faster than Intel's own 80386: 40 MHz for the AMD chip vs. 33 MHz for Intel's best.

Take a step back and look at the situation here. These little silicon goodies are literally worth more than their weight in gold. A truck was recently hijacked in Japan. It was stocked with all sorts of valuable electronic equipment and components. All was left untouched by the thieves, except for a case of 80386 chips.

You and I don't usually go out and buy these chips. No, we buy computers that say "386" on them. We don't care who makes the chip so long as it's faster than the one used by the guy in the next cubicle. But a 40 MHz chip is worth a lot more than a 33 MHz one, and if a PC clone manufacturer can strike a better deal with AMD than with Intel, there are millions of dollars at stake. In particular, Intel's monopoly collapses and the high prices of these chips come tumbling down.

Needless to say, Intel began an active defense. First, it sued AMD, trying to keep AMD from using the name "80386" on the chips. Intel lost the battle.

What else could the company do? What weapons were available? While AMD was working on its version of the '386, Intel was, of course, developing the next generation of the line, the i486. The i486 is not as revolutionary as the '386, but it is quite a bit faster at performing the same tasks. Intel figured the i486 should be able to draw big bucks, and the company priced it accordingly. But Intel knew from its previous experiences that if it wanted to keep i486 prices high, it would need to fill the 386/486 gap with something. Enter the i486/SX.

In the 286/386 world, there are add-on chips for floating-point math operations: the 80287 and the 80387, respectively. Not all programs use the floating-point instructions, but those that do, such as spreadsheets and CAD/CAM utilities, run substantially faster with the coprocessor installed.

With the increase in chip densities that accompany every new generation of silicon, Intel was able to squeeze the math coprocessor logic onto the same wafer as the main CPU. As a result, the i486 includes the floating-point functions. There's no separate math chip.

There's also no longer much need for a 16-bit version of a fast chip, as proven by the dramatic fall of 80386/SX sales. It would have been silly to make a 16-bit version of the i486. Ah, but what about those folks over at AMD? What could be

done to put a stop to those young upstarts?

Here was Intel's logic: Sales of the 80286 and 80386/SX were way down, and would not likely recover. The full-blown 80386 was now Intel's bread and butter, with the i486 the ace in the hole for the next two years. But now AMD threatened to destroy the crown jewels. Remember, there's no vendor loyalty in this business; it's all dollars. Drastic action was required.

Intel's next move was both brilliant and frightening. In effect, the company took its next heir to the throne—the i486—and crippled it. Intel disabled the floating-point processor. That's right, some engineer probably just went into the mask and disconnected one of the millions of transistors on this baby. That's all it would have taken. The result: the birth of the i486/SX. It's every bit as fast as the "real" i486 except in floating-point operations, and it costs Intel every bit as much to produce as the i486.

Pretend you're a manufacturer of PC clones. You've got a choice between AMD's fast 80386 or an even faster i486/SX. Oh, another point: the i486/SX is substantially less expensive than AMD's chip. What would you do? I thought so.

But what about those users who want to upgrade to a math chip when they run out of horsepower for their big spreadsheets? If you've bought a box with an 80386, you can just buy the separate 80387 chip and pop it into the empty socket sitting on the motherboard for just that purpose. Isn't that in AMD's favor?

Maybe not, as Intel has covered that base, too. You want to add floating-point instructions to your i486/SX? No problem. Intel will gladly ship you a math chip. Funny though, it's just a true i486 to replace your crippled /SX. Elegant and vicious. Such is life in the fast lane of Silicon Valley.

I'm taking next month off, but I'll be back in October, when I'll bring you up to date on the subject I'm asked about most: Netware for MV family computers.

(Note: at the time of this writing, Intel had not officially announced the i486/SX chip. This article is based upon industry speculation and press reports of "reliable sources.") Δ

Doug Kaye is president of Rational Data Systems, Inc., and can be reached at 1050 Northgate Dr., San Rafael, CA 94903; 800/743-3054.

