

April 1993

FOCUS

The Magazine of the North American Data General Users Group

In Focus

1993: Year of the upgrade
The latest and greatest
The disk-upgrade muddle
Thanks for the memory

Plus

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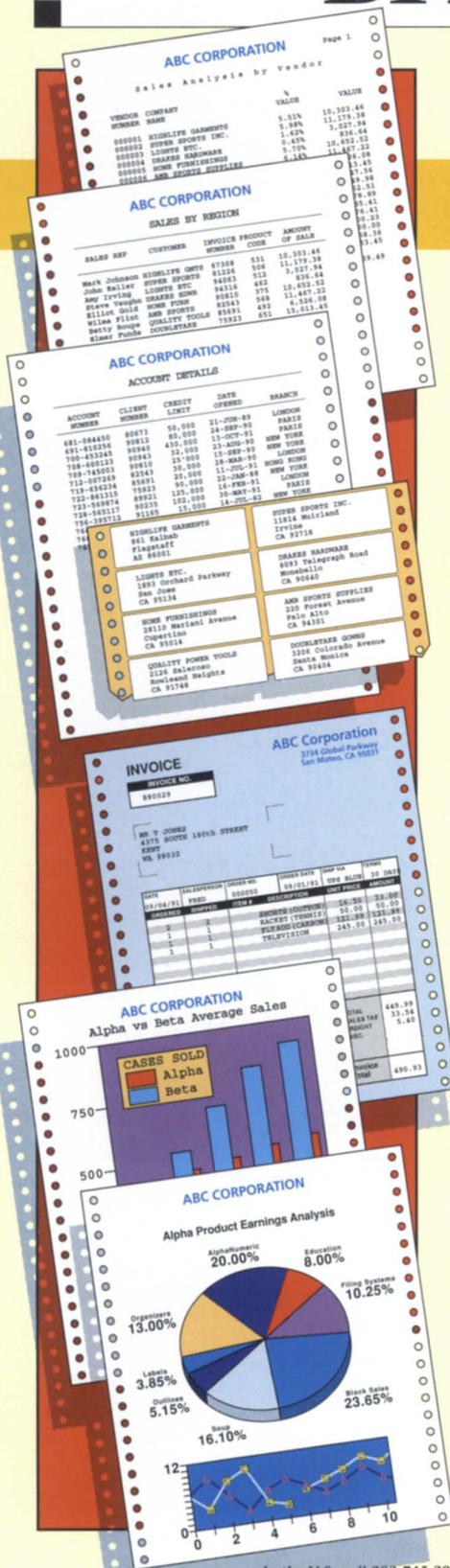
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FOCUS ON: UPGRADES

The latest and greatest

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Cover illustration by Ann Soto

About the cover:

Think of spring as nature's season of upgrades. New flowers pop out and the landscape flares to life. A resident snake sheds its skin to emerge shiny and ready to move up to the next level of... well, Snakedom. Out with the old, in with the new. Trade in, trade up. That theme of renewal and improvement is the focus of this month's Focus.

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Jan Grossman

Springing forward

Spring is here, and NADGUG has sprung into action. The officers and committee chairs have been quite busy. As I write this, some activities are in progress, but here's a summary:

- The Board of Directors met in December and February to address the business concerns of the user group. Of significance were planning for the 1994 budget, along with long-term plans for the growth of membership and benefits of the organization.

- The Audit Committee traveled to Sudbury, Massachusetts, in February to visit with Danieli & O'Keefe Associates, which manages NADGUG's membership services. This regular meeting audits the records and financial reports of the user group.

- The Membership Committee has met several times with Data General representatives and Danieli & O'Keefe to work on details for membership retention, establishing new member campaigns, and reviewing survey results.

Our Association Manager is working on a "white paper" outlining NADGUG's membership statistics.

- The Publications Committee has been working on the publication of the 1993 Membership Directory, which is targeted for distribution this spring.

- The RIG/SIG Committee has been reviewing the status of the various regional groups, the NADGUG start-up kit, and how NADGUG can better assist these groups.

- The Track Chair Committee of the Conference Committee met at the end of February and reviewed all "Call for Session" papers and set the session schedule. The Committee had a long day, but came up with an exciting program that combines a training track throughout the three days, along with

four tracks of sessions and ample time for the exhibit hall.

- Special plans are being made for the celebration of NADGUG's 20th anniversary. We will feature our history all over the exhibit hall, and recognize the early team of Data General and NADGUG volunteers who organized the group. Past presidents will be recognized at the banquet.

Changes, changes

Tim Boyer remarked recently that NADGUG has seen many changes in using operating systems during this 20-year period. Did you realize that many systems are still running RDOS, the favored op system prior to 1980? The migration path has seen RDOS, AOS, AOS/VS, and DG/UX. Let's not forget the evolution of the PC operating systems and the interfaces with networks. Thank goodness the user group has a strong user network, as I am sure none of these migrations are easy, and it always helps to contact someone who has been through it.

Dennis Doyle, NADGUG Past President, and I are scheduled to travel in early March to England to take part in the UK User Group Conference, to be held in Birmingham. Data General CEO Ron Skates was slated to speak to the group. And the UK User Group will send participants to our own NADGUG 93 conference.

The Spring Board of Governor's meeting is taking place the middle of this month in Atlanta, Georgia, with a full agenda. Committees will meet and report on their respective projects and plans. We will also have the opportunity to tour the convention center.

If any of you have concerns and ideas for NADGUG's planning, please contact any of the officers by calling 508/443-3330. Have a great spring! Δ

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The Magazine of the North American Data General Users Group

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News and notes from the greater DG Community

Greetings, Focus readers:

Last month I returned to the pages of *Focus* magazine to write the In General column. Some of you may remember that I was the editor of *Focus* a couple of years ago. Well, I'm back. My task is to sift through the mountains of press releases and news tips we receive each month, decide what's really worth repeating (about 1 percent), and send the rest to the recycling bin. Each month I'll take at least one subject important to the greater Data General community and give you the details you won't find in any other publication.

Last month I asked *Focus* readers to submit information to the new "In General" column. Today I received the first envelope addressed specifically to "In General." Inside was a press release was from **Sylvest Management Systems**, so they get top billing in the news briefs column this month. (You thought this was done scientifically?)

—Robin Perry



- ▶ **Con D. Silard Jr.** was named Director, Systems Integration, of Sylvest Management Systems Corporation, a supplier of multi-vendor Unix workstations to the federal government.
- ▶ **Computer Associates, Inc.** will port its CA-Unicenter, CA-IDMS, CA-Datacom, and Masterpiece Series software to the Aviion platform. DG/UX users will be offered a 120-day free trial use of CA-Unicenter data center administration software. CA-Datacom and CA-IDMS are data base management systems, and Masterpiece is a financial software application.
- ▶ **Erdas, Inc.**, the image-processing and graphic information system (GIS) developer, opened its first international sales office. It is located in Cambridge, England.
- ▶ Initial implementations of host-based Open Millennium, (a **Dun & Bradstreet Software** product with an embedded **Micro Focus Cobol**), will be available in the Aviion platform, among others.

DG wins copyright suit

A U.S. District Court jury ordered **Grumman Systems Support Corporation** of Bethpage, New Jersey to pay Data General more than \$50 million in a software copyright infringement and trade secret suit. Data General was awarded damages of \$36.4 million and additional interest of approximately \$15.9 million.

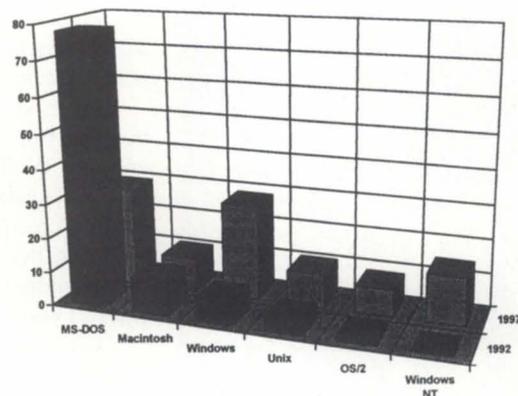
The decision came after years of litigation beginning in March 1988 when Data General filed suit against Grumman for copyright infringement and misappropriation of trade secrets relating to use of Data General's MV/ADEX diagnostic software. Grumman counter-sued, claiming anti-trust violations and interference with Grumman customers. Grumman's claims were dismissed by

the court prior to the start of jury deliberation.

Corporate spokesperson **Jim Dunlap** did not say whether the roughly \$52 million judgment was earmarked for any particular purpose, but allowed that "we are very pleased and gratified with the ruling." Although Grumman has filed an appeal, Dunlap believes the decision will stand firm.

Data General has been successful in defending the copyright of MV/ADEX in other cases. A similar case involving **Granada** was settled in Data General's favor. **STI (Service & Training, Inc.)** was issued a permanent injunction against using MV/ADEX. Injunctions have been granted against two other companies in cases pending involving **FES** of Australia and **Quiss** of the United Kingdom. Δ

Chart of the Month



Installed base of desktop systems by primary operating system in Europe (%)

The number of desktop machines in Europe will grow from 22 million in 1992 to 46 million in 1997, according to a report by **Ovum**, a London-based research firm. Ovum predicts no clear winner in the battle for the desktop operating system, but the main competitors will be **Microsoft's** Windows and Windows NT, **IBM's** OS/2, **Macintosh**, and versions of Unix from **USL/Novell**, **Sun**, and **SCO**.

Data General reports that approximately one-half of its revenues are derived from the foreign market.

The In General column is compiled monthly by Robin Perry. If you have an item for In General, please send it to Robin, c/o Focus magazine, P.O. Box 200549, Austin, TX 78720; 512/335-2286; Fax: 512/335-3083.

The latest and greatest

SYNOPSIS

Too many customers have been sold systems based on the promise of milk and honey, only to awake shortly after installation and realize that maybe their old systems weren't so bad after all.

by Rick Havourd
Special to Focus

Just when you finally get used to the software you bought a few years ago, along comes a smiling Data General salesrep touting the benefits of a new Aviion. There are a hundred and one reasons why you should buy . . . *Your old hardware is antiquated. It can't do all of the great things that open systems can.*

And if all that doesn't work, things start getting ugly . . . *Your mother wears army boots, and aren't you embarrassed that everyone else is running on a brand-new machine?*

It just doesn't seem fair. You've worked hard all this time to get everything just the way you want, only to have someone tell you that it isn't good enough. Well, maybe you don't need something new. Maybe, just maybe, your old system is exactly what you need. I'll tell you what . . . the next person who comes into your office and tells you that a new system will cure all your ills, that a new system is easy and painless to install, that new system can do more than your current one—just shoot him. Put him out of your misery and you'll live much happier.

Okay, so shooting an innocent sales rep is probably not the right idea, but it's close. People have bought into this "newer is better" notion so much that it's clouding their judgment. I think a computer's a computer—plain and simple. If it does the job, why fix it?

Our current customer base operates on machines that average close to 10 years of service. For the most part they are satisfied. Over the 10-year period we have kept the software up-to-date and they still receive active support. In most cases, a new system is *not* warranted. Change for the sake of change isn't

justified. Before we even begin talking about why you should upgrade, let's look at some reasons why you shouldn't.