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Bits and bytes from the bulletin board

Laserjet printer fonts, problems

From: Keith Chuvala

While we're waiting for DG to properly support the LJ IIIsi, has anyone figured out a way to fool CEO into thinking the printer has cartridges installed? We want to be able to use Times and Helvetica, which are native to the IIIsi, but the only way I've found to get CEO to speak those fonts is to specify a cartridge in the printer setup. Unfortunately, CEO somehow thinks I'm being naughty, and gives me a formatting warning (and no other output!) when I choose one of these fonts. Shoot, I'd be happy just to get 12 pitch out of the darned program!

From: Matt Koch

This suggestion may help. There is a CEO printer toolkit available that lets you do just about anything to any printer you want, at least that is what the manual says. My problem is that we have two of the original laserjets with a Pro-Collection font cart. As of rev 3.20, CEO no longer supports this cart. The local DG office was nice enough to loan me a copy of the Printer Toolkit, but at the moment it's complaining about the escape sequence that is needed to access the font. The toolkit requires that you run CEO rev 3.20.

What about these IAC-8 models?

From: Jim Bageant

Can anyone give me the story on the different IAC-8 models? I'm looking for an 8-line IAC with full hardware flow control on 8 lines. I've been told at least a dozen various stories concerning software revisions. [My] system is an MV/20000 Mod 1 running AOS/VS Classic 7.67.

From: Jeff Campbell

There are three kinds of IAC/8s. The IAC/8 is RS-232 only. The IAC-II/8 is switchable between RS-232 and RS-422. Both the IAC/8 and IAC-II/8 use the Micro Eclipse processor. Then there is the IAC-3/8. It is similar to the IAC-II/8 except that it uses a 68 K processor. Always remember, call your DG sales rep for more specifics (standard disclaimer). I have used all three types and never had any problems. Good luck!

Tracking CEO messages

From: Matt Koch

I need to find a way to count the number of messages received for a CEO user on my system. Does anyone know of a way to do this? DG suggested the CEO toolkit, but we do not have any of the required programming languages to use it. I could probably get a fairly close idea by tracking the numbers in the user's in-box and wastebasket, but an accurate number would be better. Any help would be greatly appreciated.

From: Alain Gross

There is a simple way to count the number of CEO messages received (or sent) by your CEO users: LOG Use CEO.POA SET/LOG. CEO_POA will log any traffic in the file :CEO_MAIL:CEO_POA_LOG. ICobol or even SORT will be enough to extract and count the needed lines. Advantage: each line is time-stamped, so you can deal with a restricted period of time. And you can know who is the sender.

Inconvenient: the log will grow up very fast. You will need to purge it often. I usually call such a method *bricolage* in my country (Switzerland), but it sometimes works better than some DG products. Hope this will help. Δ

Do you have an answer, comment, or question? Call the NADGUG/RDS electronic bulletin board, available to all NADGUG members. The phone number is 415/499-7628. There are no fees for use other than the telephone charges.

The latest products for DG systems

High-performance MV subsystems

Hopkinton, MA—Hiperstor, a subsidiary of Clearpoint Research Corp., announces the DGMS-SC family of single- and dual-channel SCSI-2 disk and tape interface controllers for all Data General systems supporting the Burst Multiplexor Channel (BMC).

Using one slot but providing capacity for up to 14 drives, the DGMS-SC family offers subsystem configurations from entry-level tape backup to multiple tape and disk subsystems.

The DGMS-SC1's dual BMC and dual SCSI-2 tape and disk subsystems provide data transfers without controller bottleneck. Dual channels support more than 500 I/Os per second. The SC1 controller supports 14 SCSI disk and tape devices from one controller. Custom-configured channels provide faster operations; with one bus for disk operations and a second for tape, disk accesses are not slowed by more time-consuming tape requests. Each SCSI bus can be configured to support single-ended or differential configurations, maintaining past investment and allowing future upgrades. Dual channels allow both configurations off a single controller.

Also available in the SC family is the SC0, a single-channel tape and disk controller. The SCT, a single-channel tape controller, is a solution for backup, booting, and file transfers. All controllers provide Data General DPJ and MTJ emulation. Additional features include hardware mirroring (RAID 1), custom diagnostics, and dual porting.

List prices range from $11,000 for an entry-level, tape-only subsystem to $48,200 for a high-performance, 4 GB dual-channel subsystem.

Clearpoint Research Corporation, 35 Parkwood Dr., Hopkinton, MA 01748; 508/435-2000.