The cost of retraining

The first thing that comes to mind is the cost of having to retrain all of your employees. Today's new software is easier to use—the so-called learning curve isn't as steep. But they already know how to run your existing software. Introducing a new software package is going to result in lost time and productivity. I personally believe that slowly phasing something in is the least disruptive method of introducing a new system. The problem with that is that it requires a great deal of effort and cooperation on the part of your vendor. How do you find the time for your payroll clerk to learn a new package when there's barely time to finish tasks on time now?

The cost of new software

The price for computer hardware is going down all the time. Unfortunately, the cost for the software to run on it is going up. If you compare the cost ratio of hardware to software over the past 10 years, you'll discover that the relative cost for software has increased steadily—steeper than the cost of hardware has declined. It is quite possible that your upfront costs will be far greater than you had anticipated (or been led to believe).

Do you really need it?

Probably the last, and most important, factor to consider is whether you really need a new system. Are there features available in your new package that substantially add to the value of the system? Or, as is more often the case, are these new features simply gimmicks that look good, but do not really improve the quality of your operation? My favorite example is Microsoft Windows. Everybody has to have it these days, but compared to MS-DOS, has anyone really seen a true increase in the level of productivity or an improvement in the quality of output?

On to the sales pitch

Okay, so before I sound like I'm stuck in the past, let's move on to a discussion about why you *should* consider

upgrading your system. As I mentioned in the beginning, these days I view replacing your current system or supplementing it with completely new applications and hardware as *upgrading*.

If you've read my other *Focus* articles, you know already that I prefer using real-life examples based on experience with our existing customer base. I have some that are perfectly content with their current platforms, so I won't talk about them. The others, though, have varying reasons for switching systems.

I want a PC

Say that with a whine in your voice—"I want a PC!"

The biggest reason that our customers look to upgrading their systems is the ability to seamlessly include personal computers as an integrated part of their work environment. Sure, we can connect a personal computer to our machines (DEC PDP-11s), but a serial line and terminal emulator really don't count—I mean, how can you compare Xmodem file transfers with network operating systems like Novell? These people are prime candidates for a new system. With an Aviiion and Netware for Unix, you get the best of both worlds—networked PCs *and* a true multi-user operating system.

To satisfy the needs of this group, we settled on a combination of equipment: one AV 4600 with TCP/IP and Netware for Unix running over twisted pair for the network transport & protocols. This provides auxiliary file services for a projected dozen (or so) PCs and Macintosh users. Six TermServers provide async connections for the 45 to 50 users who do not require a more sophisticated environment. This network is bridged to two other buildings where 10-port TermServers are installed. A native Novell server resides in a third building to provide classroom and media control applications. A second Aviiion (4300) is housed two miles away, and also provides a combined Novell and async environment that is in turn bridged into the high school campus network.

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inclusion of their existing async equipment. Using a combination of TermServers (for dumb terminals) and PCs with Reflection Software and Telnet connections, we continue to access the "old" system during the transition period. This environment allows us to upgrade users at a more relaxed pace than if we had switched all at once.

My old software doesn't do what I want

This is the ideal situation for an upgrade. Especially if you are the vendor supporting the existing line of software, as well as the one in line for the next generation! For this group, transition cannot come along fast enough. The tricky part here is for the vendor to

recognize this, and not move forward too hastily. We don't have people demanding PC connectivity, and nobody is concerned with wide area networking. They just want to change the application they are running.

Granted, I said that nobody wants a PC network, etc., but we all know that someday they will. In this case, our solution is a total async one. Again, we chose an Aviion. Using VDCs, we can easily switch to a new system without any rewiring. But because of the desire to provide access to multiple systems during the changeover, we opt for TermServers, which can switch easily between machines without any changes.

For the one or two users wanting to connect PCs to the system, we use FTPs product, PC TCP, with NFS client ability and PC NFS on the Aviion. This gives us an inexpensive solution for networking a limited number of PCs. Once the network exceeds a handful of users, PC TCP becomes too expensive, and you should start considering the alternatives. But to get in the door, this produces a simple and cost-effective solution.

Like I was saying

Our goal has always been to keep our customers happy. For new installations/prospects, we don't push towards a new environment. Instead, we are satisfied with introducing our company and product. Then it becomes a game of patiently waiting for just the right time. It's a fine line, but it also does not encourage any puffing on the part of our sales force. Too many customers have been sold systems based on the promise of milk and honey, only to awake shortly after installation and realize that maybe their old systems weren't so bad after all. These simple guidelines have led us into upgrading and installing new systems at the proper moment for ourselves and for our customers—I'm sure they won't do too badly for you, either. △

Rick Havourd is a partner with Micro Sage Software. He may be reached at: rick@msage.com; 313/663-0444; 130 South First Street, Ann Arbor, MI 48104.

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Circle 17 on reader service card.

The disk-upgrade muddle

by Dick Mooney
Special to Focus

SYNOPSIS

It might be just what you need, but disk-upgrade options are varied and often confusing.

No matter how often we address system performance issues, we continually come back at some point to our disk drives. We may need more space or faster throughput, or greater reliability, or some combination of the three. Disk manufacturers have responded by giving us faster drives, increased per-spindle capacities, and MTBFs (mean time between failure) in the area of 150,000 power-on hours for a fraction of what we used to pay per megabyte. They have also, unfortunately, made choosing the correct one overwhelming by giving us interface options like SMD, ESDI, SCSI, SCSI-2, SCSI-2 fast, SCSI-2 wide, and SCSI-2 fast *and* wide. We now have such configuration options to deal with as striping, mirroring, and RAID. And just to complicate it a little more, they're working on SCSI-3.

So what is the best choice for a system administrator thinking about upgrades? There is only one clear-cut answer to that question—it depends. It depends on your application. It depends on how much space you need. It depends on what level of redundancy you need. It depends on what the future plan of your operation is. It depends on your operating system. It

depends on how much money you have. And it depends on which sales-rep gives you the best song and dance.

Obviously, no single solution addresses all of these concerns. Mass storage has always been system- and application-dependent. As a result, the optimal solution in one case may cause another system or application to slow to a crawl. The best we can hope for is to find a technology that will solve today's specific problem and still allow for future changes. Those of you who bought Zebra drives (a great product in its day, and one near and dear to my heart) have had firsthand experience with limited technology.

SCSI: a de facto standard

Based on the amount of development going on in SCSI-interfaced drives, it appears the industry has accepted SCSI as a defacto standard. So it would seem that the choice for upgrade would be to use one of the SCSI-based solutions. Any current mass-storage subsystem problem can be addressed by SCSI, whether it's speed, space, reliability, or redundancy.

SCSI is a standard interface that will allow a host CPU to connect to a peripheral device. It is based on the original Shugart Associates SASI specification. The critical component of a SCSI subsystem is the host adapter. This circuit board is what determines the device types that can be connected to the system. If the controller supports SCSI-2, all the devices used can be SCSI-2.

The SCSI bus has 9 data lines—8 for data and 1 for parity—as well as 9 control lines. The control lines are used primarily for handshaking, and the data lines for actually moving information. Electrically, the connection between the host and device can be either single-ended (maximum cable length of about 18 feet) or differential (maximum about

with disks having low seek and latency times results in throughput rates as high as 10 MB/sec.

Command-tag queuing (CTQ) is a feature exclusive to the SCSI-2 family of products. This feature allows a set of linked commands to be sent from the host to the drive, dramatically reducing the overhead since the majority of commands can be executed in the background. CTQ has its own distinct features, like ordered or unordered execution of the command queue.

Any SCSI subsystem consists of numerous parts working intricately together. The host adapter (controller) resident in the CPU chassis connects to some form of disk chassis via a cable. The disk chassis has power supplies for each drive and some form of mounting hardware. Each drive has its own device adapter, usually built into the circuit board bolted onto the bottom of the drive. Drives of this type are referred to as *embedded* SCSI drives. SCSI specifications say that any adapter can control up to 7 devices. Therefore, if the host adapter connects to 7 other adapters and each of those connect to 7 devices (disk or tape), you could conceivably run 49 drives off a single controller. But you will probably not find anyone making nonembedded drives, because of the software required to control it.

Buried in the operating system is a utility called a device driver, which ties all the hardware together. This driver is very vendor-specific. The specifications for SCSI list what command support are required in these drivers and what commands are optional. How these commands are supported is where SCSI varies between vendors. As a rule, the disk manufacturers support all the SCSI common command set the same way. However, not all system manufacturers' device drivers behave alike. This is where the gray area of "open systems" rears its ugly head.

Many system manufacturers "proprietary" their SCSI bus. Their device drivers will not support certain SCSI commands, or perhaps they respond only to a predetermined list of devices. SCSI handshaking is accomplished by passing a series of commands back and forth across the bus. The operating system issues a series of commands, and

the SCSI device driver builds a "command block." The host adapter then establishes communication with the device by issuing a series of requests and waiting for responses. An inquiry command asks the device who it is. A mode sense command basically asks the device what state it is in, and in what manner the commands sent to it should be organized. These two com-

mands are the most commonly used to proprietyze the bus.

Perhaps the device driver will react only to a certain set of responses from the inquiry—for example, if the response does not include one of the model numbers in a table, it will not accept it. In some instances, the byte ordering of the commands as determined by the mode sense response is

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reversed. As a result, without the primary vendors' peripheral devices, the system won't work.

As hard as it is to believe, Data General is one of those companies that proprietizes its bus. More often than not, the changes are made to the device itself, and rarely do these changes improve performance or reliability. This is the case with DG. The Maxtor, Seagate, Micropolis, or Fujitsu drives used by DG have Data General proprietary firmware installed on the device adapter by the drive manufacturer to allow the drives to communicate with Data General's SCSI device driver. While this does not result in any improvement to the performance or reliability of the drives, it does result in your being forced to pay a substantial price for what is in reality a commodities product. This is where the argument about open systems usually starts. The prime vendor (DG) will tell you that open systems means software, and communications are compatible across

multiple platforms.

In my opinion, "open systems" is more than software compatibility. If I must depend on one manufacturer for my DP operation to stay alive, that manufacturer has control over system performance, my expansion options, and my budget. Worse yet, solutions to my problems are confined to that manufacturer's current price book. I am at that manufacturer's mercy because I need it more than it needs me.

The Data General MV is a purely proprietary machine. Just like Digital Equipment Company's VAX or an IBM mainframe, it was never intended to be compatible with anything other than the primary manufacturer's hardware or software. The original Aviiions (i.e., 300, 400, 3200, 4000, 5000, 6000 families) were truly open products. You could buy a generic SCSI device, hang it off the back of the Aviiion, and run your DG/UX operating system with no trouble. However, in their infinite wisdom, DG fixed this minor oversight by pro-

prietizing the bus in the 4600/530 family of Aviiion.

While DG will tell you all about the openness of the Aviiion product line, they may forget to tell you that you might be unable to upgrade in the future at something even close to the "street price" of the product. In actuality, you may be forced to pay more than twice the price. There is however, a whole industry offering compatible solutions that usually perform better, are more reliable, and offer substantially lower cost.

If the only issue is a need for more space, perhaps merely adding another disk of the type you currently have is the ideal solution. After all, if the system and applications work, why change just to expand the data base? However, when throughput and redundancy are the issues, SCSI is really the only choice. Throughput problems usually are the most complicated issues to resolve because they can be caused by so many things. Assuming

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the problem is that you are I/O-bound, and not CPU- or memory-bound, third-party SCSI solutions will bring a smile to your face. Since these companies build SCSI products only, they usually stay more state-of-the-art than a company like DG, allowing them to take advantage of the real performance of SCSI. The numbers are pretty impressive (see Figure 1).