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No fax machine required

Toronto, Ontario—A multi-user, send-and-receive fax system for AOS/VS is now available from Seidata Microsystems. MV:FAX enables users to send multiple letters, documents, reports, ASCII, or Wordperfect files directly from their terminals or PCs.

A scheduling system allows large transmissions to be coordinated at specific times, to take advantage of more economical communication rates. Transmission dates, times, and document names, together with time used, are audited automatically on disk. Such information may either be printed or inquired upon from any terminal.

Incoming faxes are stored on disk, and may either be stored or printed automatically to a laser printer or dot-matrix printer, or redirected to any printer on the MV. No fax machine is required.

A unique programmer's interface integrates with Cobol, ICobol, BBasic, Fortran, Powerhouse, and other fourth-generation language applications, allowing seamless generation of fax documents and automatic transmission of data directly from application programs.

A regular PC is used as the dedicated MV:FAX server, which connects to the MV via asynchronous lines. No special hardware is necessary.

The package includes MV software, system manager's interface, asynchronous communication software, PC software, and fax card. An unlimited user license for any MV is $4,000.

Seidata Microsystems, Inc., 15 Wertheim Court, Suite 511, Richmond Hill, Ontario, Canada L4B 3H7; 416/882-9950.

Circle 61 on reader service card.

Optimize while on-line

Salina, KS—Eagle Software and Expert Systems, Inc., announce Disk_Pak Online!, a disk optimization utility available for Data General's MV family of minicomputers.

Disk_Pak Online! runs transparently while other processing continues uninterrupted, requiring no system downtime or release of disks. Disks may be reorganized automatically, with no operator intervention. A single command allows the user to watch the optimization process, monitoring which file is being organized and how much time remains until completion.

With automatic file placement (AFP), a technique developed by Eagle Software, Disk_Pak Online! improves disk response time and overall system performance. Because the utility may be run at any time, users will save time formerly spent reorganizing disks.

The program provides support for single and multiple disk systems (DG or third-party drives) across the entire MV product line. Disk_Pak Online! also supports disk mirroring and MRC subsystems. It may be run on systems that must be up 24 hours a day, and it maintains integrity of data during optimization even in the event of a system or power failure.

Disk_Pak Online!, developed by Expert Systems, Inc., is being marketed by Eagle

Software through its network of distributors. Prices range from $500 to $5,000 depending on machine size. Upgrade pricing is available for a limited time to current Disk_Pak and Diskopt users.

Eagle Software, Inc., 169 East Cloud, P.O. Box 16, Salina, KS 67402-0016; 913/823-7257.

Circle 57 on reader service card.

Point-of-sale terminal emulates DG

Boston—Printer Products offers the PCPOS 2000, a PC-based point-of-sale terminal that can run as a Data General terminal. Data General VARs (value-added resellers) need only to install either of two software emulation packages from Rhintek, Inc.

Rhintek's EMU 220 software package allows the PCPOS 2000 to emulate the DG Dasher D214, D215, D220, D100, and 6053 terminals. The EMU 470 software package allows the PCPOS 2000 to emulate the DG Dasher 470C terminal and is compatible with DG terminals D214, D215, D220, D411, W640, and D641.

The PCPOS 2000 resembles an integrated register when installed. Due to modular construction, it disassembles for quick service with printer and keyboard detaching in seconds.

Both 286 and 386SX versions are available with a 3.5-inch, 1.44 MB floppy drive standard. A 40 MB hard drive is optional.

Available keyboards: an AT-101 enhanced or a QWERTY plus register-style. Both can include Smartwedge from Printer Products. Smartwedge includes key programmability and interfaces for dual-track magnetic stripe reader, and bar code scanner or wand. The Smartwedge setup software is for applications requiring the manipulation of data entering the keyboard. Mag-stripe input and bar code data are altered without any changes to the application program.

Several sizes and types of monitors are available, including 9-inch MGA, 12-inch MGA, or 12-inch VGA color.

Options include a 40-character, VFD pole display that provides flash and scroll modes for advertising messages. A 16-character, liquid-crystal pole display with scroll mode is also available. Both are capable of 360-degree rotation. A basic 286 package is $1,995 including receipt/journal/validation printer, 12-inch MGA monitor, AT-101 keyboard, and cash drawer.

Printer Products, 25 Denby Road, Boston, MA 02134; 617/254-1200; Rhintek, Inc., P.O. Box 220, Columbus, Maryland; 301/730-2575.

Circle 60 on reader service card.

8 mm tape backup system in two versions

Marlboro, MA—Hanson Data Systems introduces an 8 mm tape backup system for the Data General MV family of processors. The 8 mm transport will hold as much as 2.2 GB of data, and is available in two versions.

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The HST-6300 is electrically compatible with DG's 6299/6300 tape drives, and can be daisy chained to an existing drive. It is software compatible with all existing drivers, and has been verified under AOS/VS, AOS/VS II, and the Meditech Magic operating systems. List price is $12,300.

The second version comes with a new controller, and while not electrically compatible with existing Data General drives, it offers full emulation of the MTD, MTC, and MTB device drivers. Model number HST-6300P is available in both rack-mount and desktop versions. List prices are $9,225 for the rack-mount and $8,235 for the desktop version.

Hanson Data Systems, Inc., 734 Forest Street, Marlboro, MA 01752; 800/879-4374.

Circle 58 on reader service card.

Terminal-to-PC upgrade program

Westboro—With more than 475,000 CEO users worldwide and millions more non-CEO users—most using asynchronous terminals—there is significant upgrade demand to trade terminals for PCs. A new Data General Corporation promotion offers trade-up for any terminal to a Dasher/286-12j or Dasher/386SX-16. CEO Connection and its terminal emulation are pre-installed.

Every Eclipse MV family site is a candidate for this program. Users may upgrade desktops to PC technology while maintaining benefits of CEO and other applications. Implementation is facilitated with software pre-installed at the factory, and with simplified ordering and terminal return process.

The Dasher/386SX-16 system (Model 91853) includes one 3.5-inch floppy drive, a 40 MB hard disk, keyboard, cable, and RS-232 cable. The Dasher/286-12j system (Model 91368) includes dual floppy drives, a 40 MB hard disk, keyboard, cable, and RS-232 cable. CEO Connection pre-installed (DOS Model 30952-P10N) must be included in any order as a no-charge line item.

Discounts and trade-ins result in promotional price savings of more than 40 percent for either color or monochrome models.

Data General Corporation, 4400 Computer Drive, Westboro, MA 01581; 508/366-8911.

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Unix front-ending for Macintosh

La Jolla, CA—Pacerterm, a new Macintosh communications software product from Pacer Software, builds on Apple standards to provide terminal emulation and file transfer capabilities in a number of prevalent networking environments. Hypertalk-based scripting and a flexible interface to the Macintosh Communications Toolbox (CTB) enable Pacerterm users to build Macintosh front-ends to Unix systems and applications.

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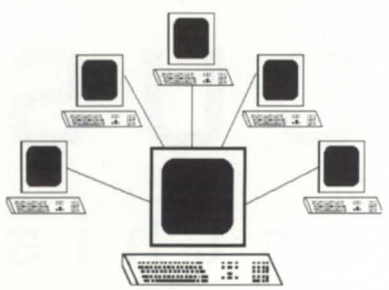

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set of terminal connection and file transfer tools. The product is intended for Macintosh users interacting with Unix or VAX systems, on-line services, or any remotely accessed computer system. Supported media include asynchronous as well as ethernet or Apple Local Talk bridged to ethernet.

Pacer Software, Inc., 7911 Herschel Ave., Suite 402, La Jolla, CA 92037; 508/898-3300.

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CEO integration with Wordperfect 5.0

Orem, UT—Wordperfect 5.0 is now linked to Data General's CEO (comprehensive electronic office). The resulting new product, Wordperfect 5.0 with CEO Integration, provides extensive options to CEO users:

- Accessing Wordperfect from the CEO Main menu without returning to the CLI prompt;
- Invoking Wordperfect automatically whenever "Edit Document" is selected from the CEO Main menu.
- Using CEO drawers and folders to access Wordperfect documents.
- Printing Wordperfect documents from either the CEO Main menu or from within Wordperfect.