Using products with this kind of inherent performance as the basis for some of the many stripe, mirror, and RAID configurations can give a new life to your DG system that you never thought possible. Each of these configurations can address specific needs.

Striping is a technique in which pieces of data are written to more than one spindle. For example, assume there are two disks, each with one surface, or platter, and we want to write 4 sectors of data. The first sector is written to the first sector of the first physical drive, the second sector to the first sector of the second physical drive, the third sec-

Figure 1: Third-party SCSI solutions

Product	I/Os per sec	Throughput
DG R.A.M.S.	< 250	5 MB/sec
DG CSS	< 125	< 3 MB/sec
DG Argus	< 125	< 3 MB/sec
Typical non-DG	> 500	> 6 MB/sec

tor to the second sector of the first physical drive, and so on. Since SCSI allows multiple drives to perform separate tasks simultaneously, both physical drives can be doing the writes at exactly the same time, theoretically cutting the number of I/Os required in half. While this scheme does not allow for redundancy, it does boost overall performance, especially if a majority of the transfers are small blocks.

Disk mirroring is intended for data redundancy and does little for performance. In this configuration, two identical disks are maintained so that if one should go down, the system will stay live. This is also sometimes thought of as *shadowing*. Quite simply, every time a block of data is written, the same block is written to a second drive. This

can be done either with software control or by the hardware alone. Since write operations must be duplicated, there is a performance loss in all write operations. The other consideration is that there must be duplicate hardware, making the final per-megabyte cost much higher than in nonmirrored environments.

The mass storage industry has addressed the need for both high performance and high data reliability with RAID. There have been many articles written in *Focus* about RAID, so I won't get too deep into it. The bottom line is that not all RAID levels are the right solution for all applications. As redundancy increases, there is some loss of performance. However, RAID technology has evolved (outside of Data General, anyway—just look at the price of Clariion) to become an extremely cost-effective solution.

RAID levels 1 through 5 are the most commonly used today. Briefly, here's what they do:

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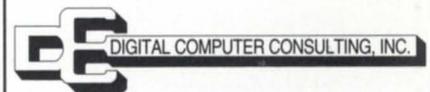
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RAID 0—Sector-interleaved striping, no redundancy.

RAID 1—Same as mirroring.

RAID 2—Data bit-interleaved across numerous spindles, some store error correction information.

RAID 3—Data bit-interleaved across numerous spindles, one spindle dedicated to parity information.

RAID 4—Data sector-interleaved

across numerous spindles, one spindle dedicated for parity.

RAID 5—Data sector-interleaved across numerous spindles, all drives store parity information.

RAID intelligence can be achieved either by using software with microcode and complicated device drivers, or by being built into the hardware.

Most third-party solutions use the hardware method. The only requirement, then, is that the system supports SCSI. As a result, you can unplug your current SCSI disk drive, plug in the RAID box, rebuild your data from backup, and have all the benefits of this technology. You do not have to rebuild kernels, load and maintain microcode, or deal with device-driver-vs.-operating-system-revision issues. As far as your system is concerned, there is merely a SCSI disk drive at the end of the cable.

Ultimately, disk subsystem performance hinges on some basic drive parameters. Regardless of the drive's size or its vendor, certain disk specifications will come into play:

Seek time—The amount of time it takes to move the read/write head of a drive from point A to point B. The longer the distance, the longer the time. As a result, this number is usually shown as the average seek time. Some vendors will refer to this as the average access time, but access time is really a combination of seek time and drive latency.

Drive latency—Once the read/write head is positioned at the correct track, there is a delay while the disk platter rotates the correct sector under the head. Latency is calculated as the time it takes the platter to spin one half of a revolution. Obviously, the faster a drive spins, the lower this figure.

Transfer rate—Drive specifications will usually show two transfer rates: burst and sustained. *Sustained* transfer rate is a more accurate reflection of what the drive will be doing in a typical environment. *Burst* rate is the maximum speed that could be obtained under ideal conditions.

Synchronous vs. Asynchronous transfer—The difference here is in how much handshaking must take place in the transfer. Asynchronous transfers require handshaking that moves data across the bus in a byte-by-byte scheme. With synchronous transfers, the host and drive set up the "rules" about the transfer first, and then move data with very little intervention. This is the faster of the two.

Data buffering—Also called *caching*, this is a method by which data

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are fed to a buffer on the drive logic board, and the buffer sends data to the host. When combined with features like read look ahead, the effective speed can be drastically increased.

At some point in time, a disk upgrade will probably be inevitable. Whether it is required because the data base has grown too large or because system performance has deteriorated, it will need to be done. And you will finally gain firsthand knowledge of what that overused phrase, "price/performance," is really all about. Δ

Dick Mooney has more than 20 years of experience working with Data General hardware, was a designer of the original Zebra disk drive, and is currently the engineering and new products manager at Hanson Data Systems, Inc., in Marlboro, Massachusetts. He may be reached at 508/481-3901.

Some options to consider . . .

- *What type of disk accesses is my system performing?* If the majority of I/O activity is write related, and redundancy is *not* a major issue, striping across multiple fast SCSI-2 drives would probably be the best solution. If redundancy is a consideration, mirroring would be a far better choice than RAID, due to RAID's high write overhead. If the majority of I/O is large block reads, look at fast SCSI-2, with or without striping, and RAID 3 for redundancy. For large numbers of small block I/Os, striping numerous small spindles should do the trick, with RAID 5 ideal for redundancy.

- *Is a system type or vendor change being considered as part of the*

future upgrade plans? Since purchasing a new mass storage subsystem would be an interim solution to a problem, be sure to verify that the new vendor does support the drive types. It's also a good idea to see if they offer their own version of it, just to see where their developers are taking their mass storage.

- *How important is the label on the box?* Quite simply, you will pay a premium for the DG logo. Only you can decide the comfort level of having all your hardware from the same vendor, and if that comfort level is worth the price.

- *How long can the system be down if the data base needs to be rebuilt?* Restoring the data base from a tape backup can be time-consuming. If your operation is so critical that the time involved would be intolerable, consider some form of redundancy.

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SYNOPSIS

Suffering with slow processing?
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Why *should* I upgrade my system, especially a new system I thought had all the necessary whistles and bells? That's a good question. Should I stay with 8 MB of memory and be satisfied with a 10-second screen response, or should I spend a thousand dollars or so to put a 16 MB SIMM (single in-line memory module) into my system and take a bite out of disk swapping?

Several years have gone by since the introduction of Data General's versatile and powerful Aviiion family of workstations and servers. The beginning of a new computer system's life span is exciting. There's the promise of third-party software and hardware, and the basic premise of "open systems" has tabbed the Aviiion as a winning system of the 1990s. The main advantage of open systems is freedom of choice—the freedom to add, for example, a piece of hardware that is not manufactured by Data General.

While we're on the subject of upgrading, there's no simpler way to upgrade a system than adding memory. Not only does adding memory speed up your system's processing, more memory also accomplishes a few key benefits.

A system limping along with minimal memory will perform the required tasks, but the speed at which this system performs is directly proportional to

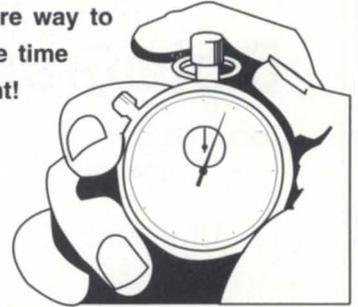
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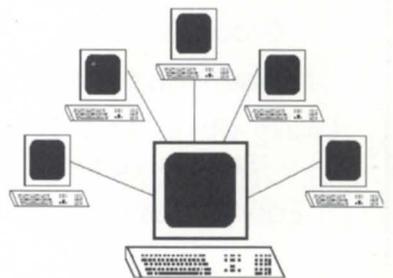
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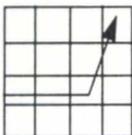
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how much random access memory (RAM) is installed. Basically, the more RAM you have, the faster your system will perform. Many Aviiion systems can expand RAM up to 128 MB, so there's plenty of potential here.

The benefits of increased RAM are numerous. The biggest advantage of upgrading your system's RAM is in reducing or eliminating disk swapping, which occurs when the system must keep going out to the disk for information because there's not enough memory to hold that information for the short term. Thus: more RAM, less disk-swapping. This disk-swapping takes time, significantly more than if the data were held in RAM. Memory is like any peripheral—it stores data and allows user access to those data. One major advantage memory has over disks is access time. These days, third-party disks offer fairly fast access time. However, no disk can come close to the access time of RAM. A good access time for a hard disk is 14

milliseconds. A standard access time for RAM is 70 *nanoseconds*. With how busy most of us are today, we need as much time as we can get. One way of getting more is to install as much memory as you can afford.

Another advantage of RAM over disks is better reliability. Hard disks have moving parts, and anyone who fixes cars can tell you about a mechanical device with moving parts. A solid-state device far outweighs any mechanical device in reliability.

The hard disk also has its purpose for long-term storage, versus RAM's short-term storage. Allow me to propose an analogy. Say for example the

amount of RAM is like the size of a desk. You don't leave your data on the desk for the long term. However, I know I would prefer a larger desk to work on compared to a smaller one. The same goes for RAM; it allows the CPU more immediate "desk" space to work on or process data. If the CPU has to go to disk for data (like getting up and walking over to a filing cabinet in another room), that takes significantly longer than going to RAM.

With today's software programs incorporating graphical user interfaces (GUIs), an appropriate amount of RAM is required. Graphics may look pretty, but it takes much more memory to process this kind of data than with character terminals in the old days. Additional RAM eases a heavily loaded or graphic-intensive system.

Adding memory is simple compared to installing additional hard drive space. Power down the system, remove the cover, and plug the SIMM into the

appropriate slot. The only thing after that is to make sure the system recognizes the additional memory upon startup.

There are a number of companies that make memory. A few things that you should consider before buying are: price, trial evaluation, compatibility, exchange/spares, and warranty. Basically, it boils down to service. Δ

Dan Gallagher is an account manager with Digital Data Systems, Inc., of Fort Lauderdale, Florida. He has been involved in all aspects of data processing since 1977. He may be reached at 305/792-3290.

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to a smaller one.**



David Novy

1993: Year of the upgrade

SYNOPSIS

Blazing-fast CPU chips combined with symmetric multiprocessing. Here's another way to think of upgrades: change platforms.

In the past, upgrades involved adding more memory, a newer or bigger disk, or a faster CPU. These days, the topic of upgrades needs to be expanded to include considerations about changing platforms. In the case of Data General users and MV machines, you need to ask yourself if you should continue running your applications on the MV, or should you migrate those applications to a Data General Aviion platform, or perhaps even a PC.

I still think that Data General's MV family and its proprietary AOS/VS (II) operating system offer an elegant computer architecture and a robust environment. But elegance and robustness have trouble surviving in today's competitive world. When you realize that today you can purchase a 125 MIPS (million instructions per second) Unix workstation with 256 MB of memory, a 2 GB disk, and a 24-bit, double-buffered, 19-inch 1280 x 1024 display for less than \$45,000, it may be time to determine if the days of proprietary hardware and operating systems are numbered.

There are instances in which it simply does not make economic sense to port an existing application to another platform. However, it would seem highly improbable that you could make a strong case for any new applications

being added to a proprietary system.

The year of the upgrade

I believe that 1993 will be regarded as the year of the upgrade, because there will be greater advances in computer technology this year than in previous years, and the level of growth in future years will be tremendous, but not as dramatic as this year. The reason I make this statement is that 1993 is when the 200 MIPS CPU chip combines with the symmetric multiprocessing operating system.

It is amazing to note that one of the fastest CPU chips on the market in 1989 was a 4 MIPS CISC chip. In 1991, the 25 MIPS RISC chips began to appear. In 1992, the 76 MIPS RISC chips appeared in quantity. In the first quarter of 1993, the 125 MIPS RISC CPU chips will appear in quantity. In the 2nd or 3rd quarter of 1993, Data General will be one of the first computer vendors to announce that 150-200 MIPS RISC chips are available in quantity on its machines. Combine this information with the fact that DG offers the most advanced symmetric multiprocessor Unix operating system on the market, and you should realize that things are about to break loose as far as computer speed is concerned.

Although the future looks to be exciting, it is not without peril. This is because many computer vendors are announcing products that are 9 months (or more) away from delivery. Previously, computer companies hesitated in announcing products that were that far away from shipment because users did not appreciate knowing that a product was announced but not deliverable. Or worse still, a product was promised and not delivered.

However, in the interest of survival, companies are announcing products nine months early as an attempt to freeze the market. Data General is one of only a few companies that still hold to the rule of not formally announcing a new product until it is 90 days from delivery. I think this honesty is admirable, but I do not believe it helps DG's sales. Potential customers are avoiding purchasing new Data General equipment today because of the misleading sales announcements put out by DG's competitors.

Be careful also of the siren song claiming that many DG competitors have symmetric multiprocessing "just around the corner." The truth is, the Data General Aviion product line offers the *only* commercially available CPU that really has hardware symmetric

multiprocessing. DG competitors must make do with software-based symmetric multiprocessing, and that is quite a difficult task to accomplish. Software-based multiprocessing often results in up to a 30 percent performance loss when the second CPU is added, if it can be done at all.

If you have decided that you need to upgrade, then you must determine *what* needs to be upgraded. Remember that the primary computer resources are CPU, disk, and memory. You can upgrade a CPU and still get poor performance, because the actual system performance bottleneck might have been in the memory or disk subsystems. Several tools available from DG can help you determine your own performance barriers. DG also has a service group available to help users determine how to improve system performance. Contact your DG sales representative for more information.

Once you determine your perfor-

mance problems, you will need to determine if you want to upgrade using DG or third-party equipment. My personal experience is that if you need a SCSI controller or an ethernet board for your Aviion, then buy it from Data General. DG's new dual SCSI controller and ethernet board are second to none in price and performance. As for disk drives and memory, it could be useful to determine what third-party products are available.

Disk drives have become commodity items. Top-of-the-line, third-party, 2 GB disk drives with MTBF (mean time between failures) in excess of 200,000 hours are available today for about \$2,000. There does not appear to be any third-party source of memory for Aviion servers, so the cost of memory for these machines is much higher than that available for similar machines from DG's competitors (256 MB of third-party memory for a Sun Sparc Server, for example, costs less than \$20,000).

The list price of 192 MB of memory for a DG Aviion is about \$48,000.

If you do decide to purchase a third-party product, give Data General a final chance to make a counteroffer. DG sales people can get very creative if they are trying to prevent a loss of business. Also remember that DG stands behind everything it sells. If you don't buy from DG, you are on your own for service, although DG may also provide service on non-DG equipment for a premium. A good rule of thumb is that unless the cost difference between Data General and third-party equipment is substantial, stick with DG. Data General has become strongly competitive in the open systems marketplace. Δ

David Novy is a technical computer 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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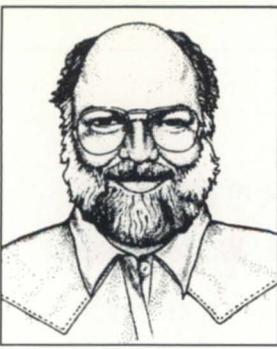
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Brian Johnson

World's Fastest Move

SYNOPSIS

Because of the way that the CLI MOVE command is written, it's faster to move files from one LDU to another by DUMPing to a pipe file and LOADing from the pipe at another terminal. So roll up your sleeves, because BJ begins a several-part series aimed at writing and benchmarking a utility to do just that.

:BOOKMOBILE

Add the following to Uncle BJ's recommended reading list: *Understanding Professional Programmers*, Gerald M. Weinberg, Dorset House Publishing, 1988. Originally published in hardcover in 1982 by Little Brown.

Also, our pals at MultiTech Systems in the Land Of Uff-Dah are giving away a handy little book entitled, *Modem Communications, A Modem Primer*. A very good low-level introduction to modem technology and standards. Give 'em a call at 800/328-9717, and see if you can get them to send you one.

:INFOS_II_5.20

A tape of Infos II rev 5.20 arrived yesterday, so I installed it today. Reading the release notice makes me think that maybe I've missed a few DG press releases. It seems that the ill-fated Infos II rev 6 is now known as Infos IITC, and is a separate product.

The release notice describes two new versions of old Infos utilities; DDUMP_2/DLOAD_2 and IVERIFY_2. DDUMP/DLOAD aren't of much interest to me because I got scared away from them years ago due to persistent bugs, but the prospect of an improved IVERIFY definitely ignited my kindling. Not for long though. When I tried putting IVERIFY_2 to the test on a couple of small Infos data bases, it consistently bombed out with, "VOL01—Simultaneous requests on same chan-

nel". The only data base I could get it to run on successfully was a freshly created empty data base. Not real handy. Gee, is it just me, or does anybody else get the impression that final QA is non-existent these days for proprietary products? In the process of looking at DDUMP_2/DLOAD_2 and IVERIFY_2 I noticed something else troubling. Check out these .PR file sizes:

DDUMP.PR	88064
DDUMP_2.PR	2795520
DLOAD.PR	83968
DLOAD_2.PR	1460224
IVERIFY.PR	65536
IVERIFY_2.PR	51283968

Whaddya think? Is the new IVERIFY_2 so complex that it actually contains 50 MB of static data and code? Yeah, right.

Last year I mentioned a disturbing tendency among new programmers to avoid dynamic allocation of data structures in favor of static allocations of "worst-case" structures. So how big do you think IVERIFY_2.PR really is? Using the "Show Allocated File Elements" utility (see my Nov. '92 column, or item SAFE on the :SYSMGR BBS) on IVERIFY_2.PR showed that only 704 of the 100,192 logical fileblocks are allocated, or 0.7 percent. The remainder is statically allocated data whose value is zero. Good luck if you try to MOVE this file around on your system or, God forbid, across a network. CLI32's MOVE

command apparently isn't as smart as DUMP_II because it doesn't use the "Read Next Allocated Element" feature of ?BLKIO to speedily bypass the unallocated elements. Duh.

Speaking of MOVE, there's a note in the release notice pointing out that the new DDUMP_2/DLOAD_2 is now smart enough to read and write to pipe files. Using DUMP/LOAD and a pipe file to move files disk-to-disk got started a few years back when somebody noticed that it was considerably faster than MOVE. The humorous thing is that this should have been a signal that something was wrong with the logic used by the MOVE command. But no—instead we have utilities being modified to use pipes instead of fixing the original problem with the MOVE command. Duh II.

Before you start thinking that I have some sort of vendetta going with DG's Infos group and that I'm just picking on them, let me set the record straight. I like Infos II. A lot. Infos IITC is another matter, but I've given my reasons in previous columns. I like the Infos group, or at least whatever's left of it. It wasn't that many years ago that I awarded the Infos group the annual :SYSMGR Speed-Up trophy for performance improvements made in rev 5.00. The problems described above are actually corporate problems, and Infos II just had the bad luck to be the most recent product release to suffer as a result.

Figure 0 - WFMOVE Function Hierarchy

```
WFMOVE
  get_global_switches
  help
  isdft (is dir file type)
  MOVE_PLUS
    ismft (is MOVEable file type)
    MOVE_DIR
      hack
      CLONE
      verify_move
    MOVE_FILE
      ismr (is more recent)
      expunge_file
      hack
      CLONE
      COPY_DATA
      verify_move
  report_statistics
```

Source code for functions shown in lower case will not be published here, but is available on the :SYSMGR BBS.

We're gonna write
WFMOVE: World's Fastest
Move, and then bench-
mark it against both CLI's
MOVE and DUMP/LOAD
to/from a pipe file.

Figure 2 - WFMOVE.C

```
/* World's Fastest Move */

/* This really improves readability. */
#define Type      fstat_pkt.styp_type

main(int argc, char *argv[]) {
    char      *cp;
    int       ier;
    P_FSTAT  fstat_pkt;

    printf("\n\tWFMOVE ver 0.00\n\n");
    setvbuf(stdout, NULL, _IOFBF, 1024);

    get_global_switches(argv[0]);

    if (argc < 2 || argc > 3) help(argv[0]);

    /* Resolve the destination directory. Otherwise */
    /* arguments using '=' or '^' will cause problems */
    /* when we descend beneath the starting directory.*/
    ier = sys_gname(argv[1], dpn, sizeof(dpn), &dpnl[0]);
    if (ier) error(argv[1], ier);

    /* Make sure the destination is a directory. */
    ier = sys_fstat(dpn, 0, &fstat_pkt);
    if (ier) error(dpn, ier);
    if (!isdir(Type)) error(dpn, ERNDR);

    /* User specified a different source directory? */
    if (argc == 3) {
        /* Yep, go there. */
        if (ier = sys_dir(argv[2])) error(argv[2], ier);
    }

    /* Get the full pathname of the source directory. */
    ier = sys_gname("=", spn, sizeof(spn), &spnl[0]);
    if (ier) error(spn, ier);

    /* Announce what we're about to do. */
    cp = (flat) ? ("+" : ("#");
    printf("%s <- %s:%s\n", dpn, spn, cp);
    fflush(stdout);

    /* Move everything in the source directory. */
    move_plus();

    /* Brag about how we did. */
    report_statistics();
}
```

Figure 1 - WFMOVE.H

```
typedef unsigned char   Uchar;
typedef unsigned long   Ulong;
typedef unsigned short  Ushort;
typedef short           Boolean;
#define YES 1
#define NO 0
#define NUL '\0' /* ASCII NUL */
#define DEF (-0) /* Default for packets */

/* Function prototypes. */
int clone(char*, char*, P_FSTAT*, char*);
/* ier = clone(newpn, oldpn, &pkt, acl); */
int copy_data(char*, char*, P_FSTAT*);
/* ier = copy_data(dpn, sfn, &pkt); */
void error(char*, int); /* error(path, ier); */
int expunge_file(char*, P_FSTAT*);
/* ier = expunge_file(pn, &pkt); */
void get_global_switches(char*);
/* get_global_switches(argv[0]); */
Ulong hack(void); /* dgsecs = hack(); */
void help(char*); /* help(argv[0]); */
Boolean isdir(int); /* YES/NO = isdir(type); */
Boolean ismft(int); /* YES/NO = ismft(type); */
Boolean ismr(P_FSTAT*, P_FSTAT*);
/* YES/NO = ismr(&dpkt, &spkt); */
void move_dir(char*, P_FSTAT_DIR*);
/* move_dir(fn, &pkt); */
void move_file(char*, P_FSTAT*);
/* move_file(fn, &pkt); */
void move_plus(void); /* move_plus(); */
void report_statistics(void);
/* report_statistics(); */
void verify_move(char*);
/* verify_move(filename); */
void warn(char*, int); /* warn(path, ier); */

/* Global storage. */
Boolean convert; /* True if /CONVERT */
Boolean delete; /* True if /DELETE */
int depth; /* Depth below the starting dir */
char dpn[$MXPL]; /* Dest pathname */
int dpnl[10]; /* Dest path lengths by depth */
Boolean early; /* True if /EARLY */
Boolean flat; /* True if /FLAT */
Boolean ldus; /* True if /LDUS */
int start_secs; /* Used if /TIME */
Boolean recent; /* True if /RECENT */
char spn[$MXPL]; /* Source pathname */
int spnl[10]; /* Source path lengths by depth */
Boolean times; /* True if /TIMES */
Boolean trace; /* True if /TRACE */
Boolean verify; /* True if /VERIFY */
```

:PART_1_OF_N

I've got a bit of a dilemma here. I'm gonna be just about everywhere in the Northern and Southern Hemispheres in March, except for North America, so I need to write an *n*-part column, where *n* is somewhere between 2 and infinity, that I can unload on the folks at *Focus* now so I don't have to write another column until I slide back into Frisco at the end of March.