Either the CEO filing system or the Wordperfect "List Files" feature will retrieve files, and the CEO Interrupt menu can be used for temporary access to CEO Mail. Beyond its new integration features, Wordperfect 5.0 offers more than 650 printer definitions. It adjusts fonts and formatting automatically to match a newly designated printer. The program provides support for more than 1,700 characters, including international languages, trademarks, copyright symbols, equations, and math characters.

Wordperfect 5.0 with CEO Integration includes all the new features of Wordperfect 5.0, including text-integrated graphics, print preview, absolute measurements, columns, speller/thesaurus, master documents, keyboard mapping, cross-referencing, styles, advanced macros, and a macro editor.

A special Wordperfect template is provided that includes all Wordperfect keystrokes, as well as the most commonly used CEO functions. The program supports all Data General terminals and includes WPTerm, a program that allows users to run Wordperfect on non-Data General terminals.

Wordperfect 5.0 with CEO Integration for Data General systems requires AOS/VS 7.65 or higher, or AOS/VS II 2.01 or higher, as well as CEO 3.10. Storage of Wordperfect and associated files requires between 10 MB and 21 MB of disk space. The program is priced from $2,640 to $24,720 depending on machine and system.

Wordperfect Corporation, 1555 N. Technology Way, Orem, UT 84057; 801/228-5006.

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A complete listing of the NADGUG software library

ACK • Updated version 1.70. Terminal emulator/file transfer program for both AOS/VS and AOS machines. 365 blocks.

Big Brother • Automatic log-off program written in Fortran 77. Donated by the U.S. Forest Service. 169 blocks.

B.J.'s BBS contributions • About 20 items, including various programs, documentation, and macros. Some of the more interesting items include the :SYSMGR benchmark suite, a continuous incremental backup, a cleanup file maintenance program, a program to find strings in files, and a type-backward program. 6,761 blocks.

New addition
C compiler • Shareware product from Benchmark Products. Subset of ANSI standard C. Shareware version has a few features disabled, but is otherwise functional. 935 blocks.

CRTEDIT • The old RDOS screen editor ported over to VS. 49 blocks.

DBCHECK • Checks the open status of an Infos file and examines the checkpointing status of a file. 187 blocks.

DUMPLOAD • A Macintosh program to dump and load AOS/VS-compatible dumps on a Macintosh. 137 blocks.

ERP • A process-termination program developed by NASA and modified by Manville. In Fortran 77. 454 blocks.

FILEMNGR • With this new version, you can move, copy, delete, view, and perform several other options faster. This is distributed as shareware. If you try it and continue to use it, you are requested to pay a registration fee. From Kim Geiger. 654 blocks.

Focus • Selected *Focus* magazine articles including a SYSLOG filtering program, a macro to copy to two tape drives at once, a Cobol screen generator, and a collection of articles by John Grant. 1,774 blocks.

FTNCVT • A Fortran 5 to Fortran 77 translator. 232 blocks.

Games • A collection from various places. Enjoy. 19,216 blocks.

IMSLUTIL • A collection of CLI macros, Cobol routines, and assembly routines callable from Cobol. By IMSL of Houston. 4,893 blocks.

JAG_UTIL • JAG_UTIL by John Grant consists of several programs: Filecount, Userspace, Scan, Glossary, Laminate, and Qhelp. 4,325 blocks.

Kermit • A file-transfer protocol developed at Columbia University. 9,697 blocks.

Logout • Another auto log-out system. 178 blocks.

Look • Used to view text files, Look allows you to move forward and backward in a file. Donated by Data General. 202 blocks.

Macros • A collection of macros from various sources. 441 blocks.

MENUDIR • An initial user menu that can chain to other applications and features a password-control system. From the Fed SIG. 486 blocks.

Misc Kerm • An expanded version of AOS Kerm, this now includes other versions of Kermit including DG/One Kermit. 6,709 blocks.

MS-DOS • A VS program that lets you read and write MS-DOS diskettes on an MV system with a 5.25-inch floppy disk drive. 984 blocks.

Notify and Prior • Two contributions from Concept Automation. Notify tells you when a process has terminated. Prior lists the priorities of processes. 162 blocks.

RDOS Kermit • Now available. You must request the Kermit tape (rather than the library tape) to get RDOS Kermit.

Softrans • A file-transfer protocol written in Fortran 77 used to communicate with proprietary PC communications packages. 462 blocks.