So, here's what I've decided to do. I mentioned above that because of the way that CLI's MOVE command is written, it's faster to move files from one LDU to another by DUMPing to a pipe file and LOADING from the pipe at another terminal. Well, we're gonna write WFMOVE: World's Fastest Move, and then benchmark it against both CLI's MOVE and DUMP/LOAD to/from a pipe file.

I'm going to use C as the language for this, although you could certainly transcribe the code into most other languages. However, there are a couple of gotchas. The other language must support direct systems calls, and it must be capable of multi-tasking. That leaves out Cobol and most flavors of BASIC. Assembly, Fortran (5 or 77), and PL/I will do nicely.

As is usually the case, the full source code for this project is available on the :SYSMGR BBS as item FOCUS:SML9304X.

Just to whet your appetite for what's to come in the next few months, here are the performance results from a test of the first pass of WFMOVE before applying any significant speed-ups. The test involved moving the contents of the :SYSGEN directory from one LDU to another on an MV/4000.

Test	Elapsed	CPU
WFMOVE	0:01:03	4.7
MOVE	0:01:43	14.5
MOVE/BUFF=4096	0:01:24	18.1
MOVE/BUFF=8192	0:01:17	16.0
MOVE/BUFF=16384	0:01:15	15.8
MOVE/BUFF=32768	0:01:16	16.4

Round I was easy. In round II I'm going to try dropping the elapsed time for WFMOVE by a factor of 2.

:WFMOVE:USAGE

The first order of business is to

define the command line format. Here it is:

```
WFMOVE[/switches] to-dir [from-dir]
      where /switches are /CONVERT,
      /DELETE, /EARLY, /FLAT,
      /HELP or /?, /LDUS, /RECENT,
      /TIMES, /TRACE and /VERIFY.
```

You probably noticed that a couple of the usual move switches are missing, and a couple of new ones have been added. Some are missing simply because they would obscure the meat of this, or because they could be added easily later. In the case of the /BUFFER-SIZE= switch, it's missing because we're going to maximize the buffersize without asking. After all, we *are* calling this "World's Fastest", and anyway, who in their right mind would want a MOVE to go slowly?

We're going to treat /FLAT a little differently from the way that the CLI does. For us it just means not to move subdirectories, or descend into them. I find that the way that CLI does /FLAT isn't really very useful.

The new switches are mostly related to enhancements that are trivially easy to implement. /CONVERT causes DIRs to be converted to infinite size CPDs. /EARLY is weird and has to do with how ACL setting is handled. I'll discuss it later when we get into the guts of this thing. /HELP or /? are obvious. /LDUS causes LDUs to be MOVED as CPDs (the default is to just bypass them). /TIMES causes the elapsed time to be reported for each file moved. /TRACE is going to be undocumented so we can use it to trigger debugging output during development.

I haven't allowed for templates or pathnames specifying which files to move because template expansion is a black art. The code to do CLI-style template expansion would dwarf the code that we need just to do the move. Instead, if no "from-dir" is specified then the current directory sub-tree is MOVED; otherwise it behaves as if "from-dir" were the current directory (i.e., it goes there before starting).

:WFMOVE:STRATEGY

We're going to attack this thing in stages. We'll start by doing the simplest possible implementation with only the

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simplest optimizations the first time around. Once functionality is achieved we'll go back in and retrofit the turbo unit.

The function hierarchy is shown in Figure 0. Functions shown in bold are the ones we're going to be looking at in the source code. The rest are just described because they're either trivial or contribute little to the topic at hand.

There are also some miscellaneous support functions that are so trivial or obvious that they aren't even mentioned—like a function to convert a string to upper case while copying it (strucpy).

There are two error-handling functions: warn and error. Both take a pathname and system error code as arguments and issue messages of the form, "Warning: error-text, File pathname",

and "ERROR: error-text, File pathname". Warn returns so you can continue, but error doesn't; it just stops the program.

:WFMOVE.H

In C, variables and definitions of global interest are usually put in an "include" file with the same name as the main program and a ".h" extension. WFMOVE.H is shown in Figure 1. It defines the calling sequence for all of the functions used and declares all the global variables.

To simplify function calling sequences, and because we're not going to overlap input and output pathname processing the first time around, the source and destination pathnames are global. "s" and "d" are used to designate source and destination, so "spn" stands for source pathname and "spnl" stands for source pathname length. Because we will be processing subdirectories recursively, we need two arrays to keep track of the source and destination pathname lengths at each level; these are two arrays called "dpln" and "spnl". Technically speaking, the maximum subdirectory depth on AOS/VS is 8, but 9 is possible when the top level is an LDU. CLI32 doesn't even handle 8 levels deep correctly, but we're going to try to do better, so the stacks allow for 9 levels.

:WFMOVE.C

Okay, let's try writing a first pass at the main function for this thing. It's always a good rule to keep the main function as short and sweet as possible so that it provides a concise overview of the overall program logic.

The source code is shown in Figure 2. As usual, you shouldn't depend too much on the printed source code: typesetting is notoriously hard on source code, and I've omitted things like the "include" statements for the sake of brevity. The complete source can always be obtained from the :SYSMGR BBS.

The first order of business is to announce the program name and version number.

Next, I tell C to buffer output just like CLI16 and CLI32 do in order to avoid a separate system call for each line written when /DELETE or /VERI-



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FY is used. The choice of a 1k buffer is arbitrary.

The next order of business is to get the command-line switch options. There's no need to show the source code for that: just be aware that it ends up setting some global Boolean variables that indicate which options are in effect. The function takes advantage of a DG C library function that allows easy parsing of minimally unique (i.e., abbreviated) switches, just like the CLI does.

The next order of business is to check for the correct number of arguments and invoke the help function if the test fails. This is done after global switch processing so that using the /? or /HELP switches doesn't require an argument. Again, the help function is not really germane to this discussion, so we'll skip it. It just outputs a command line summary using argument zero (the program name) and exits the program. Using argument zero ensures that if someone chooses to rename the pro-

gram, the help output will show the current name.

Next, it's time to set up the destination directory pathname by getting its full pathname, converting it to upper case in the process; and set up the destination pathname length stack for depth 0, and then check that "to-dir" is indeed a directory.

If a "from-dir" is specified, then a similar setup and check is done, and we move to that directory. Also, the "from-dir" is resolved to a full pathname at this point simply to allow more specific error reporting.

The next step is to announce what we're about to do, showing either '+' or '#' depending on the /FLAT switch.

Time to move some files. The "move_plus" function is effectively the equivalent of the CLI command "MOVE to-dir +". That's where the ugly stuff starts.

Finally, we report the statistics. After all, the whole purpose of this thing is to be able to brag about how

incredibly fast it is.

:TO_BE_CONTINUED

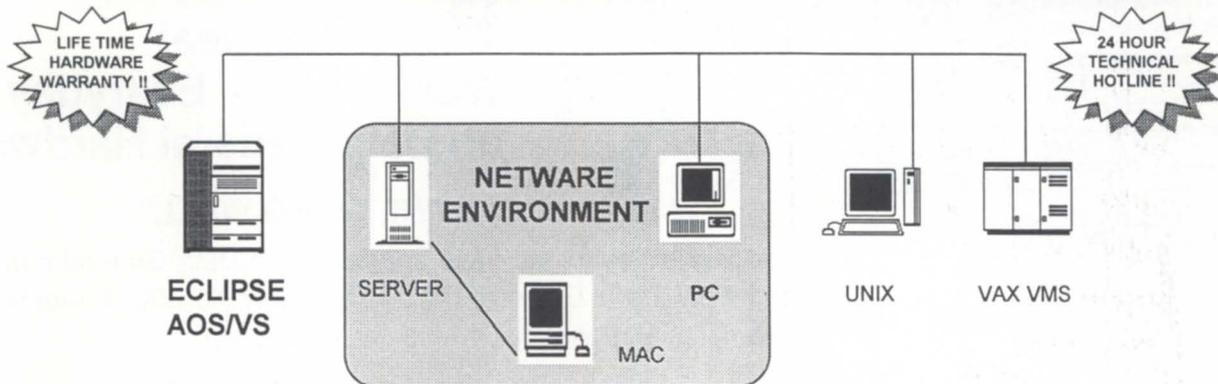
Next month I'll wrap up the first pass at this thing and we'll end up with a working WFMOVE that already outperforms either of CLI's MOVE commands.

Then we'll get on with the business of pulling away as if the CLI's were chained to fenceposts.

Stay tuned.

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Tweaking and twiddling

SYNOPSIS

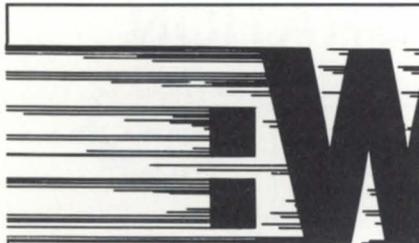
With a little experimenting, you can customize the X-Windows environment to your liking.

by Joe Cannata
Special to Focus

A product like X-Windows is complex enough to be someone's full-time career. It has many facets, and for the newcomer it can be a confusing array of concepts, options, and terminology. Even for someone who's worked with X-Windows, there are many discoveries

yet to be made. Customizing, tweaking, and twiddling can be frustrating at times, but it can also be educational and fun.