Spell • Checks the spelling of a word or spell-checks documents. Submitted by Richard Kouzes. 5,108 blocks.

TEX • Version 2.26a is now available. TEX (Terminal Emulator with Xmodem) is a terminal-emulation program written by David Down. He has revised the TEX software to include a command language. TEX is distributed as shareware. At the end of 30 days, either remove it from your system or send the author a $45 fee. 463 blocks.

VT100KER • VT100 emulator from John Grant. 1,043 blocks.

Xfer • A tape-conversion utility. 607 blocks. Δ

All NADGUG members interested in receiving the NADGUG software collection should send a 1,200-foot tape to:

Randy Berndt, Building 4, Suite 321,
5300 North Braeswood,
Houston, Texas 77096

MV/2000 and MV/1400 users should send one formatted, error-free tape cartridge. Software contributions should be sent to the same address. Be sure to include your membership number. Allow 4-6 weeks for delivery.

Thanks to Brian Johnson and :WFFCA, the library is now able to provide 1,200 ft. copies to AOS/VS rev 6 users. Thanks to Kevin Danzig for duplicating MV/2000 tapes. For information regarding non-standard library distribution, call 1-800/932-6663.

Please include a self-addressed envelope with sufficient return postage. In compliance with postal regulations, do not date the postage. Either disable the date printing completely, or set the date to "--" or zeros. Tapes cannot be returned UPS collect.

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ON-LINE HELP

***Who to call for answers about* NADGUG *and* FOCUS**

NADGUG address:
c/o Danieli & O'Keefe Associates, Inc.
Chiswick Park
490 Boston Post Rd.
Sudbury, MA 01776
FAX: 508/443-4715

FOCUS Magazine address:
c/o Turnkey Publishing, Inc.
Livingston Building, Suite 250
3420 Executive Center Dr.
Austin, TX 78731
FAX: 512/343-7633

NADGUG

Membership, RIGs, SIGs
NADGUG staff **800/932-6663**
(Outside the U.S.) **508/443-3330**

Electronic bulletin board
(300 or 1200 baud modem)
Rational Data Systems **415/499-7628**

FOCUS Magazine

512/345-5316

Editorial comments, article suggestions.....Robin Perry
(please send product announcements to the address listed above)

Information about advertising.....Michelle Sentenne

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MISCELLANEOUS

OPPORTUNITY!

Focus magazine is seeking individuals interested in writing product reviews, and technical or feature articles. You won't get rich writing for *Focus*, but you will be rewarded by having your name and article in front of the most active and influential group of Data General equipment users. If you would like to discuss your ideas with the editor, or would like to receive a copy of our editorial schedule and writer's guidelines, please call Robin Perry at 512/345-5316 (phone) or 512/343-7633 (fax).

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Data Specific

Wang exec joins Eclipse Business Unit

Gerald Paul joined Data General as the vice president of Eclipse Development within the Eclipse Business Unit (EBU). He will report to **Joel Schwartz,** vice president and general manager of the EBU. Paul will oversee development of future generations of Eclipse MV hardware, software, and peripherals.

Paul comes to Data General after 12 years at **Wang Laboratories** where he held various senior management positions, most recently as vice president of Systems and Communications Development. During his career at Wang, Paul was responsible for the development of Wang's proprietary and open systems families of computers, and its suite of communications products.

Mike Schneider, who formerly held the position assumed by Paul, will take on new senior-level responsibilities, DG says. Schneider, a 19-year veteran of DG, has held positions in systems engineering, manufacturing, development, and customer service.

ISG adds team members

Innovative Systems Group, Inc. (ISG) announced the addition of two DG professionals to its team. **Jose A. Pardo,** formerly with **NPA West**, and **Ed Oram**, formerly with **Computer Products & Repair (CPR)**, have been named senior account managers. ISG specializes in providing on-site hardware maintenance, new and used equipment sales, disaster recovery services, and systems software support for the DG community. ISG's corporate offices are located in Long Beach, California.

Talking about money

The raising of working capital, also known as cash, was the reason behind Data General's recent sale of $110 million worth of 7 3/4 percent convertible debentures due in 2001. The debentures are convertible at any time prior to maturity, unless previously redeemed, into shares of the company's common stock at a conversion price of $19.20 per share.

Company spokesperson **Jim Dunlap** said that DG is not suffering from a cash flow problem. Including proceeds from the sale, DG has $225 million in cash and a long-term debt of $152 million.

Best new name of the month

AV Object Office was named "Product of the Month" in the May issue of *Unix World* magazine. The article describes Data General as the "first system vendor . . . whose solution encompasses so much hardware: the PC, the local area network, and the minicomputer." AV Object Office is a LAN (local area network)-based office computing environment that connects PCs with Aviion servers operating on Netware LANs.

If you've never heard of AV Object Office, that's because when the product was announced this spring, it was called "Open Systems Office/pc.DAA." Plaudits to the person at DG who insisted that the product be given a more concise and understandable name.

A first: third-party Aviion service

Hanson Data Systems of Marlboro, Massachusetts, is the first third-party service supplier to support the DG Aviion family of products. For the past 10 years, Hanson Data Systems has been a supplier of new and refurbished Data General products, as well as a supplier of DG and DEC service.

Wang, IBM tie the knot

Minicomputer manufacturer **Wang Laboratories, Inc.** announced that it will sell computers made by **IBM.** In return, IBM invested $25 million in Wang securities, with potential for further investment. Wang will continue to sell its midrange VS computer line, but development and sales efforts reportedly will concentrate on IBM hardware. Wang will continue software development, making it easy for customers to migrate from its VS line to IBM's AS/400, among other projects.

The news has a potentially positive effect on Data General, if Wang customers decide to search for another hardware supplier rather than move to IBM.

CRCA CEO

The French bank **Caisse Regionale du Credit Agricole di Var** (CRCA) purchased $2 million worth of Eclipse MV and Aviion computers, upgrading its MV/20000 to an MV/30000. CRCA has been a CEO user since 1985, and will continue to use CEO on the MV and CEO Object Office on personal computers. Δ

Alliances

Spectrum Concepts

Spectrum Concepts, Inc., developer of XCOM 6.2, an LU6.2-based multiplatform file transfer software, announced an agreement with Data General that provides DG with worldwide distribution rights. XCOM 6.2 allows users on the MV platform to move data between mainframes, minis, personal computers, and workstations.

Cypher Business Systems

Cypher Business Systems, a provider of solutions for the distribution, wholesale, and retail sectors, has become a value-added reseller (VAR) for Aviion computers. Cypher supports a variety of telemarketing functions, including order entry, delivery scheduling, and account administration.

IMPAQ Software

IMPAQ Software is making its IMPAQ Insurance Automation software available on Aviion and Dasher computers. Both packages integrate the data base information, accounting, claims, and word processing functions needed to automate an insurance agency or doctor's office. Δ

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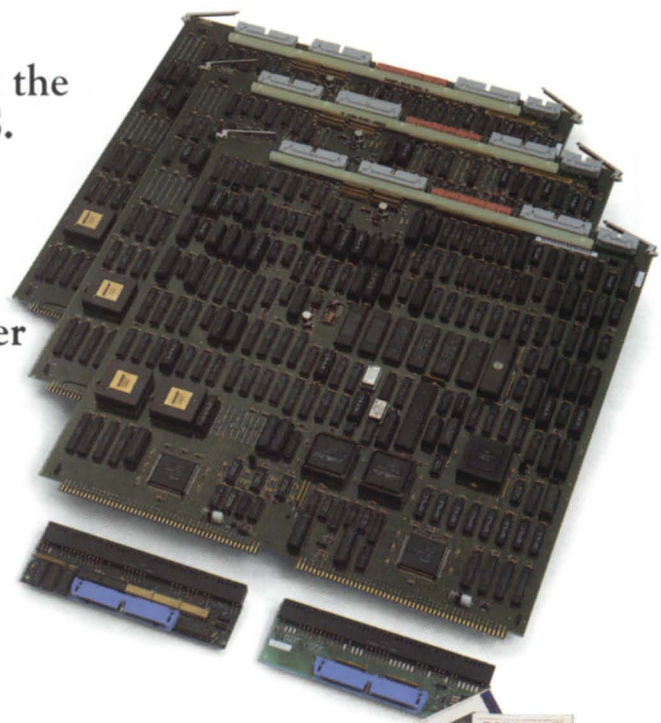

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