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In order to customize an X-Windows environment, it is necessary to be aware of the cast of characters involved. Tailoring can be done systemwide, or at the individual level. Typically, individual customization begins with a file in the user's home directory called *.Xdefaults*. This file contains elements called resources, which dictate the behavior of specified applications running in X-Windows. The following lines offer an example of a typical *.Xdefaults* entry for an application/client running under X:

```
/* xclock */
Xclock*geometry: 150x150
Xclock*foreground: black
Xclock*background: pink
Xclock*hands: white
Xclock*chime:false
```

The above items are called resources. They are modifying the way the *xclock* client (application) runs. *Xclock* is a program that displays a clock in a window. It is one of the 50-plus standard client

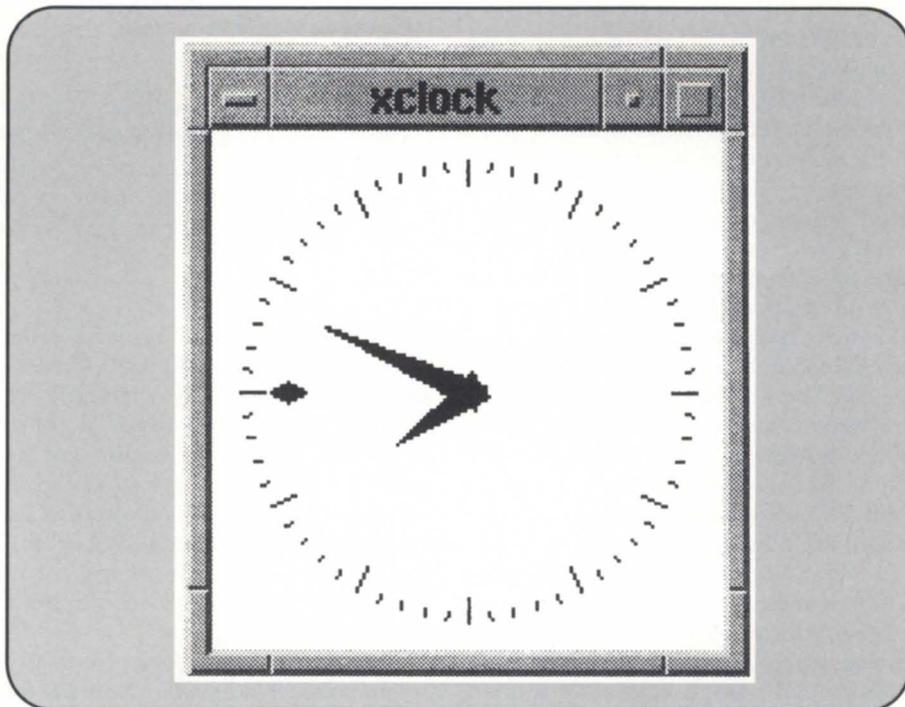


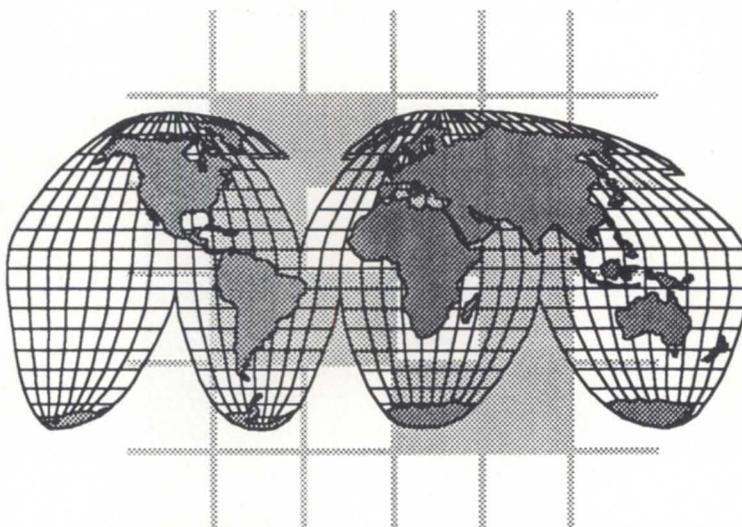
Figure 1: A sample xclock in a window



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programs that come in the standard X release from MIT. Figure 1 shows a sample *xclock* in a window.

The first part of each resource, "Xclock", refers to the application. The " * " represents the hierarchy or structure of the GUI (graphical user interface) programming objects. Pre-5.4.2 X-Windows used the standard MIT Athena widget set, one of two subroutine libraries designed to simplify X-Windows application development. It is the X Toolkit that provides the GUI, not X itself. The Athena widget set provides a standard "look and feel" to X applications. Starting in 5.4.2, X11R5 and the Open Software Foundation's (OSF) Motif 1.2 were bundled in. This introduced an additional widget set, *motif*.

Now, back to the point at hand. The "geometry" in this example is one of the resource classes. It dictates the dimensions in pixels of the clock. The "foreground" specifies the color of the foreground, and in the case of the clock, that would be the markings on the clock

Figure 2: Motif resources

xlogin.Login.Motif.greetColor:	## color of the "Welcome" message
xlogin.Login.Motif.promptColor:	## color of the login prompts
xlogin.Login.Motif.failColor:	## color of the "Login incorrect" message
xlogin.Login.Motif.foreground:	## color of the user-typed text
xlogin.Login.Motif.background:	## color of the xdm box background

face. The "background" resource is the color of the area beneath the tick marks and hands. The "hands" obviously are the color of the clock's hands. A list of all of the valid color names can be found in a file called *rgb.txt* found in */usr/lib/X11*. The last resource is an example of a Boolean, expecting either a true or false response. Being set to "false" means the clock won't chime (beep) on the half-hour.

So far, we've seen that any resources entered into the *.Xdefaults* for a client will individually customize the way in which a client runs. Suppose

you want blue hands, or no chime, or you want to see a second hand? You could change the *.Xdefaults* file each time, or you could specify at runtime an override of your custom defaults on the command line. A sample command line to invoke the clock with blue hands, a second hand updating every second, and a half-hourly chime is:

```
xclock -hd blue -update 1 -chime&
```

The "&" means to spin off the new process in the background. To find out all the possible resources or command-

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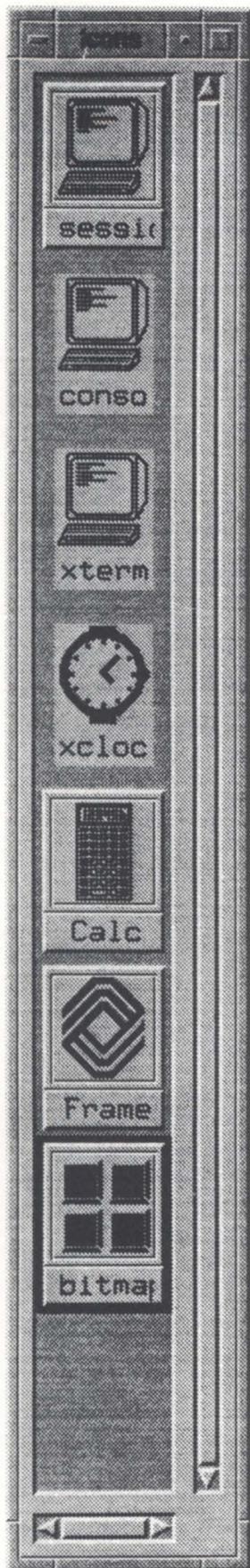


Figure 3: An icon box—a window whose sole purpose is to hold icons

line options, do a *man xclock*. Anything that is not in the man pages can be found in an excellent resource on X-Windows, the *X-Window System User's Guide OSF/Motif Edition*, by Valerie Querica and Tim O'Reilly. The Data General part number for ordering through TIPS is 069-100229.

As of January 4, 1993, "-02" was the latest rev in print, but a "-03" reflecting X11R5/Motif 1.2 is in progress and may be available when you read this.

There are other ways to make changes to the clock resources dynamically, like using *xrdb* on the command line, or invoking the clock through the Motif root window. In the spirit of keeping this as simple as possible, *xrdb* and the Motif root window will be left for a future article.

Icons, those strange, symbolic, dehydrated forms of an application you find on your screen, may be manipulated to your liking. The purpose of an icon is to reduce the real estate consumed by a windowed application, when not needed at present. Organizing your screen is like organizing a desktop. For some people, organization is not in their vocabulary. The rest, however, want to have several applications running, but then they start getting window overlap. At this point windows get buried under other windows, making them harder to find. "Iconifying," or minimizing, an application permits the user to gain back valuable desktop space, while leaving the application running. All you do is double-click the icon to restore the window to its original size and location.

Icon behavior is controlled by the Motif window manager, and altered using resources in your *.Xdefaults* file. Typically when you iconify an application, the icon appears by default in the lower-left-hand corner of the root window. An option available to you is to have what's called an icon box, a window whose sole purpose is to hold icons. Figure 2 shows an example of one. To make use of an icon box, all you need to add to the *.Xdefaults* file are these 2 lines:

```
Mwm*uselconBox: true
Mwm*iconBoxGeometry: 1x8
```

That will enable the icon box and set it



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up to show 1 column of 8 icons. More than 8 icons may be accommodated, but then the scroll bar on the bottom must be used.

Note the icon for *xclock*, and the one for the calculator. The icon for *xclock* is missing a frame, indicating that this application window is open, where the icon for *xcalc* has the frame, indicating this application has been iconified. Note that the icon pattern varies. The standard default pattern would be the last one, the 4 squares on the bitmap icon. *Bitmap* is a client that allows you to create bitmap patterns, or in other words simple pixel drawings. The icons for *xclock*, *xcalc*, and *Framemaker* have the icon bitmap patterns predetermined. The top three icons in the icon box have customized bitmaps. Bitmap patterns that ship with your system are found in `/usr/include/X11/bitmaps`. You can create your own as well. To invoke one of the customized bitmaps for an *xterm* (terminal window) icon, to possibly add some foreground/background coloring and to set the size over the 60x60 default, add these lines to your *.Xdefaults* file:

```
Mwm*icon*background: MidnightBlue
Mwm*icon*foreground: SkyBlue
Mwm*iconImageMaximum: 40x40
Mwm*xterm*iconImage:
    /usr/include/X11/bitmaps/terminal
```

You now have more control over your display.

Many sites use *xdm*, the X display manager, to start X automatically and to keep it running. It displays a user and password prompt, and validates login. The default display is a light-blue box about 3 x 5 inches on a darker gray background. The default greeting is "AViiON - DG/UX 5.4.2" or whatever rev of DG/UX is in use. The whole *xdm* display, login box, and background can be changed to make it more appealing.

To alter the *xdm* login box, the first place to start is the resource file for *xdm*. The file is *Xresources*, found in `/usr/lib/X11/xdm`. This directory contains all of *xdm*'s configuration files. The resource,

```
"xlogin.Login.greeting: AViiON - DG/UX
  USERNAME_RELEASE "
```

should be edited to read whatever you want your greeting to say. Ours in Atlanta looks like this:

```
xlogin.Login.greeting: Welcome to the
  Atlanta Education Center.
```

To confuse the issue, you need to be aware of two sets of resources in the file. Depending upon whether or not you're using the Athena or Motif widget set, the resources you need to edit will change. If the first two lines of *Xresources* look like this:

```
xlogin.lookAndFeelEnable: true
xlogin.lookAndFeel: motif
```

to change coloring and location, for example, you will edit the resources that contain "Motif". You are using the Motif widget set if the "look and feel" is set to Motif. The resources you might want to change are listed in Figure 2 (page 28).

To control the placement of the *xdm* login box, edit the geometry resource. Sizes are in pixels, and location is based on the standard offsets:

```
+0+0 Upper-left corner
+0-0 Lower-left corner
-0+0 Upper-right corner
-0-0 Lower-right corner
```

The following is an example of one with size and location specified:

```
xlogin.geometry: 700x300+310+0
```

That places the login box at the top center of the display. The length had to be extended to accommodate the long "Welcome to the Atlanta . . ." message. It took some trial and error to establish it.

I decided to carry this one step further. In 5.4 it was possible to set the background of the *xdm* root window to a solid color, or a bitmap pattern using the *xsetroot* client. If it worked for *xsetroot*, I wondered if one of the popular *gif* files that float around could be used. There is a client on the Contrib Tape called *xloadimage* that is used to display a *gif*, bitmap, or other formats on the root window. I was able to make it work. In 5.4.2, the method has changed.

I found on a local bulletin board,

Continued on page 39

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SYNOPSIS

The Fiber Distributed Data Interface (FDDI) offers improvements in high-speed data transfer for tomorrow's networks.

by Dr. Katherine Jones
Special to Focus

Do you have any of these requirements in your network today?:

- High-speed data transfer
- High reliability
- Security against taps on the network
- Longer distance for local area networks (LANs)

The solution: the fiber distributed data interface, otherwise known as FDDI. Developed by the American National Standards Institute (ANSI), FDDI is a communications standard for increased speed, bandwidth, and high availability that incorporates improvements in network availability and management over current ethernet (IEEE 802.3) and token ring (IEEE 802.5) technologies.

FDDI is a token passing, counter-rotating, dual-ring network. This means that FDDI users access the network when their computers receive a "token," which traverses that network in an orderly fashion. There are two rings: one on which the token goes clockwise; and the other ring, usually reserved for backup, on which the token moves counterclockwise. In the event of a problem, the rings will reconfigure to bypass a fiber disconnect or a bad node. The FDDI standard also allows for single-ring configurations. Dual rings are used for redundant back-

bones, and lower-cost single rings are used for workstations.

FDDI is the ANSI X3T9.5 standard covering layers 1 (physical) and 2 (link) of the Open Systems Interconnection Reference Model, designed by the International Organization for Standardization (ISO) to discuss data communications.

When is FDDI the right choice?

There are currently two primary environments for FDDI: 1) those where LANs are attached to the fiber backbone; and 2) those where hosts are directly attached to the fiber network. In the corporate or campus network where FDDI over fiber is installed as a backbone, LANs are then attached to that common spine on which inter-LAN communications and data transfer takes place. Secondly, however, there are environments in which users want their desktop workstations or computers directly attached to the FDDI network.

Directly attached end nodes and the LAN-attached backbone networks solve two very different problems. The

campus or corporatewide backbone solves the problem of traffic congestion on the LAN, while the requirement for directly attached hosts addresses the need for high-speed and greater bandwidth directly to the host.

Today the primary use of FDDI is to provide those fast backbone networks to which other LANs are attached. In these environments, ethernet-to-FDDI and token-ring-to-FDDI bridges are important as they attach systems to corporate FDDI backbones.

Growing, however, is the population of computers with FDDI adaptors that allow them to be directly attached to the high-speed network. By mid-1993, more and more users will require that servers and workstations provide higher speeds, and that networks provide greater bandwidth than that provided by ethernet or token ring. Users interested in FDDI will be attempting to achieve one or both of the following goals:

- 1) To relieve congestion on the LAN—where existing ethernet or token ring LANs do not have the aggregate speed or efficiency to handle overall network traffic.
- 2) To achieve high-speed I/O to specific hosts—where it is necessary for workstations to send or retrieve large amounts of data at high speeds from

Figure 1: Summary of FDDI advantages

FDDI feature	Benefit to users
Token access method	<ul style="list-style-type: none"> • No collisions • Supports larger network • Better utilization of bandwidth
Dual ring topology	<ul style="list-style-type: none"> • Higher availability/fault tolerance • Enhanced network mgmt. • Fault isolation • Larger network size
High data rate	<ul style="list-style-type: none"> • High density backbone support • Provides interconnection of lower speed LANs • High performance and high user count
OSI/IEEE compliance	<ul style="list-style-type: none"> • Works with current and future standard networks • Maps into other IEEE 802.x networks

particular servers. Currently, this requirement is more likely to be seen in real time or engineering environments. But as office applications develop, they will require FDDI bandwidth as well.

In the near future, the support of multiple media types will become widespread and, perhaps most influentially, will decrease costs. Concurrently, bandwidth-intensive applications will become more common, driving more and more users to demand high-speed throughput directly into large data base servers and graphical workstations. Network traffic characteristics of today's diskless workstations will be the model of these "network-intensive" applications. Tomorrow's networks are expected to support up to twice the number of workstations and servers as today's networks.

Specifically, several trends will foster the growth and interest in FDDI: image processing, in which huge files are handled across the network and

many cross-network requests are made (such as in health care and GIS environments); advances in desktop devices, where workstations are optimized for I/O and will saturate traditional ethernet and token ring LANs; and client/server computing, in which numerous requests between clients and server across the LAN will require greater bandwidth.

Comparing FDDI to ethernet and token ring LANs

The major advantages of FDDI over current ethernet or token ring technologies are as follows:

- *Wire speed*—100 Mbit/sec transmission rate using a 125 MHz signaling rate and a 5-bit/4-bit encoding scheme.
- *Distance*—2 kilometers (1.24 miles) between nodes, up to a maximum of 200 kilometers (124 miles). The distance between nodes also can be extended up to 30 km using single mode fiber.
- *Security* (on fiber media)—It is virtual-

ly impossible to tap the media without detection.

• *Reliability*—Network-based fault tolerance is accommodated through the use of dual rings and/or FDDI concentrators. If a break occurs in the primary ring, the LAN will automatically "wrap" with the secondary ring, thus keeping the network alive. It is important to note that if there are two or more wraps, the LAN will become segmented.

Two other notable features on fiber media are noise immunity and electrical safety. Fiber-optic cable is immune to electromagnetic interference. This is important in electrically noisy industrial environments (like auto plants or military installations). In addition, optical fiber will not shock a worker who accidentally cuts or comes in contact with an unterminated cable.

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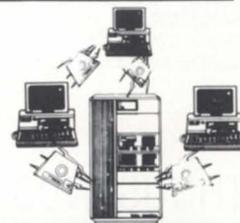
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FDDI controller (the VFC), which allows Avion systems to communicate over fiber-optic networks through a standard protocol called FDDI. The VFC is a RISC-based, high-performance node processor for high-speed, fiber-optic Fiber Distributed Data Interface networks (FDDI).

FDDI is a communications standard that incorporates advanced improvements in speed, availability, and management through a token passing, counter-rotating, dual-ring network.

The VFC allows Avion servers and the Avion 530 workstation to connect directly to the fiber network, or to connect to concentrators that themselves are attached to the FDDI ring. The VFC supports all Data General VME block mode systems.

An option to FDDI customers is the Optical Bypass Switch, a device that allows the electrical signal to circumvent a disabled host on the FDDI ring. This switch bypasses an Avion con-

Figure 2: Comparison of FDDI to ethernet and token LANs

FDDI	Ethernet	Token Ring
Line speed: 100 Mb/sec	10 Mb/sec	4 or 16 Mb/sec
Access method: Token access	Collision (CSMA/CD)	Token access
Management: Active distributed mgmt.	Passive monitoring	Passive monitoring
Distance: 100 km 2 km between nodes	500 meters (thick) 200 meters (thin) (without repeaters)	200 meters between MAUs; 260 node max. (Depends on LAN speed and cable type)
Relatively costly	Price varies with thick or thin E-net cabling	Not too expensive

(Note: Fiber costs are decreasing)

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Figure 3: ANSI and ISO standards for FDDI

ANSI/ISO Standard	FDDI Standard
X3.166-1990/ISO 9314-3:1990	Physical Layer Medium Dependent: PMD defines the transmit/receive power levels, optical transmitter and receiver interface requirements, error rates, and cable and connection specifications.
X3.148-1998/ISO 9314-1:1989	Physical Layer Protocol: PHY defines symbols, line states, encoding & decoding techniques, clocking requirements, and data framing requirements.
X3.139-1987/ISO 9314-2:1989	Media Access Control: MAC defines data link addressing, frame formatting and checking, access to the media, error detection, and token handling.
X3T9.5/84-49	Station Management: SMT includes facilities for connection management, node configuration, recovery from errors, and the encoding of SMT frames.

ected to it that is not accessible, and forwards the token to the next attached host or concentrator.

FDDI concentrators, bridges, routers, hubs, and cabling are available through Network Services.

Summary

The fiber distributed data interface is a protocol of growing importance and influence in today's data communications environments. The increasing market recognition of the need for the high reliability, speed, and security provided by FDDI is demonstrated by the number of backbone networks installed today and the interest of business, industry, and large educational institutions in this protocol. △

Dr. Katherine Jones is Senior Product Marketing Manager, Network Management and Communications, with Data General Corporation.

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The latest products for DG systems

Server-to-server

Westboro—Data General and ISOCOR announced a strategic alliance under which ISOCOR will market an asynchronous server-to-server X.400 electronic messaging solution for users of DG's Aviiion family of Unix-based servers. Based on ISOCOR's X.400 Lite technology, the system is the industry's first commercially available dial-up X.400 offering for the high-performance Unix platform.

The new ISOCOR solution for Aviiion features an asynchronous software module called ISOBRIDGE, that alleviates the need for more costly X.25 connections that previous X.400 servers required. ISOBRIDGE routes X.400 messages over dial-up lines using the

asynchronous X.400 Lite protocol. ISOBRIDGE connects to the Data General X.400 MTA via X.25 over a synchronous connection or ISO TP4 running over ethernet.

The X.400 Lite protocol will eventually be replaced by the asynchronous protocol specification (APS) being developed by the APS Alliance, once the new protocol is fully standardized. Data General and ISOCOR plan to provide APS-compatible upgrades once the new software becomes available.

ISOBRIDGE is priced at \$995. It requires a DOS PC/AT or 80x86 PC with 640 KB memory, and either an Eicon Synchronous adapter card or an ethernet 802.3 adapter card.

ISOCOR is a California corporation with operating centers in Los Angeles,

Dublin, and Paris.

Data General Corporation, 3400 Computer Drive, Westboro, MA 01580; 508/898-4056.

Circle 50 on reader service card.

Pereline 3.2

Campbell, CA—Pereline Data Systems, Inc., announced Pereline 3.2, the new version of its communications software package that allows users to connect personal computers to other computer or host systems like Data General CEO and Unix.

The autostart/background Zmodem file-transfer protocol includes advanced Zmodem features:

- Crash recovery—automatically recovers from previously aborted file transfers and picks up where it left off.
- Send only new files—offers the option of sending only files that are newer than files you already have on your local system.
- Send entire directory structure—can send all the files in a directory and any subdirectories.
- Append to existing files—useful for downloading record-oriented table information where you want only to add the new information.
- Protect existing files—automatically skips files that exist on the receiver's system, regardless of size of date.

Pereline 3.2 is priced at \$89.95, with a limited-time upgrade available at a lower price.

Pereline Data Systems, Inc., 750 Camden Avenue, Suite B, Campbell, CA 95008.

Circle 52 on reader service card.

C++ class library interface

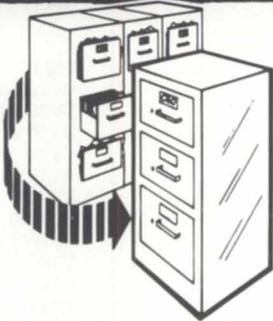
Corvallis, OR—Rogue Wave Software, Inc., has acquired all interests in a C++ class library interface to relational data bases. The product, marketed previously in Europe as Commonbase by

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Glockenspiel (now Computer Associates) and in the United States as Commonbase through Imagesoft. The product is also marketed by the Qualix Group as db++.

Rogue Wave will maintain marketing and distribution relationships for the product with Qualix, Imagesoft, and Computer Associates. the product's new name will be DB.h++.

By using C++ libraries, programmers can develop applications faster and with fewer bugs. C++ makes code reuse a reality. DB.h++ facilitates the use of object-oriented programming techniques in accessing data from multiple data bases, including those from Oracle, Sybase, Informix, and others.

Rogue Wave will be responsible for all support and enhancements to the product. Planned enhancements to DB.h++ include selected use of components from the industry standard Tools.h++, support for internationalization, distributed data base functional-

ty, and more diagnostic tools.

Rogue Wave Software, Inc., P.O. Box 2328, Corvallis, OR 97333; 503/754-3010.

Circle 54 on reader service card.

Entry level image processing



Atlanta, GA—Erdas•Vista enables GIS analysts on a budget to access the visualization and production environment of Erdas Imagine at a lower cost (\$3,000).

A file manager utility changes or updates image statistics and map information. It also enables importing and exporting Erdas 7.5 files and TIFF image files.

Erdas, Inc., 2801 Buford Highway, NE, Suite 300, Atlanta, GA 30329-2137; 404/248-9000.

Circle 51 on reader service card.

Hydrology module



Atlanta, GA—Plus III Software, Inc., announced release of its new Hydrology Module, a storm water detention application running with the existing Terramodel software system.

The new module allows users to explore and understand how water interacts with existing terrain or a proposed design. Users can determine the changing slopes of a DTM (digital terrain model), drainage areas of a DTM, slope from one point on the ground to another, volumes of a pond, and areas of a design.

The Hydrology Module is available with the release of Terramodel 8.1 and is priced at \$1,595 (DOS) and \$1,995 (Unix.)

Plus III Software, Inc., One Dunwoody Park, Suite 250, Atlanta, GA 30338; 800/235-4972.

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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:
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DASH bulletin board (2400 bps modem) **800/DASH-CSC**
Data General Customer Support Center **800/344-3577**

FOCUS Magazine

512/335-2286

Editorial comments, article suggestions Doug Johnson
(please send product announcements to the address listed above)

Information about advertising Susan de Blanc

FOCUS back issues Turnkey Publishing staff

Continued from page 31

from my PC at home, a Microsoft Windows BMP file that was a picture of the Atlanta skyline. After running several different virus checkers, I converted it to a gif format using a software package I have. Once transferred to the Aviiion, I was able to use it for our xdm logon screen here at the Education Center.

The file "Xsetup_0 in /usr/lib/X11/xdm" had to be edited, in order to get the xloadimage client to display the picture. I moved a copy of xloadimage to "/usr/lib/X11/xdm", and the "atlanta.gif" file in as well. The "Xsetup_0" file I edited looks like this now:

```
#!/bin/sh
if xdpinfo | grep 'class: .*Color' >
/dev/null
then
/usr/lib/X11/xdm/xloadimage -zoom 85 -
onroot -center -border steelblue
/usr/lib/X11/xdm/atlanta.gif
fi
```

The command line was long, so it wraps around. The "-zoom 85" scales the picture down so it is about postcard size. The "-onroot" causes the gif file to be displayed on the root window. The "-center" centers the picture on the screen. Using a "-border steelblue", which matches our xdm login screen background color, it looks like our xdm screen is part of the large, thick border, an illusion created by the reducing of the gif file. The net result is an attractive display. The one drawback is that it does take a bit longer to display the xdm screen now, because of the gif file. Workstations with smaller memory configurations might experience a longer delay.

By editing some of the resource files, you can tailor your X clients to your liking. A product of exploration is learning, and by experimenting, you'll learn more about X and Motif. By the way, for those interested, Ed Services offers a 1-day class on X-Windows, S006. Δ

Joseph Cannata is a systems training specialist, Educational Services, with Data General Corporation. He may be reached at the Atlanta Education Center, 4170 Ashford Dunwoody Rd., Suite 300, Atlanta, GA 30319; 404/705-2562.

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DASH Items...

Category: Announcements

Author: DASH Administration

Subject: **RFE answers now in DASH**

Now available: A list of all requests for enhancement (RFE) closed in the previous month will be published in the NADGUG Bulletin Board in DASH. You may use the number in the STR (software trouble report) lookup to find out how RFEs were closed. This is so you folks who help us in prioritizing RFEs can see their eventual resolutions. Please send comments on the new process to Bryan Scoggins, Manager Software Support.

Category: DG/UX

Author: DASH Administration

Subject: **Building a new DG/UX kernel using Auto Configure**

If you select "Auto Configure" when building a new DG/UX kernel, you must be aware that this will overwrite the system file. This means that any customization you may have done will be lost. This becomes an issue if you are installing a patch kit that requires *diskman* to be booted. This will in turn boot the "install" program, which allows you to build a new kernel, but it assumes you are going to do an "Auto Configuration." When this is done, the system file will be overwritten. Consult the "Managing the DG/UX System" manual for further discussion. It is highly recommended that before installing patches and/or rebuilding the kernel, you first make a backup of at least the system file. This will allow you to utilize your previous system settings.

Category: DG/UX

Author: Ned Sheppard

Subject: **Print problems w/bbx and 5.4.1**

We currently run an in-house application written in *bbx* and have had very little trouble with our Aviiion 5225 and the application since we started last June. Recently, we are having quite a few printer problems—as in the reports just disappear. They appear to calculate, etc., at the terminal, but never get to the printer. If you check the print requests *sysadm* shows no requests. We are using TI Microlasers and Okidata 2410 printers. Any ideas or suggestions?

Reply by: John Flynn

I don't know if this will help, but when that happens to me, it's because there's not enough room in the root file system (or, if *var* is a separate file system, I'd look there instead). If it is \geq 90-percent filled, I lose printouts, and sometimes even printers disappear! Find the size of the file system with 'sysadm diskuse'.

Reply by: Ned Sheppard

Thanks, John. It turns out that it was a problem with root being too full. I did not think that this was the problem, since if I checked the size of root from *sysadm*, it showed that it was 85-percent full. When I used the "df -k /" command it showed that from a user's perspective, root was in fact 99 percent full. Apparently, the system won't give users full access to all the space in a file system. It saves some space for super-users only. I zeroed out some of the large log files using "cat /dev/null > filename" and everything seems to be fine.

It was also suggested that I could create a logical disk mounted on "/var/spool/lp/tmp" for use by the spooler only, so the size of other logical disks would not interfere with the spooler.

Category: Languages

Author: Nelsa Mullen

Subject: **Micro Focus Cobol 1.2 compile**

When compiling the demo program "pi.cbl" (or any other program), I receive the error, "cob: bad magic num-

ber." What does this mean? How can I fix it? How can I find out about it?

Reply by: DG Customer Support

I assume you are running DG/UX 5.4.x. MFCobol 1.2 is COFF-based. Starting in DG/UX 5.4, the default software development environment is ELF-based. (COFF and ELF are basically just different standards for building object files.) You need to set an environment variable. From the Bourne shell, "TARGET_BINARY_INTERFACE=m88kdgu xcoff;" export "TARGET_BINARY_INTERFACE". This tells DG/UX you want to compile/link in a COFF environment. Issue a "man sde" for a more detailed explanation. Be aware that MFCobol 1.3 is ELF-based. So when you install the latest MFCobol, you do not want to set the TARGET_BINARY_INTERFACE variable.

Author: Dave Williams

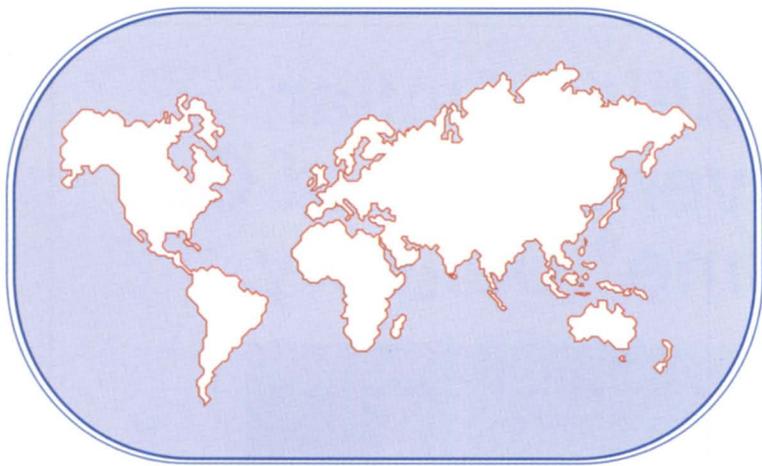
Subject: **Accessing AC0 in C**

I have an Assembler module that I want to call from a C program. The module stores a value in AC0 before returning to the C program. Is there a way I can access the accumulator from the C program once I have returned from the Assembler module?

Reply by: DASH Development

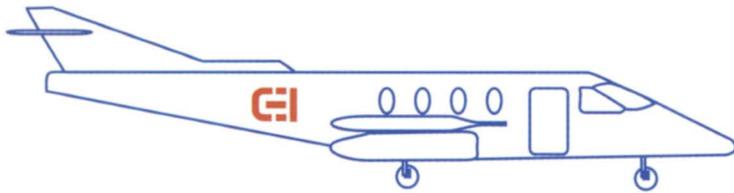
If the module stores the return value in AC0, then it's lost when the return block is pop'ed. If it stores it in the frame AC0 (FAC0), then it's the standard C return sequence, and you can retrieve the value as you would with any C function: declare the module type (int, char *, whatever), and assign the function name to a variable. (x = Assembler_Module();). Δ

DASH runs on an Aviiion 5200 server located at the Customer Support Center in Norcross, GA. The bulletin board is available 24 hours per day, 7 days per week, free of charge. Call 1-800-DASH-CSC (800/327-4272) for the modem rotary.



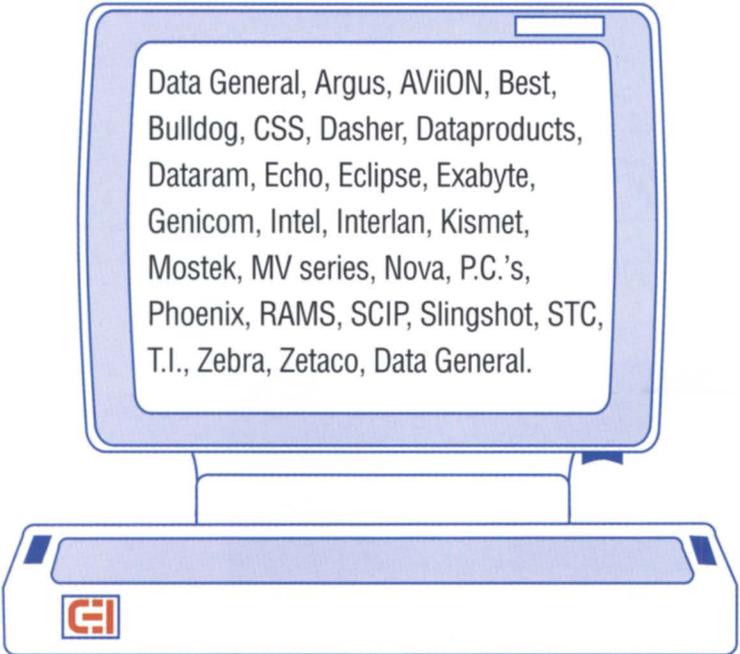
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